STATE BOARD OF EDUCATION SPECIAL MEETING
November 3, 2011
Office of the State Board of Education
Len B. Jordan Building
650 W State Street, 3rd Floor
Boise, Idaho

Teleconference Number: (877) 807-5706
Public Participant Code: 996241

Thursday, November 3, 2011, 2:00 p.m. (Mountain Time)

INSTRUCTION, RESEARCH & STUDENT AFFAIRS

1. Boise State University – Doctorate Program – Ph.D. in Bimolecular Sciences

PLANNING, POLICY & GOVERNMENTAL AFFAIRS

1. Pending Rule – Docket 08-0104-1101 – Residency Classification
2. Pending Rule – Docket 08-0109-1101 – GEAR UP Idaho Scholarship
3. Pending Rule – Docket 08-0111-1102 – Registration of Post-Secondary Educational Institutions and Proprietary Schools
4. Pending Rule – Docket 08-0114-1101 – Idaho Rural Physician Incentive Program
5. Pending Rule – Docket 08-0203-1102 – On-line Course Graduation Requirement

STATE DEPARTMENT OF EDUCATION

1. Pending Rule – Docket 08-0201-1101 – Open Negotiations
2. Pending Rule – Docket 08-0202-1101 – SISBO Manual
3. Pending Rule – Docket 08-0202-1102 – Accreditation
4. Pending Rule – Docket 08-0202-1103 – Endorsements
5. Pending Rule – Docket 08-0202-1104 – Interim Certificate
6. Pending Rule – Docket 08-0202-1105 – Official Vehicle of Approval
7. Pending Rule – Docket 08-0202-1106 – Teacher Evaluation
8. Pending Rule – Docket 08-0203-1101 – ISAT-ALT
9. Pending Rule – Docket 08-0203-1103 – Assessment
10. Pending Rule – Docket 08-0203-1104 – Dual Credit, College Entrance Exam

BUSINESS AFFAIRS & HUMAN RESOURCES

1. Boise State University – Athletic Conference Discussion

While the Board attempts to address items in the listed order, some items may be addressed by the Board prior to or after the order listed.

STATE BOARD OF EDUCATION
650 W. State Street • P. O. Box 83720 • Boise, ID 83720-0037
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BOISE STATE UNIVERSITY

SUBJECT

Approval of Full Proposal to offer a New Doctorate Program - Doctor of Philosophy (Ph.D.) in Biomolecular Sciences

APPLICABLE STATUTE, RULE, OR POLICY

Idaho State Board of Education Governing Policies & Procedures, Section III.G.4. and 5.

BACKGROUND/DISCUSSION

Boise State University is proposing a new interdisciplinary doctoral program in Biomolecular Sciences. The proposed program will be offered cooperatively by three departments in the College of Arts and Sciences, Biological Sciences, Chemistry and Biochemistry, and Physics.

Faculty members in those departments have built the solid foundation of external funding necessary for highly successful doctoral science programs, having been awarded more than $26 million in the previous five years. The proposed program builds on the experience of these departments of delivering and/or participating in thesis-based master's programs in biology, chemistry, and materials science and engineering. The program will include participation from faculty members in several other departments Materials Science & Engineering, Mechanical & Biomedical Engineering, Computer Science, and Kinesiology) as well as participation by researchers at off-campus organizations (such as the Department of Veterans Affairs Medical Center, the Mountain States Tumor and Medical Research Institute, and the Idaho Bureau of Laboratories.

Although there are similar programs at the University of Idaho and Idaho State University, the proposed program is unique in Idaho, explicitly integrating the physical sciences into the biological sciences to create a cross-disciplinary degree. Per the Board's process for Ph.D. program consideration, an external review of the proposal was conducted. The review team was comprised of Dr. Lee Weber (Emeritus Faculty member University of Nevada, Reno), Dr. Sebastian Wachsmann-Hogiu (Facility Director of the NSF Science and Technology Center and Associate Professor of Pathology at UC Davis), and Dr. Judith Van Houten (University Distinguished Professor at the University of Vermont and Director of Vermont INBRE).

The proposed program will facilitate continued collaboration among Idaho's three universities. It builds upon the highly successful statewide IDEA Network for Biomedical Research Excellence (INBRE) program, which has brought more than $44 million in federal funding to Idaho to build infrastructure for National Institute of Health (NIH)-fundable research through a collaborative effort among postsecondary institutions of Idaho.

A principal aim of INBRE is to improve the overall research productivity and grant competitiveness of states such as Idaho that have been less successful in receiving federal grants from NIH. The creation of the Ph.D. program at BSU as a stated deliverable of the Idaho INBRE program was specifically lauded by the NIH reviewers because it will broaden the range of grant opportunities to BSU, enhance collaboration between institutions, and impact Idaho's ability to compete for NIH funding. One specific example of broadening opportunities is training grants funded through the NIH Center for Biomedical Research Excellence (COBRE) program, which run in the millions of dollars but require that participating institutions grant Ph.D. degrees.

The proposed program will also increase opportunities for the sharing of coursework and faculty expertise among institutions. With a Ph.D. program at Boise, existing and future collaborations on research grants will be enhanced by the sharing of membership on graduate committees across institutions, and by the sharing of doctoral-level courses and seminars via distance delivery.

The proposed program will provide substantial economic and societal benefit to the region, the state, and the nation. Faculty and students in the program will address a wide range of biomedical research topics at the molecular level in areas that include cancer biology, immune disorders, neuropathology, molecular toxicology, regenerative medicine, antibiotic development, vaccine development, chemotherapy development, and nanomedicine. Molecular-level research at Boise State will aid in the understanding and treatment of diseases such as breast cancer, leukemia, osteoarthritis, Alzheimer's and Parkinson's disease, asthma, cholera, West Nile Virus, and drug resistant bacterial infection. Besides the direct benefits of discoveries resulting from that work, there will be substantial potential for collaboration with the area's biomedical entities. Letters of support were provided by St. Luke's Health System, St. Alphonsus Medical System, the Department of Veterans Affairs Medical Center, St. Luke's Mountain States Tumor and Medical Research Institute, and the Idaho Bureau of Laboratories.

Additionally, research in the proposed program will support the development of Idaho's biotechnology industry. For example, present projects involve development of potentially-patentable materials such as artificial cartilage, biofuels, new chemotherapeutic drugs, nano-based approaches for the treatment of cancer, and biosensors for detection of pathogens. In addition, the program will provide educational opportunities not currently available in the area, and thereby strengthen our workforce and make the area more attractive to businesses that may consider locating here. Letters of support were provided by several local biotechnology companies: Sapidyne Instruments, Inc.; Syngenta Seeds, Inc.; O.D.260, Inc; Episciences, Inc.; and Boise Technology, Inc. Additionally, letters of support were provided by the Idaho Department of Agriculture and the Center for Advanced Energy Studies at INL.

BSU has made substantial investments in preparing for the proposed program. More than $10 million has been invested in the development of facilities that support biomolecular research. An NIH grant for $4 million is funding the creation of an animal facility. Nine faculty hires have been targeted in the biomolecular sciences in recent years, and the university has set aside funds to the hire two additional faculty members and five new graduate assistantships.

The results of the external review of the program were very positive. The executive summary of their report reads as follows (emphasis added); the entire report and BSU's response is attached to the full proposal.

"The review team was extremely impressed with the quality of research and graduate education and the remarkable level of extramural funding of the faculty engaged in biomolecular research whom we met at Boise State University. Most remarkable is that these achievements were accomplished with only a MSc program. ***A new level of research accomplishments can be reached with the implementation of an interdisciplinary PhD graduate program. It will foster the kind of collaborative research that is favored by federal and other agencies and produce uniquely trained students to satisfy the needs of a growing biotech and medical community in Idaho.***

The administrative and ***community support for this program is very evident****. It will build upon the INBRE investments in the state to enhance the network of investigators and institutions.* ***This proposed program does not duplicate programs elsewhere in the state and will present opportunities for investigators in the entire state system to participate in this collaborative, interdisciplinary research with PhD students****.*

Our recommendation is that this program be implemented immediately*."*

IMPACT

The University of Idaho was the lead on both INBRE grants and had to approve Boise State's action plan, which included the development of a biomolecular Ph.D. as a deliverable, with a focus on building a particular strength in protein structure function. The University of Idaho INBRE office has written several letters of support for the Ph.D. program. With regard to the current programs at the University of Idaho, they have expressed concerns that there is an overlap in on-going research in the areas of Biochemistry, Bioinformatics, Cell Biology, Developmental Biology, Vaccine Development, Protein Structure Function, Plant Molecular Cell Biology, Immunology, Neuroscience, Molecular Genetics, Microbiology, Nanomaterials, Biophysics.

With regard to the current programs at Idaho State University, they initially felt there was significant overlap in the research areas of Biochemistry, Cancer Biology, Developmental Biology, Immunology, Neuroscience, Molecular Genetics, Microbiology, and Plant M olecular Cell Biology. However, after

receiving additional information, Idaho State while maintaining concerns for the sustainability of three programs, wrote a letter of support that was read aloud at the September 2011 CAAP meeting.

There is likely overlap in the programs between the University of Idaho and Idaho State University. The University of Idaho expressed concerns regarding the duplication in Idaho State University's Ph.D. in Microbiology that was approved by the Board in April 2010.

The current degree program offerings at the University of Idaho are:

1) Ph.D. in Bioinformatics and Computational Biology *(approved by the Board January 2003)*
2) Ph.D. in Biology – which is a broad Ph.D. covering all areas of Biological Sciences *(no records for when program was approved by the Board, likely took place prior to 2001 when Board office began its tracking system)*
3) Ph.D. in Microbiology, Molecular Biology and Biochemistry – which includes Microbiology, Molecular Biology, Cell Biology, Developmental Biology, Biochemistry *(no records for when program was approved by the Board, likely took place prior to 2001 when Board office began its tracking system)*

The current degree program offerings at Idaho State University are:

1) Ph.D. in Biology – which is a broad Ph.D. potentially covering all areas of the Biological Sciences *(no records for when program was approved by the Board, likely took place prior to 2001 when Board office began its tracking system)*
2) Ph.D. in Pharmaceutical Sciences – which includes Pharmacology, Pharmaceutics, Drug Discovery and Development *(no records for when program was approved by Board, likely took place prior to 2001 when Board office began its tracking system)*
3) Ph.D. in Microbiology – which includes Microbiology (Molecular Biology, Biochemistry and Physiology, Genetics, Biotechnology, Virology, Industrial and Environmental Microbiology, and Medical Microbiology) *(approved by the Board April 2010)*

Attachments 1 and 2 depict fiscal impact of the proposed program, but they differ substantially in the specifics of what they depict and in the total dollars shown for each year.

For personnel costs, Attachment 1 depicts only the value of the FTE specifically devoted to the Ph.D. program, and includes reallocation of FTE from existing faculty and staff lines as well as a portion of the FTE of new faculty and staff lines. Attachment 1 also includes an estimate of personnel and capital outlay expenses that will be covered by federal grants, estimated at $1,366,856 in FY2015.

In contrast, Attachment 2 focuses on future funding that will support the new program, part of which has already been committed to biomolecular sciences activities at BSU and part of which remains to be committed. The funding that is already committed is part of our overall commitment to the INBRE grant, and will be spent regardless of Ph.D. Approval. Importantly, Attachment 2 includes the entire cost of each new faculty and staff position, even if those positions are only partially assigned to the new program. This is because the university must fund each new position in its entirety, not simply that portion of each position assigned to the new program. Because Attachment 2 only includes committed funds, it only shows the grant funds associated with the initial two years of support for one of the new faculty lines. Other grant funded positions are not depicted in Attachment 2.

To illustrate the difference between the tables, an example will be used: an existing faculty member will reallocate 0.15FTE to the new program and a new faculty member will allocate 0.25FTE to the new program. Attachment 1 would include the value of 0.15FTE from the existing faculty member and 0.25FTE of the new faculty member, thereby reflecting the value of the effort reallocated and newly allocated to the new program. Attachment 2, in contrast, recognizes that even though the new faculty member will devote 0.25 FTE to the new program, the university must fund the entire 1.0FTE of that faculty member in order to proceed with the hire of that person. Therefore, Attachment 2 would include the value of 1.0FTE of the new faculty member to reflect the entire cost of that individual. But Attachment 2 would not include any value for the existing faculty member because no new funding is needed for the existing faculty member.

ATTACHMENTS

STAFF COMMENTS AND RECOMMENDATIONS

Board staff believes Boise State University (BSU) has put together a thorough and comprehensive proposal for a Ph.D. in Biomolecular Science. While there is overlap and duplication in the programs and their research areas, there are significant synergies taking place among the three institutions in the broader biomolecular research areas. BSU has also very unique pieces to this proposed program which distinguish it from the other two institutions' program. With the creation of this program there is significant potential to increase NIH funding opportunities for Idaho. Boise State could better clarify the increased opportunities for collaboration among the three institutions.

As it stands now, pursuant to Board Policy III.Z there is not a biology or biological science Statewide Program Responsibility assigned to any of the universities,

therefore it would fall under the category of Boise State's Regional Program Responsibility. There is a Primary Emphasis in the area of Biological Sciences assigned to Idaho State University, but not in the interdisciplinary areas of biomolecular sciences and biophysics.

BSU's program is consistent with their current Regional Eight-Year Plan for delivery of academic programs in the Southwest Region. It's important to note that institutions are currently working on their Five-Year Plans pursuant to the recently clarified Board Policy III.Z. The Five-Year Plans are scheduled to be presented to the Board at their August 2012 Board meeting.

"The goal of INBRE-2 is to continue/enhance successful programs in order to catalyze Idaho's transformation to competitiveness through core laboratory facilities, support services, faculty research, student educational and research opportunities and community outreach." (pg. 3, INBRE External Review) The Board must consider whether or not this can be accomplished if the Board does not approve BSU's Ph.D. proposal, as it is a key deliverable of the INBRE proposal. The Board must also consider the risk of losing future funding if this program is not approved.

Due to the funding requirements associated with the INBRE grant from NIH, BSU has over $400,000 committed to this program, with an additional $30,000 committed from the College of Arts and Sciences. They already have nearly half of the expenses at build out. There will be an additional $623,323 on-going new dollars required. The program funding is front-loaded the first two years and the on-going funding is significantly less. BSU proposes to use any new state general funds or EWA funding for faculty positions as they are the highest priority for new dollars. Reallocation of internal budgets is also a tool for providing new resources to the program. This might occur at the department, college, or university level – or all three. This leads to outstanding questions regarding the resource allocations to be used for sustainability.

BOARD ACTION

I move to approve the request by Boise State University to offer a Doctor of Philosophy in Biomolecular Sciences.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

ATTACHMENT 1

Fiscal Impact and Budget: includes FTE from existing faculty and staff lines reallocated to the new program and FTE of new faculty and staff lines allocated to the new program. This table represents a summarization of the Section 6 of the full proposal (pages 28-30 of the Full Proposal)

	FY 2013	FY 2014	FY 2015
Expenditures			
A. Personnel	$897,576	$1,203,237	$1,898,624
B. Operating Expenditures	$36,000	$36,000	$36,000
C. Capital Outlay	$495,000	$495,000	$495,000
D. Physical Facilities	0	0	0
E. Indirect Costs	N/A	N/A	N/A
Total Expenditures	$1,428,576	$1,734,237	$2,429,624
Revenue			
A. Source of Funds			
1. Appropriated funds -- Reallocation	$568,830	$809,958	$1,062,768
2. Appropriated funds -- New MCO			
3. Federal funds	$859,746	$924,279	$1,366,856
4. Other grants			
5. Fees			
6. Other:			
Total Revenues	$1,428,576	$1,734,237	$2,429,624
B. Nature of Funds			
1. Recurring*	$978,576	$1,284,237	$1,979,624
2. Non-recurring**	$450,000	$450,000	$450,000
Total Revenues	$1,428,576	$1,734,237	$2,429,624

ATTACHMENT 2

Future funding that will support the proposed program. First half of table depicts funding already committed under the INBRE grant to biomolecular sciences, regardless of PhD approval. Second half depicts additional new funding required. A fourth year, FY 2016, is depicted because that year best depicts the ongoing funding required for the program. This table represents a summarization of the table found on page 33 of the Full Proposal.

Funds already committed to the NIH INBRE grant

	FY2013			**FY2014**			**FY2015**			**FY2016**	
	ONGOING	ONE-TIME		ONGOING	ONE-TIME		ONGOING	ONE-TIME		ONGOING	ONE-TIME
Personnel	305,657			412,204			440,219			448,601	
OE											
Capital	30,000	300,000		30,000	400,000		30,000	400,000		30,000	
Facilities											
Indirects											
Total Funds Committed	335,657	300,000		442,204	400,000		470,219	400,000		478,601	
Source of Commitment											
Grant Funded	98,353			100,179							
College of Arts & Sciences	30,000	100,000		30,000	200,000		30,000	200,000		30,000	
Univ Central Funds	207,304	200,000		312,026	200,000		440,219	200,000		448,601	

New funds needed for the PhD in Biomolecular Sciences

	FY2013			**FY2014**			**FY2015**			**FY2016**	
	ONGOING	ONE-TIME		ONGOING	ONE-TIME		ONGOING	ONE-TIME		ONGOING	ONE-TIME
Personnel	344,608	98,353		562,029			575,726			588,323	
OE	20,000			20,000			20,000			20,000	
Capital	15,000			15,000			15,000			15,000	100,000
Facilities											
Indirects											
New Funds Required	**379,608**	**98,353**		**597,029**	**0**		**610,726**	**0**		**623,323**	**100,000**

IDAHO STATE BOARD OF EDUCATION
ACADEMIC/PROFESSIONAL-TECHNICAL EDUCATION
FULL PROPOSAL

Submitted by:

Boise State University

Institution Submitting Proposal

College of Arts and Sciences

Name of College, School, or Division

Departments of Biological Sciences, Chemistry & Biochemistry, and Physics

Name of Department(s) or Area(s)

A New, Expanded, or Off-Campus Instructional Program Leading to:

Doctor of Philosophy in Biomolecular Sciences
CIP: 26.0210 (biochemistry, biophysics, and molecular biology)

Degree/Certificate & 2010 CIP

Program Change, Off-Campus Component

Fall 2012

Proposed Starting Date

This proposal has been reviewed and approved by:

College Dean (Institution) — 8/2/11 Date	VP Research and/or Graduate Dean — John R Pelton 8/1/2011 Date
Chief Fiscal Officer (Institution) — 8/2/11 Date	
Chief Academic Officer (Institution) — 8/1/11 Date	Chief Academic Officer (OSBE) — Date
President — 8/2/11 Date	SBOE/OSBE Approval — Date

Before completing this form, refer to "Board Policy Section III.G. Program Approval and Discontinuance.

1. **Describe the nature of the request. For example, is this a request for a new on-campus program? Is this request for the expansion or extension of an existing program, or a new cooperative effort with another institution or business/industry or a contracted program costing greater than $250,000 per year? Is this program to be delivered off-campus or at a new branch campus? Attach any formal agreements established for cooperative efforts, including those with contracting party(ies). Is this request a substantive change as defined by the NWASC criteria?**

Boise State University proposes the creation of a new Ph.D. program in Biomolecular Sciences. Over the last decade, the sciences have evolved dramatically to become less focused on traditional single disciplines and much more focused on interdisciplinary approaches. That approach extends to industry, which now often seeks highly trained professionals with expertise and knowledge based on an interdisciplinary approach to complex problems.

The proposed program will be a highly interdisciplinary on-campus doctoral program housed in the College of Arts and Sciences that will combine studies from the traditional science disciplines of biology, chemistry, and physics to solve important cross-cutting problems at the interface of contemporary fields in biomolecular sciences. The program will focus on the (i) the study of complex nature of the molecules of biological systems as they relate to normal homeostatic and disease processes, (ii) the development of treatments for diseases as well as preventative measures such as vaccines, and (iii) the research and development of innovative devices and methodologies.

The proposed Ph.D. in Biomolecular Sciences will provide substantial economic and societal benefit to the region, the state, and the nation. Faculty and students in the program will address a wide range of research topics in areas that include cancer biology, immunology and immune disorders, neurobiology and neuropathology, pharmacology, skeletal biology, soft matter physics, molecular toxicology, forensic biology regenerative medicine, enzymology, cell membrane biophysics, plant growth regulation, microbial catalysis of biomass, bioinformatics for systems biology, antibiotic development, chemotherapy development, computer aided drug design, natural product drug discovery, nanomaterials, nanotoxicology, nanomedicine, and biofuels development.

Benefits of this research include: (i) Our research will aid in the understanding of a number of diseases and in the development of treatments and preventative measures for those diseases; examples of those diseases include breast cancer, leukemias and lymphomas, osteoarthritis, Rett Syndrome, Alzheimer's disease, Parkinson's disease, asthma, retinal detachment, cholera, West Nile Virus, and drug resistant bacterial infections (i.e., MRSA). (ii) Our research will support the development of Idaho's biotechnology industry. For example, present projects involve development of potentially-patentable materials as such artificial cartilage, anti-fouling compounds, biocompatible containment vessels, biofuels, targeted drug delivery methods, new chemotherapeutic drugs, nanomedicine based approaches for treatment of cancer, biosensors for detection of pathogens, and instrument development to support biotechnology and medical diagnostics. (iii) The program will provide educational opportunities not currently available in the area, and thereby strengthen our workforce and make the area more attractive to businesses that may consider locating here.

> "This program will benefit Boise in many ways, but here are the most obvious to this mayor. Its students will be Boiseans while pursuing their degrees, contributing both economically and culturally to 'the most livable city in the country.' Many graduates will remain in the area, adding to our skilled workforce, advancing our existing biomedical enterprises and starting new ones. It is fact that higher-education research has a positive economic multiplier effect in its host city and far beyond."—David Bieter, Mayor of Boise (Appendix B).
>
> "Biomolecular studies have the potential to benefit far more than just one industry sector. Time after time, businesses seeking to expand in or relocate in Idaho look at the work force available in the state and the quality of life enjoyed there. Greater educational opportunities serve both these areas. Additionally, a Ph.D. program does not simply offer an outlet for students seeking educational advancement. A science-based doctorate degree option represents a real and tangible venue for

> solving problems that interface dozens of fields."—Celia Gould, Director, Idaho Department of Agriculture (Appendix B).

A recent report by the National Research Council "Advancing the Nation's Health Needs" (2005) identified the importance of interdisciplinary programs, stating that "… the most significant research occurs at the interfaces between traditional research areas. This is even more likely to be true in the future because the solution to complex biological and health care problems will require experts and expertise in many different disciplines – and increasingly expertise in more than one field. Consequently, it is important to encourage such research. If this research is to be successful, individuals must be broadly trained so that they can understand and contribute to research that overlaps in different fields."

The proposed Ph.D. in Biomolecular Sciences is a key deliverable of Idaho's INBRE grant from NIH, which has been a highly successful cooperative effort among the universities. Since 2001, Idaho's BRIN/INBRE funding has totaled more than $44 million, and has provided funds to facilitate development of biomedical research in Idaho. It has also funded graduate assistantships at Idaho State to support programs such as the new Ph.D. in Microbiology and the creation of two new Ph.D. programs at the University of Idaho. From the very beginning of the BRIN/INBRE program, the creation of Boise State's Ph.D. in Biomolecular Sciences has been part of the plans. To quote from the INBRE proposal that was submitted in 2008 and subsequently funded (emphasis added; Appendix C):

> **"2.5 Facilitate Graduate Education**
> INBRE will enhance the number and quality of graduate students in Idaho. At the UI, two new interdisciplinary doctoral programs were developed with INBRE-1 funding and are now supported by the UI Research Office…INBRE support for graduate students in the Bioinformatics and Computational Biology program will continue. At ISU, INBRE graduate assistantships and national travel awards will be assigned competitively. <u>At BSU, the first PhD program in Biomolecular Sciences is being developed</u>. BSU has approved five new faculty lines and an interdisciplinary curriculum. The first cohort of PhD students is expected fall 2010 and INBRE funds at BSU will support four of these graduate assistantships with additional assistantships provided by the BSU Research Office."

In their draft Year 2 external evaluation for the NIH of the INBRE grant, the reviewers recognized the importance to Boise State University and to the Boise area of the Ph.D. in Biomolecular Sciences in maintaining the momentum created by the BRIN/INBRE grants (See Appendix C).

> "The Committee was particularly impressed by the developing interdisciplinary biomolecular research program at Boise State University. If approved by the appropriate authorities, the Interdisciplinary Biomolecular Sciences PhD Program would be unique in the State, including researchers and students from biology, chemistry, engineering and other disciplines."

The proposed Ph.D. in Biomolecular Sciences will strengthen the ability of Boise State University's faculty members to collaborate with faculty members in similar programs at the University of Idaho and Idaho State University. The value of these collaborations among researchers far outweighs any potential negative impact of similarity of programs. That is the conclusion of the recent Year 2 evaluation of the INBRE grant for the NIH by an external evaluation team. In their specific recommendations, the draft evaluation report (attached; Appendix C) states (emphasis added):

> "the Biomolecular Sciences PhD Program…would be a unique interdisciplinary program, and <u>would clearly complement and enhance the existing PhD programs at UI and ISU</u>. <u>The potential for inter-institutional collaborations between these programs is outstanding.</u>"

A letter of support (attached; Appendix C) for the Ph.D. in Biomolecular Sciences from Dr. Carolyn Bohach, University of Idaho Faculty member and Director of Idaho INBRE, notes that (emphasis added):

> "INBRE and the proposed Biomolecular Sciences Doctoral Program are both multidisciplinary, <u>collaborative</u>, and focus on the continued growth of research and research-training programs."
>
> "Your proposal for the establishment of a Biomolecular Sciences Doctoral Program builds on the early efforts of INBRE and will, I believe, <u>complement existing graduate programs</u> and serve Idaho well by creating a valuable training and research resource for the state."

The proposed Ph.D. in Biomolecular Sciences will provide opportunities for sharing both the curriculum and faculty expertise among institutions. There will be increased reciprocal opportunities for faculty members to serve on graduate committees at other institutions. Graduate students enrolled in programs at the University of Idaho and Idaho State, and who spend significant time in the Treasure Valley, will be able to enroll in doctoral level coursework at Boise State University. Doctoral-level courses in the biomolecular sciences at Boise State will be made available via distance delivery methods to students at other institutions.

The proposed Ph.D. in Biomolecular Sciences will engage faculty from the Departments of Biological Sciences, Chemistry and Biochemistry, and Physics, who have together won more than 26.6 million dollars in external research funding and shared research instrumentation funding over the past 5 years. This represents more than an 8-fold increase compared to the previous 5 years. Currently, there are 14.7 million dollars in pending grants from this group of research-active faculty members. This cadre of twenty-nine faculty researchers engaged in diverse areas of collaborative biomolecular research is one of the largest active research groups at Boise State University. The size, diversity of research, and synergy between the areas of research will help ensure the success and sustainability of the proposed interdisciplinary doctoral program. In addition, the Biomolecular Sciences Ph.D. program is expected to have important synergistic activities with the proposed Materials Science doctoral program as at least eight of the core Biomolecular Sciences faculty members have research activities that dovetail with Materials Science faculty. In addition, the Biomolecular Sciences Ph.D. program is well aligned with the continuing areas of emphasis defined for Boise State University by the State Board of Education Institutional Role and Mission statement.

2. **Quality – this section must clearly describe how this institution will ensure a high quality program. It is significant that the accrediting agencies and learned societies which would be concerned with the particular program herein proposed be named. Provide the basic criteria for accreditation and how your program has been developed in accordance with these criteria. Attach a copy of the current accreditation standards published by the accrediting agency.**
Further, if this new program is a doctoral, professional, or research, it must have been reviewed by an external peer-review panel. A copy of their report/recommendations must be attached.

The following measures will ensure the high quality of the proposed program:

Regional Institutional Accreditation. Boise State University is regionally accredited by the Northwest Commission on Colleges and Universities (NWCCU). Regional accreditation of the university has been continuous since initial accreditation was conferred in 1941. Boise State University is currently accredited at all degree levels (A, B, M, D).

Program Review. Internal program evaluations will take place every five years as part of the normal program review process conducted by the Office of the Provost at Boise State University. This process requires a detailed self study (including outcome assessments) and comprehensive review, and a site visit by external evaluators.

Graduate College. The program will adhere to all policies and procedures of the Graduate College, which is a member of the Council of Graduate Schools (Washington, D.C.), the leading authority on graduate education in the United States. The Graduate College has broad institutional oversight of all graduate degree and certificate programs.

Disciplinary Standards: Although there is no discipline-specific accrediting body for graduate studies in biomolecular sciences, the Standards of the International Union of Biochemistry and Molecular Biology for the Ph.D. Degree in the Molecular Biosciences will be adopted for the Biomolecular Sciences Doctoral Program at Boise State. These standards include:

1. The candidate should demonstrate a general knowledge of physics, chemistry, biology and cell biology, biochemistry and molecular biology, the particular Molecular Bioscience, and a detailed knowledge of his or her area of research.

2. The candidate should be familiar with the research literature of the particular Bioscience and should have the ability to keep abreast of major developments and to acquire a working background in any area.

3. The candidate should demonstrate skill in the recognition of meaningful problems and questions for research in the particular Bioscience.

4. The candidate should possess technical skill in laboratory manipulations.

5. The candidate should demonstrate that oral, written, and visual communication skills have been acquired.

6. The candidate should demonstrate skill in designing experimental protocols and in conducting productive self-directed research.

A Director of the Biomolecular Sciences Program will be appointed by the Dean of the College of Arts and Sciences, based upon the recommendation of department chairs of the three participating departments (Biological Sciences, Chemistry and Biochemistry, and Physics) to the Dean. The Director and the three chairs (Biological Sciences, Chemistry and Biochemistry, and Physics) will convene as "partner administrators" to discuss finances, policy, and administration of the program, and will meet with the Dean of the College of Arts and Sciences as needed.

A Faculty Steering Committee will be established with representation by a faculty member(s) from each of the participating disciplines: Biological Sciences (2), Physics (1), and Chemistry and Biochemistry (1), plus the program director. This committee will serve 3 year terms using a model of off-set terms to ensure program continuity. This committee will focus on curriculum changes, policy, student recruitment, admission into the program, advising, student progress reports, and related responsibilities.

An External Advisory Board will be established to provide experience and expertise that will ensure the quality of the program during the establishment phase and through annual review and evaluation. Membership will consist of representation from industry, similar programs at other universities, and biomedical research entities. The External Advisory Board will meet semi-annually with the Director and the Faculty Steering Committee.

Qualifying Examination. All students in the proposed doctoral program will be required to pass a preliminary/qualifying examination to assess the depth and breadth of the student's knowledge in the biomolecular sciences. Questions will be developed by the program faculty, with the focus on material presented in the core sequence and the required undergraduate background courses in cell biology, biochemistry, calculus, and general physics. The outcome of the preliminary examination will be determined by the Faculty Steering Committee. Failure of the preliminary examination will normally result in administrative withdrawal of the student from the program. In rare cases, and in accordance with Graduate College policy, a student may be allowed a second and final attempt to pass the examination before administrative withdrawal.

a. Curriculum – describe the listing of new course(s), current course(s), credit hours per semester, and total credits to be included in the proposed program.

The Biomolecular Sciences Doctoral Program is meant to provide students with advanced cross-training in the interdisciplinary fields of biochemistry, biophysics, cell biology, and molecular biology to foster an integrated and quantitative approach to biomolecular studies. The program is designed to provide every student with a three course core sequence by faculty in the departments of Biological Sciences (BMOL 601), Chemistry and Biochemistry (BMOL 602), and Physics (BMOL 603), to provide them with a foundation in biomolecular sciences while exposing them to the perspectives of each of these fields. Every student will take 12 credits of the core sequence (BMOL 601-603) during their first 1.5 years, as well as 10 additional credits in graduate seminars, scientific literature, writing and oral communications courses, and a scientific ethics course (BMOL 598, 605, 606, 607 and GCOLL 505, respectively). The program offers two tracks of study: Molecular Cell Biology, and Biochemistry/Biophysics, so students will also take 4-6 credits of track-specific coursework, as well as 12-14 credits of elective coursework approved by their supervisory committee.

Doctor of Philosophy in Biomolecular Sciences	
Course Number and Title	**Credits**
Core Sequence BMOL 601 Biomolecules I (4 cr.) BMOL 602 Biomolecules II (4 cr.) BMOL 603 Biophysical Instrumentation (4 cr.)	12
Additional Required Courses *BMOL 598 Graduate Seminar (3 cr.) **BMOL 605 Current Scientific Literature (3 cr.) BMOL 606 Proposal Writing (2 cr.) BMOL 607 Graduate Research Presentation (1 cr.) GCOLL 505 Responsible Conduct in Research (1 cr.)	10
Track Specific Courses Molecular Cell Biology Track: BIOL 611 Advanced Cell Biology (3 cr.) PHYS 612 Cell Biophysics and Imaging (3 cr.) Biochemistry/Biophysics Track: PHYS 611 Molecular Biophysics (4 cr.)	4-6
Electives (with committee approval)	12-14
Comprehensive Examinations and Dissertation BMOL 600Assessment [Preliminary Examination] (1 cr.) BMOL 600 Assessment [Comprehensive Examination] (1 cr.) **Culminating Activity** BMOL 693 Dissertation (24 cr.)	26
TOTAL	**66**

*1 credit course, to be taken each and every time it is offered by current students in the Biomolecular Sciences Ph.D. program. Only 3 credits apply towards degree requirements.
** 1 credit course, to be taken a minimum of three times. Only 3 credits may apply towards degree requirements.
***Up to two elective courses may be taken from approved course listing.

Molecular Cell Biology Track	
Core Sequence BMOL 601 Biomolecules I (4 cr.) BMOL 602 Biomolecules II (4 cr.) BMOL 603 Biophysical Instrumentation (4 cr.)	12
Track Specific Courses BIOL 611 Advanced Cell Biology (3 cr.) PHYS 612 Cell Biophysics and Imaging (3 cr.)	6
Additional Required Courses *BMOL 598 Graduate Seminar (3 cr.) **BMOL 605 Current Scientific Literature (3 cr.) BMOL 606 Proposal Writing (2 cr.) BMOL 607 Graduate Research Presentation (1 cr.) GCOLL 505 Responsible Conduct in Research (1 cr.)	10
***At least 12 credits of coursework from the following list of electives: BIOCHEM 512 Intermediary Metabolism (3 cr.) BIOCHEM 513 Advanced Enzymology (3 cr.) BIOL 501 Biometry (4 cr.) BIOL 503 Advanced Biometry (4 cr.) BIOL 509 Molecular Ecology (3 cr.) BIOL 510 Pathogenic Bacteriology (4 cr.)	12

BIOL 520 Immunology (3 cr.) BIOL 521 Immunology Laboratory (2 cr.) BIOL 531 Pharmacology (3 cr.) BIOL 539 Vaccinology (3 cr.) BIOL 540 General and Molecular Toxicology (3 cr.) BIOL 541 Molecular Biology of Cancer (3 cr.) BIOL 542 Molecular Neurobiology (3 cr.) BIOL 543 Advanced Developmental Biology (2 cr.) BIOL 546 Bioinformatics (3 cr.) BIOL 547 Forensic Biology (3 cr.) BIOL 548 Perl for Bioinformatics (3 cr.) BIOL 549 Genomics (3 cr.) BIOL 551 Developmental Biology (4 cr.) BIOL 565 Advanced Topics in Molecular Biology Techniques (1 cr.) BIOL 566 Adv. Topics in Molecular, Cellular and Developmental Biology (1 cr.) BIOL 570 Genetic Engineering and Biotechnology (3 cr.) BIOL 613 Molecular Genetics (3 cr.) BIOL 623 Advanced Immunology (1 cr.) BOT 523 Molecular and Cellular Biology of Plants (3 cr.) MATH 562 Probability and Statistics (4 cr.) PHYS 611 Molecular Biophysics (4 cr.) PHYS 620 Nanobiotechnology (3 cr.) ZOOL 501 Human Physiology (4 cr.)	
BMOL 600 Assessment [Preliminary Exam] (1 cr.) BMOL 600 Assessment [Comprehensive Examination] (1 cr.)	2
BMOL 693 Dissertation (24 cr.)	24
TOTAL CREDITS	66

Biochemistry/Biophysics Track	
Core Sequence BMOL 601 Biomolecules I (4 cr.) BMOL 602 Biomolecules II (4 cr.) BMOL 603 Biophysical Instrumentation (4 cr.)	12
Track Specific Courses PHYS 611 Molecular Biophysics (4 cr.)	4
Additional Required Courses *BMOL 598 Graduate Seminar (3 cr.) **BMOL 605 Current Scientific Literature (3 cr.) BMOL 606 Proposal Writing (2 cr.) BMOL 607 Graduate Research Presentation (1 cr.) GCOLL 505 Responsible Conduct in Research (1 cr.)	10
***At least 14 credits of coursework from the following list of electives: BIOCHEM 512 Intermediary Metabolism (3 cr.) BIOCHEM 513 Advanced Enzymology (3 cr.) CHEM 508 Synthetic Organic Chemistry (3 cr.) CHEM 509 Introduction to Polymer Chemistry (3 cr.) CHEM 510 Organic Polymer Synthesis (3 cr.) CHEM 511 Advanced Analytical Chemistry (3 cr.) CHEM 521 Quantum Chemistry (3 cr.) CHEM 522 Spectroscopy (3 cr.) CHEM 523 Chemical Kinetics (3 cr.) CHEM 540 Spectrometric Identification (3 cr.)	14

CHEM 551 Bioinorganic Chemistry (3 cr.) CHEM 560 Introduction to NMR Spectroscopy (2 cr.) CHEM 561 Introduction to Molecular Modeling and Computational Chemistry (2 cr.) BIOL 546 Bioinformatics (3 cr.) BIOL 549 Genomics (3 cr.) PHYS 536 Soft Matter (3 cr.) PHYS 537 Radiation Biophysics (3 cr.) PHYS 612 Cell Biophysics and Imaging (3 cr.) PHYS 620 Nanobiotechnology (3 cr.) PHYS 624 Membrane Biophysics (3 cr.)	
BMOL 600 Assessment [Preliminary Exam] (1 cr.) BMOL 600 Assessment [Comprehensive Examination] (1 cr.)	2
BMOL 693 Dissertation (24 cr.)	24
TOTAL CREDITS	66

Course Descriptions

BIOCHEM 512 INTERMEDIARY METABOLISM (3-0-3)(S) (Alternate years). An investigation into several anabolic, catabolic, and signaling processes in the cell. Special attention will be given to molecular mechanisms and regulation. Students will make extensive use of primary literature. PREREQ: CHEM 433 or PERM/INST.

BIOCHEM 513 ADVANCED ENZYMOLOGY (3-0-3)(S)(Alternate years). A deeper look into the catalytic and kinetic mechanisms of enzymes. Modern methods for studying enzymes will be included as well as learning strategies for studying steady state and transient enzyme kinetics. Students will make extensive use of primary literature. PREREQ: CHEM 322 and CHEM 433 or PERM/INST.

BIOL 501 BIOMETRY (4-0-4)(F). An application of statistical methods to problems in the biological sciences. Basic concepts of hypothesis testing; estimation and confidence intervals; t-tests and chi-square tests. Linear and nonlinear regression theory and analysis of variance. Techniques in multivariate and nonparametric statistics. PREREQ: MATH 147 or equivalent, or PERM/INST.

BIOL 510 PATHOGENIC BACTERIOLOGY (2-6-4)(S)(Odd years). Medically important bacteria, rickettsia, and chlamydia are surveyed with emphasis on their pathogenicity, host-parasite relationships, and the clinical and diagnostic aspects of the diseases they produce in humans and animals. PREREQ: BIOL 301 and BIOL 303.

BIOL 520 IMMUNOLOGY (3-0-3)(F). Principles of immunology, host defense mechanisms, the immune response, immune disorders, serology, and related topics. PREREQ: BIOL 301 or equivalent.

BIOL 521 IMMUNOLOGY LABORATORY (0-6-2)(F/S). Modern immunological laboratory techniques including flow cytometry, immune system physiology, antibody-based assays including ELISA, vaccine design, and immuno-bioinformatics. COREQ: BIOL 520.

BIOL 531 PHARMACOLOGY (3-0-3)(F). Basic pharmacological principles including mechanisms of drug action in relation both to drug- receptor interactions and to the operation of physiological and biochemical systems. Pharmacokinetics, metabolism, receptor theory and an examination of major classes of therapeutic agents used in humans. PREREQ: BIOL 227-228 or BIOL 191-192, and BIOL 301.

BIOL 539 VACCINOLOGY (3-0-3)(S). Discussion of the history, safety, epidemiology, molecular biology and immunology of vaccines. Development of the next generation of vaccines to combat infectious disease of global importance, such as HIV, malaria and tuberculosis, also will be discussed. PREREQ: BIOL 301 or PERM/INST.

BIOL 540 GENERAL AND MOLECULAR TOXICOLOGY (3-0-3)(F/S). General and molecular principles of mammalian toxicology including toxicant disposition, mechanisms of toxicity, target organ toxicity, and major classes of toxic agents. PREREQ: BIOL 301 OR PERM/INST.

BIOL 541 MOLECULAR BIOLOGY OF CANCER (3-0-3)(S). A treatment of the basic biology of cancer

and the process of tumor progression. Topics examined will include oncogenes, tumor suppressor genes, and the causes of cancer. PREREQ: BIOL 301, BIOL 343.

BIOL 542 MOLECULAR NEUROBIOLOGY (3-0-3)(F). Emphasis will be on the molecular aspects of neurobiology. Topics will include: cells of the nervous system, neurochemical transmission, nerve terminals, membrane structure and function, electrical signaling, neural development, process outgrowth and myelination and glia, and specific neural diseases including Alzheimer's disease, Parkinson's disease, and Lou Gehrig's disease. PREREQ: BIOL 301.

BIOL 543 ADVANCED DEVELOPMENTAL BIOLOGY (1-6-2)(F)(Odd years). Application of molecular and cellular methods to current topics in developmental biology. Analysis of current literature in biology with emphasis on the coordinated regulation of gene expression, cellular differentiation and migration. Laboratory studies include model systems such as chick, zebrafish, sea urchin and mouse, utilizing cell/tissue culture, histology, immunohistochemistry, RT-PCR, protein purification, SDS-PAGE, western blot and others. PREREQ: BIOL 451 or PERM/INST.

BIOL 546 BIOINFORMATICS (2-3-3)(F). Practical training in bioinformatics methods: accessing sequence data bases, BLAST tools, analysis of nucleic acid and protein sequences, detection of motifs and domains of proteins, phylogenetic analysis, gene arrays, and gene mapping. PREREQ: BIOL 343 or PERM/INST.

BIOL 547 FORENSIC BIOLOGY (3-0-3)(F). Analysis and interpretation of biological evidence in forensic contexts. Topics include entomology, botany, fingerprints, toxicology, DNA, pathology, anthropology and odontology. PREREQ: BIOL 343 or PERM/INST.

BIOL 548 PERL FOR BIOINFORMATICS APPLICATIONS (3-0-3)(F/S). The PERL programming language is used to introduce skills and concepts to process and interpret data from high-throughput technologies in the biological sciences. Key bioinformatics concepts are reinforced through lectures, computer demonstrations, weekly readings, and programming exercises from biological sequence analysis and real-world problems in proteomics and genetics. PREREQ: BIOL 446 or PERM/INST.

BIOL 549 GENOMICS (3-0-3)(F/S). A fusion of biology, computer science, and mathematics to answer biological questions. Topics include analyzing eukaryotic, bacterial, and viral genes and genomes; locating genes in genomes and identifying their biological functions; predicting regulatory sites; assessing gene and genome evolution; and analyzing gene expression data. PREREQ: BIOL 343 and MATH 254, or PERM/INSTR.

BIOL 551 DEVELOPMENTAL BIOLOGY (3-3-4)(S)(Odd years). Germ cell development, comparative patterns of cleavage and gastrulation, neurulation and induction, and development of human organ systems with emphasis on molecular and cellular mechanisms. Laboratory studies of sea urchin, frog, chick, and pig development. PREREQ: BIOL 191-192 and BIOL 301 or PERM/INST.

BIOL 565 ADVANCED TOPICS IN MOLECULAR BIOLOGY TECHNIQUES (1-0-1)(F). Discussion of scientific literature with emphasis on modern molecular biology techniques. Students lead discussions and present articles from relevant primary literature. May be repeated once for credit. PREREQ: BIOL 343 and PERM/INST.

BIOL 566 ADVANCED TOPICS IN MOLECULAR, CELLULAR AND DEVELOPMENTAL BIOLOGY (1-0-1)(S). Discussion of current research. Students lead discussions and present articles, as well as monitor recent relevant primary literature. Previous enrollment in BIOL 465 or BIOL 565 recommended. May be repeated once for credit. PREREQ: BIOL 343 and PERM/INST.

BIOL 570 GENETIC ENGINEERING AND BIOTECHNOLOGY (3-0-3)(F/S). Applications of biotechnology, genetic engineering, and recombinant DNA technology in medical diagnosis and therapy, agriculture, microbial biology and environmental systems. The principles and application of recombinant DNA technology in industrial, agricultural, pharmaceutical, and biomedical fields are discussed. PREREQ: BIOL 343.

BIOL 611 ADVANCED CELL BIOLOGY (3-0-3) (F). Contemporary and frontier topics in the biology of microbial, plant, and animal cells covering signal transduction, protein trafficking, membrane structure and transport, cell to cell communication, cellular compartmentalization, and cell biotechnology applications. PREREQ: BIOL 301 or PERM/INST.

BIOL 613 MOLECULAR GENETICS (3-0-3) (S). An advanced study of genetics in microbial, animal and plant systems, focused on the biochemical and molecular aspects of genetic structure and function. Information obtained from recent genomic analysis and comparisons will be included as well as discussion of contemporary molecular biology techniques and applications and an introduction to genomics. PREREQ: BIOL 343 or equivalent.

BIOL 623 ADVANCED IMMUNOLOGY (1-0-1)(S). An advanced study of the cellular and molecular regulation of the immune response. The course will include formal lectures, student presentations, in-depth discussion of selected topics using the current literature. PREREQ: BIOL 520 or PERM/INST.

BMOL 598 GRADUATE SEMINAR (1-0-1)(S). Seminars by scientists on a wide range of subjects in the areas of biomolecular sciences. PREREQ: Admission to program or PERM/INST. The course is graded Pass/Fail.

BMOL 600 ASSESSMENT [PRELIMINARY EXAMINATION] (1-0-1)(SU). Written assessment of material presented in the core curriculum and undergraduate prerequisite coursework. Students enroll in this course during the summer semester following completion of their second academic year of study. A daylong exam is scheduled during which students complete a written exam consisting of questions provided by the graduate faculty from topics covered in prerequisite and core courses. Examinations will be evaluated by an assembled panel of Biomolecular Sciences program faculty. PREREQ: PERM/INST. The course is graded Pass/Fail.

BMOL 600 ASSESSMENT [COMPREHENSIVE EXAMINATION] (1-0-1)(F). Students enrolled in this course prepare a research proposal on a topic other than their dissertation work and submit it to an examining committee. An oral defense of the proposal is scheduled during the semester to assess familiarity with the grant topic as well as material covered in core curriculum and prerequisite courses. Successful completion of this course is required for the student to advance to candidacy. PREREQ: PERM/INST. The course is graded Pass/Fail.

BMOL 601 BIOMOLECULES I (4-0-4)(F). An in-depth study of the metabolism of both DNA and RNA at the molecular/mechanistic level. This course will cover the mechanisms of DNA replication, transcription, translation, transposition and repair, as well as those for RNA interference, catalysis, silencing and splicing. Molecular genetics and bioinformatics approaches for studying DNA/RNA and their interactions with proteins will be discussed. PREREQ: BIOL 301, CHEM 431, MATH 170, PHYS 112.

BMOL 602 BIOMOLECULES II (4-0-4)(S). An in-depth study of proteins focusing on amino acid chemistry, protein structure, protein folding, protein function, membrane biochemistry as well as small molecules, lipids and carbohydrates. This course will discuss modern methods of protein characterization and the use of bioinformatics in understanding the chemistry/function of proteins. Recent developments in proteomics and high-throughput approaches to identifying and assessing protein function will be presented. PREREQ: BMOL 601.

BMOL 603 BIOPHYSICAL INSTRUMENTATION AND TECHNIQUES (3-3-4) (F/S). Applications and principles of key physical methods and instruments used for the characterization of the structural, functional, and dynamical properties of biological molecules and their interactions. Methods include single-molecule detection and manipulation; mass spectroscopy; X-ray, electron, and neutron diffraction; spectroscopy (optical, IR, UV, Raman); magnetic resonance (NMR, EPR, MRI); plasmon resonance; birefringence; electrophoresis; and hydrodynamic techniques. PREREQ: BIOL 301, CHEM 431, MATH 170, PHYS 112.

BMOL 605 CURRENT SCIENTIFIC LITERATURE (1-0-1)(F). Written and oral presentation of current topics from the published literature in areas of Biomolecular Sciences aimed at integrating material from the various related disciplines. Course will be multidisciplinary involving in depth discussion and critical analysis of current literature by the students. PREREQ: Graduate student status.

BMOL 606 PROPOSAL WRITING (0-2-2)(F/S). Written and oral presentation of a research proposal in an area of biomolecular sciences related to the student's proposed dissertation research project. PREREQ: BMOL 601.

BMOL 607 GRADUATE RESEARCH PRESENTATION (1-0-1)(S). Oral presentation on research activity by third year students in the Biomolecular Sciences program. PREREQ: BMOL 601, BMOL 602, BMOL 603.

BOT 523 MOLECULAR AND CELLULAR BIOLOGY OF PLANTS (3-0-3)(F/S). Molecular and cellular aspects of growth and development of plants and their responses to biological and environmental stimuli. Plant genome organization, mechanisms of gene regulation, techniques to generate transgenic plants, and practical applications of plant biotechnology. PREREQ: BIOL 301.

CHEM 508 SYNTHETIC ORGANIC CHEMISTRY (3-0-3)(F) (Alternate years). The scope and limitations of the more important synthetic reactions are discussed within the framework of multistep organic synthesis. PREREQ: CHEM 309 or PERM/INST.

CHEM 509 INTRODUCTION TO POLYMER CHEMISTRY (3-0-3) (F)(Alternate years). An introduction to the concepts of polymer synthesis, characterization, structure, properties, and basic fabrication processes. Emphasis is on practical polymer preparation, on the fundamental kinetics and mechanisms of polymerization, and on structure-property relationship. PREREQ: CHEM 309 or PERM/INST.

CHEM 510 ORGANIC POLYMER SYNTHESIS (3-0-3)(S) (Alternate years). A study of the synthesis and reactions of polymers. Emphasis is on practical polymer preparation and on the fundamental kinetics and mechanisms of polymerization reactions. Topics include relationship of synthesis and structure, characterization of polymer structure, step-growth polymerization, chain-growth polymerization via radical, ionic and coordination intermediates, copolymerization. PREREQ: CHEM 309 or PERM/INST.

CHEM 511 ADVANCED ANALYTICAL CHEMISTRY (3-0-3)(F). Stoichiometry involved in separations and instrumental methods of analysis. The course will be flexible in nature to adapt to the varied background of the students. PREREQ: CHEM 322 or PERM/INST.

CHEM 521 QUANTUM CHEMISTRY (3-0-3)(F)(Alternate years). Formal introduction to quantum mechanics, Dirac notation, angular momentum and operator algebra. Emphasis will be placed on electronic structure theory, reaction mechanisms and the use of modern quantum chemistry theoretical packages. PREREQ: CHEM 322, or PHYS 309 and PHYS 432, or PERM/INST.

CHEM 522 SPECTROSCOPY (3-0-3)(F)(Alternate years). Concepts and practical usage of modern chemical spectroscopic techniques, including electronic absorption, infrared/Raman, X-Ray/ EXAFS, magnetic resonance and magnetic circular dichroism. Emphasis will be placed on the application of these techniques to the structure/function characterization of chemical and biochemical systems. PREREQ: CHEM 521 or PERM/INST.

CHEM 523 CHEMICAL KINETICS (3-0-3)(F)(Alternate years). A comprehensive study of the role of quantum chemistry and thermodynamics in chemical reactions. Emphasis will be placed on determining reaction coordinates and transition states. Extensive use will be made of modern computational chemical computer programs for calculating potential energy surfaces and transition states. PREREQ: CHEM 322, or PHYS 309 and PHYS 432, or PERM/INST.

CHEM 540 SPECTROMETRIC IDENTIFICATION (3-0-3)(S). Identification of compounds using modern spectrometric techniques. PREREQ: CHEM 309 and CHEM 321.

CHEM 551 BIOINORGANIC CHEMISTRY (3-0-3)(S)(Alternate years). Exploration of the vital roles that metals play in biochemical systems. Emphasis is on transition metals in biology. Course will focus on structural, regulatory, catalytic, transport and redox functions of bioinorganic systems. PREREQ: CHEM 322 or PERM/INST.

CHEM 560 INTRODUCTION TO NMR SPECTROSCOPY (1-3-2) (Offered intermittently). This course will instruct students on the theory and practice of one- and two-dimensional NMR spectroscopy. Emphasis will be placed on using the NMR spectrometer to solve a variety of chemical and biological problems. PREREQ: CHEM 322, or PHYS 309 and PHYS 432, or PERM/INST.

CHEM 561 INTRODUCTION TO MOLECULAR MODELING AND COMPUTATIONAL CHEMISTRY (1-3-2)(Offered intermittently). Overview of modern computational chemistry. Use of computational chemistry tools and their application to problems of chemical and biological interest. PREREQ: CHEM 322, or PHYS 309 and PHYS 432, or PERM/INST.

COMPSCI 510 DATABASES (4-0-4)(S). A study of the theoretical foundations of database management

systems. Design and implementation of alternatives for various database models, including, but not limited to, hierarchical, network, and relational models. Comparison of the reliability, security, and integrity of various database systems. Implementation of a simple systems. PREREQ: COMPSCI 242 or PERM/INST.

COMPSCI 521 DESIGN AND ANALYSIS OF ALGORITHMS (3-0-3)(F). Design techniques such as amortized analysis, dynamic programming, and greedy algorithms. Computational geometry, graph algorithms, primality and other number-theoretic algorithms, specialized data structure techniques such as augmenting data structures, combinatorial graph reduction and functional repetition. NP completeness and approximation algorithms. PREREQ: COMPSCI 242.

COMPSCI 530 PARALLEL COMPUTING (4-0-4)(F). Motivation for parallel computation and survey of different models. Fundamental techniques used in parallel algorithms. Implementation on parallel machines and simulations on clusters of workstations. Distributed computing versus parallel computing. Examples of distributed programming environments. PREREQ: COMPSCI 242 or PERM/INST.

COMPSCI 557 ARTIFICIAL INTELLIGENCE (3-0-3)(F/S). Course will include a survey of some of the following topics, plus a project: Principles of knowledge-based search techniques; automatic deduction; knowledge representation using predicate logic, semantic networks, connectionist networks, frames, rules; applications in problem solving, expert systems, game playing, vision, natural language understanding, learning, robotics; LISP programming. PREREQ: COMPSCI 242 and COMPSCI 354 or PERM/INST.

GCOLL 505 RESPONSIBLE CONDUCT IN RESEARCH (1-0-1)(F,S). Basic concepts, principals and practices governing research compliance and Responsible Conduct for Research (RCR) in each of four disciplinary areas (one area chosen by each student): biomedical sciences, social and behavioral sciences, physical sciences and engineering, humanities. Each area includes an overview of research misconduct, data acquisition and management, responsible authorship, peer review, mentoring, conflicts of interest, collaborative research, human subjects and animal research. On-line materials produced by the Collaborative Institutional Training Initiative (CITI). Lectures will cover the on-line materials and related case studies, and other areas of research compliance including patents, intellectual properties, non-disclosure agreements and sponsored projects. PREREQ: Graduate standing.

ECE 556 PATTERN RECOGNITION (3-0-3)(S)(Alternate years). Basic concepts of statistical and neural pattern recognition. Structure of pattern classification problems. Mathematics of statistical decision theory; multivariate probability functions, discriminant, parametric and nonparametric techniques. Bayesian and maximum likelihood estimation, feature selection, dimensionality reduction, neural network recognition and clustering. PREREQ: COMPSCI 225, and either MATH 360 or MATH 361.

MATH 562 PROBABILITY AND STATISTICS II (4-0-4)(F)(Odd-numbered years). Provides a solid foundation in statistical theory and its use in solving practical problems in the real world. Topics include moment-generating functions, multivariate probability distributions, hierarchical models and mixture distributions, functions of random variables, central limit theorems, estimation, hypothesis testing, multiple linear regression, the analysis of variance, analysis of categorical data, non-parametric statistics. PREREQ: MATH 301, MATH 361 and MATH 275.

MATH 572 COMPUTATIONAL STATISTICS (3-0-3)(F)(Even numbered years). Introduction to the trend in modern statistics of basic methodology supported by state-of-art computational and graphical facilities, with attention to statistical theories and complex real world problems. Includes: data visualization, data partitioning and resampling, data fitting, random number generation, stochastic simulation, Markov chain Monte Carlo, the EM algorithm, simulated annealing, model building and evaluation. A statistical computing environment will be used for students to gain hands-on experience of practical programming techniques. PREREQ: MATH 361.

PHYS 536 SOFT MATTER (3-0-3)(F/S). Examples of soft matter include glues, paints, soaps, rubber, foams, gelatin, milk, and most materials of biological origin. Introduction to the principles underlying the physical properties and behaviors of soft matter, including colloids, polymers, gels, and liquid crystals. Expected background: one semester of upper-level thermodynamics from any department. PREREQ: PERM/INST.

PHYS 537 RADIATION BIOPHYSICS (3-0-3)(F/S). Physical properties and biological effects of different kinds of radiation: action of radiation on various cellular constituents: target theory, genetic effects, repair of radiation damage, physics of radiology and radiotherapy, isotopic tracers. PREREQ: PHYS 307 or PERM/INST.

PHYS 611 MOLECULAR BIOPHYSICS (3-3-4)(F/S). Introduction to the basic concepts and applications of molecular biophysics. Topics include energy and molecular forces in biological structures, conformations of biomolecules, polyelectrolytes in biological systems, transport processes, molecular motors, reaction rates, ions in solution, biological polymers and membranes. PREREQ: BIOL 301, CHEM 431, MATH 170, PHYS 112.

PHYS 612 CELL BIOPHYSICS AND IMAGING (2-2-3)(F/S). Biophysics and imaging of cellular structure and function. Topics include cell rigidity, motility, osmotic pressure, endocytosis, trafficking and diffusion in cytoplasm, ion channels and electrolyte balance, neural electrical signaling. Key techniques of imaging cells, including confocal, fluorescence, multi-photon, and phase-contrast microscopies, and special treatments and methods for live-cell imaging. PREREQ: BIOL 301, CHEM 431, MATH 170, PHYS 112.

PHYS 620 NANOBIOTECHNOLOGY (3-0-3)(F/S). An introduction to the biological and biomedical uses of nanotechnology, including the nature and applications of nanostructures to cell biology, imaging, biosensors, medical therapy (including anti-cancer therapies and drug delivery), and biotechnology. PREREQ: BMOL 603.

PHYS 624 MEMBRANE BIOPHYSICS (3-0-3)(F/S) Membranes are of fundamental importance for biological systems due to their roles in cellular compartmentalization, signal transduction, metabolism, and energy synthesis. Topics include structures and functions of membrane bilayers and of membrane proteins, physics of membrane fusion, and mechanisms of cell signaling and energy transduction. PREREQ: BMOL 602, PHYS 611.

ZOOL 501 HUMAN PHYSIOLOGY (3-3-4)(F/S). Functional aspects of human tissues and organ systems with emphasis on regulatory and homeostatic mechanisms. PREREQ: BIOL 301 or PERM/INST.

b. Faculty

Twenty-nine faculty members (tenured/tenure-track and research) from the Departments of Biological Sciences, Biochemistry and Chemistry, and Physics will participate in the program. All of the existing faculty are active researchers, have published extensively in national and international journals, and have received funding to support their research through grant and contracts. The four proposed new faculty hires will have similar expectations. The tenured/tenure-track and research faculty participants are as follows:

Eric Brown, Ph.D., Oregon State University, 2002, Assistant Professor – Dept. Chemistry & Biochemistry. Organic and inorganic chemistry, synthesis of organometallic complexes to model enzyme active sites.

Henry Charlier, Ph.D., Medical College of Wisconsin, 1996, Associate Professor - Dept. Chemistry & Biochemistry. Biochemistry, enzymology of carbonyl reductase and alcohol dehydrogenase.

Ken Cornell, Ph.D., Oregon Health Sciences University, 1997, Associate Professor - Dept. Chemistry & Biochemistry. Biochemistry, vaccine development, infectious disease, antibiotic development.

Kevin Feris, Ph.D., Ph.D., University of Montana, 2003, Associate Professor – Dept. Biological Sciences. General microbiology, applied and environmental microbiology, microbial physiology.

Daniel Fologea, Ph.D., University of Bucharest, 2002, Assistant Professor – Dept. of Physics. Experimental biophysics, cell membrant biophysics, nanobiotechnology.

Jennifer Forbe, Ph.D., University of Utah, 2003, Assistant Professor – Dept. Biological Sciences. General and comparative animal physiology, natural product drug discovery for infectious disease and cancer.

Morgan Giddings, Ph.D. University of Wisconsin-Madison, 1997, Research Associate Professor – College of Arts and Sciences. Bioinformatics for systems biology, proteomics, computational biology.

Jeffrey Habig, Ph.D., University of Wisconsin-Madison, 2003, Research Assistant Professor – Dept. Chemistry & Biochemistry. Bioinformatics for modeling, proteomics, genomics.

Greg Hampikian, Ph.D., University of Connecticut, 1990, Professor – Dept. Biological Sciences. Forensic science biotechnology development, technological uses of artificial DNA and protein, population genetics.

Charles Hanna, Ph.D., Stanford University, 1990, Professor – Dept. of Physics. Modeling of nanoscale physical and biophysical systems, condensed matter physics, thermodynamics and statistical mechanics, physical interactions in biomolecular systems.

Minoti Hiremath, Ph.D., New York University School of Medicine, 2007, Research Assistant Professor – Dept. of Biological Sciences. Cell biology, developmental biology, molecular biology of cancer.

Cheryl Jorcyk, Ph.D., The Johns Hopkins University, 1990, Associate Professor – Dept. Biological Sciences. The role of oncostatin M (OSM) in breast cancer metastasis, cell signaling, and interaction with the extracellular matrix.

Jeunghoon Lee, Ph.D., University of Connecticut, 2005, Assistant Professor - Dept. Chemistry & Biochemistry, Organic chemistry, nanomaterials, polymer chemistry, synthesis and applications of nanoparticles.

Byung I. Kim, Ph.D., Seoul National University, 1998, Associate Professor – Dept. of Physics. Single molecular biophysics, scanning probe microscopy, interfacial water research, single molecular force microscopy, electrochemical scanning tunneling microscopy, nanotribology, and nanoindentation.

Owen McDougal, Ph.D., University of Utah, 1998, Associate Professor - Dept. Chemistry & Biochemistry, Organic chemistry, NMR structural analysis of peptides, chemical modeling.

Kristen Mitchell, PhD., Washington State University 2003, Assistant Professor – Dept. Biological Sciences. Molecular pharmacology and toxicology, immunotoxicology, cell cycle regulation.

Rajesh Nagarajan, Ph.D., Wesleyan University, 2004, Assistant Professor - Dept. Chemistry & Biochemistry, Biochemistry, organic chemistry, antibiotic development.

Julia Oxford, Ph.D., Washington State University, 1986, Professor – Dept. Biological Sciences. Structure and function of extracellular matrix molecules, cell signaling, developmental biology, tissue engineering, cartilage regeneration, and biomaterials.

Alex Punnoose, Ph.D., Aligarh University, India, 1994. Professor- Dept. of Physics. Nanomaterials, nanobiotechnology, cancer nanotechnology, nanomedicine, nanotoxicology, electron spin resonance, catalysis.

Troy Rohn, Ph.D., University of Washington, 1994, Professor – Dept. Biological Sciences. Neurobiology and neurodegenerative diseases, including Parkinson's and Alzheimer's disease, and pharmacology.

Marcelo Serpe, Ph.D., University of California, Davis, 1991, Professor – Dept. Biological Sciences, Plant Physiology, plant molecular and cellular biology.

Juliette Tinker, Ph.D., University of Iowa, 2000, Assistant Professor – Dept. Biological Sciences. Medical microbiology, vaccine development, bacterial pathogenesis.

Don Warner, Ph.D., University of Michigan, 2002, Associate Professor - Dept. Chemistry & Biochemistry, Organic chemistry, medicinal chemistry, synthesis of anticancer agents, computational chemistry.

Denise Wingett, Ph.D., Washington State University, 1991. Professor – Dept. of Biological Sciences. Immunology and immune disorders, nanotoxicology, nanomedicine, new drug development, cancer research.

Dong Xu, Ph.D., San Diego State University, 2007, Assistant Professor - Dept. Chemistry & Biochemistry, Computational chemistry.

The addition of the following four new full-time Assistant/Associate Professors specializing in cell biology, physiology, molecular genetics, and biophysics is planned. These individuals will be involved in teaching the core curriculum sequence

Cell Biologist, Ph.D. University committed hire for Fall 2012, Associate Professor, Dept. of Biological Sciences.

Physiologist, Ph.D. University committed hire for Fall 2012, Associate Professor, Dept. of Biological Sciences.

Molecular Geneticist, Ph.D. University committed hire for Fall 2012, Associate Professor, Dept. of Biological Sciences.

Biophysicist, Ph.D. University committed hire for Fall 2012, Associate Professor - Dept. of Physics. Biophysical Instrumentation, Molecular Biophysics, Cell Biophysics, Membrane Biophysics.

The FTE assignments of the official tenure track faculty for year 3 of the program (FY15) are shown in the following table:

Table 1. Current tenured/tenure track and research faculty contributing to the Biomolecular Sciences Ph.D. Program

Regular Faculty	**Expertise**	**Program FTE- year 3**
Eric Brown	Inorganic/Organic Chemistry	0.09
Henry Charlier	Biochemistry, Enzymology	0.09
Ken Cornell	Biochemistry, Vaccine Development	0.32
Kevin Feris [1]	Applied Microbiology	0.09
Daniel Fologea [1]	Biophysics	0.33
Jennifer Forbey [1]	Pharmacology	0.09
Morgan Giddings (research faculty)	Bioinformatics	0.05
Jeffrey Habig (research faculty)	Bioinformatics	0.00*
Greg Hampikian	Cell Biology, Forensic Biology	0.17
Charles Hanna	Soft Matter Physics, Modeling	0.00*
Minoti Hiremath (research faculty)	Molecular Biology of Cancer	0.00*
Cheryl Jorcyk	Cancer Biology	0.32
Jeunghoon Lee	Organic Chemistry, Nanomaterials	0.09
Byung Kim [2]	Biophysics	0.21
Owen McDougal	Organic Chemistry, NMR, Modeling	0.16
Kristen Mitchell [1]	Toxicology	0.35
Rajesh Nagarajan [3]	Biochemistry, Organic Chemistry	0.15
Julie Oxford	Developmental Biology	0.28
Alex Punnoose [3]	Nanomaterials, Nanobiology	0.09
Troy Rohn	Pharmacology, Neurobiology	0.22
Marcelo Serpe	Plant physiology and Cell Biology	0.09
Juliette Tinker [1]	Microbiology, Vaccine Development	0.19
Don Warner	Organic Chemistry, Medicinal Chem.	0.05
Denise Wingett [2]	Immunology, Cell Biology	0.17
Dong Xu	Computational Chemistry	0.07
New Hire – Dept. Biological Sciences [5]	Cell Biologist	0.36
New Hire – Dept. Biological Sciences	Molecular Geneticist	0.24
New Hire – Dept. Biological Sciences	Physiologist	0.30
New Hire – Dept. Physics	Biophysicist	0.36

[1]Hired as replacement (retirement or otherwise); hire was made with the PhD in Biomolecular Sciences in mind.
[2]New biomolecular faculty line funded initially by INBRE and subsequently by the university.
[3]New biomolecular faculty line created and funded by the university (Punnoose initially funded by EPSCoR).
[4]New biomolecular faculty line to be funded initially by INBRE and subsequently by the university.
[5]New biomolecular faculty line to be funded by the university.
*Drs. Habig, Hanna, and Hiremath do not have program teaching assignments in the third year of the proposed program - FTE values in this table pertain to year three.

Affiliate/Adjunct Faculty: Several affiliate faculty holding doctorate degrees or Ph.D./M.D. degrees that are conducting biomedical research in the Boise area (i.e., Boise VA Medical Center) will participate in the program as graduate student mentors, graduate student committee members, research collaborators, and instructors, including Dr. Amy Bryant, Dr. Richard Olson, Dr. Dennis Stevens, and Dr. Barry Cusack.

c. Students– briefly describe the students who would be matriculating into this program.

Students entering into the program would typically have an undergraduate degree in biochemistry, biology, biophysics, cell biology, chemistry, computer science, genetics, microbiology, physics, or a closely related field. The undergraduate prerequisites for entry into this program include coursework equivalent to the following offerings at Boise State University: Cell Biology (BIOL 301), Biochemistry (CHEM 431), Calculus 1 (MATH 170), and General Physics or Physics with Calculus (PHYS 112 or PHYS 212). Deficiencies in some coursework prerequisites do not necessarily prevent students from entering the program, as they may be remedied by taking additional coursework early in the program.

The proposed program will bridge traditional fields of science into the multidisciplinary area of Biomolecular Sciences. Students trained in this program will acquire the essential skills to apply both theoretical and experimental knowledge to cross-cutting areas of biomolecular research. Because of the relative uniqueness of this multidisciplinary program, we intend to recruit students nationally and internationally, although an emphasis on recruiting students from the Western States region will exist. Initially, we anticipate some recruitment from a limited number of highly qualified Boise State undergraduate and Masters level students, as well as highly qualified students from other universities and colleges in Idaho. A concerted effort in student recruitment will be made from the onset, and with increased publicity and funding, a high quality applicant pool is expected to develop.

d. Infrastructure support – clearly document the staff support, teaching assistance, graduate students, library, equipment and instruments employed to ensure program success.

Staff support

For the participating departments (Biological Sciences, Biochemistry and Chemistry, and Physics), currently 5 full-time administrative assistants, 2 grants accountants, 6 laboratory materials supervisors/stockroom managers, and numerous work-study staff provide support to the departments, students and faculty. In addition, the affiliated Biomolecular Research Center provides research technicians for research laboratories and shared research facilities and grant writing support staff. A college-level grants accountant also provides support to this group of faculty researchers. Boise State University provides staff for pre- and post-award grant administration. Purchasing and research instrumentation acquisition for research are supported by Boise State University staff.

Teaching Assistance and Graduate Students

Assistance to faculty members will be provided by current graduate teaching assistants (13 in Biological Sciences, 3 in Biochemistry/Chemistry) that support existing Master of Science graduate programs. The implementation of the proposed program involves the creation of 15 additional teaching assistantships to support the program. Graduate students may be supported by any one of these new 15 teaching assistantship positions and/or through grant-funded research assistantships. It is anticipated that an initial student cohort will comprise 8 students in year 1, 8 students in year 2, and 14 students in year three for a total of 30 enrolled students by year 3 of program initiation.

Library Resources

Presently, library sources are not adequate for this program. Some funds are being committed at this time and we will develop a plan for further support of library resources as the program matures. Importantly, many relevant journals are available through the library through on-line subscriptions, including Science Direct, Elsevier Journals, and through inter-library loans.

Research Equipment and Instrumentation

Research equipment and instrumentation are adequate for the initiation of the program. In addition to instrumentation in faculty research laboratories, an aggregate ~$ 3.7 M awarded to Boise State University by the National Science Foundation Major Research Instrumentation Program for shared, multi-user instrumentation supports biomolecular research including a fluorescent activated cell sorter (FACS), a scanning x-ray photoelectron spectrometer (XPS), a confocal microscope, an x-ray, an analytical transmission electron microscope (TEM), an electron spin resonance spectrometer, and a liquid chromatography mass spectrometer (LC-MS). Boise State supports these multi–user facilities with three permanent full-time research scientists that manage these instruments. Below is a detailed list of equipment valued at greater than $100,000 supporting the proposed program.

Table 2. Major Research Instrumentation (purchase cost > $100,000)

Instrument	**Model/Description**
X-ray MicroCT Scanner	SkyScan 1172 X-ray micro computed tomographic scanner
Mass Spectrometer with Dionex UPLC	Bruker MaXis UHR-TOF mass spectrometer with electrospray ionization, hyperbolic quadripole, and attached Dionex UPLC
Mass Spectrometer	Bruker HCTultra ETDII ion trap mass spectrometer
Tandem Mass Spectrometer	ThermoElectron Deca XP-Plus tandem mass spectrometer with Surveyor two-dimensional HPLC
Confocal Microscope	Zeiss LSM 510 Meta 405 with Axio Observer Z1 confocal microscopy imaging system
Transmission Electron Microscope	JEOL 2100 LaB6 analytical transmission electron microscope with EDX and scanning TEM options
Scanning Probe Microscope	Veeco Metrology Digital Instruments Nanoscope IV scanning probe microscope
Atomic Force Microscope	SPM1000HV Control Electronics, AFM 100 AFM interface module for use with RHK control systems, AIM-MI control interface for molecular imaging and DI (PicoSPM & multimode)
In Vivo Imaging System	Caliper Life Sciences Xenogen IVIS® spectrum imaging system
Fluorescent Activated Cell Sorter	Beckman Coulter 5-laser Influx model fluorescent activated cell sorter (FACS) with 2 scatter, 13 fluorescence detectors and sort module for deposition into 96-well plates
Flow Cytometer	Coulter Epics XL 4 color flow cytometer
Scanning Electron Microscope	JEOL JSM-6340F field emission scanning electron microscope
Electron Spin Resonance Spectrometer	EleXsys E-500 EPR spectrometer (Bruker Bio-Spin) with 1.7 Tesla magnet and 2-300 K temperature
X-ray photoelectron spectrometer	PHI VersaProbe X-ray photoelectron spectrometer (XPS)
Computer Animated Visualization Environment (mini-CAVE)	MiniCAVE (Computer Animated Virtual Environment)- Idaho National Labs 3D visualization system provides users enhanced modeling and simulation capabilities in an immersive virtual reality display
Analytical Ultracentrifuge	Beckman XL-1 analytical ultracentrifuge
Beowulf Parallel Computation Cluster	61-node (122-processor) Beowulf parallel computation cluster for computational/modeling studies
Raman/Photoluminescence Spectrometer	Horiba Jobin Yvon T64000 triple monochromator with multichannel CCD detector and a single channel PMT detector
Capillary Electrophoresis	ABI Genetic Analyzer 3130
Nuclear Magnetic Resonance	Bruker Avance III 600 MHz NMR with liquids (BBO, TXI, and TCI cryoprobe) and solids (4mm MAS) probes

In addition to the major scientific instrumentation listed above, faculty in the biomolecular sciences have access to the following equipment: Reichert SR7000 Surface Plasmon Resonance spectrometer for real time interaction analysis, BioRad External Laser Molecular Imager, Kodak IS4000R Image Station, Robosep Robot (StemCell) for isolating immune cell subsets, Leica DM2500 fluorescent microscope with DIC objectives, Gyromax 737R incubator shaker for bacterial culturing, 4 HPLCs (including size exclusion and reverse phase chromatography and LC), NanoDrop Technologies ND-1000 for quantification of nucleic acids in small volumes, Protean Isoelectric Focusing System, Silicon Graphics Imaging Computer for 3-D modeling of molecular structures, Eppendorf Vacufuge concentrator 5301, Savant SC110A/UVS400 concentrator/vacuum system, Cary 50 microplate reader, OLIS DM 45k Spectrofluorimetry system, Stopped-Flow, BioTek microplate washer, Olympus BX60 fluorescence microscope, Nikon Eclipse TS100 microscope with fluorescence capabilities, ABI 7300 and an I-Core Smart Cycler II Real-Time PCR thermocycler, standard PCR thermocyclers (Techne and MJ Research), LI-COR Global IR2 4200 gel-based automated DNA sequencer , LI-COR Global 4300 automated DNA sequencer, Sorvall high speed centrifuge, Beckman TL100 ultracentrifuge, Omni GLH tissue homogenizer, Beckman scintillation counter, Agfa CP 1000 film processor, FX Pro Plus multi-imager (Molecular imager), 2 photodiode array spectrophotometers and 12 CCD array spectrophotometers (Hewlett-Packard Model 8452 diode array Bausch and Lomb 2000), Leica CM1950 OUVVM cryostat, Accuri C6 4 color flow cytometer, molecular modeling stations fluorescence spectrometer (Ferrand Optical Mark-1), Jasco J-810 spectropolarimeter, MicroCal Microcalorimeter, field-flow fractionation channels (including thermal, electrical and flow FFF), multiangle laser light scatter (MALS) detector in tandem with size exclusion chromatography (SEC) and a refractive index detector, dynamic light scatter (DLS) detector for determination of hydrodynamic radius, time-resolved UV resonance raman spectroscope, Zetasizer NanoZS for zeta potential measurements, Philips X'Pert x-ray powder diffractometer, Fourier transform infrared spectrometer, as well as many other items of scientific instrumentation.

Facilities

Computer labs: The departments involved in the Biomolecular Sciences graduate program have two networked laboratories dedicated for use by students enrolled in the proposed program. These computer labs have 74 workstations for general student and research use, and are networked to university servers.

Research laboratories: Each faculty member listed in this proposal is conducting active research and has dedicated laboratory space with appropriate facilities to conduct research in their discipline. Laboratories are located in the Science building, the Multi-Purpose building, and the Math/Geosciences building.

Animal Vivarium: Currently, researchers utilize the Animal Facility at the Boise VA Medical Center. A new research animal vivarium will be located on the Boise State University campus, to be built with funding from an NIH grant of nearly $4 million. Phase 1 construction consisting of ~6,370 sq. ft. is planned to begin in November 2011.

Other Resources: The College of Arts and Sciences maintains an instrument repair shop. The Simplot-Micron Instructional Technology Center provides media support including film production and satellite television. To facilitate distance collaborations, a Tandberg video conferencing unit is available for Biomolecular faculty use in the nearby Business Building. Additional federal and state government laboratories in Boise and the vicinity conducting research or work related to the Biomolecular Sciences program include the Department of Veteran Affairs Medical Center, MSTI (Mountain States Tumor Institute), MSTMRI (Mountain States Tumor and Medical Research Institute), the Health and Welfare Department lab, and the State of Idaho laboratories. In addition, collaborations between BSU faculty researchers in the Biomolecular Sciences area and St. Alphonsus and St. Lukes Regional Medical Centers are ongoing. The proposed program is also supported by the Boise State Biomolecular Research Center (BRC).

e. Future plans – discuss future plans for the expansion or off-campus delivery of the proposed program.

At the present time there are no plans to expand the proposed program off-campus.

2. **Duplication – if this program is unique to the state system of higher education, a statement to that fact is needed. However, if the program is a duplication of an existing program in the system, documentation supporting the initiation of such a program must be clearly stated along with evidence of the reason(s) for the necessary duplication.**
   Describe the extent to which similar programs are offered in Idaho, the Pacific Northwest and states bordering Idaho. How similar or dissimilar are these programs to the program herein proposed?

The University of Idaho and Idaho State University each have several Ph.D. programs that have similarities to the proposed Ph.D. program in Biomolecular Sciences.

At the University of Idaho:

- The Ph.D. in Bioinformatics and Computational Biology has areas of focus: (i) biology, specifically focusing on the study and research of biological systems and the understanding of the molecular and genetic data, (ii) mathematics, specifically focusing on the methods and models used in genetic and molecular biological research, and (iii) computer science, with specific focus on the skills and techniques to develop and use databases and other data management systems.
- The Ph.D. in Biological and Agricultural Engineering includes specializations in water resources, bioremediation, or bioenergy. The proposed program is closest to the third of those areas, which focuses on design and testing of new ways to produce biodiesel and other forms of alternative energy from feedstock such as locally grown canola oil or manufacturing waste.
- The Ph.D. in Biology has focus in three areas: (i) ecology and evolution (animal behavior, genetics, microbial ecology, systematics), (ii) neurobiology (retinal development and neurophysiology), and reproductive biology (development, endocrinology, fertility).
- The Ph.D. in Microbiology, Molecular Biology, & Biochemistry involves research in the following areas: bioremediation, biodegradation & molecular ecology; developmental and cellular biology; cell cycle regulation; molecular machines; pathogenic mechanisms in infectious disease; signal transduction and gene regulation; and biochemistry and protein structure/function
- The Ph.D. in Neuroscience involves investigations of the development, anatomy and physiology of the nervous system; research of cognitive and behavioral processes; and the application of mathematics and computer science to understand and model neurological function.

At Idaho State University:

- The faculty members of the Ph.D. in Biology have research expertise that falls into the areas of biomedicine, anatomy and physiology, ecology and evolution, microbiology and biochemistry, and science education.
- The faculty members of the Ph.D. in Microbiology have research expertise in the radiation effects in unicellular organisms; microbial stress response; mineral-microbe interactions; ecophysiology and molecular biology of 'extreme' microorganisms; medical mycology; microbial molecular biology; microbial diversity and evolution of prokaryotes; the biogeochemistry of novel prokaryotic isolates; and the evolution of protein structure and function.
- The PhD in Pharmaceutical Sciences has focus in three areas: pharmacology (the study of drug action on biological systems), pharmaceutics (the design and evaluation of contemporary pharmaceutical dosage forms and drug delivery systems), and drug discovery & development (the process by which new or existing chemical species are found for the treatment of various diseases and carried through preclinical and clinical studies).

We offer the following reasons to justify the creation of a new doctoral program that has similarities to existing programs at the other two universities.

1. **The proposed program is distinct in its structure and emphases from those of Boise State's sister institutions.** The uniqueness of the proposed program stems from its explicit bringing together of the disciplines of biology, chemistry, and physics, and more specifically the subdisciplines of molecular biology,

cell biology, physiology, biochemistry, and biophysics. None of the above programs at University of Idaho or at Idaho State University includes faculty representation from all three disciplines of biology, chemistry, and physics.

This point is reinforced in the specific recommendations that resulted from the recent Year 2 external evaluation for the NIH of the INBRE grant; the draft report (attached; Appendix C) states (emphasis added):

> "The Committee was particularly impressed by the developing interdisciplinary biomolecular research program at Boise State University. If approved by the appropriate authorities, the Interdisciplinary **Biomolecular Sciences PhD Program would be unique in the State,** including researchers and students from biology, chemistry, engineering and other disciplines. The Committee noted the University's commitment of scarce resources to support this program. Moreover, it is essential for sustaining the research momentum in the Boise area after NIH INBRE funding sunsets."

That said, we acknowledge that although it is a unique program, there remains a substantial potential for overlap among the programs. Therefore additional reasons follow.

2. **The field of biomolecular science is vast** and can easily accommodate multiple graduate programs, as is evidenced by the fact that the University of Idaho and Idaho State University each has several doctoral programs in related fields, as do essentially all research universities.

In addition, there is little overlap at the areas of specific research focus of Boise State University researchers with the areas of specific focus of researchers at the other institutions. The following table contains descriptions of areas of specific research focus research of the faculty members associated with the proposed Ph.D. in Biomolecular Sciences. Our examination of the web pages of faculty members at the University of Idaho and at Idaho State University revealed only occasional overlaps of specific research focus.

Boise State University faculty in Biomolecular Sciences: areas of specific research focus.
Pharmaceutical Development and Characterization • Creation and characterization of analogs of the chemotherapeutics drugs anthracycline and mitomycin without cardiotoxic side effects, and study of the mechanisms of cardiotoxicity. • Using *in vivo, in vitro,* and *in silico* preclinical approaches to discover and develop natural products for treatment of infectious disease and cancer. • Development of new anti-cancer drugs based on artificial protein and nullomer DNA sequences • Computational prediction, design, synthesis, and evaluation of molecular probes that specifically target nicotinic acetylcholine receptor isoforms significant to Parkinson's disease therapy. • Design and development of nanoparticle-based novel nanomedicines to provide targeted treatment of cancer, autoimmune diseases, and bacterial diseases. • Use of biofunctionalized multifunctional nanoparticle probes to improve targeted delivery and photothermaltherapy of cancer. Use of liposomes as carriers for targeted and controlled drug delivery. • Development of targeted therapeutics for leukemias/lymphomas, respiratory diseases, and immune disorders, and the potential utility of novel anthracycline drug analogs for the treatment of autoimmune diseases. • Structure-based drug design and virtual screening techniques to discover novel therapeutic approaches to microbial targets, infectious diseases, and other diseases such as cancer, diabetes, autoimmunity, and inflammation. • Development of potential therapeutics that target Oncostatin-M signaling for the treatment of breast cancer metastasis to bone.

Vaccine and antibiotic development

- Synthesis and testing of oral vaccines for infectious disease, e.g., an oral vaccine candidate for West Nile virus.
- Development of antibiotics with novel mechanisms of action, e.g., characterization of a novel antibiotic with activity against E. coli responsible for hemolytic-uremic syndrome.
- Design of inhibitors of biofilm formation as a means of controlling virulence *in P. aeruginosa*, a biofilm producing bacterium implicated in various diseases including meningitis, cystic fibrosis and pneumonia.
- Development of non-toxic derivatives of bacterial enterotoxins as vaccines that can be delivered through novel routes, such as the nose or mouth, targeting, for example, *Staphylococcus aureus*, which causes antibiotic-resistant hospital-acquired infections in humans and mastitis in dairy cattle.

Basic biomolecular research

- Planar bilayer lipid membranes formation and characterization; protein reconstitution in artificial bilayer lipid membranes; electrical and optical characterization of transmembrane transporter insertion and functioning; liposome preparation, loading, functionalization, proteoliposomes.
- Synthesis of bioinorganic complexes to model metalloenzyme active sites and reactivity.
- Development of tools for the interpretation of mass-spectrometry based proteomics data, including improved MS/MS database search accuracy, improved peptide mass fingerprint accuracy using peak height statistics, and integration of bottom-up with top-down proteomic data sets. Examination of aspects of antibiotic drug resistance in *E. coli* and *P. aeruginosiae* using a systems biology approach.
- Modeling of nanoscale biophysical systems and study of physical interactions in biomolecular systems, including interactions of metal oxide nanoparticles with the outer membrane of bacteria and cancer cells.
- Use of biofunctionalized multifunctional nanoparticle probes to improve targeted delivery and photothermaltherapy of cancer.
- Quantitative measurement of biomolecular interactions on various levels in viral, bacterial and cellular systems as well as single molecule using scanning probe microscopy, interfacial water research, single molecular force microscopy, electrochemical scanning tunneling microscopy, nanotribology, and nanoindentation.
- Use of computer simulation techniques including molecular dynamics, brownian dynamics, and coarse grained modeling to probe the structures, functions, interactions of proteins and their complexes.
- Investigation of the biophysical and biochemical interactions between nanoparticles and biological systems.
- Study of mechanisms by which biological soil crusts and soil fungi affect establishment of vascular plants.

Biological Basis of Disease

- Study of the molecular basis of tumor development and cancer metastasis, with focus on the role of Oncostatin M in breast cancer metastasis, specifically to bone.
- Study of the structure and function of extracellular matrix molecules, cell signaling, tissue engineering, cartilage regeneration, and biomaterials. Cause and treatment of arthritis, osteoporosis, hearing loss, blindness, cleft palate and other birth defects.
- Study of the role of the immune system and non-parenchymal cells in regulation of liver regeneration, the mechanisms of cell cycle regulation by aryl hydrocarbon receptor ligands, and linking dioxin toxicity to cell cycle regulation.
- Study of the role of caspases in promoting pathology associated with Alzheimer's Disease and Parkinson's Disease, and exploration of treatment possibilities such as the use of a caspase inhibitor.
- Using proteomics to understand host-virus interactions, combining agent-based modeling and evolutionary search techniques to explore complex systems (e.g. tissue regeneration).
- Embryonic mammary development, role of parathyroid hormone related protein signaling and the mechanism of its crosstalk with estrogen, Wnt and Bone Morphogenic Protein signaling in mammary development and breast cancer, tumor stromal interactions in breast cancer.

Biofuels development

- Microbial catalysis of biomass; advanced bio-based catalyst development; development of third generation biofuels; conversion of agricultural, municipal, and other organic rich wastes to biofuels and bio-products; design and deployment of advanced microbial catalysts.

3. **The program will facilitate collaboration and cooperation among the universities**. The proposed program is a key deliverable of Idaho's INBRE grant from NIH, which has funded a highly successful cooperative effort among the three universities. As noted above, INBRE (and predecessor BRIN) grants have brought more than $44 million in federal funding to Idaho, providing funds to facilitate development of biomedical research and research collaborations in Idaho. In their draft report, the INBRE external reviewers recently stated in their draft report (attached; Appendix C; emphasis added):

> **"…**the Biomolecular Sciences PhD Program… would be a unique interdisciplinary program, and would clearly complement and enhance the existing PhD programs at UI and ISU. The potential for inter-institutional collaborations between these programs is outstanding."

A memo (attached; Appendix C) from Dr. Scott Minnich, faculty member at the University of Idaho and Associate Director of Idaho INBRE, notes that (emphasis added):

> "In summary, the faculty, the environment, and the students at BSU are poised to expand graduate training at the Ph.D. level. The emphasis in biomolecular sciences will not only be unique, but will further enhance collaborations in the biomedical research across Idaho."

As noted earlier in this proposal, a letter of support (attached; Appendix C) for the Ph.D. in Biomolecular Sciences from Dr. Carolyn Bohach, University of Idaho Faculty member and Director of Idaho INBRE, notes that (emphasis added):

> "INBRE and the proposed Biomolecular Sciences Doctoral Program are both multidisciplinary, collaborative, and focus on the continued growth of research and research-training programs."
>
> "Your proposal for the establishment of a Biomolecular Sciences Doctoral Program builds on the early efforts of INBRE and will, I believe, complement existing graduate programs and serve Idaho well by creating a valuable training and research resource for the state."

It is also worth noting the potential for collaborations between faculty members in the biomolecular sciences that exist outside the realm of biomedicine and the NIH. For example, in his work on microbial catalysis of biomass to create biofuels, Boise State University faculty member Dr. Kevin Feris is collaborating with several members of the University of Idaho faculty.

4. **The proposed program will provide opportunities for sharing both the curriculum and faculty expertise among institutions.** There will be increased opportunities for faculty members to serve on graduate committees at other institutions. Graduate students enrolled in programs at the University of Idaho and Idaho State, and who spend significant time in the Treasure Valley, will be able to enroll in doctoral level coursework at Boise State University. Doctoral-level courses in the biomolecular sciences at Boise State will be made available via distance delivery methods to students at other institutions. In his letter of support for the proposed program, (Appendix B) by Dr. J.W. Rogers, Director of the Center for Advanced Energy and Associate Director of INL, noted that the proposed program would be:

> "…a nice complement to the Bioinformatics and Computational Biology Program offered at the University of Idaho."

5. **The program will provide substantial local benefit**. As is described below and is documented in letters of support, the proposed program will (i) produce research results with the potential to have substantial economic benefit as intellectual property, e.g., biomaterials and biotechnological inventions, (ii) produce research results that provide societal benefit by increasing our understanding the causes of human disease and developing cures for those diseases, (iii) provide educational opportunities to local industry and government scientists, (iv) make the region more attractive to biotechnology businesses considering relocation to this area.

> "We…believe that [the proposed program] is an important step in meeting the needs of our area. Personally, I believe that biotech is the greatest growth opportunity for the future. We can either prepare for it and benefit, or ignore it and be left behind." "Our R&D includes many collaborations with universities…We would prefer to see more of this type of work being done in Idaho"—Steve Lackie, President of Sapidyne, Inc. (Appendix B)

The following are similar programs in nearby states.

Molecular Biosciences Program, Montana State University. Areas of study include Cell, Developmental and Molecular Biology; Immunology and Infectious Disease; Bioinformatics; Genomics and Proteomics; Biophysics; Chemical Biology; Life in Extreme Environments; Bio-inspired Materials; Environmental Microbiology; Virology, and Plant Sciences.

School of Molecular Biosciences, Washington State University. Molecular biosciences can be best viewed as a dynamic continuum in which approaches derived from chemistry, physics, and biology are utilized to address the fundamental mechanisms of living things. The School offers Ph.D. degrees in Biochemistry, Biotechnology, Genetics and Cell Biology, and Microbiology. Options within these degrees offer flexibility to add emphasis in chemistry, molecular biology, physics, and biotechnology.

Biomolecular Science and Engineering Program, UC Santa Barbara. This program offers a unique mix for graduate training and research at the frontiers of Biochemistry, Molecular Biology, Bioengineering, and Biomolecular Materials.

The Graduate Program in Molecular and Cellular Biosciences, Oregon Health and Science University. Students can pursue interdisciplinary interests across departmental boundaries in areas including the autonomic nervous system, cancer biology, chemical biology, developmental biology, endocrinology, gene regulation, immunology, inflammatory processes, metabolism, microbial pathogenesis, signal transduction, structural biology, and virology.

Environmental and Biomolecular Science Program, Oregon Health and Sciences University. The program spans a wide scope of research areas that involve study of physical, chemical, and biological processes using biomolecular, chemical, genetic, and computational approaches.

The Molecular Biosciences Interdisciplinary Program, University of Nevada at Reno. The program involves 60 faculty members from nine different departments. Research areas include biochemistry, bioinformatics, cancer biology, cardiovascular research, cell biology, gametogenesis and fertility, functional genomics, hormones, immunology, infectious diseases, insect biochemistry, insect molecular genetics, neuroscience, metabolic regulation, metabolomics, microbiology, microbial ecology, nutrition, regulation of gene expression, pathology, protein structure-function, plant biochemistry, plant molecular genetics, proteomics, signal transduction, smooth muscle biology, stem cell biology, and virology. Students earn their graduate degree in one of three dissertation programs: Biochemistry, Cellular and Molecular Biology, and Cellular and Molecular Pharmacology and Physiology.

4. Centrality – documentation ensuring that program is consistent with the Board's policy on role and mission is required. In addition, describe how the proposed program relates to the Board's current Statewide Plan for Higher Education as well as the institution's long-range plan.

The following excerpts are from the current role and mission statement formulated by the State Board of Education (SBOE). The excerpts indicate that the proposed program is consistent with SBOE intentions for Boise State University.

> Boise State University "**offers a variety of masters and select doctoral degrees**" and "**conducts coordinated and externally funded research studies**".
>
> "Boise State University is a comprehensive, urban university serving a diverse population through undergraduate and **graduate programs, research,** and state and regional public service".
>
> "Boise State University will formulate its academic plan and generate programs with primary emphasis on business and economics, engineering, the social sciences, public affairs, the performing arts, and teacher preparation. Boise State University will give **continuing emphasis** in the areas of the health professions, the **physical and biological sciences**, and education and will **maintain basic**

strengths in the liberal arts and **sciences**, which provide the core curriculum or general education portion of the curriculum".

The proposed program is also consistent with the strategic plan for Boise State University, called *Charting the Course*, which places a focus on "**exceptional research** defined by **progressive scholarship** and creative activity, and **graduate programs that have groundbreaking applications locally, regionally, and globally**".

5. Demand – address student, regional and statewide needs.

a. Summarize the needs assessment that was conducted to justify the proposal. The needs assessment should address the following: statement of the problem/concern; the assessment team/the assessment plan (goals, strategies, timelines); planning data collection; implementing date collection; dissemination of assessment results; program design and on-going assessment. (See Board policy III.X., Outcomes Assessment.)

There is a substantial need for the educational opportunities that a PhD program in Biomolecular Sciences would provide, for the resulting PhD graduates, and for the research that a PhD program in Biomolecular Sciences would produce. The needs assessment that led to this proposal was garnered from a number of sources over the past 5 years. Direct inquiries from prospective students to the departments and faculty expressing their interest in a biomolecular-related doctoral program is one of the primary motivations for the proposed program. Additional support has been provided by various local businesses and employers interested in highly trained graduates with expertise in biomolecular science-related disciplines and in the research that would result from the program. Letters of support from various local biomedical and biotechnological research companies, research institutes, hospital systems, and government agencies are attached in Appendix B.

A. The National Need for Research by PhD students and their Faculty Mentors

The National Institutes of Health devotes more than $21 billion per year towards biomedical and biomolecular research. The National Science Foundation and other agencies, including the Department of Energy and the Department of Defense, also devote a large amount of funds in support of biological and biomolecular research (i.e., $6.2 billion, $604 million, $94 million, respectively). Furthermore, a number of foundations, including the M.J. Murdock Charitable Trust, the American Federation for Aging, and the Susan Komen Breast Cancer Foundation also invest substantial sums in grants to biological research. The fact that various federal and private entities collectively fund many billions of dollars worth of research grants each year illustrates the great need for research in the biological and biomolecular sciences.

The proposed academic program will fuse physical sciences and the basic molecular life sciences into a single curriculum, removing traditional barriers to interdisciplinary thinking, training, and research at the interface between the life sciences, chemistry, physics, and computational biology. Our interdisciplinary doctoral program in Biomolecular Sciences will benefit from and contribute to the increasing synergy between life sciences and the physical sciences, and will contribute to growth in areas such as biotechnology, biomaterials, and nanobiotechnology in the public and private sectors.

Research presently underway at Boise State University demonstrates that the proposed program will help meet research needs of federal and private entities. For example,

- We are presently conducting projects that will provide basic information on the causes of various diseases, to aid in the development of therapies. Examples include breast cancer, leukemias and lymphomas, osteoarthritis, Rett Syndrome, Alzheimer's disease, Parkinson's disease, asthma, retinal detachment, cholera, vaccine development, West Nile Virus, drug resistant bacterial infections (i.e., MRSA), parasitic infections, and genetic analysis of human populations.
- We are presently conducting projects that will aid in the development of materials that will be of substantial use to society. Examples include artificial cartilage, anti-fouling compounds, biocompatible containment vessels, biofuels, targeted drug development for treatment of microbial infections and new chemotherapeutic drugs, nanomedicine based approaches for treatment of cancer, biosensors for detection of pathogens, and instrument development to support biotechnology and medical diagnostics.

B. The Local Need for Research and for Graduate Educational Opportunities.

1. Local Industry. The local biotechnology industry will benefit from the creation of a highly-trained local workforce and from research discoveries that come from the new program. It is important to note that companies often will assess the availability of appropriate educational programs before relocating to an area. The following quotes are from letters of support from local industry (attached; Appendix B):

> "It would be favorable for us if BSU were to have a PhD program in Biomolecular Sciences for developing a local candidate pool as well as for establishing greater collaboration potential between us and the university."—Michael Hill, PhD, President of Boise Technology, Inc.
>
> "[the proposed program] will provide an advanced degree option in interdisciplinary Biomolecular Science for employees who would otherwise need to relocate to pursue advanced education in the areas of biochemistry, bioinformatics, biophysics, cell biology, and molecular biology."—Sandy Koch, Biology Supervisor, and Brian McGovern, Microbiology Supervisor, Analytical Laboratories, Inc.
>
> "Having local access to graduate level science courses would be a great asset to our employee development and talent management." "It would be an asset to our research endeavors in Idaho to have access to specific courses or a full PhD program without travel or relocation…"—Teresa Mitzel, Head of Product Evaluation and Advancement, Syngenta Seeds, Inc.
>
> "The field of medicine is changing as technologies continue to advance rapidly. All companies must keep up in order to stay competitive. For this reason, we welcome a program where innovative research in drug development and biomedical research occur in our home town."—Carl Thornfeldt, M.D., Founder and CEO of Episciences, Inc.
>
> "At OD260, Inc., we value a workforce with this type of advanced education. Graduates of the PhD program in Biomolecular Sciences will be prepared and well aligned to industry requirements."—Xavier Danthinne, PhD, President of O.D.260, Inc.

2. Biomedical Research and Health Care Organizations. There are several regional research and health care entities that would benefit from PhD-level scientists trained in biomolecular sciences. These include basic and clinical researchers located at the 1) Boise VA Medical Center (VAMC), 2) Mountain States Tumor and Medical Research Institute (MSTMRI), 3) Mountain States Tumor Institute (MSTI), 4) St. Luke's Health System, 5) St. Alphonsus Health System, and 6) the Idaho Bureau of Laboratories. A variety of clinical and federally funded biomedical research programs are conducted at each of these facilities.

The Boise VAMC has long history of biomedical research with research programs specializing in pulmonary diseases, drug resistant microbial infections, cardiovascular disease, pharmacology, mechanisms of cancer chemotherapeutics, and new drug development. Growth in the research capacity at the Boise VAMC is expected to increase with construction of a new research building planned for this year. A local pool of biomolecular science PhD graduates will enhance the established VA research programs, and is also important for attracting new research scientists to their expanding facility. It is also important to note that many of the VAMC researchers have active collaborations with faculty participants listed on this proposal. Thus, the existing synergy between VAMC and Biomolecular Science research faculty would be further enhanced by the implementation of the proposed doctoral program, and the VAMC leaders have indicated that our graduates would be actively recruited.

> "…we are happy that Boise State will be supporting a program that will train scientists who are capable of doing high-quality independent research who can work as part of an interdisciplinary team…"—Dennis Stevens, PhD, MD, Associate Chief of Staff for Research and Development, Veterans Affairs Medical Center (Appendix B)

Researchers at MSTMRI and MSTI, which are part of the Boise-based St. Luke's Health System also conduct a variety of research projects including federally funded initiatives as well as applied clinical research. There is

already a strong relationship between MSTMRI and many of the BSU faculty researchers are members of this organization. MSTMRI provides pilot project grants so researchers can obtain crucial preliminary data and parlay this opportunity into larger federally funded grant awards. Reciprocal exchanges of student researchers between BSU biomolecular science faculty and MSTMRI researchers is fairly common, and expected to be even more commonplace with the implementation of the proposed doctoral program. One of the expressed future goals of MSTMRI is to facilitate translational research which strives to bridge the gap between basic research and new approaches and improvements to patient care. To meet this goal, a local pool of PhD-level researchers is an important consideration.

> "We…have long valued our association with the faculty at Boise State, and look forward to working with the graduates of the Biomolecular Sciences program. We have a special interest in individuals who might undertake translational cancer research."—Theodore Walters, MD, Director of St. Luke's MSTMRI (Appendix B)

Researchers and clinicians associated with St. Luke's Health System and St. Alphonsus Health System will also benefit from collaborations with our faculty members and from the research that will result from the program.

> "Our physicians have enjoyed the collaboration with your many scientific centers and agree such a PhD program will further the efforts to serve the people of our region. By joining forces with your biologists, chemists, biochemists, and physicists with our clinical physicians, pharmacists, and nurse researchers we will indeed create an advanced and contemporary atmosphere for the advancement of students' education and experience."—David Pate, MD, JD, President and CEO, St. Luke's Health System. (Appendix B)

The Idaho Bureau of Laboratories provides the state with research in the realm of public health.

> "The program's research foci in bioinformatics, genomics, molecular forensics, vaccinology, and next generation antibiotic development are particularly relevant to public health laboratory work. As such, the Idaho Bureau of Laboratories (IBL) would benefit from close association with faculty and students in the program."—Christopher Ball, PhD, Bureau Chief, Idaho Bureau of Laboratories (Appendix B)

3. Energy Research Entities. One of the research programs in our proposed program focuses on the development of microbial catalysts that can be used to convert various forms of biomass into third-generation biofuels. The research from that program and the students trained in those methodologies will benefit the state of Idaho.

> "…we have active programs in bioenergy, biofuels, biocatalysis, bioconversion, microbiomes, and biological aspects of carbon management…At the INL and CAES, we are constantly seeking qualified scientists and engineers to work in these disciplines and typically we must recruit out of state. Your proposed program would go a long way toward providing a highly skilled workforce programs as well as the ever-increasing workforce pipeline necessary to support the growing biotechnology industry in the state of Idaho."—J.W. Rogers, Jr., Director of the Center for Advanced Energy Studies and Associate Director of the Idaho National Laboratories (Appendix B)

> "…the program has the potential to have substantial impact on Idaho's ability to create alternative forms of energy and diversify our economic base."—John Chatburn, Interim Administrator, Office of Energy Resources, State of Idaho (Appendix B)

b. Students – explain the most likely source of students who will be expected to enroll (full-time, part-time, outreach, etc.). Document student demand by providing information you have about student interest in the proposed program from inside and outside the institution.

Need for an interdisciplinary PhD program by potential local and out-of-area students. Boise State faculty members receive numerous inquiries each year from students interested in receiving a PhD in Biomolecular Sciences. The bulk of these inquiries come from outside of the area, from people who have assumed Boise State already has a PhD in Biomolecular Sciences (or related area) in place. Faculty also receive numerous

inquiries from individuals employed locally (e.g., local biomedical research entities) about the expected timing for a Biomolecular Sciences doctoral program. The need extends not only to providing training to students at the doctoral level, but that the training will be delivered at the intersection of disciplines thereby preparing students for the manner in which future research will be conducted.

> "Given the interdisciplinary nature of the program, several IBL employees have expressed interest in enrolling when the program is approved. Having IBL scientists in this program would provide an excellent opportunity to advance the research, training and outreach missions of the Bureau."—Christopher Ball, Bureau Chief, Idaho Department of Laboratories (Appendix B)

> "…having a local graduate program for graduate level studies would help with our employees who wish to further their education."—Steve Lackie, President, Sapidyne, Inc. (Appendix B)

Failure to provide graduate education opportunities may lead to the loss of valuable workers by local industry.

> "We have lost a few of our brightest junior level scientists to graduate schools out of state. We would welcome local graduate programs that might help us to retain our brightest with the opportunity to enroll in a local graduate program."—Michael Hill, PhD, President of Boise Technology, Inc. (Appendix B)

> "We have had several undergraduate level employees continue their education, and so far this has meant leaving the area. This is not only a loss to our company, but is also a loss of talent to the state."—Steve Lackie, President, Sapidyne, Inc. (Appendix B)

The establishment of the Biomolecular Sciences PhD program has been in discussion for several years, and students have enrolled at Boise State, anticipating the beginning of the program. Therefore, during the first year of the proposed program, due to demand and the number of highly qualified students, we expect that most (80%) of prospective students will be fulltime students who have recently graduated with an undergraduate BS degree from Boise State University or the surrounding Treasure Valley area. The remaining 20% of students are expected to be part-time students, or recent graduates, who are now employed in the local workforce seeking a graduate degree for career advancement. By year two of the program, our national recruitment efforts will be well underway and we expect that ~50% of students in the program will be from the local area, with the remaining 50% recruited from out of state. By the end of the year five, we expect that ~70% of students will be recruited from out of state. We are anticipating a cohort of 8 students in year one, followed by 8 more students in year 2, and ramping up to a combined total of 30 students by year 3 of program implementation.

Differentiate between the projected enrollment of new students and those expected to shift from other program(s) within the institution.

Projected enrollment is expected to be largely based on new students entering the program. Any shifts from other on-campus programs would likely be from chemistry or biology students who have entered the Masters of Science programs in these departments because a doctoral degree was not available. Based on differences in program completion times and desired employment goals pending graduation, it is expected that only a few students would shift programs.

d. Expansion or extension – if the program is an expansion or extension of an existing program, describe the nature of that expansion or extension. If the program is to be delivered off-campus, summarize the rationale and needs assessment.

NA – the proposed program is a new program that will be delivered on the Boise State University main campus.

6. Resources – fiscal impact and budget

On this form, indicate the planned FTE enrollment, estimated expenditures, and projected revenues for the first three fiscal years (FY) of the program. Include both the reallocation of existing resources and anticipated or requested new resources. Second and third year estimates should be in constant dollars. Amounts should reflect explanations of subsequent pages. If the program is a contract related, explain the fiscal sources and the year-to-year commitment from the contracting agency(ies) or party(ies).

I. PLANNED STUDENT ENROLLMENT

	FY 13		FY 14		FY 15	
	FTE	Headcount	FTE	Headcount	FTE	Headcount
A. New enrollments	7.9	8	15.8	16	29.4	30
B. Shifting enrollments	0	0	0	0	0	0

II. EXPENDITURES

	FY 13		FY 14		FY 15	
	FTE	Cost	FTE	Cost	FTE	Cost
A. Personnel Costs						
1. Faculty	1.52	$100,323	3.3	$212,401	5.0	$332,092
2. Administrators	0.45	$42,712	0.5	$43,567	0.5	$44,438
3. Adjunct faculty	0	$0	-	$0	-	$0
4. Graduate/instructional & research assistants	5.5	$96,000	11.0	$195,840	22.5	$561,816
5. Research personnel	9.0	$355,355	9.0	362,462	9.0	369,711
6. Support personnel	2.15	$75,763	2.2	$77,279	2.2	$78,824
7. Fringe benefits		$193,140		$239,693		$299,133
8. Other: T/F Waivers		$34,383		$71,995		$212,610
Total FTE Personnel And Costs:	21.1	897,576	30.9	1,203,237	46.6	$1,898,624

	FY 13	FY 14	FY 15
B. Operating expenditures			
1. Travel			
2. Professional services			
3. Other services			
4. Communications			

5. Utilities			
6. Materials & supplies			
7. Rentals			
8. Repairs & maintenance			
9. Materials & goods for manufacture & resale			
10. Miscellaneous	$36,000	$36,000	$36,000
Total Operating Expenditures:	$36,000	$36,000	$36,000
	FY 13	FY 14	FY 15
C. Capital Outlay			
1. Library resources	$45,000	$45,000	$45,000
2. Equipment	$450,000	$450,000	$450,000
Total Capital Outlay:	$495,000	$495,000	$495,000
D. Physical facilities Construction or major renovation	0	0	0
E. Indirect costs (overhead)	N/A	N/A	N/A
GRAND TOTAL EXPENDITURES:	$1,428,576	$1,734,237	$2,429,624

III. REVENUES

	FY 13	FY 14	FY 15
A. Source of funds			
1. Appropriated funds -- Reallocation – MCO	$568,830	$809,958	$1,062,768
2. Appropriated funds -- New – MCO			
3. Federal funds	$859,746	$924,279	$1,366,856
4. Other grants			
5. Fees			
6. Other:			
GRANT TOTAL REVENUES:	$1,428,576	$1,734,237	$2,429,624

	FY 13	FY 14	FY 15
B. Nature of Funds			
1. Recurring*	$978,576	$1,284,237	$1,979,624
2. Non-recurring**	$450,000	$450,000	$450,000
GRAND TOTAL REVENUES:	$1,428,576	$1,734,237	$2,429,624

* Recurring is defined as ongoing operating budget for the program that will become part of the base.

** Non-recurring is defined as one-time funding in a fiscal year and not part of the base.

NOTES for Line Items in Tables I, II, and III

I.A One student FTE is assumed to be 24 student credits; not every student is projected to take 24 credits per year.

I.B Although some students may shift from M.S. programs into the Ph.D. program, this effect is expected to be negligible.

II.A.1 Faculty FTE estimates are tied to university faculty workload policy 4560 and based on three-year teaching plans from the Department of Biological Sciences, Department of Chemistry and Biochemistry, and Department of Physics. Faculty cost estimates are based on academic year salaries, with FY11 salaries assumed for the first year of the program, and then 2% annual adjustments applied for the second and third years of the program. See tables attached after section 6.e for details.

II.A.2 Administrative FTE estimates are based on experience with existing PhD programs at the university and allow for the multi-departmental nature of the proposed program. Administrative cost estimates are based on administrative contract salaries that vary from 10 months to 12 months depending on the position, with FY11 salaries assumed for the first year of the program, and then 2% annual adjustments applied for the second and third years of the program. See tables attached after section 6.e for details.

II.A.3 Use of adjunct faculty is not anticipated for this program.

II.A.4 The university will fund (in year 3) fifteen graduate instructional assistants; those GAs will not teach in the PhD program but will provide assistance with the delivery of undergraduate programs and provide research assistance in the summer. Therefore, the FTE devoted to the proposed program is calculated as one-half of the university-funded GAs, i.e., 7.5 FTE in the third year. It is estimated that by the third year an equal number of graduate assistantships (i.e., 15) will be funded through federal grants; therefore for that year, 7.5FTE funding for graduate assistantships is ascribed to appropriated funds and 15FTE to federal funds. A graduate assistantship includes a 12-month $24,000 stipend and an academic year tuition and fee waiver. Annual adjustments of 2% and 5% are assumed for stipends and tuition and fee waivers, respectively.

II.A.5 See tables attached after section 6.e for details on research and research support personnel.

II.A.6 See tables attached after section 6.e for details on administrative support personnel.

II.A.7 Fringe benefits are computed using FY11 fringe rate parameters defined for various employee categories by the university budget office and available at http://finad.boisestate.edu/budget/pdf/FY11fringe.pdf. The fringe rate for graduate assistants is computed at 4% during the academic year but 10% during the summer as requested by the university research office.

II.A.8 The FY11 cost of a full-time academic year graduate tuition and fee waiver is $7,774. This cost is projected into future years using an assumed annual increase of 5%. Thus, we project a full-time academic year graduate tuition and fee waiver to be $7,774x1.05x1.05 = $8,571 at program start in FY13, and then to increase annually by 5% for the first three years of the program.

II.B.10 The program is expected to increase administrative operating expenditures by $36,000 per year distributed variably among irregular salaries, travel, communications, student recruiting expenses, seminar speakers, and materials and supplies. Annual percentage increases of these costs are not projected but this line will be adjusted to reflect actual experience with the program.

II.C.1 Cost estimates for new library resource cost are based on discussions between program faculty and the Dean of Libraries. See section 6.d for details.

II.C.2 Of the costs listed here, $200,000 per year is the estimated new faculty startup costs that will be paid in each of the first three years of the program (startup costs are one-time costs). The source of startup funds is indirect costs from federal grants. See section 6.d for details. We estimate that an additional $250,000 per year will be secured from federal equipment grants, such as Major Research Instrumentation grants. We have averaged approximately that amount in past years.

II.E Indirect costs associated with the proposed program are not estimated for this proposal, but are part of the indirect cost structure of the university.

III.A.3 Estimate of funding from federal grants is based on current grant funding of tenured/tenure-track faculty salaries, current grant funding of research staff, and estimated grant funding of graduate assistantships (see note II.A.4 above).

III.B. See explanation in section 6.e. below.

6.a. Faculty and Staff Expenditures

Project for the first three years of the program, the credit hours to be generated by each faculty member (full-time and part-time), graduate assistant, and other instructional personnel. Also indicate salaries. After total student credit hours, convert to an FTE student basis. Please provide totals for each of the three years presented. Salaries and FTE students should reflect amounts shown on budget schedule. Project the need and cost for support personnel and any other personnel expenditures for the first three years of the program.

Detailed three-year lists and projections for faculty and staff expenditures, including research, research support, and administrative support personnel, are provided in the tables attached after section 6.e.

6.b. Administrative Expenditures

Describe the proposed administrative structure necessary to ensure program success and the cost of that support. Include a statement concerning the involvement of other departments, colleges, or other institutions and the estimated cost of their involvement in the proposed program.

The program director will report to the Dean of the College of Arts and Sciences as a Chair-level administrator. The three department chairs of Biology, Chemistry, and Physics and the director will work as a group to manage finances, policy, and administration of the program. The director and three department chairs will work together to ensure that the required courses are taught on an appropriate schedule, to ensure the equitable assignment of resources such as graduate teaching assistantships, and to ensure effective management of program processes such as student recruitment, admission recommendations, student advising, progress exams, and dissertation defenses. The director and the chairs will be supported by an appropriate number of administrative support personnel. Detailed three-year lists and projections for administrators and administrative support personnel are provided in the tables attached after section 6.e.

6.c. Operating Expenditures (travel, professional services, etc.)

Briefly explain the need and cost for operating expenditures.

The proposed program is expected to generate increased annual administrative operating costs estimated at approximately 3% of the program personnel costs or $36,000. These increased administrative operating costs will vary from year to year among irregular salaries, travel, communications, student recruiting expenses, seminar speakers, and materials and supplies. Increased research operating costs are to be paid by grants and contracts.

6.d. Capital Outlay

(1) Library Resources

(a) Evaluate library resources, including personnel and space. Are they adequate for the operation of the present program? If not, explain the action necessary to ensure program success.

Library staff members have analyzed our holdings in light of the proposed program and have identified library resources needed to improve the quality of the program. At this time $45,000 per year has been committed to purchase top priority items. A plan is being developed to continue to build the strength of the library resources for the proposed program.

(b) Indicate the costs for the proposed program including personnel, space, equipment, monographs, journals, and materials required for the program.

See comments below in Section 6.e. below regarding the investment of funds in space for laboratories and an animal care facility.

(c) For off-campus programs, clearly indicate how the library resources are to be provided.

The proposed program is not an off campus program.

(2) Equipment/Instruments
Describe the need for any laboratory instruments, computer(s), or other equipment. List presently available equipment and any equipment (and cost) which must be obtained to support the proposed program.

Presently available equipment, instrumentation, and special research facilities are described in the body of this proposal. New faculty hires associated with the proposed program will require one-time startup expenditures, primarily for instrumentation. These startup expenditures are projected to be $200,000 in each of years one, two, and three of the program. In addition, the University has been very successful in securing Major Research Instrumentation grants from the National Science Foundation, averaging approximately $250,000 per year.

6.e. Revenue Sources
(1) If funding is to come from the reallocation of existing state appropriated funds, please indicate the sources of the reallocation. What impact will the reallocation of funds in support of the program have on other programs?

The creation of the proposed PhD in Biomolecular Sciences has been our goal since the very beginning of BRIN/INBRE a decade ago, and Boise State University has already invested substantial resources to lay the foundation for the proposed program:

- Nine new tenure-track faculty hires have been made in support of the Ph.D. in Biomolecular Sciences; four additional hires are planned. Additionally, four new research faculty members will participate in the PhD BMS.
    - Two new biomolecular faculty lines were funded initially by INBRE and subsequently by the university.
    - Two new biomolecular faculty lines were created and funded by the university, one initially by an EPSCoR grant.
    - Five biomolecular faculty lines were hired as retirement replacements with the Ph.D. in Biomolecular Sciences in mind during the hiring process.
- Approximately $13 million has been spent or committed to create facilities that support biomolecular research.
    - $3.4 million of PBFAC Set B funding spent to convert and remodel space for new research laboratories, in order to accommodate new biomolecular PhD faculty members.
    - $5.4 million of PBFAC Set B funding spent on HVAC and electrical upgrades of buildings that house biomolecular research laboratories.
    - $4.2M (including $3.9 million from an NIH CO6 grant) committed for a new vivarium devoted to research in the biomolecular sciences.

In addition, the university has committed $448,601 of ongoing funding (as of year 4 of the program) and $600,000 of one-time funding as part of our obligations to the INBRE grant. The ongoing funding will fund two faculty members, a staff member, five graduate assistantships, and a portion of the needed library resources. The one-time funding is for startup equipment, etc., for new faculty members.

To complete our preparation for the proposed program, we will need to fund the hiring of 2 additional new tenure-track faculty members, one lecturer, 10 additional graduate assistants, and assorted staff members, as well as other resources such as library materials. The resulting total ongoing commitment, as of year 4 of the program, will be $623,323; an additional $100,000 of one time funds will be needed. The source of those funds will be a reallocation over the next several years from various sources, including salary savings and expense reductions in other areas. In addition, new funding will be committed from any increases in state and tuition revenues and Enrollment Workload Adjustment funding as that funding becomes available. This is consistent with how the University has funded new graduate programs in the past. See section (3) below for additional information.

Detail of our existing commitments to the INBRE grant as well as new funds needed to fund the proposed program may be found in the table on the following page.

Funds already committed to the NIH INBRE grant		**FY2013**		**FY2014**		**FY2015**		**FY2016**	
Name	Position and Rank	ONGOING	ONE-TIME	ONGOING	ONE-TIME	ONGOING	ONE-TIME	ONGOING	ONE-TIME
BioSc #1 (cell bio)	Professor, Full	$ 98,353		$ 100,179		$ 102,042		$ 103,942	
BioSc #2 (mol gen)	Professor, Assistant			$ 100,179		$ 102,042		$ 103,942	
Bioinformatics Coordinator (Bio Sc)		$ 44,450		$ 44,450		$ 64,041		$ 65,181	
5 initial GradAsst		$ 120,000		$ 122,400		$ 124,848		$ 127,345	
5 initial GradAsst Tuition/Fee Waivers		$ 42,854		$ 44,997		$ 47,247		$ 48,192	
OE and Capital									
Library (part)		$ 30,000		$ 30,000		$ 30,000		$ 30,000	
Startup fpr BioSc #1			$ 100,000		$ 100,000		$ 100,000		
Startup fpr BioSc #2			$ 100,000		$ 100,000		$ 100,000		
Startup fpr BioSc #3			$ 100,000		$ 100,000		$ 100,000		
Startup fpr Physics #1					$ 100,000		$ 100,000		
Totals:	Grant Funded	$ 98,353		$ 100,179					
College of Arts&Sci Committed		$ 30,000	$ 100,000	$ 30,000	$ 200,000	$ 30,000	$ 200,000	$ 30,000	
Central Committed to INBRE grant		$ 207,304	$ 200,000	$ 312,026	$ 200,000	$ 440,219	$ 200,000	$ 448,601	
New funds needed for the PhD in Biomolecular Sci		**FY2013**		**FY2014**		**FY2015**		**FY2016**	
Name	Position and Rank	ONGOING	ONE-TIME	ONGOING	ONE-TIME	ONGOING	ONE-TIME	ONGOING	ONE-TIME
BioSc #1 (cell bio)	Program Director 3 mo	$ 32,198		$ 32,806		$ 32,513		$ 33,540	
BioSc #2 (mol gen)	Professor, Assistant		$ 98,353						
BioSc #3 (physiol)	Professor, Assistant	$ 80,090		$ 81,551		$ 83,041		$ 84,561	
Physics #1 (biophy)	Professor, Assistant			$ 81,551		$ 83,041		$ 84,561	
BioLecturer #1		$ 50,870		$ 51,747		$ 52,640		$ 53,552	
BioLecturer #2 (0.3 FTE)		$ 16,000		$ 16,000		$ 16,000		$ 16,000	
0.5 FTE Admin Asst (Program Dir)		$ 21,158		$ 21,510		$ 21,871		$ 22,237.51	
0.5 FTE Admin Asst (Bio Sc)		$ 21,158		$ 21,510		$ 21,871		$ 22,237.51	
10 Graduate Teaching Asst		$ 120,000		$ 244,800		$ 249,696		$ 254,690	
10 each Tuition/Fee Waivers		$ 42,854		$ 89,994		$ 94,493		$ 96,383	
Saved A260 funds		$ (39,720)		$ (79,440)		$ (79,440)		$ (79,440)	
OE and Capital									
Miscellaneous		$ 20,000		$ 20,000		$ 20,000		$ 20,000	
Library (part)		$ 15,000		$ 15,000		$ 15,000		$ 15,000	
Startup fpr Physics #1									$ 100,000
	Total Required	**$ 379,608**	**$ 98,353**	**$ 597,029**	**$ -**	**$ 610,726**	**$ -**	**$ 623,323**	**$ 100,000**
				$ 217,422		**$ 13,696**		**$ 12,598**	
				↑↑new this year ongoing		**↑↑new this year ongoing**		**↑↑new this year ongoing**	

(2) If an above Maintenance of Current Operations (MCO) appropriation is required to fund the program, indicate when the institution plans to include the program in the legislative budget request.

There is not a plan to request MCO funds as part of a legislative appropriation.

(3) Describe the federal grant, other grant(s), special fee arrangements, or contract(s) to fund the program. What does the institution propose to do with the program upon termination of those funds?

Although the university did use NIH funding (BRIN and INBRE programs) to start two new faculty positions in the biomolecular sciences over the past decade, these positions are now fully funded by the university. One additional position will be funded initially by INBRE then funded by the university. After program start, grant and contract funding will be used to support the direct and indirect costs of research activities. Direct costs include summer faculty salaries, graduate research assistantships, postdoctoral appointments, usage fees for special research facilities, instrumentation, materials and supplies, communications, meeting travel, and publication costs.

Section 6.a Instructional Staff Expenditures						
Year 1						
Name	**Position and Rank**	**Annual Academic Year Salary**	**FTE Assignment to This Program**	**Program Salary**	**Projected Student Credits**	**FTE Students (24 credits per FTE)**
Feris, K	Professor, Associate	$57,783	0.00	$0	0	0.00
Forbey, J	Professor, Assistant	$54,018	0.00	$0	0	0.00
Giddings, M	Res Faculty Member	$90,000	0.02	$1,800	3	0.13
Hampikian, G	Professor, Full	$70,596	0.02	$1,412	8	0.33
Heath, J	Professor, Assistant	$54,018	0.00	$0	0	0.00
Jorcyk, C	Professor, Full	$67,517	0.13	$8,777	9	0.38
Mitchell, K	Professor, Assistant	$60,674	0.17	$10,315	11	0.46
Oxford, J	Professor, Full	$77,050	0.13	$10,017	13	0.54
Rohn, T	Professor, Full	$64,397	0.03	$1,932	3	0.13
Serpe, M	Professor, Full	$63,399	0.00	$0	0	0.00
Tinker, J	Professor, Assistant	$54,018	0.02	$1,080	3	0.13
Wingett, D	Professor, Full	$64,335	0.01	$643	1	0.04
BioSc #1 (cell bio)	Professor, Full	$75,000	0.17	$12,750	24	1.00
BioSc #2 (mol gen)	Professor, Assistant	$75,000	0.17	$12,750	24	1.00
BioSc #3 (physiol)	Professor, Assistant	$60,000	0.01	$600	1	0.04
Lecturer #1	Lecturer	$36,000	0.00	$0	0	0.00
Lecturer #2	Lecturer	$36,000	0.00	$0	0	0.00
Brown, E	Professor, Assistant	$56,514	0.00	$0	0	0.00
Charlier, H	Professor, Associate	$63,711	0.00	$0	0	0.00
Cornell, K	Professor, Associate	$61,048	0.20	$12,210	37	1.54
Lee, J	Professor, Assistant	$56,308	0.00	$0	0	0.00
LeMaster, C	Professor, Full	$80,908	0.00	$0	0	0.00
McDougal, O	Professor, Associate	$61,048	0.00	$0	0	0.00
Nagarajan, R	Professor, Assistant	$56,015	0.03	$1,680	3	0.13
Warner, D	Professor, Associate	$61,132	0.00	$0	0	0.00
Xu, D	Professor, Assistant	$56,015	0.00	$0	0	0.00
Hanna, C	Professor, Full	$83,510	0.00	$0	0	0.00
Kim, B	Professor, Associate	$61,319	0.15	$9,198	9	0.38
Punnoose, A	Professor, Full	$75,255	0.00	$0	0	0.00
Fologea, D.	Professor, Assistant	$55,100	0.09	$4,959	5	0.21
Physics #1 (biophy)	Professor, Assistant	$60,000	0.17	$10,200	35	1.46
		TOTALS	1.52	$100,323	189	7.88

Section 6.a Instructional Staff Expenditures						
Year 2						
Name	**Position and Rank**	**Annual Academic Year Salary**	**FTE Assignment to This Program**	**Program Salary**	**Projected Student Credits**	**FTE Students (24 credits per FTE)**
Feris, K	Professor, Associate	$58,939	0.09	$5,305	5	0.21
Forbey, J	Professor, Assistant	$55,098	0.00	$0	0	0.00
Giddings, M	Res Faculty Member	$91,800	0.03	$2,754	6	0.25
Hampikian, G	Professor, Full	$72,008	0.07	$5,041	19	0.79
Heath, J	Professor, Assistant	$55,098	0.02	$1,102	8	0.33
Jorcyk, C	Professor, Full	$68,867	0.15	$10,330	13	0.54
Mitchell, K	Professor, Assistant	$61,887	0.12	$7,426	11	0.46
Oxford, J	Professor, Full	$78,591	0.21	$16,504	24	1.00
Rohn, T	Professor, Full	$65,685	0.17	$11,166	14	0.58
Serpe, M	Professor, Full	$64,667	0.00	$0	0	0.00
Tinker, J	Professor, Assistant	$55,098	0.21	$11,571	29	1.21
Wingett, D	Professor, Full	$65,622	0.12	$7,875	11	0.46
BioSc #1 (cell bio)	Professor, Full	$76,500	0.24	$18,360	36	1.50
BioSc #2 (mol gen)	Professor, Assistant	$76,500	0.19	$14,535	27	1.13
BioSc #3 (physiol)	Professor, Assistant	$61,200	0.20	$12,240	13	0.54
Lecturer #1	Lecturer	$36,720	0.01	$367	1	0.04
Lecturer #2	Lecturer	$36,720	0.06	$2,203	12	0.50
Brown, E	Professor, Assistant	$57,644	0.00	$0	0	0.00
Charlier, H	Professor, Associate	$64,985	0.03	$1,950	6	0.25
Cornell, K	Professor, Associate	$62,269	0.25	$15,567	43	1.79
Lee, J	Professor, Assistant	$57,434	0.09	$5,169	5	0.21
LeMaster, C	Professor, Full	$82,526	0.00	$0	0	0.00
McDougal, O	Professor, Associate	$62,269	0.07	$4,359	6	0.25
Nagarajan, R	Professor, Assistant	$57,135	0.09	$5,142	5	0.21
Warner, D	Professor, Associate	$62,355	0.00	$0	0	0.00
Xu, D	Professor, Assistant	$57,135	0.00	$0	0	0.00
Hanna, C	Professor, Full	$85,180	0.09	$7,666	9	0.38
Kim, B	Professor, Associate	$62,545	0.18	$11,258	13	0.54
Punnoose, A	Professor, Full	$76,760	0.07	$5,373	6	0.25
Fologea, D.	Professor, Assistant	$56,202	0.17	$9,554	15	0.63
Physics #1 (biophy)	Professor, Assistant	$61,200	0.32	$19,584	43	1.79
		TOTALS	3.25	$212,401	380	15.83

Section 6.a Instructional Staff Expenditures						
Year 3						
Name	Position and Rank	Annual Academic Year Salary	FTE Assignment to This Program	Program Salary	Projected Student Credits	FTE Students (24 credits per FTE)
Feris, K	Professor, Associate	$60,117	0.09	$5,411	5	0.21
Forbey, J	Professor, Assistant	$56,200	0.09	$5,058	5	0.21
Giddings, M	Res Faculty Member	$93,636	0.05	$4,682	15	0.63
Hampikian, G	Professor, Full	$73,448	0.17	$12,486	38	1.58
Heath, J	Professor, Assistant	$56,200	0.01	$562	4	0.17
Jorcyk, C	Professor, Full	$70,245	0.32	$22,478	40	1.67
Mitchell, K	Professor, Assistant	$63,125	0.35	$22,094	34	1.42
Oxford, J	Professor, Full	$80,163	0.28	$22,446	48	2.00
Rohn, T	Professor, Full	$66,999	0.22	$14,740	29	1.21
Serpe, M	Professor, Full	$65,960	0.09	$5,936	15	0.63
Tinker, J	Professor, Assistant	$56,200	0.19	$10,678	20	0.83
Wingett, D	Professor, Full	$66,934	0.17	$11,379	23	0.96
BioSc #1 (cell bio)	Professor, Full	$78,030	0.36	$28,091	65	2.71
BioSc #2 (mol gen)	Professor, Assistant	$78,030	0.24	$18,727	51	2.13
BioSc #3 (physiol)	Professor, Assistant	$62,424	0.30	$18,727	41	1.71
Lecturer #1	Lecturer	$37,454	0.00	$0	0	0.00
Lecturer #2	Lecturer	$37,454	0.10	$3,745	18	0.75
Brown, E	Professor, Assistant	$58,797	0.09	$5,292	5	0.21
Charlier, H	Professor, Associate	$66,285	0.09	$5,966	5	0.21
Cornell, K	Professor, Associate	$63,514	0.32	$20,324	66	2.75
Lee, J	Professor, Assistant	$58,583	0.09	$5,272	5	0.21
LeMaster, C	Professor, Full	$84,177	0.00	$0	0	0.00
McDougal, O	Professor, Associate	$63,514	0.16	$10,162	14	0.58
Nagarajan, R	Professor, Assistant	$58,278	0.15	$8,742	14	0.58
Warner, D	Professor, Associate	$63,602	0.05	$3,180	3	0.13
Xu, D	Professor, Assistant	$58,278	0.07	$4,079	6	0.25
Hanna, C	Professor, Full	$86,884	0.00	$0	0	0.00
Kim, B	Professor, Associate	$63,796	0.21	$13,397	25	1.04
Punnoose, A	Professor, Full	$78,295	0.09	$7,047	5	0.21
Fologea, D.	Professor, Assistant	$57,326	0.33	$18,918	37	1.54
Physics #1 (biophy)	Professor, Assistant	$62,424	0.36	$22,473	69	2.88
		TOTALS	5.04	$332,092	705	29.38

Section 6a. Research and Research Support Personnel Expenditures					
Year 1					
Name	**Position**	**Annual Rate (12-month)**	**FTE Assignment to This Program**	**Program Salary**	**PerCent of Salary to Program**
Bond, L	Bioinformatics Coord (Bio Sc)	$45,000	0.50	$22,500	50%
Brown, R	Res Technician/Mgr (Bio Sc)	$60,000	0.25	$15,000	25%
Rasmussen,J	Res Associate (Bio Sc)	$41,510	0.25	$10,378	25%
Chingas, G	Research Instr Mgr (Ch&Bioch)	$70,909	0.25	$17,727	25%
Thurber, A	Lab Mgr (Physics)	$57,000	0.25	$14,250	25%
Alileche, A.	Asst Res Prof (Bio Sc)	$54,000	0.5	$27,000	50%
Habig, J.	Res Asst Prof (Chem Bioch)	$62,000	0.5	$31,000	50%
Hiremath, M.	Res Asst Prof (Bio Sc)	$44,000	0.5	$22,000	50%
Bolin, C.	Postdoc Res Assoc (Bio Sc)	$40,000	0.5	$20,000	50%
Moselhy, J.	Postdoc Res Assoc (Bio Sc)	$40,000	0.5	$20,000	50%
Goswami, J.	Res Assoc (Bio Sci)	$26,000	0.5	$13,000	50%
Bullock, W.	Res Assoc (Chem Bioch)	$42,000	0.5	$21,000	50%
Yan,J.	Res Asst (Chem Bioch)	$35,000	0.5	$17,500	50%
Davis, B.	Res Asst (Bio Sc)	$30,000	0.5	$15,000	50%
de Oliveira,D.	Res Asst (Bio Sc)	$32,000	0.5	$16,000	50%
Eidemiller, S.	Res Asst (Bio Sc)	$30,000	0.5	$15,000	50%
Martin, B.	Res Asst (Bio Sc)	$25,000	0.5	$12,500	50%
Ryan, R.	Res Asst (Bio Sc)	$30,000	0.5	$15,000	50%
Hamilton, H.	Res Asst (Bio Sc)	$30,000	0.5	$15,000	50%
Zou, Y.	Res Asst (Bio Sc)	$31,000	0.5	$15,500	50%
		Year 1 Totals	9.0	$355,355	

Year 2					
Bond, L	Bioinformatics Coord (Bio Sc)	$45,900	0.50	$22,950	50.0%
Brown, R	Res Technician/Mgr (Bio Sc)	$61,200	0.25	$15,300	25.0%
Rasmussen,J	Res Associate (Bio Sc)	$42,340	0.25	$10,585	25.0%
Chingas, G	Research Instr Mgr (Ch&Bioch)	$72,327	0.25	$18,082	25.0%
Thurber, A	Lab Mgr (Physics)	$58,140	0.25	$14,535	25.0%
Alileche, A.	Asst Res Prof (Bio Sc)	$55,080	0.5	$27,540	50%
Habig, J.	Res Asst Prof (Chem Bioch)	$63,240	0.5	$31,620	50%
Hiremath, M.	Res Asst Prof (Bio Sc)	$44,880	0.5	$22,440	50%
Bolin, C.	Postdoc Res Assoc (Bio Sc)	$40,800	0.5	$20,400	50%
Moselhy, J.	Postdoc Res Assoc (Bio Sc)	$40,800	0.5	$20,400	50%
Goswami, J.	Res Assoc (Bio Sci)	$26,520	0.5	$13,260	50%
Bullock, W.	Res Assoc (Chem Bioch)	$42,840	0.5	$21,420	50%
Yan,J.	Res Asst (Chem Bioch)	$35,700	0.5	$17,850	50%
Davis, B.	Res Asst (Bio Sc)	$30,600	0.5	$15,300	50%
de Oliveira,D.	Res Asst (Bio Sc)	$32,640	0.5	$16,320	50%
Eidemiller, S.	Res Asst (Bio Sc)	$30,600	0.5	$15,300	50%
Martin, B.	Res Asst (Bio Sc)	$25,500	0.5	$12,750	50%
Ryan, R.	Res Asst (Bio Sc)	$30,600	0.5	$15,300	50%
Hamilton, H.	Res Asst (Bio Sc)	$30,600	0.5	$15,300	50%
Zou, Y.	Res Asst (Bio Sc)	$31,620	0.5	$15,810	50%
		Year 2 Totals	9.0	$362,462	

Year 3					
Bond, L	Bioinformatics Coord (Bio Sc)	$46,818	0.50	$23,409	50.0%
Brown, R	Res Technician/Mgr (Bio Sc)	$62,424	0.25	$15,606	25.0%
Rasmussen,J	Res Associate (Bio Sc)	$43,187	0.25	$10,797	25.0%
Chingas, G	Research Instr Mgr (Ch&Bioch)	$73,774	0.25	$18,443	25.0%
Thurber, A	Lab Mgr (Physics)	$59,303	0.25	$14,826	25.0%
Alileche, A.	Asst Res Prof (Bio Sc)	$56,182	0.5	$28,091	50%
Habig, J.	Res Asst Prof (Chem Bioch)	$64,505	0.5	$32,252	50%
Hiremath, M.	Res Asst Prof (Bio Sc)	$45,778	0.5	$22,889	50%
Bolin, C.	Postdoc Res Assoc (Bio Sc)	$41,616	0.5	$20,808	50%
Moselhy, J.	Postdoc Res Assoc (Bio Sc)	$41,616	0.5	$20,808	50%
Goswami, J.	Res Assoc (Bio Sci)	$27,050	0.5	$13,525	50%
Bullock, W.	Res Assoc (Chem Bioch)	$43,697	0.5	$21,848	50%
Yan,J.	Res Asst (Chem Bioch)	$36,414	0.5	$18,207	50%
Davis, B.	Res Asst (Bio Sc)	$31,212	0.5	$15,606	50%
de Oliveira,D.	Res Asst (Bio Sc)	$33,293	0.5	$16,646	50%
Eidemiller, S.	Res Asst (Bio Sc)	$31,212	0.5	$15,606	50%
Martin, B.	Res Asst (Bio Sc)	$26,010	0.5	$13,005	50%
Ryan, R.	Res Asst (Bio Sc)	$31,212	0.5	$15,606	50%
Hamilton, H.	Res Asst (Bio Sc)	$31,212	0.5	$15,606	50%
Zou, Y.	Res Asst (Bio Sc)	$32,252	0.5	$16,126	50%
		Year 3 Totals	9.0	$369,711	

Section 6a. Administrative Support Personnel Expenditures					
Year 1					
Name	**Position**	**Annual Rate (12-month)**	**FTE Assignment to This Program**	**Program Salary**	**PerCent of Salary to Program**
Redshaw, E	Bus Mgr/Grant Acct Officer(COAS)	$58,490	0.10	$5,849	10.0%
Jibben, B	Grant Mgr/Writer Assmnt Coord (Bio Sc)	$46,876	0.25	$11,719	25.0%
Korol, M	Grants Accountant (Bio Sc)	$41,247	0.25	$10,312	25.0%
Kator, G	Grants Accountant (Ch&Bioch)	$40,000	0.25	$10,000	25.0%
TBD	Admin Asst (Program Dir)	$28,900	0.50	$14,450	50.0%
Gee, E	Management Asst (Bio Sc)	$35,651	0.10	$3,565	10.0%
TBD	Admin Asst (Bio Sc)	$28,900	0.50	$14,450	50.0%
Harryman, D	Admin Asst (Ch&Bioch)	$27,331	0.10	$2,733	10.0%
Moss, B	Admin Asst (Physics)	$26,853	0.10	$2,685	10.0%
		Year 1 Totals	2.15	$75,763	

Year 2					
Redshaw, E	Bus Mgr/Grant Acct Officer(COAS)	$59,660	0.10	$5,966	10.0%
Jibben, B	Grant Mgr/Writer Assmnt Coord (Bio Sc)	$47,814	0.25	$11,953	25.0%
Korol, M	Grants Accountant (Bio Sc)	$42,072	0.25	$10,518	25.0%
Kator, G	Grants Accountant (Ch&Bioch)	$40,800	0.25	$10,200	25.0%
TBD	Admin Asst (Program Dir)	$29,478	0.50	$14,739	50.0%
Gee, E	Management Asst (Bio Sc)	$36,364	0.10	$3,636	10.0%
TBD	Admin Asst (Bio Sc)	$29,478	0.50	$14,739	50.0%
Harryman, D	Admin Asst (Ch&Bioch)	$27,878	0.10	$2,788	10.0%
Moss, B	Admin Asst (Physics)	$27,390	0.10	$2,739	10.0%
		Year 2 Totals	2.15	$77,279	

Year 3					
Redshaw, E	Bus Mgr/Grant Acct Officer(COAS)	$60,853	0.10	$6,085	10.0%
Jibben, B	Grant Mgr/Writer Assmnt Coord (Bio Sc)	$48,770	0.25	$12,192	25.0%
Korol, M	Grants Accountant (Bio Sc)	$42,913	0.25	$10,728	25.0%
Kator, G	Grants Accountant (Ch&Bioch)	$41,616	0.25	$10,404	25.0%
TBD	Admin Asst (Program Dir)	$30,068	0.50	$15,034	50.0%
Gee, E	Management Asst (Bio Sc)	$37,091	0.10	$3,709	10.0%
TBD	Admin Asst (Bio Sc)	$30,068	0.50	$15,034	50.0%
Harryman, D	Admin Asst (Ch&Bioch)	$28,435	0.10	$2,844	10.0%
Moss, B	Admin Asst (Physics)	$27,938	0.10	$2,794	10.0%
		Year 3 Totals	2.15	$78,824	

Section 6.b Administrative Expenditures					
Year 1					
Name	**Position and Rank**	**Annual Contract Salary**	**FTE Assignment to This Program**	**Program Salary**	**PerCent of Salary to Program**
BioSc #1 (cell bio)	Program Director	$100,000	0.25	$25,000	25.0%
Wingett, D	Dept Chair (Bio Sc)	$85,780	0.10	$8,578	10.0%
LeMaster, C	Dept Chair (Ch&Bioch)	$89,898	0.05	$4,495	5.0%
Hanna, C	Dept Chair (Physics)	$92,789	0.05	$4,639	5.0%
		Year 1 Subtotals	0.45	$42,712	45.0%

Year 2					
BioSc #1 (cell bio)	Program Director	$102,000	0.25	$25,500	25.0%
Wingett, D	Dept Chair (Bio Sc)	$87,496	0.10	$8,750	10.0%
LeMaster, C	Dept Chair (Ch&Bioch)	$91,696	0.05	$4,585	5.0%
Hanna, C	Dept Chair (Physics)	$94,645	0.05	$4,732	5.0%
		Year 2 Subtotals	0.45	$43,567	45.0%

Year 3					
BioSc #1 (cell bio)	Program Director	$104,040	0.25	$26,010	25.0%
Wingett, D	Dept Chair (Bio Sc)	$89,246	0.10	$8,925	10.0%
LeMaster, C	Dept Chair (Ch&Bioch)	$93,530	0.05	$4,676	5.0%
Hanna, C	Dept Chair (Physics)	$96,538	0.05	$4,827	5.0%
		Year 3 Subtotals	0.45	$44,438	45.0%

APPENDIX A1:

Doctor of Philosophy in Biomolecular Sciences
Boise State University
External Program Review Report

BOISE STATE UNIVERSITY
SITE VISIT REPORT

Reviewing the proposal for

Doctor of Philosophy (PhD) in Biomolecular Sciences

College of Arts and Sciences
Departments of Biological Sciences, Chemistry & Biochemistry, and Physics

Judith Van Houten, University of Vermont
Sebastian Wachsmann-Hogiu, University of California, Davis
Lee Weber, University of Nevada, Reno

15 September 2011

A. Executive summary

The review team was extremely impressed with the quality of research and graduate education and the remarkable level of extramural funding of the faculty engaged in biomolecular research whom we met at Boise State University. Most remarkable is that these achievements were accomplished with only a MSc program. A new level of research accomplishments can be reached with the implementation of an interdisciplinary PhD graduate program. It will foster the kind of collaborative research that is favored by federal and other agencies and produce uniquely trained students to satisfy the needs of a growing biotech and medical community in Idaho.

The administrative and community support for this program is very evident. It will build upon the INBRE investments in the state to enhance the network of investigators and institutions. This proposed program does not duplicate programs elsewhere in the state and will present opportunities for investigators in the entire state system to participate in this collaborative, interdisciplinary research with PhD students.

Our recommendation is that this program be implemented immediately.

B. Review Process

Drs. Lee Weber (Emeritus Faculty member University of Nevada, Reno), Sebastian Wachsmann-Hogiu (Facility Director of the NSF Science and Technology Center and Associate Professor of Pathology at UC Davis), and Judith Van Houten (University Distinguished Professor at the University of Vermont and Director of Vermont INBRE) met on September 14 and 15, 2011 on the Boise State University Campus to review the proposed PhD Program in Biomolecular Sciences. This team was provided with the INBRE proposal and external evaluation report of INBRE, 2008 Memorandum to Dr. Jack Pelton, Graduate College Dean, about the Organizational Structure for the PhD in Biomolecular Sciences and the 2011 proposal to the Idaho State Board of Education.

On September 14, the team met with administrators (Dr. Tony Roark (Interim Dean of the College of Arts and Sciences), Dr. Martin Schimpf (the Provost and VP for Academic Affairs), Dr. Carolyn Bohach (the PI of the Idaho INBRE grant), Dr. Jack Pelton (Dean of the Graduate College), Dr. Mark Rudin (VP for Research), Dr. Marilyn Moody (Dean University Library), (Vice President for Finance), Dr. James Munger (Vice Provost for Academic Planning), Chairs of Biology, Chemistry and Physics Departments, Dr. C. Daniels and Dr. Mark Thomas of ISU (by phone), 6 faculty, and 11 graduate students. The team also met with Michael Hill (Boise Technology), Steve Lackie (Sapidyne), Theodore Walters (St. Luke's Mountain States Tumor and Medical Research Institute), Christopher Ball (Idaho Department of Health and Welfare). See full agenda attached.

The review team toured facilities and faculty laboratories: four in Chemistry, five in Biology and two in Physics.

On September 15, the team composed its report and made a presentation to Drs. Munger, Pelton, Roark, Schimpf, Wingett, Hanna and LeMaster.

C. Readiness

Boise State University is a rapidly growing university serving a large metropolitan area of more than half million people. The strategic location of the University in the Treasure Valley with a VA and other diagnosis and treatment centers, as well as a high number of small and large businesses will most likely support further developments within individual schools and colleges.

The College of Arts and Sciences, through INBRE and other funding mechanisms, has made significant strategic investments over the last 8 years towards a full PhD program in the field of biomolecular sciences. This field has seen major advances nationally and internationally as it has the potential to help understand basic mechanisms of disease, diagnose disease, and provide treatments. Biomolecular science, as it encompasses several disciplines such as biology, chemistry, physics, and engineering, requires a unique interdisciplinary approach that can be effective only in settings where a collaborative environment is created, and faculty from different departments have the possibility to interact and work together on a daily basis. The establishment of collaborative research networks is the goal of the NIH-funded INBRE program.

During our visit to BSU, we particularly looked into various aspects of the environment within the College of Arts and Sciences, to evaluate their readiness for a PhD program in the field of biomolecular sciences.

1. Facilities. Over the past 8 years BSU has acquired a large number of state-of-the-art instruments for research in this field. Basic analytical instruments as well as dedicated instruments are available to perform the proposed fundamental and applied research, and faculty members seem to have adequate lab space for their work. A new vivarium to be built with funding from the NIH will further add value to the program, as it will allow for time-sensitive research to be performed directly at the University. Overall, facilities are comparable with those at research-intensive, PhD-granting institutions and we think that they are suitable for the proposed PhD program.

2. Faculty. We would like to congratulate the chairs of the three departments participating in this program for their leadership and hard work in bringing together faculty from their departments and significantly contributing to the advancement of this program.

We were highly impressed by the quality and enthusiasm of the faculty. We were amazed that they are able to perform nationally competitive research with only masters degree students.

Participating faculty are already engaged in research projects that are related to the proposed program, and received significant extramural funding as detailed in the proposal. They also currently offer a large number of courses that are specific to the program and could easily be incorporated into the new curriculum. One major hurdle in implementing such interdisciplinary programs is bringing the faculty from different departments to work together. From our discussions with the faculty is seemed very obvious that they are already working together on interdisciplinary projects. In addition, they actively collaborate with faculty in other departments such as material sciences, kinesiology, as well as VA medical center and other medical programs in the region. There are also active collaborations with faculty at the other two Idaho Universities.

Overall, we think that the faculty are well prepared and already performing research and teaching comparable to national research intensive institutions. However, to take their research to the next level of competitiveness, they need a strong PhD program.

3. Administrative support. BSU administration appears to be as enthusiastic about this program as the faculty and students. Over the past 8 years, they have lived up to their commitment to the INBRE program to make strategic faculty hires in interdisciplinary areas. This was specifically preparatory to the development of the PhD program. They have also been supportive for graduate stipends and technical support. The chairs of the participating department are also fully supportive to this program.

4. Community support. There seems to be very strong community support, as evidenced by letters of support and our direct conversations. Michael Hill (Boise Technology), Steve Lackie (Sapidyne), Theodore Walters (St. Luke's Mountain States Tumor and Medical Research Institute), Christopher Ball (Idaho Department of Health and Welfare) reiterated their support for an interdisciplinary PhD program in the area that would satisfy their needs for highly trained personnel.

D. Recommendations

The review team recommends that the PhD program be implemented as soon as possible. All of the component parts, faculty, facilities and technical assistance are in place. There is high demand for the program from the current MS students, who will contribute to a successful beginning for the program because they are well trained and understand collaborative research. The majority of graduate students interviewed by the review team showed interest in a PhD program and almost all of them expressed the desire to do their research at BSU if at all possible.

The review team recommends that the following be implemented as the new program evolves in its early years:

1. Equal co-advisors from different disciplines relevant to the each student's research should be approved by the Steering Committee.

2. The program should develop a student-centric approach and trust in the student and co-advisors. This allows the curriculum requirements beyond the three required core courses to be left to the co-advisors and student, who together will develop a program of courses that are designed to prepare the student for truly interdisciplinary research.

The "track" approach to the courses beyond the core should be abandoned and replaced with selection by the advisors with the students, perhaps with approval of the Steering Committee. Courses from outside the College of Arts and Sciences will undoubtedly be needed for many of the students' training.

3. The richness of the pool of potential advisors for the program was not apparent from the formal proposal. However, the review team's interviews with faculty revealed that there are many interdisciplinary projects in the Biology, Chemistry and Physics Departments connecting faculty from these departments to others across the campus. The mathematicians, engineers, kinesiologists and others who are key collaborators with the program faculty listed in the proposal should be recognized as "affiliate" faculty. The program should be opened up to these faculty and others across the campus, the VA and other health care entities, and other campuses, who can contribute to the training of interdisciplinary graduate students. Importantly, it should be possible for faculty at UI and ISU to participate as affiliate faculty and train graduate students as a co-advisor.

4. The review team recommends that incoming students be required to do two to three rotations in the first year in research laboratories involving more than one discipline as a mechanism of locating the most appropriate labs and advisors for interdisciplinary training.

5. A liaison between the Biomolecular Sciences PhD Program and the Materials Science PhD Program should be established. This will promote synergy and allow the programs to become complementary rather than competitive.

6. The retention, promotion and tenure guidelines should be carefully considered by the administration at all levels so that faculty who carry out interdisciplinary, collaborative research are not at a disadvantage.

E. Relationship to other Idaho Graduate Program.

Both the University of Idaho and Idaho State have successful graduate programs that are organized within single departments or single disciplines. There are PhD programs in Biology, Microbiology / Molecular Biology / Biochemistry, Biological and Agricultural Engineering, and Bioinformatics and Computational Biology at the University of Idaho. Idaho State offers the PhD in Pharmacy, Pharmaceutical Sciences, Microbiology, and Biology. These types of discipline based graduate training programs have been the norm in this country since at least the 1950's. Such programs will continue to play an important role in training specialist within the existing biomedical disciplines. However,

there is an increasing synergy between biomedical and applied science, physics, and engineering, which has been largely the result of advancements in nanotechnology, requires more broadly trained investigators. The term “interdisciplinary” no longer means training that crosses the boundaries between departments with the biological science disciplines such as biology, microbiology, and biochemistry. The term now means crossing the boundaries between the life sciences, physical sciences, medicine, and engineering. There are no existing graduate programs in Idaho that do this. Thus, as the only truly interdisciplinary program in Idaho, this proposed program would fill a major void in graduate training for the state.

A major strength of this program is the role it can play in fostering collaboration between faculty at the 3 Idaho research universities. National funding agencies have recognized the importance of multi-investigator and multi-institutional interdisciplinary research teams for tackling significant biomedical research problems. The fraction of total grant money going to these types of projects has been increasing and will continue to increase in the future. The Idaho BRIN and INBRE programs have made considerable progress toward promoting interactions between investigators at the 3 universities. The proposed graduate program was listed as a deliverable in the INBRE proposals and is an important component in the goal of developing nationally competitive research teams in the IDEA states that in aggregate receive less than 5% of total NIH research funds. This will be the first broadly interdisciplinary graduate program. As such, it can act as a nexus for interdisciplinary research collaborations among the state universities. The development of these collaborations will be critical for Idaho to succeed in the competition with other states for research and infrastructure dollars.

Both the faculty and the administrators at Boise State were very receptive to the committee’s suggestion that the graduate program be open to participation by faculty from The University of Idaho and Idaho State. They were also receptive to the idea that outside faculty could serve as graduate student advisors and, as the program develops, have students working in their laboratories. This would be an ideal outcome for this program if it could ultimately tap the intellectual resources of the state university system. There would no doubt be administrative barriers to extending the program to the other institutions over the near term. So it would seem to be in the best interest of the other institutions for this program to succeed at Boise State. We know from our conversations with representatives from the biomedical devices and biotechnology sector in Boise that the unique interdisciplinary training of the program’s graduates will make them ideal employees. Thus, the PhD program will also contribute to the state’s economic development.

The NIH has made it clear that the future focus of research funding will be directed toward translational research, which is a process that will move discoveries from the laboratory bench to clinical application as quickly as possible. Establishing this PhD program at Boise State will allow Idaho faculty to conduct translational research as well as train a cadre of new investigators who will be particularly qualified to conduct this type of research. The program will facilitate translational research, despite the

absence of a medical school in Idaho. According to the Appendix material and conversations we had with representatives from health care institutions, they are very eager to collaborate with faculty and students at the Idaho universities. In order for Idaho to remain competitive for NIH funding, it is essential for its researchers to establish and maintain interactions with the medical facilities in the state. Because Boise is the home of the major medical facilities in the state, BSU faculty are in the best position for establishing these relationships. A PhD program with a strong biomedical emphasis will be a major step toward growing research collaborations with the existing medical institutions.

Biomedical research at Boise State is limited by the absence of a PhD program. Establishment of this program would move their research to the next level of national competitiveness, which should allow them develop local translational research collaborations. Researchers from the University of Idaho and Idaho State would benefit from such opportunities to conduct translational research either through participation in the graduate program or peer-to-peer collaborations.

APPENDIX A2:

Doctor of Philosophy in Biomolecular Sciences
Boise State University
Response to External Program Review Report

RESPONSE to the Site Visit Report for the proposed Doctor of Philosophy (PhD) in Biomolecular Sciences at Boise State University College of Arts and Sciences Departments of Biological Sciences, Chemistry & Biochemistry, and Physics September 20, 2011

Site Visit Report authors (external reviewers):
Judith Van Houten, University of Vermont
Sebastian Wachsmann-Hogiu, University of California, Davis
Lee Weber, University of Nevada, Reno

A. Response to the executive summary

We are in complete agreement with the executive summary. Great care was taken in the design of the Biomolecular Sciences PhD program to ensure that it would be truly interdisciplinary and collaborative (interweaving Biology, Chemistry, and Physics), and that it would not duplicate other PhD programs in Idaho. A key benefit for the State of Idaho is that it will increase the ability of BSU to collaborate with UI, ISU, and state and federal agencies (such as the Veteran's Administration), and to contribute in important areas of research that will benefit the State of Idaho and all of its universities. Another major educational and economic benefit to the State of Idaho is that it will help meet the needs of companies in Idaho for highly trained personnel, and contribute to providing future employment opportunities for Idaho citizens.

B. Response to Readiness

We are in complete agreement with the Readiness section of the report. Boise State University has almost a decade of preparation for this PhD program, including strategic faculty hiring, acquisition of sophisticated research instrumentation and development of laboratory facilities, and the growth of research collaborations and extramural funding, as outlined in the site visit report. This proposed PhD program is widely supported by the faculty, the departments, the administration, and by the larger community.

C. Response to recommendations

We agree with the spirit of all of the recommendations made in the site visit report, although there are some differences in the specific implementation that warrant discussion. We address the specific recommendations (summarized in italics) one at a time, below.

1. *Equal co-advisors from different disciplines relevant to the each student's research should be approved by the Steering Committee.*

We agree that the students' PhD dissertation research should involve the input and perspectives from faculty of different disciplines, and that dissertation co-advisors can be a useful way to ensure the multi-disciplinary nature of the program and student's research. Fortunately, BSU already allows co-advising in

graduate programs, including at the PhD level. The proposed PhD program will implement an approval process, in collaboration with the Graduate College, to facilitate and encourage dissertation co-advising. We will also help meet this goal by requiring each student's dissertation committee to include at least one faculty member from each of the three key departments (Biological Sciences, Chemistry and Biochemistry, and Physics). In addition, committee members from outside these three departments and from outside the university (e.g., Veterans Administration, and other Idaho institutions of higher learning) will also be allowed to serve on the dissertation committee, upon appointment as affiliate faculty members of the program.

2. *The program should develop a student-centric approach and trust in the student and coadvisors. This allows the curriculum requirements beyond the three required core courses to be left to the co-advisors and student, who together will develop a program of courses that are designed to prepare the student for truly interdisciplinary research. The "track" approach to the courses beyond the core should be abandoned and replaced with selection by the advisors with the students, perhaps with approval of the Steering Committee. Courses from outside the College of Arts and Sciences will undoubtedly be needed for many of the students' training.*

We strongly agree that flexibility in courses and research collaborators is important for this interdisciplinary program, and understand and respect the recommendation of the external review team. The review team raises an important concern, that defining specific tracks could have the unintended consequence of making the proposed PhD program less interdisciplinary and less collaborative across departments. This is an issue that the program design committee recognized in its deliberations as having two key aspects : (1) the program must be sufficiently flexible to accommodate a wide variety of interdisciplinary biomolecular research projects, yet (2) the program must be sufficiently rigorous in its courses and training to ensure that all students obtain a solid foundation in Cell and Molecular Biology, Biochemistry, and Biophysics, the foundation disciplines for an informed interdisciplinary education in the Biomolecular Sciences. The program design committee also sought to avoid creating a "big tent" PhD program that would be so minimal in its structure and academic requirements that it could end up housing a collection of several de facto single-discipline PhD programs under the guise of "Biomolecular Sciences", instead of meeting the intended goal of creating a single, coherent interdisciplinary PhD program.

The recommendation of the external review team to revisit the curriculum and abolish the tracks has been a catalyst for further serious reflection. We have concluded that the best way to meet the recommendations of the review team and the original goals of the program design committee is to take the following actions: (1) keep the core courses (as recommended by the review team); (2) eliminate the formality of tracks (also as recommended by the review team); (3) allow students to take elective courses outside the College of Arts and Sciences (as recommended by the review team), and (4) require that all students take the Advanced Cell Biology (BIOL 611) and one Biophysics course (PHYS 611 or 612) to ensure the proper breadth of fundamental background courses. These curricular changes are easily made by the university; they open the curriculum considerably, allow a greater choice of electives, and significantly streamline the program design.

3. *The richness of the pool of potential advisors for the program was not apparent from the formal proposal. However, the review team's interviews with faculty revealed that there are many interdisciplinary projects in the Biology, Chemistry, and Physics Departments connecting faculty from these departments to others across the campus. The mathematicians, engineers, kinesiologists, and others who are key collaborators with the program faculty listed in the proposal should be recognized as*

"affiliate" faculty. The program should be opened up to these faculty and others across the campus, the VA and other health care entities, and other campuses, who can contribute to the training of interdisciplinary graduate students. Importantly, it should be possible for faculty at UI and ISU to participate as affiliate faculty and train graduate students as a co-advisor.

We strongly agree with this recommendation, and note that faculty from other disciplines, and researchers from outside the university, are currently allowed and encouraged to serve on dissertation committees in existing BSU graduate programs, including researchers from the Boise VA Medical Center and other research entities, as well as faculty from other Idaho Universities. The proposed three departments within the Biomolecular Sciences PhD program will make use of the existing approval process, in collaboration with the Graduate College, for appointing affiliate faculty members. The appointment of affiliate faculty members will allow researchers from outside the three departments and outside of BSU, to serve on dissertation committees, and, where warranted, to act as co-advisors, upon approval of the program. Such affiliate program members, will also be required to have appointments as affiliate faculty members in at least one of the three departments (Biological Sciences, Chemistry and Biochemistry, or Physics).

4. *The review team recommends that incoming students be required to do two to three rotations in the first year in research laboratories involving more than one discipline as a mechanism of locating the most appropriate labs and advisors for interdisciplinary training.*

We agree wholeheartedly with this recommendation. The three departments will work together to implement a requirement of 3 ten-week rotations for all first-year students in the program.

5. *A liaison between the Biomolecular Sciences PhD Program and the Materials Science PhD Program should be established. This will promote synergy and allow the programs to become complementary rather than competitive.*

We agree that establishing a liaison between the two PhD programs would reinforce the synergy, and encourage greater cooperation, between the two programs. We anticipate that there will be significant synergy and research collaborations between the two programs, based on the extent of the existing research and academic collaborations between the faculty members of both proposed programs. Indeed, several researchers will be faculty members in one PhD program, and affiliate members in the other, and will therefore be able to be supervisors or dissertation committee members in both programs.

6. *The retention, promotion and tenure guidelines should be carefully considered by the administration at all levels so that faculty who carry out interdisciplinary, collaborative research are not at a disadvantage.*

We agree that the issue of promotion and tenure requires special attention for faculty members carrying out interdisciplinary research that involves multiple departments. A key issue is that different departments typically have significantly different expectations for promotion and tenure, and it is unreasonable to expect a faculty member to meet multiple and widely varying tenure requirements. In order to address this potential difficulty, the faculty lines of each tenured or tenure-track faculty member in this program will reside in one of the three departments (Biological Sciences, Chemistry and Biochemistry, or Physics), even in the case of joint appointments, and the faculty member will be responsible for meeting the tenure and promotion comments of the department in which their faculty line resides. The tenure-granting department will solicit input on the faculty member's research from all the departments in which the faculty member has an appointment or significant research collaborations.

D. Relationship to other Idaho Graduate Programs

We are in complete agreement with external review committee's description of the relationship between the proposed PhD program in Biomolecular Sciences and existing Idaho graduate programs. The proposed Biomolecular Sciences PhD program is uniquely interdisciplinary in Idaho, in that it crosses department (Biology, Chemistry, and Physics) and disciplinary (life sciences, physical sciences, biomedicine, and engineering) boundaries in a way, and to an extent, that is not done elsewhere in the state. The establishment of this program will expand and deepen research collaborations across the state, especially between Idaho's three public universities, and will make Idaho more competitive for statewide research infrastructure grants. Indeed, the creation of the proposed Biomolecular Sciences PhD program at BSU was one of the key deliverables Idaho's successful INBRE proposals, which was funded by the NIH and which benefitted all the public universities and colleges in the state.

APPENDIX B:
Letters of Support

Name and Title	Organization
David Bieter Mayor	City of Boise
Celia Gould, Director	Idaho Department of Agriculture
John Rogers, PhD Director	Center for Advanced Energy Studies, Idaho National Laboratories
Chris Ball, PhD Bureau Chief	Idaho Bureau of Laboratories
John Chatburn Administrator	Idaho Office of Energy Resources
David C. Pate, MD, JD President and CEO	St. Luke's Health System
Sally E. Jeffcoat President and CEO	St. Alphonsus Medical System
Dennis L. Stevens, PhD, MD Associate Chief of Staff for Research and Development	Department of Veterans Affairs Medical Center, Boise
Theodore Walters, MD Director	St. Luke's Mountain States Tumor & Medical Research Institute
Steve Lackie President	Sapidyne Instruments, Inc., Boise
Teresa Mitzel Head of Product Evaluation and Advancement	Syngenta Seeds, Inc., Boise
Xavier Danthinne, PhD President	O.D. 260, Inc., Boise
Carl R. Thornfeldt, MD Founder and CEO	Episciences, Inc. (Epionce), Boise
Michael Hill, PhD President	Boise Technology, Inc., Nampa
Sandy Koch Biology Supervisor Brian McGovern Microbiology Supervisor	Analytical Laboratories Inc., Boise

Office of the Mayor

David H. Bieter
Mayor

City Council
President
Maryanne Jordan
Council Pro Tem
Alan W. Shealy

Elaine Clegg
David Eberle
Lauren McLean
TJ Thomson

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TDD/TTY
800/377-3529

Web
www.cityofboise.org/mayor

July 27, 2011

James C. Munger, PhD
Vice Provost for Academic Planning
Boise State University
Boise, ID 83725

Re: New Biomolecular Sciences PhD at Boise State University

Dear Vice Provost Munger,

I am pleased to hear that Boise State is pursuing a new doctorate program in Biomolecular Sciences.

I understand this interdisciplinary degree option is designed to meet the needs of students seeking post-graduate education in biochemistry, bioinformatics, biophysics, cell biology, and molecular biology.

This program will benefit Boise in many ways, but here are the most obvious to this mayor. Its students will be Boiseans while pursuing their degrees, contributing both economically and culturally to "the most livable city in the country." Many graduates will remain in the area, adding to our skilled workforce, advancing our existing biomedical enterprises and starting new ones. It is fact that higher-education research has a positive economic multiplier effect in its host city and far beyond.

The City of Boise and I support your efforts and wish you good fortune.

Sincerely,

David H. Bieter
Mayor

STATE OF IDAHO
DEPARTMENT OF AGRICULTURE

C.L. "BUTCH" OTTER
Governor
CELIA R. GOULD
Director

August 3, 2011

James Munger, Ph.D
Department of Biology
Boise State University
Boise, ID 83725-1515

Dear Dr. Munger,

I am writing to express my strong support for Boise State University's proposed doctorate program for biomolecular sciences. As you know, BSU has a long tradition of recruiting some of Idaho's best talent and keeping those individuals in the state where they are most needed. There is no doubt that a highly-skilled and well-educated work force is one of the greatest assets to Idaho's economy and way of life.

Specifically, biomolecular studies have great potential to positively affect the Idaho State Department of Agriculture's mission of preventing, monitoring and controlling pests and diseases. Moreover, agriculture as a whole stands to benefit from bio-science research. Agriculture has been a driving cultural and economic force in Idaho for generations, and it is a dynamic, evolving industry greatly enhanced by efforts in dozens of fields. Synergy between agriculture and research has paved the way for incredible advancements in Idaho, and I am confident that innovation will continue to help drive Idaho's success in markets domestically and around the world.

Biomolecular studies have the potential to benefit far more than just one industry sector. Time after time, businesses seeking to expand in or relocate to Idaho look at the work force available in the state and the quality of life enjoyed here. Greater educational opportunities serve both of these areas. Additionally, a Ph.D program does not simply offer an outlet for students seeking educational advancement. A science-based doctorate degree option represents a real and tangible venue for solving problems that interface dozens of fields.

Idahoans already possess tremendous work ethic and drive to succeed. Now we need to empower them with additional opportunities to thrive. I appreciate the opportunity to bring to light the many ways that a biomolecular science doctorate program will benefit all of Idaho. I hope this program proposal receives positive consideration.

Sincerely,

Celia R. Gould

Celia Gould, Director

CAES
Center for Advanced Energy Studies

July 13, 2011

James C. Munger, PhD
Vice Provost for Academic Planning
Boise State University
Boise, ID 83725

Dear Dr. Munger,

I would like to go on record strongly endorsing your proposed new graduate program in Biomolecular Sciences. A PhD in Biomolecular Sciences is not currently offered in Idaho and this program would fill a unique niche as well as being a nice complement to the Bioinformatics and Computational Biology Program offered at the University of Idaho. Such a program is easily justified in the State of Idaho in a highly qualified workforce for existent and emerging biotechnologies.

At the Idaho National Laboratory (INL) and the Center for Advanced Energy Studies (CAES), we perform collaborative research on the most challenging problem for the 21st Century – providing clean energy options for our nation and our state. To this end, we have active programs in bioenergy, biofuels, biocatalysis, bioconversion, micro-biomes and biological aspects of carbon management. Successful execution of these programs relies on the ability to understand the interface between disciplines such as biology, biochemistry, chemistry, materials, and physics. Our successful execution of these programs is reliant on a highly trained and skilled workforce that understands and appreciates the integrated and qualitative aspects of discipline interfaces at the biomolecular level. Our research programs are interdisciplinary by their very nature and often lead to technology-based economic development opportunities within the state. At the INL and CAES we are constantly seeking qualified scientists and engineers to work in these disciplines and typically we must recruit out of state. Your proposed program would go a long way toward providing a highly skilled workforce pipeline for our programs as well as the ever-increasing workforce pipeline necessary to support the growing biotechnology industry in the State of Idaho.

Please do not hesitate to contact me if I can be of further assistance in helping you launch this exciting new educational opportunity at Boise State University.

Sincerely,

J. W. Rogers, Jr., PhD
Director, Center for Advanced Energy Studies

JWR-03-11

995 University Boulevard • Idaho Falls, ID 83401
www.caesenergy.org

IDAHO DEPARTMENT OF
HEALTH & WELFARE

C.L. "BUTCH" OTTER – GOVERNOR
RICHARD M. ARMSTRONG – DIRECTOR

CHRISTOPHER L. BALL, PH.D., HCLD (ABB) – Chief
BUREAU OF LABORATORIES
2220 Old Penitentiary Road
Boise, Idaho 83712-8299
PHONE 208-334-2235
FAX 208-334-4067
EMAIL ballc1@dhw.idaho.gov

July 28, 2011

James C. Munger, PhD
Vice Provost for Academic Planning
Boise State University
Boise, ID 83725

RE: Proposed Ph.D. in Biomolecular Sciences

Dear Dr. Munger,

I am very pleased to provide a letter of support for the proposed Ph.D. program in Biomolecular Sciences at Boise State University. The program's research foci in bioinformatics, genomics, molecular forensics, vaccinology, and next generation antibiotic development are particularly relevant to public health laboratory work. As such, the Idaho Bureau of Laboratories (IBL) would benefit from close association with faculty and students in the program. Given the interdisciplinary nature of the program, several IBL employees have expressed interest in enrolling when the program is approved. Having IBL scientists in this program would provide an excellent opportunity to advance the research, training and outreach missions of the Bureau. Moreover, the graduates from this program would be well qualified to fill the Bureau's most technical and difficult to recruit positions. Please feel free to contact me if I can be of further assistance as you seek approval for this important program.

Sincerely,

Christopher L. Ball Ph.D., HCLD (ABB)
Bureau Chief

cc: Jane Smith,
Administrator, Division of Public Health and
Idaho State Health Official

OFFICE OF ENERGY RESOURCES

C.L. "BUTCH" OTTER
Governor

JOHN CHATBURN
Interim Administrator

304 N. 8th Street, Ste 250
P.O. Box 83720
Boise, ID 83720-0199

(208) 332-1660
FAX (208) 332-1661

July 20, 2011

Dr. Jim Munger
Vice Provost for Academic Planning
Boise State University
1910 University Drive
Boise, ID 83725-1001

Dear Dr. Munger,

It is my pleasure to write in support the creation of a new PhD program in Biomolecular Science at Boise State University.

From our standpoint, the proposed PhD program will have two primary benefits. First, one of the research topics in the program focuses on microbial catalysis of biomass, such as agricultural, municipal, and other organic rich wastes, to biofuels. As such, the program has the potential to have substantial impact on Idaho's ability to create alternative forms of energy and diversify our economic base.

Second, in general terms, the program will generate research and a skilled workforce that will serve the region and state's economy in the areas of biotechnology, health, and biomedicine.

Sincerely,

John Chatburn
Administrator
Office of Energy Resources

St Luke's

April 12, 2011

Mary Givens
Director
Office of Technology
Division of Research
Boise State University
1910 University Drive
Boise, Idaho 83725-1135

Dear Ms. Givens:

It is my pleasure to write in support of Boise State University establishing a PhD program in Biomolecular Science within the College of Arts and Sciences. My staff have polled many of our physician scientists and administrators at St. Luke's Health System and everyone is quite supportive of this program enhancement.

The interdisciplinary nature of this curriculum is especially appealing. Our physicians have enjoyed the collaboration with your many scientific centers and agree such a PhD program will further the efforts to serve the people of our region. By joining the forces of your biologists, chemists, biochemists and physicists with our clinical physicians, pharmacists and nurse researchers we will indeed create an advanced and contemporary atmosphere for the advancement of students' education and experience.

On a longer term note, we are also happy that BSU will be supporting a program that will generate a skilled workforce that can serve the state's biomedical needs and further contribute to Idaho's economic development.

We are enthusiastic about the development of this PhD program and look forward to our continued working together.

Sincerely,

David C. Pate, MD, JD
President and CEO
St. Luke's Health System

St. Luke's Health System
David C. Pate, MD, JD
President and CEO
420 West Idaho Street
Boise, Idaho 83702
P (208) 381-1831

Saint Alphonsus Health System

June 13, 2011

Dr. Martin Schimpf
Provost & Vice President for Academic Affairs
Boise State University
1910 University Drive
Boise, ID 83725-1001

Dear Dr. Schimpf,

It is my pleasure to write in support of Boise State University establishing a PhD program in Biomolecular Science within the College of Arts and Sciences. This on-campus doctoral program will offer students the opportunity to combine studies from traditional science disciplines to solve important cross-cutting problems at the interface of contemporary fields in biomolecular sciences.

This program will add value to the mission of Boise State by building on existing and planned strengths to generate a skilled workforce that can serve the region and state's health and biomedical economy while addressing challenges of national importance. It will additionally add value to Idaho's economy by providing an advanced degree option in interdisciplinary biomolecular science to meet the needs of students who would otherwise need to relocate to pursue advanced education in the areas of biochemistry, bioinformatics, biophysics, cell biology, and molecular biology.

At Saint Alphonsus Medical Center, we value a workforce with this type of advanced education. Graduates of the PhD program in Biomolecular Science will be prepared and well aligned to industry requirements.

In the longer term, we are also happy that Boise State will be supporting a program that will train scientists who are capable of doing high-quality independent research who can work as part of an interdisciplinary team to solve important problems and generate a skilled workforce that can serve the state's biomedical needs and further contribute to Idaho's economic development.

We are enthusiastic about the development of this PhD program and look forward to our continued working relationship.

Sincerely,

Sally E. Jeffcoat
President & CEO

1055 North Curtis Road
Boise, ID 83706
Phone: (208) 367-2000 | Fax: (208) 367-3966
www.saintalphonsus.org

ATTACHMENT 3

DEPARTMENT OF VETERANS AFFAIRS
Medical Center
500 West Fort Street
Boise ID 83702-4598

In Reply Refer To:

June 13, 2011

Dr. Martin Schimpf
Provost & Vice President for Academic Affairs
Boise State University
1910 University Drive
Boise, ID 83725-1001

Dear Dr. Schimpf:

It is my pleasure to write in a letter in support of Boise State University establishing a PhD program in Biomolecular Science within the College of Arts and Sciences. This on-campus doctoral program will offer students the opportunity to combine studies from traditional science disciplines to solve important cross-cutting problems at the interface of contemporary fields in biomolecular sciences.

This program will add value to the mission of Boise State by building on existing and planned strengths to generate a skilled workforce that can serve the region and state's health and biomedical economy while addressing challenges of national importance. It will additionally add value to Idaho's economy by providing an advanced degree option in interdisciplinary biomolecular science to meet the needs of students who would otherwise need to relocate to pursue advanced education in the areas of biochemistry, bioinformatics, biophysics, cell biology, and molecular biology.

At the Boise VA Medical Center, we value a workforce with this type of advanced education. Graduates of the PhD program in Biomolecular Science will be prepared and well aligned to industry requirements.

In the longer term, we are also happy that Boise State will be supporting a program that will train scientists who are capable of doing high-quality independent research who can work as part of an interdisciplinary team to solve important problems and generate a skilled workforce that can serve the state's biomedical needs and further contribute to Idaho's economic development.

The Boise VAMC is establishing a Biomedical Research Center than can be an important component for graduate education in Boise. Our new facility will be completed in February of 2012.

ATTACHMENT 3

We are enthusiastic about the development of this PhD program and look forward to our continued working relationship.

Sincerely,

Dennis L. Stevens

Dennis L. Stevens, Ph.D, M.D.
Associate Chief of Staff for Research and Development
Veterans Affairs Medical Center
500 West Fort Street
Boise, Idaho 83702
Email: dlsteven@mindspring.com

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Mountain States
Tumor & Medical
Research Institute

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June 28, 2011

Dr. Martin Schimpf
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Boise State University
1910 University Drive
Boise, ID 83725-1001

Dear Dr. Schimpf,

It is my pleasure to write in support of Boise State University establishing a PhD program in Biomolecular Science within the College of Arts and Sciences. I understand that this on-campus doctoral program will offer students the opportunity to combine studies from traditional science disciplines to solve important cross-cutting problems at the interface of contemporary fields in biomolecular sciences.

I know that this program will add value to the mission of Boise State by building on existing and planned strengths to generate a skilled workforce that can serve the region's and state's health and biomedical economy while addressing challenges of national importance. It will additionally add value to Idaho's economy by providing an advanced degree option in interdisciplinary biomolecular science to meet the needs of students who would otherwise need to relocate to pursue advanced education in the areas of biochemistry, bioinformatics, biophysics, cell biology, and molecular biology.

We at St. Luke's Mountain States Tumor and Medical Research Institute have long valued our association with the faculty at Boise State, and look forward to working with the graduates of the Biomolecular Science program. We have a special interest in individuals who might undertake translational cancer medicine research.

In the longer term, we are also happy that Boise State will be supporting a program that will train scientists who are capable of doing high-quality independent research who can work as part of an interdisciplinary team to solve important problems and generate a skilled workforce that can serve the state's biomedical needs and further contribute to Idaho's economic development.

We are enthusiastic about the development of this PhD program and look forward to our continued working relationship.

Sincerely,

Theodore A. Walters, MD
Director

Sāpidyne

True Solution Phase Equilibrium and Kinetic Binding Analysis

KinExA TECHNOLOGY

July 27, 2011

James C. Munger, PhD
Vice Provost for Academic Planning
Boise State University
Boise, ID 83725

RE: BSU Proposed Biomolecular Program

Dear Dr. Munger

Thank you for the information on the proposed new graduate program in biomolecular sciences. We, here at Sapidyne, believe this is an important step in meeting the needs of our area. Personally, I believe that biotech is the greatest growth opportunity for the future. We can either prepare for it and benefit, or ignore it and be left behind. I'm glad to see that you are working to prepare for it!

Sapidyne has hired several PhD level scientists, and so far we have always had to recruit from out of state. The proposed program would not only provide PhD level scientists, but also enable a partnership benefiting both us and the university. In addition to providing exciting research opportunities and internships for the students, having a local program for graduate level studies would help with our employees who wish to further their education. We have had several undergraduate level employees continue their education, and so far that has meant leaving the area. This is not only a loss to our company, but is also a loss of talent to the state.

In our effort to stay at the leading edge with our instrumentation, we continue to have a significant portion of our revenue go back into R&D. Our R&D includes many collaborations with universities to catch new technology at the earliest stage possible. While we have had some collaborative work with BSU, most of our collaborations have been outside of Idaho. For instance, we have had very productive collaborations with Tulane University, UCSF, Thomas Jefferson University, and Tokyo University of Technology to name just a few. All of these collaborations have resulted in publications by the university researchers and enhancements to our instruments and industry reputation. We would prefer to see more of this type of work being done in Idaho. In fact, we would be willing to provide a research grant for a binding study we need done, provided BSU is able to expand its capabilities as described in your proposal.

In summary, we are fully in support of your proposed new program and hope to see it implemented as soon as possible. If there is anything we can do to help, please don't hesitate to contact me.

Best regards,

Steve Lackie
President

700 W. Diamond St. Boise, Idaho 83705 • Fax: (208) 345-5251 • Tel: (208) 345-3400 • www.sapidyne.com

Teresa Mitzel
Head of Product Evaluation & Advancement
Vegetables NA

Tel: 208-327-7251
Fax: 208-378-6625
Mobile: 831-801-2786
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syngenta

Dr. James C. Munger
Vice Provost for Academic Planning
Boise State University
Boise, ID 83725

July 6th, 2011

PhD program in Biomolecular Sciences

Dear Dr. Munger,

I am writing this letter in support of your intended PhD program for Biomolecular Sciences at Boise State University. Syngenta is one of the world's leading companies with more than 26,000 employees in over 90 countries dedicated to our purpose: Bringing plant potential to life. Through world-class science, global reach and commitment to our customers we help to increase crop productivity, protect the environment and improve health and quality of life.

Syngenta has our vegetable business seated in this area of the Treasure Valley and locally conducts plant variety development for sweet corn, green beans and peas, as well as research and development of new crop protection chemistry. Syngenta's Idaho facilities also house our Quality Assurance Lab where we conduct tests on seed germination, seed health and purity tests on our genetics. Having local access to graduate level science courses would be a great asset to our employee development and talent management. Genomics, as well as cellular and molecular biological sciences are fundamental to Syngenta's success in new product development and integrated solutions for our customer base. It would be an asset to our research endeavors in Idaho to have access to specific courses or a full PhD program without travel or relocation for these areas of study.

It is encouraging to see Boise State University aspiring to meet the needs of the changing world as well as the local ecomony.

Sincerely,

Teresa Mitzel
Head of Product Evaluation and Advancement - Syngenta Vegetables

O.D.260 Inc.

PO Box 534 • Boise • ID 83701
Phone (208)345-7369 • FAX (208)345-7569
E-mail xdanthin@od260.com
www.od260.com

July 6, 2011

Dr. Martin Schimpf
Provost & Vice President for Academic Affairs
Boise State University
1910 University Drive
Boise, ID 83725-1001

Dear Dr. Schimpf,

It is my pleasure to write in support of Boise State University establishing a PhD program in Biomolecular Science within the College of Arts and Sciences. This on-campus doctoral program will offer students the opportunity to combine studies from traditional science disciplines to solve important cross-cutting problems at the interface of contemporary fields in biomolecular sciences.

This program will add value to the mission of Boise State by building on existing and planned strengths to generate a skilled workforce that can serve the region and state's health and biomedical economy while addressing challenges of national importance. It will additionally add value to Idaho's economy by providing an advanced degree option in interdisciplinary biomolecular science to meet the needs of students who would otherwise need to relocate to pursue advanced education in the areas of biochemistry, bioinformatics, biophysics, cell biology, and molecular biology.

At OD260, Inc., we value a workforce with this type of advanced education. Graduates of the PhD program in Biomolecular Science will be prepared and well aligned to industry requirements.

In the longer term, we are also happy that Boise State will be supporting a program that will train scientists who are capable of doing high-quality independent research who can work as part of an interdisciplinary team to solve important problems and generate a skilled workforce that can serve the state's biomedical needs and further contribute to Idaho's economic development.

We are enthusiastic about the development of this PhD program and look forward to our continued working relationship.

Sincerely,

Xavier Danthinne, Ph.D.
President

We Deliver the Beauty of Healthy Skin™

epionce®

July 11, 2011

To Whom It May Concern:

Episciences, Inc. is a Boise-based company which manufactures and distributes the physician-dispensed product line, Epionce. As a company based on breakthrough scientific technology in skin care, we are in support of a PhD in Biomolecular Sciences through Boise State University.

The field of medicine is changing as technologies continue to advance rapidly. All companies must keep up in order to stay competitive. For this reason, we welcome a program where innovative research in drug development and biomedical research occur in our hometown. Our products were initially developed to help with the symptoms of skin diseases. Innovative research by graduate students in normal homeostatic and disease processes would also be of interest to us. Additionally, since our products are based upon botanical extracts, local research and potential partnership for plant biotechnology would be incredibly positive for us.

It is our preference to remain in Boise and utilize local resources wherever possible. To have access to graduates of a program of this nature here in Boise is certainly our preference. We would hope that other businesses in similar or supporting industries would either move to or be created in Boise due to a strong program of this nature being founded here.

Sincerely,

Dr. Carl Thornfeldt MD

Dr. Carl Thornfeldt
Founder and CEO of Episciences, Inc.

Cc Jim Munger

Boise Technology, Inc.
A Scientific Research Company
5465 E Terra Linda Way, Nampa, Idaho 83687

Michael W. Hill, Ph.D.
President/Senior Scientist
michael@boisetechnology.org

July 20, 2011

James C. Munger, PhD
Vice Provost for Academic Planning
Boise State University
Boise, ID 83725
208-426-4010

Dear Dr. Munger,

As you are aware Boise Technology, Inc is a small high–tech research company located in the Boise valley. In fact, about half of our technical staff is Ph.D. scientists. Although most of our work is in the area of physical chemistry we do currently have one project with a biomolecular focus and we would like to develop more. We are even currently searching for Ph.D. biologist/biochemist/biomolecular scientist to fill an opening in our organization. It would be wonderful if we had a local candidate pool to choose from to fill this position but instead we will most likely have to fill the position from outside the local community. It would be favorable to us if BSU were to have a PH.D. program in Biomolecular Sciences, for developing a local candidate pool as well as for establishing greater collaboration potential between us and the university. I also believe that developing a successful biomolecular program would benefit the establishment of other Ph.D. programs in the sciences at BSU. And this would also be of great value to us.

The bachelor's level scientists that we hire are usually intelligent and driven. We have lost a few of our brightest junior level scientists to graduate schools out of state. We would welcome more local graduate programs that might help us to retain our brightest with the opportunity to enroll in a local graduate program.

I am very glad to see that BSU is committed to continue to develop new graduate programs in the sciences, and to retain or recruit the brightest and the best to the local community. Please always strive to enhance the capabilities of Boise State University. It will enhance the community.

Best regards,

Michael W. Hill, Ph.D.

Analytical Laboratories, Inc.

July 19, 2011

Dr. Jim Munger
Vice Provost for Academic Planning
Boise State University
1910 University Drive
Boise, ID 83725-1001

Dear Dr. Munger,

It is our pleasure to write in support the creation of a new PhD program in Biomolecular Science at Boise State University.

Analytical Laboratories, Inc. performs comprehensive testing for individuals, private groups, commercial establishments, mines, and government organizations. We are certified for biological, bacteriological, physical, and chemical analyses in drinking water and we perform testing, consulting, and sampling services for wastewater, soil, food, fertilizer, and petroleum products.

From our standpoint, the proposed PhD program will have several benefits. First, it will provide an advanced degree option in interdisciplinary Biomolecular Science for our employees who would otherwise need to relocate to pursue advanced education in the areas of biochemistry, bioinformatics, biophysics, cell biology, and molecular biology.

Second, the program will produce high-quality research that may provide direct and indirect benefits to our business. For example, much of the testing we perform involves technology-intensive protocols that have been developed through similar research efforts.

Third, in general terms, the program will generate research and a skilled workforce that will serve the region and state's economy in the areas of health, biotechnology, and biomedicine.

Sincerely,

Sandy Koch
Biology Supervisor

Brian McGovern
Microbiology Supervisor

1804 North 33rd St. • Boise, Idaho 83703-5814
1-800-574-5773 • Ph: (208) 342-5515 • Fax: (208) 342-5591
E-mail: ali@analyticallaboratories.com • Website: www.analyticallaboratories.com

APPENDIX C:

INBRE/BRIN materials

1. Letter of support for the proposed PhD program from Carolyn Bohach, State INBRE Director and University of Idaho faculty member
2. Memo from Scott Minnich, Associate INBRE Director and University of Idaho faculty member, detailing research collaborations.
3. Letter of support for the 2008 INBRE proposal from Dr. Tim White, former President of the University of Idaho
4. Letter of support for the 2008 INBRE proposal from Dr. Lawrence Ford, former Interim Vice President for Research, Idaho State University.
5. Letter of support for the 2008 INBRE proposal from Dr. Bob Kustra, President of the Boise State University
6. Excerpts from 2011 Draft Report from NIH External Evaluation Committee
7. Guide to highlighted excerpt of the 2008 INBRE proposal
8. Highlighted excerpt from the 2008 INBRE proposal

IDAHO INBRE
IDeA Network of Biomedical Research Excellence

Idaho INBRE Program
University of Idaho
PO Box 444207
Moscow, ID 83844-4207

Ph: 208.885.5373
Fx: 208.885.6904
inbre@uidaho.edu
www.inbre.uidaho.edu

June 28, 2011

James C. Munger, Ph.D.
Vice Provost for Academic Planning
Boise State University
1910 University Drive, Mail Stop 1001
Boise, ID 83725-1001

Dear Dr. Munger:

This letter is to convey my support for the creation of the Biomolecular Sciences Doctoral Program at Boise State University. This program will be a productive collaboration between existing strengths and will provide a focal point around which to grow graduate education and future research efforts at your institution.

The goals stated in developing this Doctoral Program are in-line with the current Idaho IDeA Network for Biomedical Research Excellence (INBRE) Program supported by the National Institutes of Health (NIH), for which I am Director. INBRE and the proposed Biomolecular Sciences Doctoral Program are both multidisciplinary, collaborative, and focus on the continued growth of research and research-training programs. The thematic focus of INBRE is *"Cell Signaling"* so there will be synergy with your proposed degree program. The overall goal for both programs is to increase federally-funded biomedical research taking place in Idaho. Therefore, the programs are mutually supportive.

The INBRE Program has facilitated a developing strength in proteomics and protein structure/function studies at Boise State University. Your proposal for the establishment of a Biomolecular Sciences Doctoral Program builds on the early efforts of INBRE and will, I believe, complement existing graduate programs and serve Idaho well by creating a valuable training and research resource for the state.

On behalf of the Idaho INBRE Program, I give my full support to the establishment of the Biomolecular Sciences Doctoral Program at Boise State University.

With best regards,

Carolyn H. Bohach

Carolyn Hovde Bohach, Ph.D., Professor and
Director of the Idaho INBRE Program

Supported by NIH Grant Number P20 RR016454 from the INBRE Program of the National Center for Research Resources

IDAHO INBRE
IDeA Network of Biomedical Research Excellence

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www.inbre.uidaho.edu

University of Idaho and Boise State University- real and potential collaborative research opportunities:

1. Bioinformatics

   Under the auspices of the INBRE program, the University of Idaho has assisted BSU in development of a collaborative effort in bioinformatics. Researchers at BSU have access to the U of I bioinformatics core facility headed by Dr. James Foster. Dr. Foster has provided oversight and advice to bioinformatics development at BSU.

2. Infectious Disease and Vaccine Development.
   a. Several faculty members of BSU (Drs. Cornell and Tinker) have acquired funding for vaccine development against West Nile-like virus and *Yersinia pestis*. Because the U of I has select agent status for Class 1 infectious agents and maintains and runs a ABSL-3 facility, members of the U of I faculty have been requested to be collaborators on grants. Such collaboration would facilitate conducting model organism vaccine trials for vaccine efficacy. This is a natural melding of talents on both campuses since U of I faculty have extensive experience in vaccine development.
   b. Dr. Cornell is also conducting INBRE-funded studies on *Escherichia coli* O157:H7. This organism is the focus of research in two laboratories at the U of I and Dr. Cornell has spent time on the U of I campus learning genetic techniques to employ in his own studies. The U of I runs and maintains a BSL-2 certified cattle barn to do field trials on this pathogen and its cattle reservoir host. Increased collaboration between Dr. Cornell's laboratory and the Minnich/Bohach team is welcomed and anticipated.
3. Developmental Biology

   Drs. Oxford and Jorysk are conducting developmental biological studies in mice and zebra fish. The latter model organism is used extensively by Dr. D. Stenkamp at the U of I and she has provided training and given advice to BSU faculty. They have a collaborative ongoing research interaction.

4. The U of I INBRE research core sponsors a monthly symposium that fosters collaboration between BSU faculty in Biology and Engineering with faculty from UI, ISU, NNU, and C of I.

In summary, the faculty, the environment, and the students at BSU are poised to expand graduate training at the Ph.D. level. The emphasis in bimolecular sciences will not only be unique, but will further enhance collaborations in the biomedical research across Idaho.

Supported by NIH Grant Number P20 RR016454 from the INBRE Program of the National Center for Research Resources

University of Idaho
Open Space. Open Minds.

University Research Office
PO Box 443010
Moscow ID 83844-3010

Phone: 208-885-4989
Fax: 208-885-5752

TO: Dr. Carolyn Bohach, Director Idaho INBRE Program

FROM: Tim White, President
Doug Baker, Provost
John Tracy, Vice President of Research

RE: A Plan for Sustainability of Biomedical Research Infrastructure at the University of Idaho

DATE: April 15, 2008

Over the past six years the NCRR Division of the National Institutes of Health has invested more than $60 million in biomedical research in the State of Idaho*. A significant fraction of these funds was directed to develop infrastructure at the University of Idaho. The intention of this investment by NIH was that the University would sustain these facilities at the completion of the funding period. Indeed at a recent meeting at the NIH, representatives of the NCRR, our principle funding institute, made it clear that renewal of INBRE would be contingent partly on a firm commitment by the University to sustain this investment after the INBRE grant sunsets. The University recognizes the need to invest in the future, not only to be successful in the next competitive round of INBRE, but also to provide support for research facilities that will recruit and retain the best faculty and students.

To meet these challenges, we will initiate three actions:

First, in the near term, the University of Idaho will commit to providing support to the INBRE program equivalent to one-half of the earned Facilities and Administration costs recovered from a successful INBRE renewal back to the program. This money will be used, as it was in BRIN and INBRE 1, for activities such as the summer undergraduate research conference, seed grants, salary for post-doctoral fellows, stipends for graduate students, equipment service contracts, and to take advantage of unanticipated opportunities. The expenditure of these funds will be directed by the INBRE PI to advance the INBRE program. The University of Idaho Research Office will provide appropriate financial management assistance to ensure that these funds are available.

Second, the University of Idaho will commit to support the bioinformatics facility and the imaging core with a shared INBRE/University cost split beginning in 2009 and extending through 2014, at which point the University will assume the full responsibility of supporting these key research support facilities.

Third, in the longer term we will develop a "Biomedical Research Center" at the University of Idaho. This Center would reside in an existing academic unit, and would develop funding for faculty appointments, support for research infrastructure and support for interdisciplinary graduate programs. Funding for the Center will be solicited by the University through the State Board of Education appropriation process as part of the future strategic research direction of the University. The plan for the Center will also include investments by hospitals and other health care facilities, corporations, foundations and other non-governmental agencies. Once a plan for the UI center is in place, with identified sources of funding, the University could join the statewide biomedical research working group to develop a multi-university cooperative plan.

In addition to this commitment by the University of Idaho, every institution of higher education in Idaho has committed specific statements in real dollar terms towards a plan to sustain what the INBRE Program has built on their campuses and in our state. The theme of Idaho's INBRE renewal proposal is "sustainability." We hope that this letter is viewed as convincing evidence that we are committed to maintain NIH's investment at the end of this grant period.

---

* BRIN ($8M), INBRE ($16M), COBRE Inf Ds. ($21M), COBRE Evol ($20M), Lariat ($1M), Confocal (~$1M).

By _____
Name: Tim White
Title: President

By _____
Name: Doug Baker
Title: Provost

By _____
Name: John Tracy
Title: Vice President of Research

IDAHO STATE UNIVERSITY

Office of Research
921 South 8th Avenue,
Stop 8130
Pocatello, Idaho
83209-8130

Physical Address:
1010 South 5th St.
Bldg 11, Room 205

January 8, 2008

Dr. Carolyn Bohach
Professor
Director of the NIH Idaho INBRE
Department of Microbiology, Molecular Biology, and
Biochemistry
University of Idaho
Moscow, ID 83844-3052

Dear Dr. Bohach:

Idaho State University is committed to building an excellent biomedical research program. We are Idaho's leader in providing education in the health professions and supporting sciences; such education is a major emphasis of our state-given mission statement. ISU views research as the most effective means to keep our faculty vital and current in their fields. The "Infrastructure Network for Biomedical Research Excellence (INBRE) in Idaho" has been an excellent foundation for expanding our research efforts, and strengthening our ongoing collaborations with biomedical researchers at the other institutions in the region. This letter outlines the institutional biomedical research infrastructure ISU has developed over the last seven years under the BRIN/INBRE program and the long-term, sustaining commitment to this project that ISU will phase in over the next six years.

Over the duration of the BRIN/INBRE program ISU has established the following infrastructure:

1. We have built the ISU Bioinformatics Core, hiring Dr. Michael Thomas, constructed a 24 node bioinformatics computing center that links to the state bioinformatics core at the University of Idaho and hiring Mr. Luobin Yang, bioinformatics system administrator/programmer.

2. New faculty hires in the Departments of Biomedical and Pharmaceutical Sciences, Biological Sciences and Psychology have emphasized researchers with a biomedical focus.

3. Collaborations with faculty from the College of Engineering have developed biomedical engineering projects.

4. Development and expansion of the ISU Molecular Research Core Facility has fostered a strong molecular research emphasis.

Phone: (208) 282-2714
Fax: (208) 282-4529
www.isu.edu/research

5. The "Pipeline to Graduate Education" program has allowed numerous undergraduates to participate in cutting edge biomedical research and we have markedly increased PhD graduates in biomedical emphasis areas.

To sustain and continue the advances ISU has seen under the first 8 years of the BRIN/INBRE program we have established the ISU Biomedical Research Institute (IBRI). To continue the growth and development of biomedical research over the next six years, as INBRE II sunsets, ISU commits to phase in funding, through the IBRI budgeting process, for the following:

1. The Bioinformatics system administrator/programmer position will be moved to a state-line FTE ($50,000+FB);

2. Six, 12-month PhD graduate research assistantships will be funded permanently ($22,000 each+FB);

3. Ten permanent Undergraduate Summer Research Fellowships will be supported ($55,000+FB);

4. Funding for faculty release time (5 annually) will be established for NIH grant writing and submission ($50,000);

5. One FTE for a full-time technician to staff the Center for Biological Imaging ($40,000+FB);

6. Funding for four new tenure-track faculty FTEs with biomedical research emphasis;

7. Establish a fund ($50,000) for service contracts for major biomedical research instrumentation.

I am confident that support from the continuing INBRE award will allow the productive group of ISU researchers to become further self-sustaining in their research efforts. I fully support the proposal, and hope you will give it every possible consideration.

Sincerely,

Lawrence C. Ford

Lawrence C. Ford
Interim Vice President for Research

BOISE STATE UNIVERSITY
Office of the President
1910 University Drive Boise, Idaho 83725-1000
phone 208-426-1491
fax 208-426-3779
http://www.boisestate.edu

April 11, 2008

Carolyn Hovde Bohach
Professor and Director of the NIH Idaho INBRE
University of Idaho
Moscow, ID 83844-3052

Dear Dr. Bohach:

An enhanced ability to address national, regional, and local health concerns by Boise State University is at the core of our motivation for continued growth of medical research capacity and our ability to offer research training programs in biomedical research. The statewide proposal to renew the Idaho-IDeA Network for Biomedical Research Excellence Program (INBRE) comes with my strongest support for the continuing growth in biomedical research capacity at Boise State University.

Boise State has been involved in the Idaho-INBRE Program since 2004 during which time it has provided scholarships and an enriched science experience to many students. This program has supported science education as well as support for a summer research experience for undergraduates. This past summer we received over 100 applications, out of which 37 students were selected for research internships. This program is an example of the successful efforts of our faculty members to recruit, retain, and educate our students. Additionally, young faculty members have received seed grant funding through Idaho-INBRE with which to establish productive research laboratories to address nationally recognized health issues such as Alzheimer's disease, osteoarthritis and cancer. Research instrumentation has also been made available to faculty and student researchers through the INBRE program in partnership with other funding available from Boise State. We look forward to continuing these activities and strengthening our research programs as we move forward with our plans to establish a multidisciplinary doctoral program in Biomolecular Sciences.

As outlined in this proposal, sustainability of research is our emphasis. To allow the improvements to become integrated into Boise State's continuing efforts, the University makes the following institutional commitments in support of the Idaho-INBRE Program renewal:

1. Four Graduate Student Stipends. The University will cover the costs of these stipends throughout the entire granting period (2009-2014) and beyond.

2. Recruitment of three new faculty members that strengthen existing biomedical research emphases at Boise State, and who address the research mission of the NIH.

3. Two Laboratory Facility Managers/Technicians. The University will secure non-INBRE funding to support these positions.

4. Bioinformatics Coordinator. The University will secure non-INBRE funding for 0.25-FTE for a Bioinformatics Coordinator who will provide informational technology support of research and teaching associated with bioinformatics activities. An additional 0.25 FTE will be funded by the INBRE grant.

5. Increase in Research Space for the New Faculty Members and a Shared Equipment Core Laboratory. The University continues to secure state resources specifically for renovating faculty and core laboratory facilities on an annual basis. Those facilities directly supporting the Idaho-INBRE effort will continue to be given a high priority in the University's funding request throughout the grant-funding period and beyond.

6. Sustain Instrumentation Centers. The University will develop and implement a recharge policy to ensure instrument centers supporting the Idaho-INBRE effort have a mechanism in place to become self-sustaining by the end of the granting period.

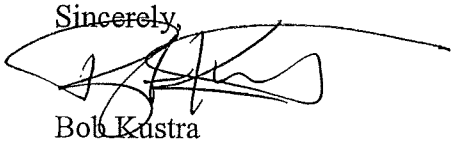
7. Ensure Teaching Loads are Compatible with Maintaining a Research Program. The University has developed a Workload Policy that allows Deans and Department Chairs flexibility in assigning the teaching, research, and service loads of their faculty. Faculty involved with Idaho-INBRE activities will be given due consideration of release time to ensure the goals and objectives of the program are met. Specifically, participants will teach no more than one course per semester which will allow them to carry out research at 75% effort with grant funds available to compensate adjustments in teaching loads if necessary.

8. Recovered indirect costs. The University has a favorable policy dictating return of recovered F&A to support research infrastructure.

9. Online access to scientific journals. Boise State recently committed to spending more than $1 Million over five years to provide access to faculty and students to more than 1,800 of Elsevier's journals. The availability of this collection will provide support for current programs and research on-campus including biology, engineering, health science, nursing, geophysics, mathematics, biomolecular and biomedical science, chemistry, and musculoskeletal research.

Today, a multidisciplinary approach is essential to address complex biomedical problems. The next generation of young scientists must be trained accordingly, and the establishment of research and research training programs as proposed here will address these needs. It is with great enthusiasm that I offer my support for these efforts.

Sincerely,



Bob Kustra
President

Guidance and Evaluation for the Idaho IDeA Network of Biomedical Research Excellence

---

A Mid-term Report on Behalf of the National Institutes of Health
by the External Evaluation Committee

EXTERNAL EVALUATION COMMITTEE

George M. Happ, Ph.D.

Christiane Herber-Valdez, Ed.D.

Heywood R. Sawyer, Ph.D.

May 2011

- Proceed expeditiously with approval and funding the Ph.D. Program in Interdisciplinary Biomolecular Sciences at BSU.

- Providing strong, inter-institutional support for the implementation of BSU's Ph.D. Program as befitting an institution on the threshold of achieving research intensive status. This is a "win-win" opportunity for all Idaho institutions, and is necessary for the continued success of INBRE and its sustainability.

- The Committee was particularly impressed by the developing interdisciplinary biomolecular research program at Boise State University. If approved by the appropriate authorities, the Interdisciplinary Biomolecular Sciences Ph.D. Program would be unique in the State, including researchers and students from biology, chemistry, engineering and other disciplines. The Committee noted the University's commitment of scarce resources to support this program. Moreover, it is essential for sustaining the research momentum in the Boise area after NIH INBRE funding sunsets.

- BSU is progressing toward becoming a Carnegie Mellon designated Research Intensive University. Critical to maintaining this momentum is the approval and implementation of the Biomolecular Sciences Ph.D. Program. This would be a unique interdisciplinary program, and would clearly complement and enhance the existing Ph.D. programs at UI and ISU. The potential for inter-institutional collaborations between these programs is outstanding.

Guide to highlighted portions of the INBRE-2 proposal that are relevant to the PhD in Biomolecular Sciences that is proposed by Boise State University.

1. Reference to the overall structure of the Idaho INBRE network

   - Page 320: Paragraph and table describe the institutions that participate in INBRE (including the University of Idaho, Idaho State University, and Boise State University) and the fact that MOUs have been developed to describe the arrangements of the collaborative agreement among institutions.

2. References to Boise State University creating a PhD in Biomolecular Sciences:

   - Page 308: Paragraph gives an overview of all of the institutions participating in INBRE
   - Pages 315 and 316: Description of progress on strategies to increase the number of graduate students. First described are two graduate programs at the University of Idaho that were created in part based on INBRE funding. Following that is a description of Boise State University's proposed PhD in Biomolecular Sciences, which the INBRE proposal describes as an unprecedented step in providing access to graduate education in the biomedical sciences near the population base of Idaho.
   - Page 328: Description of proposed efforts to facilitate graduate education, including the creation of a new PhD in Biomolecular Sciences.

3. References to the development of a proteomics core lab at Boise State. Note that Boise State's focus on proteomics was to be in the development of a core facility, not in the focus of (or limitation of) its research.

   - Page 310: Paragraph gives an overview of research core facilities, etc., developed with INBRE funding.
   - Page 313: Description that all INBRE researchers are able to access major instruments at the various institutions.

4. References to the development of research collaborations among the researchers at INBRE-supported institutions.

   - Page 313: States that these research collaborations among institutions form the basis for many of the collaborative projects proposed in the application. Note that the descriptions of proposed research are regarded as confidential and therefore may not be shared with CAAP and OSBE.
   - Page 326: A figure depicts collaborations among faculty members.

5. References to the importance of INBRE in supporting the growth of the biotechnology industry in Idaho.

   - Page 319: Description of a gathering of biomedical/pharmaceutical representatives and the role of INBRE in that gathering and in facilitating biotechnology in Idaho.
   - Page 331: Description that INBRE will continue efforts to support the development of the biotechnology industry of Idaho.

6. References to the extensive resources that Boise State University and INBRE have been devoted to the support of biomedical research at Boise State.

   - Page 320: A table listing the types of support, including renovations of research labs, increase in other infrastructural items, new faculty members, faculty development, graduate student support, and library resources.
   - Page 328: References new faculty lines and new graduate assistantships that were created at Boise State University to support the proposed PhD in Biomolecular Sciences.

Program Director/Principal Investigator (Last, First, Middle): Bohach, Carolyn H.

RESEARCH PLAN FOR THE NETWORK

Specific Aims

1. To strengthen Idaho's biomedical research infrastructure and expertise by building on the established INBRE network with the scientific theme of "*Cell Signaling*".
2. To provide support to Idaho faculty, post-doctoral fellows, and graduate students to increase the research base and capacity.
3. To provide research opportunities to Idaho undergraduate students and serve as a pipeline for these students to continue in health research careers.
4. To enhance the science and technology knowledge of Idaho's workforce.
5. To expand Idaho research opportunities across the Western IDeA Region.

Background and Significance

The BRIN and INBRE-1 Programs have had a profound effect on biomedical research at every level and in all regions of Idaho. Unprecedented research and educational collaboration were built between ten institutions in Idaho. This **Network** fosters core laboratory facilities, support services, faculty research, graduate and undergraduate student research opportunities, a pipeline to graduate education, and outreach to the community.

FIG. 1. Idaho INBRE Institutions

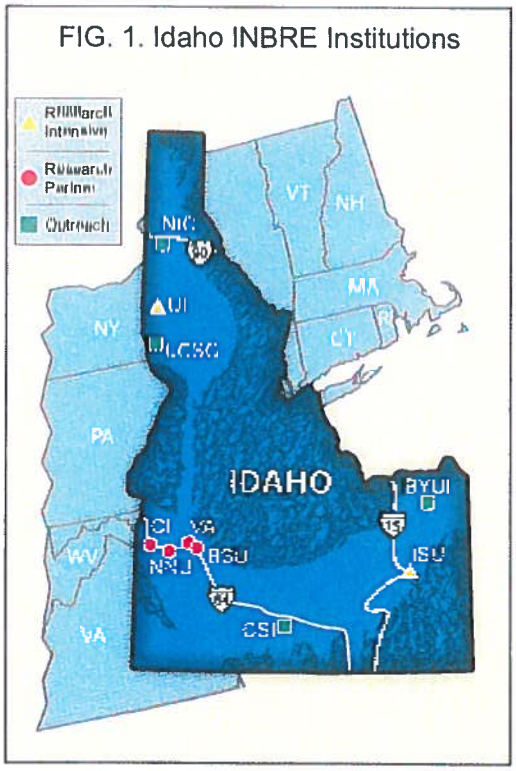


Figure 1 shows a **to-scale map of Idaho** against the US Eastern seaboard to highlight Idaho's large geographic area, mountainous terrain, limited four-lane highway system, and the locations of the INBRE Network institutions. Nine Idaho institutions of post-secondary education and the Boise VA Medical Center participated in the INBRE-1 Program and continue in this INBRE-2 renewal application. The University of Idaho (UI, ▲) at Moscow is Idaho's flagship Land Grant, Carnegie Foundation-ranked Research-Intensive University and administers the INBRE Program. Idaho State University (ISU, ▲) at Pocatello is also a Research-Intensive University. Three Research Partner Institutions with developing research activities include: Boise State University (BSU, ●), a metropolitan university about to begin its first PhD program in biomedical sciences, and two small liberal arts colleges, The College of Idaho (CI, ●) at Caldwell and Northwest Nazarene University (NNU, ●) at Nampa. Four Outreach Institutions (■) that serve undergraduate students, exclusively, include: Lewis-Clark State College (LCSC) at Lewiston; Brigham Young University-Idaho (BYUI) at Rexburg; and two State-funded community colleges, College of Southern Idaho (CSI) and North Idaho College (NIC).

Table 1. Idaho INBRE Network Institutions with Abbreviations

Research Intensive ▲	Research Partner ●	Outreach ■
UI - *University of Idaho*	**BSU** - *Boise State University*	**BYUI** - *Brigham Young Univ.-Idaho*
ISU - *Idaho State University*	**CI** - *The College of Idaho*	**CSI** - *College of Southern Idaho*
	NNU - *Northwest Nazarene University*	**LCSC** - *Lewis-Clark State College*
	VA - *The Boise VA Medical Center*	**NIC** - *North Idaho College*

Idaho's population of 1.47 million is rapidly growing with an increase of >13% since 2000. Idaho's minorities and underserved populations include many first-generation college students (at some colleges >65% of the student body), a small number of Native Americans (seven tribes with a combined population of 20,530), and people of Hispanic or Latino origin (total population, 139,000).

Sustainability Theme

An overarching theme of this renewal application is **"Sustainability."** That is, how can the research infrastructure and programs started with the BRIN/INBRE initiatives be maintained for the foreseeable future? To address this question, the President of each participating institution supplied a letter of commitment that explicitly outlines how the essential INBRE programs on their campus will be sustained as INBRE-2 sunsets in 2014 (see Letters of Support, pages 333-348). Each institution has a different culture and thus each has defined a specific subset of programs they intend to support with permanent funds beyond INBRE-2. In addition to these institutional commitments, the UI's letter commits to develop a statewide initiative to create a permanent inter-institutional network modeled after INBRE to sustain specific research and science education programs. Thus, not only will each institution continue INBRE programs critical to its mission, but the most successful legacy of INBRE, **"The Network"**, will also be sustained in Idaho.

Progress Report – INBRE-1 Accomplishments

INBRE has been a catalyst for transformations to research competitiveness. One profound effect of INBRE funding has been to change the culture at the primarily undergraduate teaching institutions (Research Partners) to embrace research in educational programs and as opportunities for faculty rejuvenation. Dr. Heggland is one of the 17 successful faculty at the Research Partner Institutions who participated in Idaho's INBRE-1. Her story (below) epitomizes the power of INBRE funding to make a **sustainable** difference in the lives of faculty and the students who are the nation's next generation of scientists.

Dr. Heggland's Story

From humble beginnings with one student growing tissue culture cells in a cabinet drawer, to receiving the first ever NIH R15 grant at the small liberal arts College of Idaho (CI), the development of Dr. Sara Heggland's research program epitomizes the significance and realized potential first envisioned with the award of funding from the BRIN/INBRE Programs. Seven years ago, Dr. Heggland was a full-time Biology teacher at CI hoping to squeeze some research in "on-the-side," and possibly have one student work in her "lab." Now, thanks to BRIN/INBRE funding, Dr. Heggland considers herself a "teacher-scholar and research mentor" at this small four-year, liberal arts institution. Twenty-five of her undergraduate students have presented original research at 20 regional or national meetings.

Dr. Heggland (left) and two undergraduate students

Last year, two of her students were first authors on peer-reviewed publications and several of her INBRE-funded undergraduates are attending graduate school. Dr Heggland's excitement for research extends beyond her own laboratory and has inspired the entire CI campus. She was invited to apply for a coveted Howard Hughes grant to continue the successful undergraduate research program at CI that was begun with BRIN/INBRE funding. She spearheads a campus-wide research conference, now in its third year, which draws more than 20% of the student body from 15 different departments/programs and attracts funds from the CI central administration to foster the growing research culture. Dr. Heggland's involvement in BRIN/INBRE-funded research revitalized her career and inspired her to teach through research and stay current in her field. She models for her students those qualities inherent to achieving success in scientific research. Dr. Heggland's transformation is a microcosm of the Idaho INBRE Program achievements. With the BRIN/INBRE investment, talented faculty at small schools are advancing their research, establishing collaborations with previously inaccessible colleagues, and creating a research culture where there was none before. The increased competitiveness fostered by BRIN/INBRE will **sustain** the improved research facilities and environment for the next generation of scientists.

The Idaho INBRE-1 Program had five goals:

- **Goal 1. Establish a Multidisciplinary Research Network**
- **Goal 2. Establish a Network of Research Partners**
- **Goal 3. Establish a Pipeline to Graduate Education**
- **Goal 4. Enhance a Network of Outreach Colleges**
- **Goal 5. Enhance the Scientific Knowledge of the Workforce**

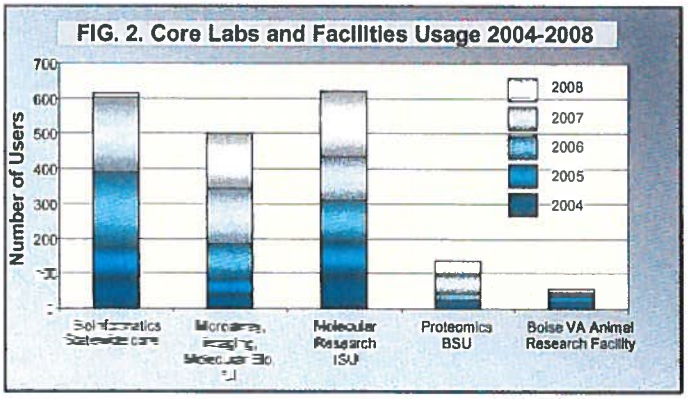
Significant progress was made towards each Goal. The Idaho INBRE-1 administrative structure was developed at UI and was critical to the success of the program. It brought together talented leaders and scientific mentors to enhance and maintain the research **Network** across Idaho. The Central administration included the PI (Director), a Program Coordinator (Associate Director), a Bioinformatics Coordinator, an Outreach Coordinator, and an Evaluator. Three important committees monitored program progress and included, (i) a Statewide Steering Committee with representatives from each **Network** institution and the UI Vice President for Research; (ii) a Senior Advisory Research Committee (SARC) comprised of Idaho researchers with strong track records of NIH and other extramural funding and a commitment to guide junior investigators in the **Network**; and (iii) an External Advisory Committee (EAC), comprised of experts in the "*Cell Signaling*" research theme, minority recruitment, and evaluation. For the administrative structure and list of the individuals on each committee, see Appendix A, Tables A-1 to A-4 on CD.

Progress towards Goal 1 Establish a Multidisciplinary Research Network

Faculty, students, and support staff were involved from all campuses (FIG. 1) under the umbrella of the scientific theme, "*Cell Signaling*". Outlined below **(1-4)** are measurable outcomes from the Idaho Network that include increases in research infrastructure and use, support services, capacity, statewide and regional communication, and scientific collaborations.

1. Developed or enhanced research facilities in the Network that were well used: Research Core Laboratories, Statewide Bioinformatics Facilities, and Research Vivarium.

Figure 2 shows the number of investigators (by year) that used the INBRE Research Core Laboratories and Facilities. Based on the existing strengths at the three universities (UI, ISU and BSU) research core labs and facilities were enhanced or introduced. At the UI, the microarray, molecular biology, and imaging core labs were enhanced; at ISU, a molecular research core lab was developed with emphasis on DNA sequencing; at BSU a proteomics core lab was developed. Each of these core labs has a dedicated technician who trains faculty and students and is responsible for maintaining the equipment. BRIN/INBRE-1 funding was leveraged to gain support from other sources including the NCRR Shared Instrumentation Program and the Murdock Foundation, and at the UI, INBRE partnered with the two COBRE Programs to improve the Research Core Labs. Examples of important large equipment purchases that significantly enhanced the Idaho research environment included an IVIS 200 for *in vivo* imaging, a multi-photon laser confocal microscope, a DNA Sequencer, a Tandem Mass Spectrometer, an analytical ultracentrifuge, a flow cytometer, SEC-MALS and FFF-MALS, and a 600 MHz NMR Spectrometer. See Appendix B, on CD for the list of large equipment purchased with INBRE-1 funds. At the Boise VA, INBRE funding opened the conveniently located Animal Research Vivarium to faculty and students from BSU, CI, and NNU (all within a 25 mile radius).



Bioinformatics capabilities were enhanced or built at all Network institutions and ranged from the main Beowulf cluster and components at the UI to smaller workstations at the two-year colleges. ISU and BSU both introduced dedicated bioinformatics classrooms and research facilities. Hardware and software (specific to scientific foci) were upgraded routinely. INBRE funding for these upgrades was leveraged for NSF instrumentation awards (ISU, BSU), institutional funds (UI), and a COBRE award (UI). Access Grid Node

classrooms were installed at UI, ISU, and BSU to provide high-bandwidth multipoint (worldwide) classes and seminars that were recorded and podcast.

Part of the "**sustainability**" effort has been to build the costs of this research infrastructure into the operating base of the three universities. For example, in 2007, the UI bioinformatics coordinator (Dr. C Brown) and one systems administrator (R Lyon) were moved to permanent state-funded salaries and BSU hired a tenure track, full-time bioinformatics faculty member (Dr. G Yu). See Appendix B on CD, for INBRE-1-supported Instrumentation and Equipment Acquisitions for Research Core Labs and Statewide Bioinformatics Facilities.

2. Developed bioinformatics training at every institution in the Network
Bioinformatics workshops that focused on research and teaching techniques were part of the agenda at every Annual Idaho INBRE Summer Research Conference. For example, in 2004, the workshop presented beginning, intermediate, and advanced bioinformatics applications. Faculty, students, and staff attended workshops consistent with their level of expertise. The statewide bioinformatics coordinator (Dr. C Brown) traveled to each campus to follow-up the workshop by offering one-on-one training. In addition, bioinformatics-savvy faculty or staff at each campus answered day-to-day bioinformatics software-use questions. The ISU Bioinformatics Symposium, which has been held annually since 2003, hosted training sessions for educators and researchers and showcased collaborative research activities with participants from throughout the Pacific Northwest. In 2008, ISU conducted a separate workshop on applied bioinformatics for microbial genomics that included participants from UI, BSU, CSI, the Idaho National Lab, and several local biotech companies.

Separate from the formal workshops and symposia, INBRE bioinformatics services were used heavily. For example, in a one year period (2007), the bioinformatics coordinator had over 50 individual meetings with 20 faculty and postdocs, 10 graduate students, and 3 undergraduates - including individual INBRE researchers from all Idaho research institutions and from other INBRE states. Also, bioinformatics personnel were co-PIs or supporting scientists for multiple NIH and NSF grant proposals requiring bioinformatics expertise.

3. Enhanced statewide telecommunications for the Network
Regular telecommunications meetings between researchers at various institutions were established using the Breeze videoconferencing system. One outcome was a biology curriculum articulation agreement between two-year and four-year colleges.

Using NIH Lariat funds [under the directorship of Dr. G Jacobs (Montana State Univ.) and Dr. R Johnson (Univ. of Washington)] with a UI match, a 2.8 Gbps connection with the Northwest Gigapop was established in Idaho. This connection significantly enhanced access to national data sources and imaging facilities through wideband connectivity. In 2005, small Access Grid Nodes were built at UI, ISU, and BSU to enable long-distance research meetings. By 2010, connections will be expanded to 10 Gbps, enabling teragrid connections through the Univ. of Washington in Seattle. Idaho institutions and researchers will have access to this infrastructure through UI. An outstanding result of the improved telecommunications and interactions with the Univ. of Washington was that 27 Idaho INBRE researchers were given access to e-journal holdings through affiliate faculty appointments with that institution. This single action significantly improved Idaho's research competitiveness through these faculty and their laboratories.

4. Established a Western INBRE states Network
Through the Western IDeA Consortium, formed during BRIN, and with better telecommunications links between the seven Western states, the INBRE directors met monthly to discuss common challenges and new opportunities. Shared research interests, potential collaborators, and available core facilities were identified and interactions were designed to foster new collaborations. The first multi-state INBRE Symposium on Infectious Disease resulted in April 2006 at the UI. More than 100 individuals representing all seven Western IDeA states participated (AK, HI, ID, MT, NV, NM, and WY). Additionally, the annual bioinformatics conference was developed, the first successful western INBRE lab meeting (AK, ID, and MT) was hosted by Idaho in 2006, and a bioinformatics colloquium was held in 2007.

Progress towards Goal 2 Establish a Network of Research Partners

INBRE-1 recruited key Idaho researchers working in the scientific theme of "*Cell Signaling*". This broad topic was chosen to allow the greatest participation of faculty researchers and students at the Research Partner Institutions and to foster their interactions with UI and ISU (research-intensive institutions). Outlined below (**1-10**) are specific activities and measurable outcomes from the Idaho **Network** that included recruitment of research faculty, mentoring, increased publications, increased presentations, increased grant applications and funding, and increased intrastate and interstate networking that built relationships to enhance research opportunities.

1. Recruited faculty at Research Partner Institutions

At the beginning of INBRE-1, all faculty interested in participating in INBRE-sponsored research were required to write a 10-page proposal outlining a specific project and career plans. Proposals were peer reviewed, modified, and resubmitted for final approval by the External Advisory Committee and the NIH NCRR staff. A total of 17 faculty from three Research Partner Institutions participated in INBRE-1 at various levels.

2. Provided various levels of faculty participation in research at the Research Partner Institutions.

To maximize flexibility and encourage greater faculty involvement with research, four levels of participation were designed:

- The "**Magnet PI**" (similar to the NIH Junior Investigator) committed at least 50% of their time to research. They received salary commensurate with this time and funds for a technician, travel, and supplies.
- The "**Research Collaborator**" committed at least 25% of their time to research, usually in the summer, and worked in collaboration with another lead researcher. They received salary commensurate with this time and funds for travel and supplies.
- The "**Student Research Mentor**" was a category created in the third year of INBRE-1 (in response to external review of the Program) for faculty who were interested in having students work in their lab, but not in developing an independent research program. They were provided partial summer salary and a modest supply budget.
- The "**Mentor PI**" also created in the third year of INBRE-1(in response to external review of the Program) for more senior researchers interested in continuing their own research and serving as mentors for two of the more junior investigators.

3. Provided faculty mentoring

Magnet PIs (junior investigator) were required to identify a scientific Mentor to guide their research. The INBRE Program Coordinator spoke directly with the Mentor to explain the level of commitment and expectations that included:

- An initial face-to-face meeting(s), usually in the mentor's lab, to discuss the research plans and career goals of the junior investigator.
- Assistance in preparing manuscripts.
- Review of Specific Aims, and assistance in grant preparation.
- Exploration of joint collaborations between the junior investigator and mentor.
- Continued periodic meetings between the junior investigator and mentor.

Table 2. Research Partner Institution Faculty Participation

Institution	Category	Name
BSU	Magnet PI Collaborator Mentor PI	Charlier, Jorcyk, Rohn Shadle[1], Knowlton Oxford
CI	Magnet PI Collaborator Student Research Mentor	Heggland, Craig[2] Dadabay[3] Ayers[2], Gunderson[3]
NNU	Magnet PI Collaborator	Chase, Myers[3], Strohmeyer[3] Nixon[3], Nogales[1], Kapica[2]

[1]left in 2005; [2]left in 2006; [3]new hires in 2005-2007

4. Set expectations and required annual non-competing renewals

Funding to each investigator, regardless of the category, was provided on a yearly basis, contingent on successful performance. The expectations were geared to each level of research participation (see Appendix C on CD for the INBRE-1 annual expectations, Tables C1- C-4). Progress towards these objectives was compiled by each researcher in a non-competing renewal package and reviewed each April by the Senior Advisory Research Committee (SARC). If sufficient progress was made, funding was awarded for the next year. This was more than a "rubber stamp" process. In fact, in three cases, funding was reduced or eliminated for lack of performance. The non-competing renewal process was important because it provided clear

benchmarks for researchers to work toward and gave them a sense of achievement each year as their research skills grew. The process also assured quality control in the INBRE-funded research being conducted.

5. Established a Senior Advisory Research Committee (SARC)
The Senior Advisory Research Committee (SARC) was comprised of senior researchers in Idaho each of whom has current (or previous) grant support from the NIH (see Appendix A on CD, Table A-2 for SARC members). The SARC served to i) review the annual non-competing renewals of all INBRE-funded investigators; ii) assure that appropriate, successful, ongoing mentoring was provided to each investigator; and iii) review all new faculty applications to become an INBRE researcher. SARC decisions were forwarded to the External Advisory Committee (EAC) for review.

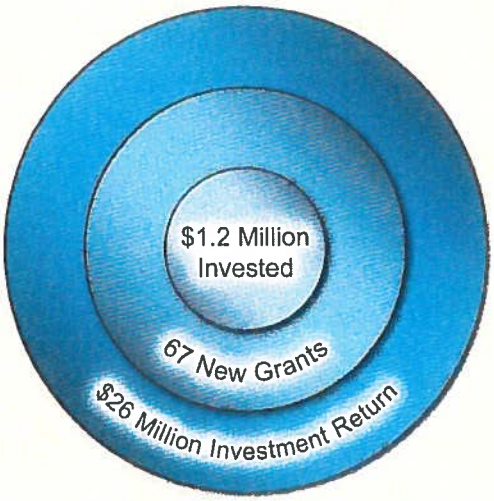
6. Held monthly networking meetings with Research Partners Institution faculty
The researchers from the Research Partner Institutions met monthly with the INBRE Program Coordinator (MB Laskowski). Conveniently, the three institutions (CI, BSU, NNU) and the Boise VA Medical Center are located within a 25 mile radius. Attendance was consistently high with 12 to15 faculty at every meeting. Discussion topics included strategies for publishing papers, mentoring undergraduates in research, preparing grant budgets, and balancing teaching obligations with research. An important byproduct of these networking meetings was the formation of new collaborations between faculty at difference institutions. In fact, this became the basis of many of the collaborative projects proposed in this renewal application (pages 364-500).

7. Assured access to Research Core Labs for all Idaho researchers.
INBRE-1 funds supported the use of Research Core facilities by all researchers in Idaho. Figure 2 shows the Core Labs and Facilities and the increased usage by year from 2004 through part of 2008.

8. Developed laboratories and facilities of research labs at Research Partner Institutions
Each partner institution in the Network developed laboratory infrastructure that ordinarily included small equipment (see Appendix D, on CD, for list of instrumentation and equipment). All researchers in the Network were able to access major instruments at the Core Research Labs and Facilities at UI, ISU, BSU, and the VA. Samples were either transported by the investigators or sent to the labs where they were processed.

9. Provided funds for seed grants and monitored progress toward submission of grants
Over eight years, seed grant funds were provided to researchers at UI, ISU, and BSU with the express purpose of igniting increased grant applications and awards. As illustrated in Figure 3, the investment of $1.2 million resulted in a stunning >20-fold increase in new research funds coming to Idaho.

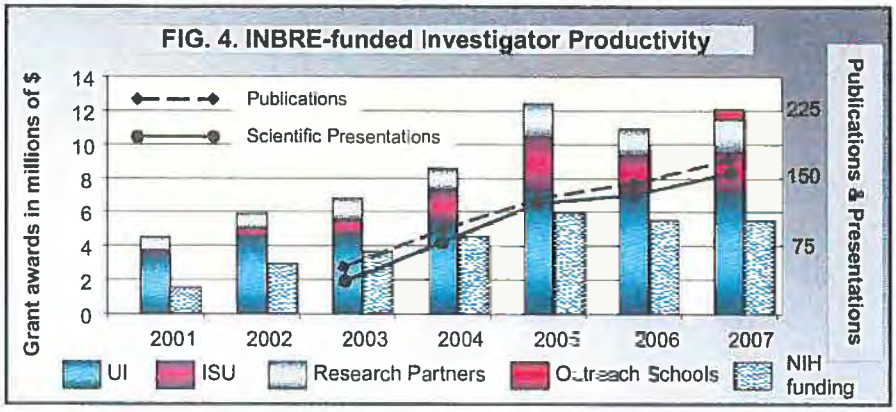
FIG. 3. Funding Outcomes of 35 Seed Grants



10. Increased the number of grant applications, grant awards, journal publications, and scientific presentations from the Idaho Network
Figure 4, below, shows a compilation of the productivity of INBRE-funded investigators across the Idaho **Network**. Expectations for all INBRE-supported researchers included presentation at scientific meetings, publishing in high quality peer-reviewed journals, and submitting R-type grant applications to the NIH and other federal and non-federal agencies, as appropriate. Investigators at the research intensive UI and ISU needed little mentoring for these activities. Faculty at the Research Partner Institutions were guided towards reaching each goal via interactions (i) with their scientific mentor, (ii) with the SARC, (iii) at the monthly meeting of the Network of Research Partners, (iv) at the Annual Idaho INBRE Summer Research Conference, and (v) at the bi-annual EAC/Steering committee meetings. As outlined above, annual

expectations were established and investigators did a formal non-competing renewal process with the SARC to secure continued INBRE funding (See Appendix C, on CD).

Specific mentoring activities included guidance in manuscript writing and grantsmanship. The scientific mentor had a critical role in both activities. Magnet PIs (junior investigators) were encouraged to develop specific aims early on, and to review these with the scientific Mentor. Drafts of experimental approach and methods were analyzed critically by the Mentor. Also, in-person visits were encouraged between the investigator and scientific Mentor to review summary statements of un-funded proposals so necessary improvements could be incorporated into re-submissions.



Other activities were provided to help Idaho faculty improve their competitiveness in biomedical research. For example, manuscript writing and grantsmanship skills were part of the agenda at every Annual Idaho INBRE Summer Research Conference. In 2007, the video entitled, *Inside the NIH Grant Review Process*, provided by the NIH Center for Scientific Review was continually playing in a viewing room throughout the conference and attendees all received a copy of the DVD to own. To help faculty submit the best grant application, the option was offered to have all grant applications reviewed by experts who applied NIH and NSF standard scoring criteria. Also, assistance was provided to researchers to explore non-NIH funding. Finally, bridge support for "meritorious but not funded" proposals was provided. Although common at many institutions, bridge-funding is not a policy, even at the research-intensive institutions in Idaho. Figure 4 shows that total non-INBRE grant award dollars, publications, and presentations all more than doubled over the period. Activity increased at all institutions including the Outreach schools that were awarded ~$200,000 in 2007.

Progress towards Goal 3 Establish a Pipeline to Graduate Education

Activities for students majoring in science and health-related fields were developed to increase the number of participants in a pipeline to graduate education. Outlined below **(1-5)** are measurable outcomes from the Idaho **Network** that included increases in opportunities for undergraduate students, graduate students, and post-doctoral fellows to participate in research, increases in exposure to science for K-12 students, and enhancing science teaching skills for K-12 educators.

1. Increased undergraduate student participation in biomedical research

Four avenues of undergraduate summer research participation (Fellows, Scholars, Interns, and Academic Year Researchers) were developed and described here:

- **The INBRE Summer Research Fellows Program**

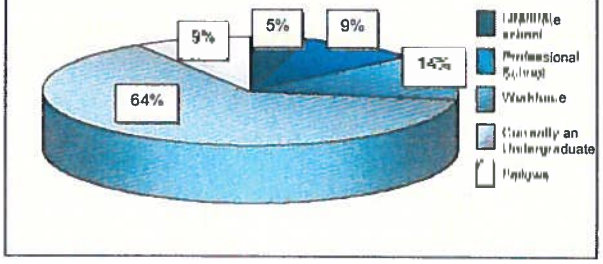
  This program was the most successful and popular among faculty and students, alike. At the research-intensive (UI and ISU) and Research Partner institutions (BSU, NNU, CI), upper-class undergraduates participated in laboratory research for 10-weeks during the summer. Students were paired with a faculty member and a specific research project. At the end of the 10-weeks, students and faculty from across Idaho came to the Annual Idaho INBRE Summer Research Conference to share their research through poster sessions and scientific talks. INBRE funded between 30 and 40 students each year. The program was so popular that several institutions used other funding sources to increase participation. For example, BSU supported 2-8 "extra" Fellows/year. An important measure of the quality of

these programs was the achievements and career paths chosen by the Program alumni. Figure 5, above, shows that 68% of the students entered graduate or professional school in the biomedical arena.

- **The INBRE Summer Scholars Program**

Because students with no lab research experience often have difficulty finding their first research opportunity, this program served to enhance their competitiveness. Each July, 12 to 18 freshman and sophomore students with an interest in science as a career but with no research lab experience spent two weeks at BSU under the supervision of a faculty/graduate student team in molecular biology. The students worked in groups of four or five on research problems that required learning PCR, gene cloning, DNA sequencing, and protein purification. At the end of the two weeks, the team created a poster, and presented their results at the Annual Idaho INBRE Summer Research Conference. Figure 6 shows that although 64% of these students are still undergraduates, 14% went on to do further research as graduate students or INBRE Fellows and another 9% are in professional school.

FIG. 6. Career Paths for INBRE Scholars



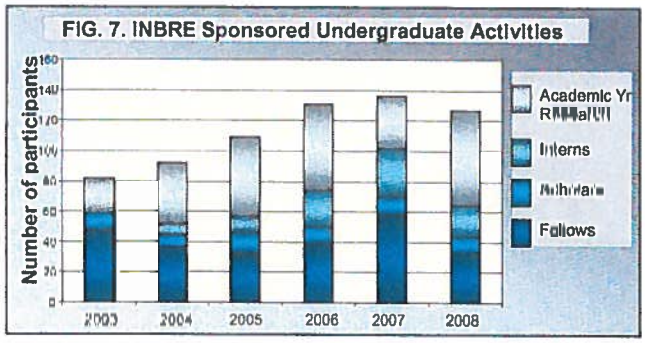
- **The INBRE Internship Program**

Internship programs placed students from Outreach Institutions into research laboratories, local biotechnology and other industries, or health care facilities for 10 weeks in the summer. These experiences gave students needed practice and exposure to new skills in laboratory techniques.

- **Academic Year Researchers**

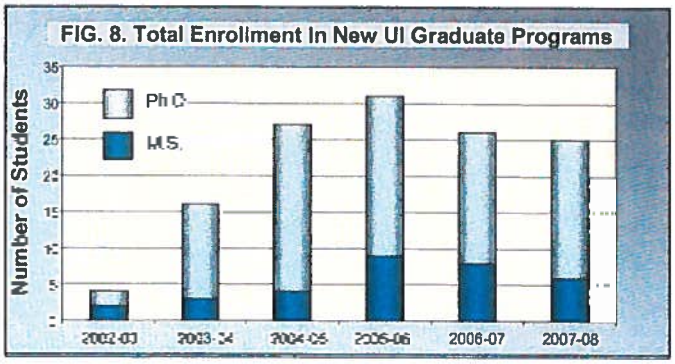
Depending on the funds available, undergraduate students did research at the Research Partner Institutions (BSU, CI, NNU). Their research experience enriched their undergraduate education and provided critical continuity in faculty research labs at institutions that do not have graduate programs. Figure 7 shows the overall number of undergraduate students by program and year. Participation by minority/disadvantaged students was sought in each program. All undergraduates in the Idaho **Network** were informed about graduate programs and career opportunities in research. An 'Undergraduate Research Coordinator' was designated at each participating institutions to advise students who expressed interest in science careers. Also, at the Annual Idaho INBRE Summer Research Conference, undergraduate students from every region of the state interacted with graduate students, postdoctoral fellows, and faculty. These interactions exposed students to the research opportunities in Idaho and to contacts who could help guide their education.

FIG. 7. INBRE Sponsored Undergraduate Activities



2. **Increased the number of graduate students in biomedical research**

FIG. 8. Total Enrollment In New UI Graduate Programs



Several strategies were used to increase the number and quality of graduate students in the **Network**. The quality of the applicant pools and participants was monitored and enhanced recruitment was developed. In 2003, the UI established two new MS/PhD training programs: Bioinformatics and Computational Biology and Cognitive Neurosciences. INBRE funded 3 to 4 PhD graduate students in these programs each year. Figure 8 shows the number of graduate students in these programs. Applicants were admitted only with

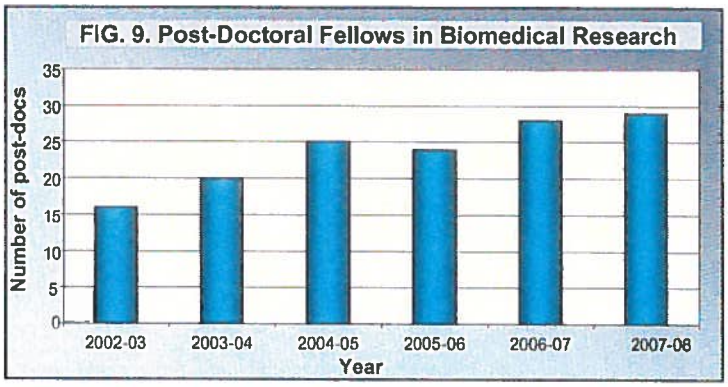
financial support and admission was highly selective. Students were required to have regular thesis committee meetings, and major professors were required to submit annual progress reports for each student. The graduate program reviewed student progress each semester and adequate mentoring was provided to all students. Both programs were cited by an external review of all graduate programs at UI (the "Yardley Report") as among the best on the UI campus, and were recommended for deeper university investment. Both programs have graduated the first cohort of PhDs, some of whom were INBRE-supported.

A critical part of creating an effective pipeline to graduate education was to develop and add to the science curriculum and programs offered at the **Network** institutions. The Idaho State Board of Education recently approved BSU's 'Notice of Intent' to establish a new PhD program in Molecular Biosciences and new MS programs in Biochemistry and Chemistry. These are unprecedented steps to providing access to graduate education in the biomedical sciences near the population base of Idaho. The success of BSU's proposal was a direct result of INBRE. It was by INBRE-funded research, INBRE-enabled access to the Boise VA Vivarium facilities, and INBRE-guided leadership to the BSU administration that these new graduate programs will be a reality.

3. Increased postdoctoral training

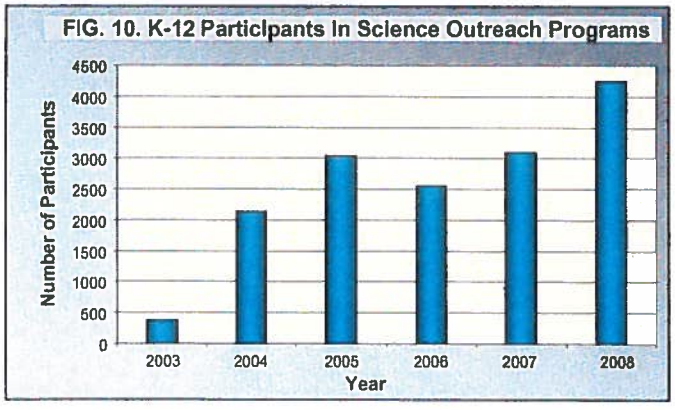
The "end of the pipeline" is the postdoctoral fellowship. Five goals were set to increase the number of trainees and enhance the quality of their experiences:

- Developed a competitive two-year Post-doctoral Fellow program at the Research Intensive Institutions, UI and ISU. In 2005, six awards were made. These activities almost doubled the number of post-doctoral fellows in biomedical areas between 2002 and 2008 (FIG. 9).
- Assured nationwide recruitment of postdoctoral fellows at UI and ISU.
- Monitored progress of the postdoctoral fellows toward productive research experience. Applications for postdoctoral fellow support were reviewed externally. One of the criteria for awarding the funds was that the fellow would work in a productive environment.
- Assured appropriate mentoring of fellows.
- Assisted in eventual placement of postdoctoral fellows as appropriate.



4. Increased participation in K-12 science and math

The "beginning of the Pipeline" is K-12, but the BRIN/INBRE-1 RFAs precluded use of direct funds in this area (NIH policy allowed K-12 investments starting in 2006, but no new funds were available). Nevertheless, such programs were considered vital to increasing the number of students in science and biomedical research careers, and therefore indirect cost returns were used to support these initiatives. To reach the largest number of students with the limited resources, existing programs were augmented rather than new ones created. Even the minor infusion of funds had a staggering effect, increasing the number of participants by the 1000s (FIG. 10). Briefly, programs included: (i) 'UDOC', directed to students from minority or disadvantaged backgrounds, (ii) 'Fired Up', an environmental study project for high school students and their teachers, (iii) 'Science Extravaganza', four days of science demos and tasks for junior high students in Nampa, ID, (iv) 'Science Olympiad', a statewide competition for both junior and senior high school students in more than 20 science &



engineering process-focused activities, (v) Migrant/Minority Summer Camp, (vi) Science Summer Camp, (vi) The Magic valley Science Expo, (vii) Summer Bioinformatics Academy, (viii) Dr. Picklestein Science Shows, (ix) Hands-on Chemistry/Biochemistry Experience, and (x) Upward Bound.

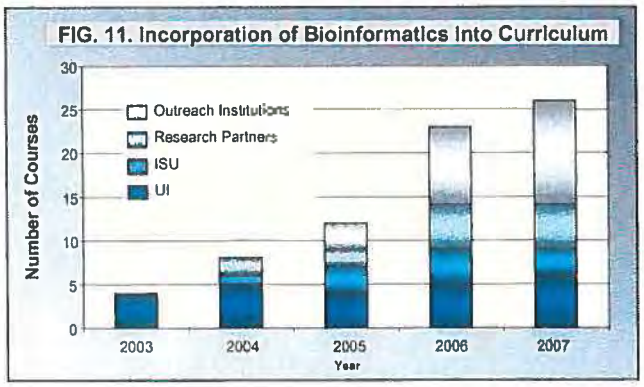
5. Trained K-12 educators in teaching science.
The popular and traditional Summer Science Camp at CSI gives sixth grade students experiences in science. Last year, the program was re-vamped to focus on 'teaching the teachers'. Elementary school educators with limited experience in science education participated in a week-long course taught by CSI science faculty. The course identified the core elements of teaching the scientific method and provided opportunities to explore how to teach science in the classroom. Each teacher developed activities to capture the excitement and satisfaction that comes from doing science. After four weeks of collaboration with the CSI faculty mentor, the 6th grade teachers used their projects to teach at the Summer Science Camp. This experience gave the educators the confidence and support to introduce these activities into their traditional classrooms, where minimal science had occurred, previously. The approach of 'teaching the teacher' **sustained** the activity, reached a much larger number of students, and successfully addressed the need for improving K-12 science education. When the medical staff at the local hospital heard of this project, they immediately pledged $2,000 to support its continuation. Professors at CSI are writing a grant proposal to the Idaho State Board of Education for funding to expand the program.

Progress towards Goal 4 Enhance a Network of Outreach Colleges
The Outreach Institutions (NIC, LCSC, CSI, and BYUI), focus on high quality undergraduate education and served a vital role in the Idaho **Network**. Outlined below **(1-6)** are specific activities and measurable outcomes that enhanced student preparation for science technical positions, graduate school, or professional training. Included are curriculum modernization, course articulation, integration of bioinformatics into the curriculum, professional development opportunities, intern training, laboratory equipment acquisitions, and K-12 outreach.

1. Facilitated curriculum development
Curriculum development was identified as critical to improving preparation of students in both science and math at the Outreach Institutions. INBRE-1 funded faculty release time and travel to attend workshops for curriculum development or release time to develop new science curricula; each institution modernized its curriculum significantly as a result.

2. Facilitated articulation of science courses between 2- and 4-year colleges
Historically, there were numerous impediments for students transferring from a 2-year to a 4-year college because of significant differences in curricula at each institution. Via teleconferencing and a statewide meeting, faculty worked to design biology curricula that were consistent between institutions, allowing students at 2-year colleges to more readily complete their baccalaureate degrees at an Idaho 4-year institution.

3. Added bioinformatics to the curriculum
Similar to the Research Partner Institutions, the faculty at the Outreach Institutions have access to bioinformatics facilities/support on their campuses and participated in bioinformatics workshops at the Annual Idaho INBRE Summer Research Conference. For large bioinformatics projects, all faculty had access to the computer facility at BSU or the UI, without charge. Like all institutions in the Network, the Outreach schools included bioinformatics in one or more courses that included biology, forensic sciences and computer science courses, demonstrating the interdisciplinary nature of its use.



This major modernization of the curriculum had a dramatic affect as an ever increasing number of courses incorporated bioinformatics at all Idaho INBRE Institutions (FIG. 11). Existing classes using bioinformatics

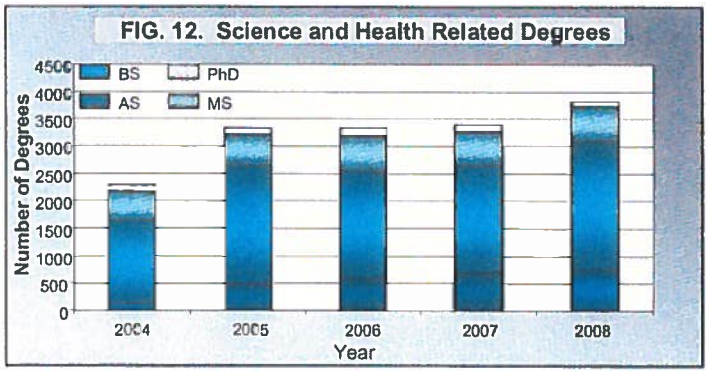
continued to incorporate new examples to more lectures. The effect of INBRE's initial investment to **sustain** this change was realized at NIC, where the board of trustees plans to fund the development of a new bioinformatics curriculum.

4. Increased undergraduate student participation in biomedical research
None of the Outreach Institutions (except LCSC) had research on their campuses; nonetheless, they created or enhanced programs to place students in research laboratories, local biotechnology and other industries, or health care facilities in the community for 10 weeks in the summer through the INBRE Internship Program (see Goal 3, point **1**, above).

5. Provided laboratory equipment improvements.
INBRE funds provided state-of-the-art laboratory facilities for science courses. For example, as LCSC, rotary evaporators, UV/vis and Fluorescence spectrometers, GC mass spec, HPLC, FTIR, 60 MHz NMR, and a lyophilizor were purchased. See Appendix D, on CD for a list of laboratory equipment.

6. Increased participation in K-12 science and math
The Outreach Institutions played a major role in this Pipeline activity. See Goal 3, points **4** and **5**, above.

Progress towards **Goals 1, 2, 3, and 4** combined had an overall outcome of increasing the number of undergraduate students pursuing science and health-related careers in Idaho. Figure 12 shows the increase since 2004. Likewise, progress towards all four Goals has increased the number of faculty participating in research activities. The Research Partner and Outreach Institutions have experienced a cultural shift. They are linked into the Idaho **Network** that has provided enhancement to biomedical research infrastructure, curriculum modernization, greater collaborative opportunities for faculty in teaching and research, access to scientific seminar programs, and career development opportunities.



Progress towards Goal 5 Enhance the Scientific Knowledge of the Workforce
Enhancing the scientific knowledge of the Idaho workforce was addressed on several levels. Outlined below (**1-2**) are specific activities and measureable outcomes from the Idaho **Network** that included presentations to the public, to industry, and to the state legislature:

1. Organized talks and mini-courses to disseminate biomedical information to the public
The **Network** Outreach Institutions offered public lectures on a variety of topics that were very popular. For example, NIC sponsored a series of seven annual "Health Talks" that averaged 58 participants per event. BSU supported the annual Mini-Medical School Program. This series of 5 public presentations extending over five weeks focused on one medically relevant topic each year such as cancer, heart disease, digestion, etc. Public participants enrolled in the course and "graduated" if they attended all presentations. A basic science presentation was followed by clinical 'grand rounds' on the topic, and concluded with the latest advances from biomedical research in the field. The general audience was limited to about 100 participants and was very well-liked with enrollment capped each year. INBRE sponsored the 'Science-on-Tap' series in which experts gave talks in a local restaurant pub. This venue captured not only audiences that planned to attend, but also people who, "found themselves in the midst of a scientific talk" when they were "just going out to eat". Since 2005, ISU has conducted workshops and training sessions, and served as research consultants, throughout SE Idaho, including at USDA-ARS, DOE-INL, and several private companies (see Appendix E, on CD for a list of the Public Biomedical Presentations)

2. Gradually developed Idaho's biomedical industry.

An ambitious, but essential objective of Goal 5 was to help develop a significant biomedical research industry in Idaho. Two strategies were employed during INBRE-1:

- Interacted with Idaho's U. S. Congressional delegation to promote biomedical research and education. Only returned overhead funds were used for activities involving politicians. Congressional staffers were invited to a UI lab (Dr. C Bohach) to sequence their own DNA. The participants learned a technique to isolate DNA from cells, PCR, and electrophoretic gel separation of DNA. They went home with a scanned picture of a portion of their DNA sequence. This experience focused on the impact of biomedical advances. Before attending a NISBRE Scientific meeting in Washington D.C., one student and one faculty representative from every Idaho INBRE **Network** institution (all 10) met with Idaho's Federal Senators and Congressmen to discuss the impact of INBRE on biomedical research and education. This was a red-letter experience for the Idaho students many of whom had never travelled outside of Idaho before. Also, faculty and students met with state Congressmen on their campuses to emphasize the importance of biomedical research to Idaho's future.

- Invited biomedical/pharmaceutical company representatives to participate in a symposium. This event had an unanticipated outcome and resulted in Idaho's first biomedical technology organization called BioIdaho. Chartered as a 501(c)(6) organization under the State of Idaho, BioIdaho's board represents all biotech businesses, universities, governmental representatives and investors. INBRE was a major supporter of the development of this organization with the Director (MB Laskowski) as the first chairman of the board. Important tax-relief legislation resulted in promotion of the state's biotech industry. Participation in the national BIO meetings increased visibility of Idaho's unique niche in the biotech industry. Idaho's first biomedical research institute was established at ISU and there are discussions to start a Biomedical Research Center at the VA Medical Center that will house faculty from three institutions: UI, ISU, and BSU.

Evaluation During INBRE-1

During BRIN/INBRE-1 formative and summative evaluations of the Idaho Program were routinely performed for the required Annual Progress Reports. Two years into the INBRE-1 Program (April 2006), a review by extramural faculty with expertise in each main emphasis area of the Idaho INBRE Program was commissioned to assess our progress during the first two years and to recommend changes to meet our goals. Experts in our "*Cell Signaling*" research theme (Dr. L Weber, University of Nevada), Pipeline Programs (Prof. C Garcia, Univ. of Washington) and Evaluation (Dr. C Scott, Univ. of Washington) visited every partner campus and met with students, faculty, and administrators to assess the "State of the Idaho INBRE" after two years. The report by this commission and their recommendations enabled revision and refocusing during the second half of the Program (see Appendix F, on CD for the Extramural Review Recommendations and Response)

End of Progress Report

Research Design and Methods

This application for continuation of the IDeA INBRE in Idaho is a collaborative effort of Research Intensive Institutions to sponsor research with BS/MS-granting institutions (Research Partner Institutions) and two- and four-year colleges (Outreach Institutions). **Five Specific Aims** are developed to enhance the established Idaho **Network** by strengthening the programs that have been especially productive in research, bioinformatics, capacity building, and science education. Each component of the plan includes **"sustainability"** strategies to carry on what the NIH has built in Idaho once the INBRE program sunsets in 2014. The Presidents of all participating institutions have provided letters with up-front commitments to continue specific programs on each campus and the UI letter includes plans for a legislative initiative to establish an inter-institution biomedical research network patterned after the INRBE model (see Letters of Support, pages 333-348). Table 3 summarizes the commitments. Thus, the transformations towards competitiveness initiated by the INBRE program will have an enduring impact on biomedical research and training in Idaho.

Table 3. BEYOND 2014: Sustaining INBRE-Sponsored Advancements in Biomedical Research

Commitment	UI	ISU	BSU	CI	NNU	LCSC	BYUI	CSI	NIC
New Biomedical Building					✓	✓		✓	✓
Renovation/Addition of Space			✓	✓		✓			
Research Infrastructure	✓	✓	✓	✓	✓	✓			
Bioinformatics	✓				✓	✓		✓	
New Faculty	✓	✓	✓	✓	✓	✓			
Faculty Development		✓	✓	✓	✓	✓	✓		
Post-doc support	✓								
Graduate student support	✓	✓	✓						
Undergraduate Research Support		✓		✓	✓	✓	✓		✓
Curriculum Development						✓			
Salary lines		✓	✓			✓			
New online access to library journals			✓						
Science Outreach						✓		✓	✓

Specific Aim 1: To strengthen Idaho's biomedical research infrastructure and expertise by building on the established INBRE Network with the scientific theme of "*Cell Signaling*".

The research theme, "*Cell Signaling*", established in INBRE-1, will continue because it is sufficiently broad to include the majority of the most productive researchers, yet specific enough to define an area of emphasis to recruit faculty and build graduate training programs. "*Cell Signaling*" also readily lends itself to interdisciplinary collaborations and bioinformatics analyses. **Seven actions (1.1-1.7, below)** will accomplish **Specific Aim 1** and include structuring committees, providing research infrastructure, enhancing bioinformatics, and systematic summative and formative evaluation to sustain the Idaho **Network**.

1.1. Maintain the Established Idaho INBRE Network.

The INBRE-2 Idaho Network will include 10 institutions (Table 4) and will not change from that developed during INBRE-1. See Figure 1, page 308, for locations of participants in Idaho. The research intensive **UI** will be the awardee institution and will subcontract with the other institutions. Memoranda of Understanding (MOU) have been executed to clearly describe the arrangements.

Table 4. Idaho INBRE Network Institutions with Abbreviations

Research Intensive ▲	Research Partner ●	Outreach ■
UI - *University of Idaho*	**BSU** - *Boise State University*	**BYUI** - *Brigham Young Univ.-Idaho*
ISU - *Idaho State University*	**CI** - *The College of Idaho*	**CSI** - *College of Southern Idaho*
	NNU - *Northwest Nazarene University*	**LCSC** - *Lewis-Clark State College*
	VA - *The Boise VA Medical Center*	**NIC** - *North Idaho College*

The **UI** and **ISU** are research intensive institutions offering PhD degrees in biomedical sciences. The research Partner institutions are primarily undergraduate teaching institutions with developing research programs. The Outreach Institutions are 2 and 4-year schools where teaching excellence is the primary mission (see Appendix G, on CD for brief descriptions of each **Network** Institution).

1.2. Maintain the Administrative Core and Build for Sustainability

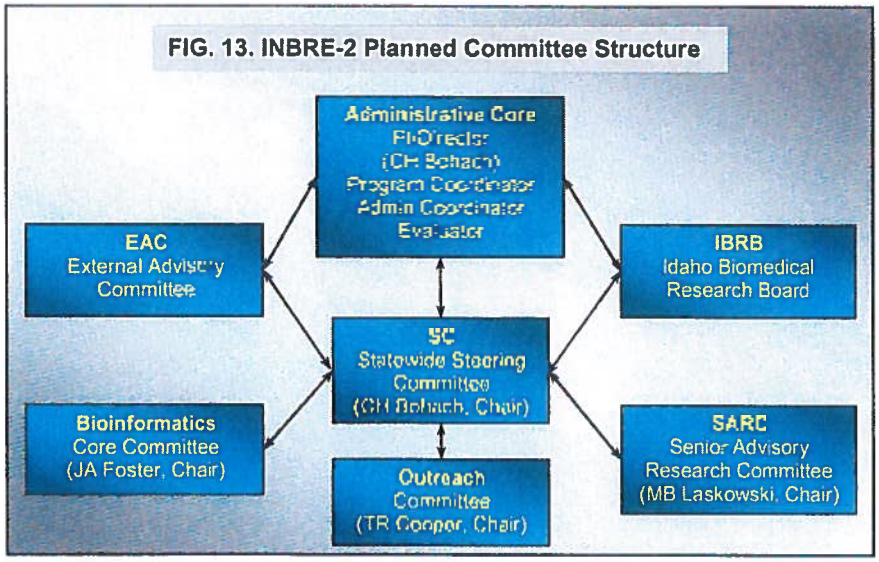
The Administrative Core will provide logistical support for the **Network** by (i) facilitating systematic communication among investigators, (ii) providing training and mentoring for faculty and students, (iii) overseeing research activities in "*Cell Signaling*" and (iv) assuring investigator access to state-of-the-art research facilities. The four-member Administrative Core will remain the same as INBRE-1:

- **Carolyn Hovde Bohach (Carolyn J. Hovde), PhD,** as the PI/Director, a position she has served in since 2006. Dr. Bohach has strong scientific credentials as an established, internationally recognized, biomedical research scientist in microbial infectious disease (cell signaling) with R01/R01-like funding since 1991 focused on *Escherichia coli* O157:H7 and *Yersinia pestis*. She has administrative experience as the current Idaho INBRE Program Director and previous to that, the BRIN/INBRE Program Coordinator from 2000 to 2006.
- **Michael B. Laskowski, PhD,** as the Program Coordinator, a position he has served in since 2006. Dr. Laskowski has a strong record as a biomedical research scientist in nerve development and regeneration, (cell signaling) funded by an NIH R01 grant for 15 consecutive years. He has broad administrative experience as the previous PI/Director of the Idaho BRIN/INBRE-1 and as the Director of the WWAMI (Washington, Wyoming, Alaska, Montana, and Idaho) Medical Program at the UI/Washington State Univ. site for 17 years. His primary responsibility will be to assist the PI/Director and guide the mentoring activities for junior investigators to develop sustainable research programs.
- **Leslie Thompson**, as the Administrative Coordinator, a position she has served in since 2008. Ms Thompson has a decade of experience in program coordination and grants management. Her primary responsibility will be to assist the PI/Director and Program Coordinator in all INBRE activities.
- **Margaret Ricci, MS** as the Evaluator, a position she has served in since 2007. Previous to this, Ms. Ricci was the BRIN/INBRE Outreach Coordinator from 2000 to 2007 an experience that familiarized her with each Idaho institution. Her primary responsibility will be to coordinate assessment by collection and analysis of data associated with INBRE activities.

1.3. Maintain and Build Committees Overseen by the Administrative Core

Six committees, overseen by the Administrative Core, will include a Statewide Steering Committee (**SC**), an External Advisory Committee (**EAC**), a Senior Advisory Research Committee (**SARC**), a Bioinformatics Core Committee, an Outreach Committee, and an Idaho Biomedical Research Board (**IBRB**). Figure 13 outlines the relationship between committees.

FIG. 13. INBRE-2 Planned Committee Structure



a. Statewide Steering Committee (SC). The Statewide Steering Committee (**SC**) will establish the policies and operating procedures of the Idaho INBRE **Network**, oversee the development of relevant workshops, lecture series, review the progress of mentoring teams, and design an evaluation plan. The 15-member **SC** will be chaired by the PI/Director, (CH Bohach) and will include a representative(s) from each Research Intensive, Research Partner, and Outreach Institution. The ongoing continuity of the Idaho **Network** is demonstrated by the SC membership which remains the same as in INBRE-1.

The **SC** will meet at least 3 times during the first year of INBRE-2 and at least semi-annually, thereafter. The **SC** members will be:

- **Carolyn H. Bohach, PhD,** PI/Director (see above)
- **Michael B. Laskowski, PhD,** Program Coordinator (see above)
- **John (Jack) McIver, PhD** and UI Vice President for Research.
- **James A. Foster, PhD,** Director of the statewide Bioinformatics Core (see below).
- **T. Rhena Cooper, MS,** Outreach Coordinator, **NIC** (see below).
- **Christopher K. Daniels, PhD**, Research Intensive **ISU,** Director of the ISU Biomedical Research Institute and an established biomedical investigator with expertise in cell signaling.
- **Ann Koga, PhD,** Research Partner Institution, **CI,** and Professor and Pre-Health Advisor in Biology
- **Dan F. Nogales, PhD,** Research Partner Institution, **NNU,** and Dean, School of Health and Science.
- **Richard D. Olson, PhD**, Research Partner Institution, **VA,** and an NIH-funded investigator specializing in cardiovascular pharmacology and cardiotoxicity (cell signaling).
- **Julia T. Oxford, PhD**, Research Partner Institution, **BSU**, and Professor of Biology, NIH-funded Investigator with expertise in cartilage and bone development (cell signaling).
- **Steve D. Christenson, PhD, and Todd Kelson, PhD,** Outreach Institution, **BYUI**, both are Professors of Biology
- **Matthew A. Johnston, PhD and Jane S. Finan, MS,** Outreach School, **LCSC,** Dr. Johnston is Division Chair, Natural Sciences and Mathematics and Professor Finan is in Biology.
- **Mark A. Sugden, PhD and Amy Rice-Doetsch, PhD,** Outreach Institution **CSI**. Dr. Sugden is Instructional Dean and Professor of Biology and Dr. Rice-Doetsch is a Professor in the Biology.

b. External Advisory Committee (EAC). The External Advisory Committee (**EAC**) will provide scientific expertise in "*Cell Signaling*", advice to the **SC** and PI/Director on scientific and administrative matters, and monitor the progress of the Idaho **Network** towards competitiveness and **sustainability**. The members have been selected for their scientific expertise, experience with mentoring, grantsmanship, and expertise in building sustainable research programs. The **EAC** will meet at least twice per year and summaries of recommendations made and actions taken will be included in annual progress reports to the NIH NCRR. To provide continuity from INBRE-1, two **EAC** members will remain and others will be new (see **EAC** Letters pages 349-354):

- **Lee A. Weber, PhD** (continuing) Professor Emeritus, University of Nevada at Reno. Dr. Weber is a molecular biologist with expertise in structure and expression of human stress protein genes and the function of the heat shock proteins in stress resistance. He has a history of NIH R01 funding and was the Director of the Nevada INBRE until 2007.
- **Beulah Holmes Gray, PhD** (continuing) Professor Emeritus, University of Minnesota. Dr. Gray is an immunologist with expertise in the innate immune response and oxidative and non-oxidative killing by human polymorphonuclear leukocytes and has a history of NIH R01 funding.
- **Mitchell J. Brittnacher, PhD**, (new), Principal Research Scientist, Department of Genome Science, Univ. of Washington. Dr. Brittnacher is an expert in bioinformatics and has a history of NIH R01-like funding.
- **Robert Hoover, PhD** (new), former President of CI as well as UI. Dr. Hoover brings a unique perspective, having been president of a research intensive university (UI), as well as an outreach college (CI); both in the Idaho INBRE. Dr. Hoover's strong leadership perspective will guide and strengthen collaboration between both ends of the research culture and among all participating institutions in Idaho.
- **Teresa M. Koehler, PhD** (new), Herbert L. and Margaret DuPont endowed Professorship in Biological Science in the department of Microbiology and Molecular Genetics, University of Texas Houston Medical Center. Dr. Koehler is a microbiologist with basic and applied research programs in genetics, physiology, and host interactions of *Bacillus anthracis* and has had continual NIH R01 funding since 1992.
- **Guy H. Palmer, DVM, PhD,** (new) Diplomate, American College of Veterinary Pathologists, Professor of Microbiology and Pathology, Chair of the Graduate Studies Program, Director of the NIH Immunology Training Program in the College of Veterinary Medicine and the School of Molecular Biosciences, Washington State Univ. Dr. Palmer is an immunologist, member of the National Academy of Science, and has and continual NIH R01 funding since 1986. His research is focused on antigenic variation of vector-borne pathogens at both the in-host and population levels.

c. Senior Advisory Research Committee (SARC). Established during INBRE-1, this statewide committee will specifically oversee the research activities of the Idaho Network by (i) advising the Director on the distribution and use of resources related to research throughout Idaho, (ii) monitoring mentoring relationships, (iii) reviewing the non-competing renewals of the INBRE-funded investigators (See Aim 2, below), and (iv) overseeing the appointments of new faculty participants. The **SARC** will consist of senior researchers with strong records of publication and extramural grant support under the theme of "Cell Signaling". The eight-member **SARC** will include **CH Bohach, PhD** (UI; INBRE Director), the PI's of Idaho's two UI COBRE grants, **Gregory A. Bohach PhD** and **Larry J. Forney, PhD,** and four NIH-R01 or R01-like funded investigators, **Patricia L. Hartzell, PhD** (UI), **James C. K. Lai, PhD** (ISU), **Dennis L. Stevens, MD, PhD** (VA), **JT Oxford, PhD** (BSU). The Program Coordinator, **MB Laskowski** will chair the **SARC** and it will meet at least twice yearly.

d. Outreach Committee
The Outreach Committee will coordinate the pipeline to graduate education and educating the workforce activities across Idaho (see Specific Aims 2 and 4, below). It will strengthen the **Network** in the 2- and 4-year colleges in Idaho to promote biomedical research opportunities for students and faculty. **TR Cooper, MS** will continue as the Outreach Coordinator/Committee chair, a position she has served in since 2007. Professor Cooper has more than a decade of experience teaching microbiology/biology at **NIC** and developing outreach and undergraduate student research opportunities in the community. This Committee will be comprised of **CH Bohach, PhD** (UI; INBRE Director) and representatives from each Outreach Institution: **A Rice-Doestch, PhD** (CSI) and **MA Sugden, PhD,** (CSI), **MA Johnston, PhD,** (LCSC) **JS Finan, MS** (LSCS), and **SD Christenson, PhD** (BYUI). The Committee will meet regularly via teleconference and at least yearly in person.

e. Bioinformatics Core Committee
The Bioinformatics Core Committee will provide strategic, scientific, and educational input for bioinformatics resources across Idaho. **JA Foster, PhD** will continue as the Director of the statewide Bioinformatics Core (see below) and the Chair of this committee. Dr. Foster is the PI of the UI NSF EPSCoR Computing Center, is Co-PI on the COBRE Grant "*Evolutionary Ecology*," and Director of the Bioinformatics and Computational Biology Graduate Program. The Bioinformatics Core Committee will be comprised of **CH Bohach, PhD** (UI: INBRE Director) and representatives from the Research Intensive Institutions, **Celeste Brown, PhD** (UI) and **Michael A. Thomas, PhD** (ISU); the Research Partner Institutions: **Gong X. Yu, PhD** and **Laura Bond** (BSU), **A Koga, PhD** (CI), **Xueyi Wang, PhD** and **Barry L. Myers** (NNU) and representatives from the Outreach Institutions: **MA Johnson, PhD** (LCSC), **A Rice- Doetsch** (CSI), **T Kelson, PhD** (BYUI) and **TR Cooper, MS** (NIC). The Committee will meet regularly to share expertise, tools, and best-practices.

f. Idaho Biomedical Research Board (IBRB).
The mission of the Idaho Biomedical Research Board (**IBRB**) will be to develop statewide strategies to **sustain** key elements of the biomedical research **Network** patterned after the INBRE model. The **IBRB** will be comprised of prominent academic, business, and political leaders in Idaho with an interest in growing the biomedical research enterprise. They will meet quarterly and will have statewide representation of key stakeholders.

1.4. Enhance Training and Mentoring
The **Administrative Core** and the Committees outlined above, will oversee and facilitate the specific training and mentoring activities that will include workshops on grantsmanship, scientific presentation, manuscript writing; seminar series; visiting scientists; career counseling; graduate school recruiting; and the statewide Annual Idaho INBRE Summer Research Conference. Activities are detailed in Specific Aims 2-4, below.

1.5. Maintain and Expand Shared Research Facilities
An integrated statewide system of Research facilities that includes three Research Core Laboratories, statewide Bioinformatics Facilities, and a Research Vivarium was developed and enhanced by BRIN/INBRE-1 and will be maintained and strengthened. Access to these shared resources will be facilitated and full-time expert technical assistance will be provided. User fees will be waived or paid for INBRE faculty and students. The cost of reagents and other materials will be met by the investigator through small faculty development

seed grants so that faculty, postdocs, or students need only provide funds for consumable supplies. Additionally, researchers from all the Western IDeA states will be invited to use these facilities (Specific Aim 5). See Appendix B, on CD for descriptions of the Research Core Labs and Bioinformatics Facilities.

Idaho INBRE-COBRE interactions are intertwined in much of the research infrastructure on the UI campus because it has been built through partnerships between INBRE and two COBRE Programs, *Host-Pathogen Interactions* (GA Bohach, PI) and *Evolutionary Biology* (LJ Forney, PI). The synergy between all three programs has leveraged the funds to provide excellent Research Core Facilities that are open to all biomedical investigators statewide. Interactions will continue and resources will be shared through scientific collaborations formed within the **Network** and also across the Western IDeA Region (See Letters of Support, pages 355-358 and Specific Aim 5).

1.6. Maintain and Expand the Bioinformatics Core

The Bioinformatics Core established technological and human resources that support biomedical research in Idaho. Bioinformatics is incorporated into activities at various levels on every Idaho campus as evidenced by separate INBRE bioinformatics budgets by most **Network** institutions. To maintain critical mass in three types of bioinformatics analyses used in *"Cell Signaling"* research, areas of emphasis will continue in (i) evolutionary analysis (UI), (ii) gene expression analysis (ISU), and (iii) protein structure analysis and proteomics (BSU). UI will host local databases and a distributed cluster computer for statistical modeling and phylogenetic estimation. ISU will host a distributed cluster computer and software tightly integrated with their high throughput sequencing facility. BSU will host a distributed cluster computer and software tightly integrated with their mass spectrometer facility.

Each facility will be available to faculty and students in every state institution via high-speed telecommunications. The high-end computing hardware will remain available to all INBRE participants through secure internet connections and access to state-of-the art analytical software, and experts will provide specialized help as necessary. The facilities received COBRE (UI) or instrumentation (BSU, ISU) awards, substantial material support from each university administration, and support from individual NIH and NSF research awards. In particular, a UI COBRE (LJ Forney, PI), which was recently renewed for five years, will fund additional processing capacity for cluster computing.

Bioinformatics hardware and software needs will be optimized statewide for educating and training students and faculty in best-bioinformatics-practices and providing access to specialized high performance computing. Planned upgrades include, at UI, power supplies, servers and cluster nodes, increase disk storage capacity, and transfer of all bioinformatics system administrators to permanent Idaho State salaries; at ISU, computing nodes and data storage and building an integrated bioinformatics teaching/research facility; at BSU, integrating a new mass spectrometer and software, adding two general-purpose servers, increasing data storage capacity, expanding cluster computing capacity, and supporting additional staff on a permanent state line. BSU will also significantly enhance its telecommunications connections by leveraging INBRE funds with NSF instrumentation awards, institutional support, and service fees in individual grants.

The Bioinformatics Core will continue faculty/student training and education:

Professional training: **C Brown, PhD** (UI), **MA Thomas PhD** (ISU), and **G Yu, PhD** (BSU) will continue to provide research-specific help and training. This includes both ad hoc help for scientists with specific questions, and periodic workshops and short courses open to all INBRE participants.

Graduate education/training: UI will continue to offer an MS/PhD program in Bioinformatics and Computational Biology, as it has since 2003.

Undergraduate education: All Institutions in the **Network** will continue to integrate bioinformatics into existing and new courses, and to integrate bioinformatics education with research. ISU and BSU will develop a shared baccalaureate degree program in bioinformatics. INBRE will continue to develop bioinformatics exercises and integrate them into undergraduate classes. INBRE institutions will maintain and continue to use local and remote bioinformatics servers for hands-on undergraduate student education. All institutions will continue to participate in undergraduate research projects and workshops. The undergraduate and graduate programs

have been designed to articulate seamlessly, so that the most promising baccalaureate graduates can advance their education through the PhD degree in Idaho.

1.7. Develop an Evaluation Plan

Evaluation will be done to assess the effectiveness of the approach to meet the goals of the statewide **Network**. In conjunction with the **SC** and the **EAC** the Administrative Core will set benchmarks for recruitment and retention of outstanding faculty and students; modernization of curriculum; and access to and use of Research Core Facilities. Summative and formative evaluations will assess the quality and number of students, the productively of the mentors and investigators, and the impacts of community educational opportunities on the workforce. This and research data will be shared in accordance with NIH policy.

Formative evaluation will be provided to individual investigators by their mentors and the **SARC** through monitoring of their progress in periodic meetings throughout the year. Focus will be placed on the generation of preliminary data needed to submit grants and the organization and submission of manuscripts to be submitted for publication. Summative evaluations of INBRE-funded investigators will occur through a non-competing renewal process (See Specific Aim 2) that will include the achievement of specific milestones and will assess investigator productivity. Expectations will vary for each level of research participation but all INBRE-funded investigators will be expected to publish high quality papers, disseminate their research results in seminars and/or at national meetings, and actively participate in the training students. These criteria will be evaluated at each biannual **EAC-SC** meeting. Funding for INBRE investigators that are failing to meet these expectations, despite receiving adequate mentoring, will be discontinued following a one year warning period.

An independent external evaluation will be done at the end of the second year of funding to assess the effectiveness of the **Network** Programs. A formal review report will be created and shared with the Administrative Core and the **EAC**. Review recommendations and the Idaho INBRE responses, including plans for corrective measures, if needed, will be reported to NCRR.

Specific Aim 2: To provide support to Idaho faculty, post-doctoral fellows, and graduate students to increase the research base and capacity.

Seven actions (2.1-2.7, below) will accomplish Specific Aim 2 and include increasing faculty participation in research at the Research Partner Institutions, setting expectations, providing and monitoring mentoring, providing faculty development opportunities, supporting graduate students and post-doctoral fellows, and increasing biomedical research interactions across the Network and with a Clinical Translational Science Award (CTSA) Institution.

2.1. Increase Faculty Participation in Research

Although stated in the INBRE FOA, "Attaining R01 support is not a criterion for evaluation of investigators at primarily undergraduate institutions", funding is critical to **sustaining** a research program. Therefore, plans for participation in research and pathways to NIH funding were designed to foster team and individual faculty research with the goal of winning grant awards. Varied levels of research participation were developed to encourage many faculty to participate and to increase interactions between established and developing researchers. Mentoring towards measurable outcomes of publications, presentations, and grant awards is an important strategy for **sustainability**.

Research projects and participants were selected for this renewal application by a simple RFA mechanism with open competition that allowed new as well as previously INBRE-funded investigators to apply. The "Idaho INBRE RFA" was released in December of 2007 (see Appendix H, on CD for the Idaho INBRE RFA). Two-page pre-proposals were due in late January 2008. Faculty applied for one of four levels of research participation, each with a pathway towards an NIH award and ample opportunities for undergraduates to participate in research. Table 5 below outlines the participation levels. The Program Leader category allows established research faculty to develop and mentor teams of researchers focusing on a theme with the goal of an NIH R01 award. This plan brings less experienced faculty in contact with a seasoned researcher. Likewise, the Co-investigator and Student-Research Mentor categories allow faculty who primarily teach in the classroom to become involved in ongoing research projects with more experienced research faculty.

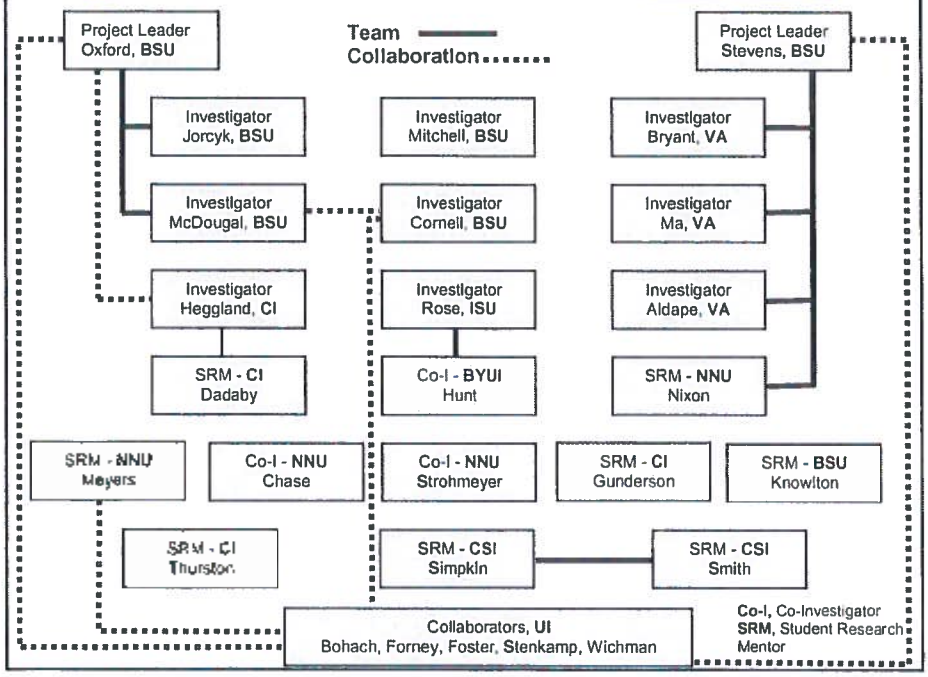
Forty-seven (47) applications were received, externally reviewed, and scored. From these, a subset of applicants was invited by the **SARC** to complete full 10-page proposals (3 page proposals for Co-investigators). These proposals were reviewed externally, again, and the **nine** receiving the highest scores are included in this application as proposed Investigator Research Plans (See pages 364-500 and note: Student Research Mentor plans are not included). Interestingly, this process identified a mix of 14 new and 8 previously-INBRE-funded faculty, a progression that increased the number of participants. Future applicants will be considered using the same review process. This approach facilitated the formation of natural collaborations among the Idaho institutions, many of which would not have happened without the partnerships created during INBRE-1.

Table 5. Levels of Faculty Research Participation in INBRE-2

Title	Research Interactions	Goal	Effort
Program Leader	(equivalent to the NIH Project Investigator), senior individual with previous NIH or equivalent support; **mentors** a team of Junior Investigators from Research Partner Institutions	NIH R01	Weekly meetings Mentoring Coordinates project
Investigator	Works independently **or** with Co-investigators (below)	NIH R01, R15, or R03	Research – 75% Teaching – 25%
Co-Investigator	Collaborates with Program Leader, Investigator (see above), **or** mentor outside of Idaho	NIH R01, R15, R21 or R03	Research – 50% Teaching – 50%
Student Research Mentor	Works with undergraduate students. Research projects can be independent **or** collaborative with a Program Leader or an Investigator.	Present research at national meeting and publish a peer-reviewed scientific paper	Research – summer Teaching – full-time

Important aspects of the research plans selected for this renewal application were appropriate time commitments to research activities and appropriate budget requests to accomplish the proposed work. Idaho standards for 50% research commitment require faculty at the primarily undergraduate institutions to teach two lecture courses/semester with all accompanying multiple laboratory sections (without technical/prep help). This level of teaching is inconsistent with developing a new research program. Therefore, research commitment level for the "Investigator" category was re-defined in Idaho as 75% which equals teaching one course/semester. Figure 14 outlines the proposed research faculty showing the rich internal and cross-institution collaborations that are planned (collaborations/mentoring outside of Idaho are not shown).

FIG. 14. Research Interactions across the Idaho Network



2.2. Facilitate and Monitor Faculty Mentoring

Mentoring is the most important catalyst for developing young faculty into productive, competitive, independent investigators able to coordinate a research program. A strategic plan for mentoring will be patterned after the successes of INBRE-1. Faculty (FIG. 14) applying to participate at the various levels outlined in Table 5 have developed Investigator Research Plans that identify a scientific mentor(s) with specific project expertise (see Research Plans, pages 364-500).

The mentoring process will begin with a meeting between the INBRE

Program Coordinator (**MB Laskowski**), each INBRE researcher, and the identified scientific mentor(s). The goal of the scientific mentoring relationship will be to guide the Investigator toward applying for and receiving an NIH award or, as appropriate, for the individual to contribute towards a grant application. Mentor activities will include reviewing drafts of publications and grant application, teaching new techniques if applicable, and assisting in resubmission if necessary. The Program Coordinator (**MB Laskowski**) will facilitate and monitor interactions between Mentor and junior faculty throughout the course of the award to assure mutual satisfaction. A key to success will be that the mentor develops a vested interest in the success of the INBRE researcher. Thus, opportunities for collaboration, co-authorship of publications, and writing a grant application with roles for each party will encourage mentors to devote the necessary time and effort to the junior investigator's success. Mentors may also be compensated monetarily according to NIH guidelines. Mentoring will also be monitored through investigator's semi-annual face-to-face meetings with the **SARC**. A final important component of the mentoring process will be monthly networking meetings to bring INBRE-funded faculty together to discuss their successes and challenges as they work towards developing research programs. These meetings provide the venue for great peer-support and peer-mentoring. Mentoring activities and the mutually beneficial potentials are outlined in Table 6. Thus, through interactions with a scientific mentor, the INBRE Program Coordinator, the **SARC**, and peers, the young investigators will move at a measured pace toward their goals.

Table 6. Mentoring Activities

Scientific Mentor	Vested Interest	SARC	Peers
Assist in developing research plan	Collaboration	Bi-annual meeting	Monthly meeting
Review drafts of publications	Co-authorship: Manuscripts	Evaluate expectations	Support
Teach a new technique		Monitor success	Offer solutions
Review specific aims			Collaborate
Review drafts of grant applications	Co-submissions: Grants		Commiserate
Assist in resubmission if necessary			Celebrate

2.3. Set Productivity Standards

Based on the success of a similar approach in INBRE-1, Productivity Standards will be set for each category of research participation (See Appendix I, on CD for Productivity Standards, Tables I-1 to I-4). Shown in Table 7, as an example, are the Productivity Standards for the Idaho INBRE "Investigator" level of research participation. An important element of these standards is an annual "non-competing renewal," patterned after the NIH format. All INBRE-supported researchers will be expected to submit annual progress and requests for continued funding to the **SARC**. Funding for INBRE investigators that are failing to meet expectations, despite receiving adequate mentoring, will be discontinued following a one year probationary period.

Table 7. Productivity Standards Idaho INBRE Investigator	Year 1	Year 2	Year 3	Year 4	Year 5
Participate in weekly networking meetings	✓	✓	✓	✓	✓
Meet with Senior Advisory Research Committee (SARC) representatives					
Hire a technician	✓				
Present research at national/international meeting					
Submit a manuscript to a refereed journal of high impact	✓	✓	✓	✓	✓
Identify a Scientific Mentor					
Meet with Scientific Mentor		✓	✓	✓	✓
Plan for an R15, R22, R03, or R01					
Write R15, R22, R03, or R01, have it reviewed by INBRE-paid reviewer			✓		
Submit grant to NIH					
If R01 funding is obtained, graduate off INBRE funding				✓	✓
If unfunded, review with scientific mentor, address all reviewers comments and resubmit an R15, R22, R03, or R01					
Re-package grant for submission to other agencies			✓	✓	✓
Continue efforts to supplement INBRE funding with NIH or other funding					
Submit a non-competing renewal package to the SARC	✓	✓	✓	✓	✓

2.4. Facilitate Faculty Participation in Biomedical Research

INBRE will provide opportunities to enhance individual and interdisciplinary biomedical research competitiveness across Idaho. The most promising research faculty will be indentified through competitive application processes to allocate resources for faculty development. All initiatives are presented here, but will be administered separately at each institution. Also, because no single approach addresses the needs of all faculty, each institution may not necessarily provide all listed options.

Summary of Faculty Development Initiatives:

- Seed Grants to fund research to acquire preliminary data/expertise for future external grant applications.
- Teaching Release to increase the time available for research, including academic year release from teaching assignments and summer salary for research. Related to this opportunity is the difficulty in attracting qualified personnel willing to teach one or two highly specialized courses. This challenge will be met with a 'Post-doctoral Science Educator' position to be shared among the Research Partner Institutions (all within 25 miles radius) so that a single more desirable full-time position can be recruited.
- Bridge-funding to support scientifically meritorious but un-funded projects.
- Seminars to bring Idaho faculty to other Idaho Institutions and/or to bring outside speakers to Idaho. Seminars will bring new knowledge, idea exchange, exposure to new topics, and scientific collaborations.
- Mini-Sabbatical Program to provide 1-4 months in salary, travel, and housing to support activities to acquire new research skills, develop pilot data for an NIH grant proposal, energize a career, or reach the underserved populations in Idaho.
- Visiting Scholars Program to increase the critical mass of researchers in a particular area by bringing experts from outside Idaho for a 1- to 4-week stay to coordinate special techniques workshops, work as collaborators, interact with students, or give public seminars.
- New Faculty Recruitment to supplement funding for faculty recruited to Idaho institutions by contributing to start-up packages. Emphasis will be placed on recruiting individuals who can specifically participate and contribute to the "*Cell Signaling*" theme.
- Mentoring Program to enable any new investigators or mid-career faculty with excellent research potential in Idaho to work closely with an established scientific research Mentor.
- Training in Grant Writing for both individual and multidisciplinary research teams on campuses and between campuses across Idaho (see **Dr. S Shadle** Letter of Support, page 362).
- Training in Manuscript Preparation to facilitate successful publication in high quality scientific journals.
- Training in Budget Preparation to facilitate grant applications.
- Training for Grant Management Personnel to enhance the research capacities at Institutions that have not had a tradition of grant awards.

2.5. Facilitate Graduate Education

INBRE will enhance the number and quality of graduate students in Idaho. At the UI, two new interdisciplinary doctoral programs were developed with INBRE-1 funding and are now supported by the UI Research Office. Graduate student support will continue through a competitive process that will select the most promising students in the best educational environments to assure success. INBRE support for graduate students in the Bioinformatics and Computational Biology program will continue. At ISU, INBRE graduate assistantships and national travel awards will be assigned competitively. At BSU, the first PhD program in Biomolecular Sciences is being developed. BSU has approved five new faculty lines and an interdisciplinary curriculum. The first cohort of PhD students is expected in fall 2010 and INBRE funds at BSU will support four of these graduate assistants with additional assistantships provide by the BSU Research office.

Graduate programs supported by INBRE will be monitored for the number and quality of student applicants and participants. Strategies will be developed to increase the quality of applicant pools. Students sponsored by INBRE will be mentored and annual feedback from both student and mentor will be required to assess progress and assure successful educational experiences. Undergraduate awareness of Idaho Graduate programs will be enhanced through invited seminars by faculty from the Research Intensive Institutions to all campuses.

2.6. Increase Postdoctoral Fellowships

INBRE will invest in the "end of the Pipeline" post-doctoral training (See Specific Aim 3, below) because it is critical to the intended goal of developing the next generation of biomedical researchers. The following initiatives will enhance post-doctoral training in Idaho and will be administered separately at each institution.

- Support postdoctoral training via a competitive externally reviewed grant program to provide two-year postdoctoral fellowships. Criteria for awarding the funds will include a productive work environment, defined research goals, and a mentoring plan that includes training in publishing and grant writing.
- Assure nationwide recruitment of postdoctoral fellows to Idaho.
- Assure appropriate mentoring of fellows.
- Monitor progress of postdoctoral fellows toward productive research experience by external review.
- Assist in placement of postdoctoral fellows into the workforce.

2.7. Participate in Clinical Translational Science Research

Idaho INBRE will participate in translational medicine by partnering with the Univ. of Washington {recipient of a CTSA grant from the NCRR, entitled Institute of Translational Health Science (ITHS)} in the Community Outreach Core. The Univ. of Washington is the leader of the WWAMI (Washington, Wyoming, Alaska, Montana, Idaho) Medical Program, and therefore, Idaho has a long history of scientific and educational collaboration through the established WWAMI infrastructure. The INBRE PI (**CH Bohach**) is a member of the newly formed WWAMI States Translational Research Consortium Steering Committee for ITHS-INBRE-COBRE-WWAMI collaboration. This will provide the INBRE program the opportunity for its faculty to develop novel methods in clinical translational research. To begin the collaboration, all researchers in Idaho have been invited to apply for competitive pilot project funding to take basic research to the next level of translational research. Also, the Idaho INBRE program will participate in regional interdisciplinary conferences in clinically relevant topics with the goal of developing interdisciplinary collaborations. As the ITHS matures and as Idaho INBRE's participation expands, other opportunities will emerge. By having Idaho INBRE represented on the Steering Committee, key researchers will be made aware of new opportunities as they develop. In addition, opportunities across the Western IDeA states to interface with a CTSA will be developed (see Specific Aim 5).

All INBRE researchers in this renewal application have the potential to collaborate with the ITHS, however, one Investigator Research Plan, in particular, is exceptionally well suited. **Dr. D Stevens, MD. PhD**, Adjunct BSU faculty and research scientist at the VA Medical Center in Boise is a Project Leader (Mentor) of the proposal entitled, *Impact of Antibiotics on Expression of Virulence-associated Exotoxin Genes in Gram Positive Pathogens* (see pages 385-402). A three-way collaboration focused on bacterial pathogenesis between this INBRE team, the UI *Host-Pathogen Interactions* COBRE team (PI, **GA Bohach**), and the Univ. of Washington ITHS (PI, **Nora Disis**) will be developed and include the preclinical analysis of therapeutics or interventions strategies against Gram positive bacterial infections.

Specific Aim 3: To provide research opportunities to Idaho undergraduate students and serve as a pipeline for these students to continue in health research careers.

A broad base of students with interest, enthusiasm, and knowledge in science is a necessary first step to develop the next generation of biomedical researchers. A comprehensive pipeline spanning K-12 through post-doctoral training will be provided with progressively greater experiences in biomedical research to increase the number of students pursuing careers in health-related science. To accomplish this, all Institutions in the Idaho **Network** will be involved at various levels. A series of interlocking programs comprise the **"Pipeline to Graduate Education"** and will be maintained and enhanced in Idaho. The Administrative Core will coordinate the Pipeline, but the activities will occur at all 10 INBRE **Network** sites. Central to the success of the Pipeline is that students are mentored and provided with information and advice to enter the next step of training. Programs developed during INBRE-1 are at the point where any student in Idaho who has an interest in and talent for research can find an opportunity to pursue that career in Idaho. The programs are described as **four actions (3.1-3.4, below):**

3.1. Provide Opportunities for Graduate and Post-doctoral Student Research

Graduate student and post-doctoral fellow research activities are addressed in Specific Aim 2, above.

3.2. Provide Opportunities for Undergraduate Research:

Four highly successful avenues of undergraduate research participation (Fellows, Scholars, Interns, and Academic Year Research) and a national meeting opportunity will be continued.

- **The INBRE Summer Research Fellows Program**
  At the research-intensive (UI and ISU) and Research Partner institutions (BSU, NNU, CI), upper-class undergraduates will participate in laboratory research for 10-weeks during the summer. Students will be paired with a faculty member and a specific research project. At the end of the 10-weeks, students and faculty from across Idaho will come to the Annual Idaho INBRE Summer Research Conference to share their research through poster sessions and scientific talks. INBRE will fund 30 to 40 students each year.
- **The INBRE Summer Scholars Program**
  Because students with no research experience often have difficulty finding their first research opportunity, this program will enhance their competitiveness. Each July, 12 to 20 freshman or sophomore students with an interest in science as a career but with no lab experience will spend two-weeks in an intense immersion course at BSU. They will be supervised by a faculty/graduate student team to do a group project in molecular biology. Four to five students will work together on research problems that require learning PCR, gene cloning, DNA sequencing, and protein purification. At the end of the two weeks, the team will create a poster, and present their results at the Annual Idaho INBRE Summer Research Conference.
- **The INBRE Internship Program**
  Internship programs will place students from Outreach Institutions into research laboratories, local biotechnology industries, or health care facilities for 10 weeks in the summer. These experiences will give students needed skills and practice in lab techniques. The Interns will come to the Annual Idaho INBRE Summer Research Conference to share their research through poster sessions and scientific talks.
- **Academic Year Research**
  The research momentum created during the summer will be maintained at some level during the academic year, especially at the Research Partner Institutions where there are no or few graduate students. Funds will be provided to support undergraduate students to continue their research during the academic year. The program will be site-specific and each college will decide the number of academic-year fellowships.
- **Travel Grant Awards.** There is no better incentive for students to become excited about research than to present results at a national meeting. Thus, built into the Summer Fellows Program is an expectation that all students present their results at a national meeting. Each student prepares for this by presenting a poster at the Annual Idaho INBRE Summer Research Conference in August.

3.3. Provide Opportunities for K-12 Programs

The best way to **sustain** improved science experiences for K-12 students is to 'teach the teacher'. If a lasting impact is made on the educator, then a much larger number of students are ultimately influenced. The successful Science Camp educator experience, developed at the community college, CSI, will be continued and serve as the model for other institutions. INBRE will contribute modestly to a variety of already established interactions that include direct outreach of science programs to K-12 grades and science faculty partnering with local K-12 educators. Examples of the Programs that will be continued include:

- Science Camp with educator training at CSI
- The Summer Research Academy for high school students and their teachers at ISU.
- Migrant/Minority Summer Camps at BSU.
- The Magic Valley Science Expo at CSI.
- Science Expo at NNU
- Girls in Science and Technology at NNU
- Dr. Pickelstein science experiments for K-8 through BSU
- Summer High School Student Scholars program at BSU
- Science Extravaganza at NNU.
- Science Olympiad, statewide.

SEPA (R25) and INBRE: INBRE involvement with the K-12/pre-college level programs will be interfaced and sustained by seeking funding in partnership with the Boise Discovery Center and local schools through The Science and Education Partnership Award [(SEPA) (R25)] funding mechanism. The SEPA Program, under the aegis of NCRR, was designed specifically to expose K-12 students to science and opportunities for careers in

science. **Henry A. Charlier, PhD**, Associate Professor of Chemistry at BSU will write a SEPA proposal during the first year of the INBRE-2 grant. Dr. Charlier was a junior investigator in INBRE-1 and frequently makes classroom presentations at elementary schools as "Dr. Pickelstein" and has developed excellent rapport with K-12 students and educators.

3.4. Develop Biomedical Outreach Education Websites

Interactive informative INBRE-Outreach Institution Websites will be developed for easy access by K-12 educators. The Outreach Institution, LCSC, has begun to develop this approach and the in-progress INBRE-LCSC site (http://www.lcsc.edu/inbre/) will serve as a model for other institutions.

Specific Aim 4: To enhance the science and technology knowledge of Idaho's workforce.

The Outreach Institutions will educate the workforce through new and refreshed biotechnology curriculum and provide engaging activities to educate the lay public. The goal will be to enhance the scientific literacy of the populace and ready a trained labor force. Long term **sustainability** of the INBRE program accomplishments in Idaho will require the non-scientific community to appreciate the everyday importance of biomedical research. Thus, through **two actions (4.1-4.2, below)** support from the general population and the business community in Idaho will be gained for the infrastructure/opportunities initiated and developed by INBRE.

4.1. Encourage the developing biotechnology industry

Idaho is at the early stages of developing a biotechnology-based economy. Currently based on agricultural links to biotechnology, new areas in the biomedical arena are emerging and will flourish as research and technology transfer expands in the State. Idaho's first biomedical technology organization called Bioldaho, is a 501(c)(6) chartered organization with a broad base representing all biotech businesses, all colleges and universities, government and health care organizations, and investors. INBRE-2 will continue to partner with this organization, as well-paying jobs for Idaho citizens are central to **sustaining** INBRE's impact on the State.

A Biotechnology Assoc. Degree was initiated at CSI and will provide a pool of employees for Idaho's emerging biotechnology industry. The Summer Interns Program at NIC provides hand-on training in health care and pharmaceutical settings to ready students for employment. Both opportunities will be continued and expanded.

4.2. Educate the General Public

Although print, audiovisual media, and the internet provide much information especially on sensational discoveries or the risk/benefits of specific foods or lifestyle choices, the power of in-person interactions is not diminished. Three activities, initiated during INBRE-1 will be continued and expanded to specifically target educating the general population about biomedical research advances:

- **The Mini-Medical School**
  Medical and research experts will present a medically-relevant topic to the lay community in evening sessions over a period of five weeks. The format mimics a regular course with required registration, nominal tuition, and a certificate of completion at the end. Typical topics may include: "Maintaining Mental Health," "Living with Heart Disease," A Digest of Digestion" or "Managing Cancer." Importantly, new research findings will be presented with basic and clinical science. The Mini-Medical School was presented during INBRE-1 in the Boise area with **BSU** and attracted ~100 people/year. This venue will be continued and expanded to two new sites: Pocatello (location of **ISU** and Bannock Regional Medical Center) and Coeur d'Alene (Location of **NIC** and Kootenai Medical Center and the Cancer Care Center). The success of this program requires a community with a regional hospital, medical sub-specialists, a local sponsoring college, and faculty who have expertise in the topic.
- **Science "On Tap"**
  Local research scientists speak about a topic of general interest in a public restaurant/pub every month. This community outreach program, offered at Coeur d'Alene in association with **NIC** was partly supported by INBRE-1 and attracts ~60 people at each presentation, often in standing-room-only conditions. Topics will be selected with a general appeal, such as "Emerging infectious diseases," "Health effects of global warming" and "Evolution around us." Speakers will be selected from the local college to make the topic

accurate but understandable and to describe how new biomedical breakthroughs help expand our knowledge. This popular program will continue and be expanded to Moscow, Lewiston, and Twin Falls.

- **Health Talks**
  Faculty and physicians speak in a weekly Seminar Series format that is open to the public. Research is related to health topics of general interest. **NIC** will continue to sponsor the series that attracts approximately 70 participants every week.

Specific Aim 5: To expand Idaho research opportunities across the Western IDeA Region.

All INBRE PIs from the Western IDeA States (Alaska, Hawaii, Idaho, New Mexico, Montana, Nevada, and Wyoming) propose this identical **Last Specific Aim** (or voice their support in the case of Nevada's PI, not up for renewal). Cooperative activities in the Western IDeA region will be formally expanded to maximize opportunities for faculty and students in research and in sharing INBRE/COBRE-built research infrastructure (see Letters of Support, pages 356-358 and 361). Likewise, each renewal proposal identifies a line-item $20,000 towards this Aim, and if funded, the first 6 -9 months will be used to plan and initiate the program. Regional collaborations will be driven by common scientific research themes and/or available services and will include INBRE, COBRE, and/or an NIH Center for Translational Science (CTSA) investigators. Common research themes with potential for collaboration are shown in Table 8.

Table 8. Potential for Research Expansion across the Western IDeA Region

Scientific Themes	Alaska	Hawaii	Idaho	Montana	Nevada	New Mexico	Wyoming
Health for rural/indigenous communities	✓	✓		✓		✓	✓
Infectious diseases	✓		✓	✓	✓	✓	✓
Cancer and the cellular bases for disease	✓	✓	✓	✓	✓	✓	✓
Neurosciences		✓	✓		✓	✓	✓
Evolution modeling & systematics	✓	✓	✓	✓	✓	✓	✓
Services Available Bioinformatics infrastructure/activities	✓	✓	✓	✓	✓	✓	✓
✓ indicates INBRE, COBRE, or both INBRE & COBRE funding							

Together the **Regional Network** of scientific and translational expertise provides critical mass ripe for interstate cooperation. **Four actions (5.1-5.4, below)** to expand the **Network** interactions are proposed:

5.1. Collaborative Interstate Seed Grants
Competitive seed grants will be offered to develop collaborative biomedical research projects with participants from two different Western IDeA states and (if applicable) one NIH CTSA, such as the Institute for Translational Health Science at the Univ. of Washington (see Letter of Support, page 359-360). Funding at $40-60K total/yr will be provided by equal contribution/participating program, with competitive renewal available for a second year. The goal for recipients will be to submit an NIH R-type proposal.

5.2. Undergraduate Student Interstate Research Opportunities
Opportunities for undergraduate students to participate in transformative research experiences in another Western IDeA state will be provided. Individual INBRE programs will host expertise-specific student programs, such as lab fellowships, workshops, and summer camps. This plan will expand the horizons of all **Network** students.

5.3. Regional Scientific and Programmatic Meetings
Western IDeA states regional meetings will be hosted annually to showcase research projects and encourage collaborations and special topic workshops will be sponsored. Likewise, the Western INBRE PIs will meet annually to improve regional coordination.

5.4. Regional Resource Exchange
A repository for public data, publications, and tools will be established among the Western IDeA states and serve as a clearinghouse, available to all regional INBRE and COBRE participants, documenting available resources and expertise.

APPENDIX D:
Curricula Vitae of Biomolecular Sciences Faculty

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Assistant Professor of Chemistry
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Postdoctoral Research Associate, NIH Postdoctoral Fellow
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November 2002 – June 2006
Advisor: Professor William B. Tolman

EDUCATION

Ph.D., Organic Chemistry (2002)
Oregon State University, Corvallis, OR
Advisor: Professor Kevin P. Gable
Ph.D. Dissertation: "*Rhenium-Catalyzed Oxygen-Atom Transfer Reactions: Mechanism and Applications*"
GPA: 3.92 / 4.00

B.S., Chemistry (1997)
University of Idaho, Moscow, ID

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3. Paviet-Hartmann, P.; Roman, A.; Campbell, K.; Horkley, J.; Brown, E.; Gomez-Aleixandre, A.; Espartero, A. G. "Development of an Extraction Process for the Removal of Technetium-99 from Waste Streams." *ISEC Proc.*, *Submitted and Under Review*.

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6. Brown, E.C.; Bar-Nahum, I.; York, J.T.; Aboelella, N.W.; Tolman, W.B. "Ligand Structural Effects on Cu_2S_2 Bonding and Reactivity in Side-On Disulfido-Bridged Dicopper Complexes." *Inorg. Chem.* **2007**, *46*, 486-496.

7. York, J.T.; Brown, E.C.; Tolman, W.B. "Characterization of Complex Comprising a $[Cu_2(S_2)_2]^{2+}$ Core: Bis(μ-S_2^{2-})dicopper(III) or bis(μ-$S_2^{\cdot-}$)dicopper(II)*?." Angew. Chem., Int. Ed.* **2005**, *44*, 7745-7748.

8. Brown, E.C.; York, J.T.; Antholine, W.E.; Ruiz, E.; Alvarez, S.; Tolman, W.B. "$[Cu_3(\mu\text{-}S)_2]^{3+}$ Clusters Supported by N-Donor Ligands: Progress Towards a Synthetic Model of the Catalytic Site of Nitrous Oxide Reductase." *J. Am. Chem. Soc.* **2005**, *127*, 13752-13753.

9. Brown, E.C.; Aboelella, N.W.; Reynolds, A.M.; Aullón, G.; Alvarez, S.; Tolman, W.B. "A New Class of (μ-η^2:η^2-Disulfido)dicopper Complexes: Synthesis, Characterization, and Disulfide Exchange." *Inorg. Chem.* 2004, *43*, 3335-3337.

10. Gable, K.P.; Brown, E.C. "Rhenium-Catalyzed Epoxide Deoxygenation." *Synlett*, **2003**, 2243-2245.

11. Gable, K.P.; Brown, E.C. "Kinetics and Mechanism for Rhenium-Catalyzed O-Atom Transfer from Epoxides." *J. Am. Chem. Soc.* **2003**, *125*, 11018-11026.

12. Gable, K.P.; Brown, E.C. "Coordination of a Tethered Epoxide to a Coordinatively Unsaturated Rhenium Oxo Complex." *Organometallics* **2003**, *22*, 3096-3101.

13. Gable, K.P.; Brown, E.C. "Efficient Catalytic Deoxygenation of Epoxides Using [Tris(3,5-dimethylpyrazolyl) hydridoborato]rhenium Oxides." *Organometallics* **2000**, *19*, 944-946.

ORAL PRESENTATIONS

1. Shadle, S.E.*, Warner, D.L.; Brown, E.C.; Towns, M.H. "Measuring the Effect of an Instrument-Intensive Curriculum on Student Critical Thinking Skills at Boise State University." 240th National ACS Meeting: Boston, MA; August 2010.

2. Roman, A.*; Campbell, K.; Brown, E.; Nunez, A.; Paviet, Hartmann, P. "Radiation Effects on the Separation of Technetium-99 by Macrocompounds." 240th National ACS Meeting: Boston, MA; August 2010.

3. Warner, D.L.*; Brown, E.C.; Shadle, S.E.; Towns, M.H. "Assessment of Student Critical Thinking Skills in the Boise State Undergraduate Chemistry Laboratory." 239th American Chemical Society National Meeting, San Francisco, CA, March 2010.

4. Roman, A.*; Horkley, J.; Brown, E.; Paviet, Hartmann, P. "Technetium Extraction and Analysis from Nuclear Waste Streams." 239th American Chemical Society National Meeting, San Francisco, CA, March 2010.

5. Brown, E.C.*; Gable, K.P. "Catalytic Deoxygenation of Epoxides with Rhenium(V) Compounds: Kinetic Analysis and Identification of the Catalytically Active Species." 221st National ACS Meeting: San Diego, CA; April, 2001.

6. Brown, E.C.*; Gable, K.P. "Catalytic Deoxygenation of Epoxides with Rhenium(V) Compounds: Kinetic Analysis and Identification of the Catalytically Active Species." 56th Northwest Regional ACS Meeting: Seattle, WA; June 2001.

7. Brown, E.C.*; Gable, K.P. "Catalytic Deoxygenation of Epoxides with Rhenium Compounds: Kinetic Analysis and Identification of the Catalytically Active Species." 219th National ACS Meeting: San Francisco, CA; March 2000.

8. Brown, E.C.*; Gable, K.P. "Catalytic Deoxygenation of Epoxides with Rhenium Compounds: Kinetic Analysis and Identification of the Catalytically Active Species." Oregon Academy of Science Meeting: McMinniville, OR; February 2000.

9. Brown, E.C.*; Gable, K.P. "Synthesis and Reactivity of $(Tp'ReO)_2(\mu\text{-}O)_2$." 54th Northwest Regional ACS Meeting: Portland, OR; June 1999.

POSTER PRESENTATIONS

1. Ingalls, B.*; Standley, E.; Diebels, B.; Sullivan, M.; Brown, E.C. "Understanding the Mechanism of Carbonyl Sulfide Activation by Carbonic Anhydrase." Idaho IDeA Network of Biomedical Research Excellence (INBRE) Conference, Moscow, ID, August 2010.

2. Standley, E.; Diebels, B.; Sullivan, M.; Brown, E.C.* "Understanding the Mechanism of Carbonyl Sulfide Activation by Carbonic Anhydrase." Joint 65th Northwest and 22nd Rocky Mountain Regional Meeting of the American Chemical Society: Pullman, WA June 2010.

3. Spiropulos, N.; Allen, K., Sullivan, M.; Sorenson, S.; Arif, A.; Brown, E.C* "Structural Modeling of Peptide Deformylase." 239th American Chemical Society National Meeting, San Francisco, CA, March 2010.

4. Standley, E.*; Diebels, B.; Brown, E.C. "Understanding the mechanism of action of carbonic anhydrase on heterocumulenes using synthetic models." 239th American Chemical Society National Meeting, San Francisco, CA, March 2010.

5. Spiropulos, N.; Allen, K., Sullivan, M.; Sorenson, S.; Arif, A.; Brown, E.C* "Preparation of Zn(II) Complexes Containing N_2S Donor Atom Sets: Models of the Active Site of Peptide Deformylase." 237th American Chemical Society National Meeting, Salt Lake City, UT, March 2009.

6. Standley, E.*; Diebels, B.; Sullivan, M.; Brown, E.C. "Understanding the Mechanism of Action of Carbonic Anhydrase on Heterocummulenes using Synthetic Models.", Donald S. Matteson Symposium, Washington State University, Pullman, WA, October 2009. (*Awarded best undergraduate poster*)

7. Standley, E.*; Diebels, B.; Sullivan, M.; Brown, E.C. "Understanding the Mechanism of Action of Carbonic Anhydrase on Heterocummulenes using Synthetic Models." Pacific Northwest Undergraduate Research Symposium, Oregon State University, Corvallis, OR; August 2009.

8. Spiropulos, N.*; Allen, K., Sullivan, M.; Sorenson, S.; Arif, A.; Brown, E.C. "Development of Zn(II) Hydroxide Complexes Containing N2S Donor Sets: Molecular Motifs of Peptide Deformylase." Idaho IDeA Network of Biomedical Research Excellence (INBRE) Conference, Pocatello, ID, August 2009.

9. Spiropulos, N.*; Aaron, C.*; Allen, K., Sullivan, M.; Sorenson, S.; Arif, A.; Brown, E.C. Preparation of Zn(II) Complexes Containing N_2S Donor Atom Sets." Boise State University Undergraduate Research Symposium, Boise State University, Boise, ID, April 2009.

10. Sullivan, M.*; Brown, E.C. "Preparation of Ligands Containing N_2S Donor Atom Sets: Models of the Active Sites of Peptide Deformylase." Idaho IDeA Network of Biomedical Research Excellence (INBRE) Conference, Boise, ID; August 2008.

11. Diebels, B.*; Brown, E.C.; Yu, G. "Serial Analysis of Protein Expression (SAPE) by Quantitative Mass Spectrometry." Idaho IDeA Network of Biomedical Research Excellence (INBRE) Conference, Boise, ID; August 2008.

12. Allen, K.*; Brown, E.C. "Preparation of Ligands Containing N2S and N3 Donor Atom Sets: Models of the Active Sites of Several Metalloproteins." 50th Idaho Academy of Science Conference, Nampa, ID; March 2008.

13. Horkley, J.*; Wolfrom, E.; Pak, J.; Paviet-Hartmann, P.; Brown, E.; Todd, T. "New Macrocyclic Compounds Synthesis for the Selective Extraction of Technetium." 32nd Actinide Separation Conference, Park City, UT; May 2008.

14. Allen, K.*; Brown, E.C. "Preparation of Ligands Containing N2S and N3 Donor Atom Sets: Models of the Active Sites of Several Metalloproteins." BSU Senior Seminar Series, Boise, ID; Spring 2008.

15. Paviet-Hartmann, P.*; Horkley, J.; Brown, E.; Pak, J. "Synthesis of New Macrocyclic Compounds for the Selective Extraction of Technetium-99." 42nd ACS Western Regional Meeting, Las Vegas, NV; September 2008.

16. Paviet-Hartmann, P.*; Pak, J.; Brown, E.; Horkley, J.; Wolfrom, E. "Extraction of Perrhenate and Pertechnetate by Crown Ethers." 50th Idaho Academy of Science Conference, Nampa, ID; March 2008.

17. Allen, K.C.; Brown, E.C. "Preparation of Ligands Containing N_2S and N_3 Donor Atom Sets: Models of the Active Sites of Several Metalloproteins." Idaho IDeA Network of Biomedical Research Excellence (INBRE) Conference, Moscow, ID; August 2007.

18. Brown, E.C.; York, J.T.; Antholine, W.E.; Ruiz, E.; Alvarez, S.; Tolman, W.B. " The Development of Copper-Sulfur Chemistry Relevant to Modeling the Active Site of Nitrous Oxide Reductase." 12th International Conference on Biological Inorganic Chemistry; Ann Arbor, MI; July 2005.

19. Brown, E.C.; Johnson, B.R.; Aboelella, N.W.; Tolman, W.B. " Recent Develepments in Multinuclear Copper Complexes Relevant to the Cu_Z Site in Nitrous Oxide Reductase." Gordon Research Conference: Inorganic Reaction Mechanisms; Ventura, CA; February 2005.

20. Brown, E.C.; Johnson, B.R.; Aboelella, N.W.; Reynolds, A.M; Tolman, W.B. "Progress Towards Modeling the Active Site of Nitrous Oxide Reductase." Gordon Research Conference: Metals in Biology: Ventura, CA; January 2004.

21. Brown, E.C.; Shapiro, P.J. "Synthesis of Novel Boryl-Substituted Cyclopentadienyl Titanium Complexes." 52nd Northwest Regional ACS Meeting; Moscow, ID; June 1997.

GRANTS FUNDED

2010	**NSF REU,** *Co-PI* REU Site: Summer Research in Chemistry at Boise State University for First Year Undergraduates	$112,461
2010	**Mountain State Tumor & Medical Research Institute,** *PI* Investigating the Unusual Metal Dependency of Peptide Deformylase Using Synthetic Models	$7,500
2009	**BSU Design for Learning Success**, *Co-PI* Expanding Access to Organic Chemistry at BSU	$20,000
2008	**Mountain State Tumor & Medical Research Institute,** *PI* Preparation of Synthetic Analogues for Zinc and Iron-Containing Peptide Deformylase	$5,000
2008	**Idaho State Board of Education**, *Co-PI* Going Green: Environmental, Economic and Efficient Organic Chemistry Lab Curriculum	$99,700
2008	**NSF CCLI**, *Co-PI*	$200,800

	Acquisition of GC/MS and FT-IR Instrumentation to assist with the Integration of Research-Based Learning throughout Boise State University's Chemistry Curriculum	
2008	**SBOE HERC**, *Co-PI* Serial Analysis of Protein Expression (SAPE) for Quantitative Mass Spectrometry	$102,000
2007	**Inland Northwest Research Alliance**, *Co-PI* Detector for Pertechnetate Ion in the Shallow Geologic Subsurface	$15,000
2007	**DOE LDRD**, *PI of BSU Subcontract* Enhancement of Separation Methods in Nuclear Fuel Recycling	$750,000 (BSU subcontract: $100,000)
2006	**NSF CRIF:MU RUI**, *Co-PI* Acquisition of a 500 MHz NMR Spectrometer at Boise State University	$500,000

AWARDS AND HONORS

- **NIH Ruth Kirschstein Postdoctoral Fellowship**, University of Minnesota, *2003-2005*
- **David P. Shoemaker Memorial Fellowship**, Oregon State University, *2000 – 2001*: Award given to a senior graduate student for their outstanding academic career and potential for an extraordinary research career in chemistry
- **Tarter Fellowship**, Oregon State University, *2000 and 2001*: Summer research fellowship
- **ASBSU Golden Apple Award Nominee (Teaching Award),** *2008 and 2009*
- **BSU Top Ten Scholar Honored Faculty Member,** *2010*

SERVICE

- Chair, American Chemical Society (ACS) Snake River Local Section, *2009-2010*
- Co-General Chair for 2012 ACS Northwest Regional Meeting (NORM 2012), *present*
- Chair-Elect, ACS Snake River Local Section, *2008-2009 and 2011-present*
- ACS NOR Board Delegate, *2010 - present*
- Senator, BSU Faculty Senate, *2009-2011*
- Manuscript reviewer for *Inorganic Chemistry*, *2007 – present*
- Idaho Academy of Science 50th Anniversary Organizing Committee, *2007-2008*
- Department of Chemistry, Honors and Awards Committee, *Fall 2006 - present*
- College of Arts and Sciences Honors and Awards Committee, *Fall 2006*
- Boise State University Biosafety Committee, *2008-2010*
- Chemistry Olympiad Coordinator, *2010 and 2011*

PROFESSIONAL DEVELOPMENT

- Regional Meeting Planning Conference, 2010
- American Chemical Society Leadership Conference, 2009
- Service Learning Workshop, Boise State University, Fall 2006
- Preparing Future Faculty Program, University of Minnesota, Fall 2004

COURSES TAUGHT

- Chemistry 111- General Chemistry I
- Chemistry 111L – General Chemistry Laboratory
- Chemistry 112 – General Chemistry II Online Course
- Chemistry 307 – Organic Chemistry I
- Chemistry 309 – Organic Chemistry II
- Chemistry 310 – Organic Chemistry II Laboratory
- Chemistry 324 – Advanced Laboratory II
- Chemistry 401 – Advanced Inorganic Chemistry
- Chemistry 286, 386, 498 – Chemistry Seminar

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EDUCATION:

1991-1996 Medical College of Wisconsin, Department of Biochemistry, Milwaukee, WI
- •Ph.D. in Biochemistry, January 1997
- •Research Advisor: Henry M. Miziorko, Professor, Ph.D.

1986-1991 University of Wisconsin-Stevens Point, Departments of Chemistry and Biology, Stevens Point, WI
- •B.S. Chemistry (ACS) and Biology, May 1991

PROFESSIONAL EXPERIENCE:

2000-present ASSISTANT PROFESSOR, Chemistry Department, Boise State University, Boise, ID
- •Teaching: General Chemistry, Biochemistry, Seminar, Enzyme Kinetics and Mechanism, Bioinformatics.
- •Research: Two projects involving the study of alcohol dehydrogenase, carbonyl reductase
- •Performed research with >100 undergraduate students and 2 masters student.

1997-2000 POSTDOCTORAL FELLOW, Department of Biochemistry, The University of Iowa, Iowa City, IA
- •Applied steady state and transient enzyme kinetics, and site-directed mutagenesis techniques to study cooperativity in alcohol dehydrogenase
- •Expressed and purified recombinant protein from both yeast and bacteria
- •Optimized conditions for protein crystal growth
- •Used a stopped-flow spectrophotometer and a fluorometer
- •Utilized software to model protein structure (O), fit data (Fortran programs of Cleland and Nonlin), conduct bioinformatic searches (GCG) and simulate chemical reactions (Kinsim)
- •Mentored an undergraduate students during their summer research fellowships

1991-1996 GRADUATE STUDENT/RESEARCH ASSISTANT, Department of Biochemistry, Medical College of Wisconsin, Milwaukee, WI
- •Applied steady state kinetics, active site directed affinity labeling, inhibitor design, and protein chemistry to study the enzymatic mechanisms of phosphoribulokinase and 3-hydroxy-3-methylglutaryl-CoA synthase
- •Prepared coenzyme A thioesters, thioethers, sulfoxides, and analogs
- •Used HPLC, FPLC, anaerobic chamber, and NMR
- •Trained lab personnel

1991 SEMESTER BREAK RESEARCH PROGRAM PARTICIPANT, Department of Biochemistry, Medical College of Wisconsin, Milwaukee, WI
- •Applied steady state enzyme kinetics to study the conjugation of ubiquitin to target proteins

1990 DOE SCIENCE AND ENGINEERING RESEARCH SEMESTER FELLOW: Argonne National Laboratory, Chemistry Building, Argonne, IL
- •Synthesized organic superconductors using organic and inorganic synthetic procedures that involved electrocrystallization

1987-1988 UNDERGRADUATE TEACHING ASSISTANT: University of Wisconsin-

Stevens Point, Biology Department, Stevens Point, WI
•Taught transmission electron microscopy, sample preparation, and photography
•Conducted research project on geotropism in plants

1987-1988 TUTOR: University of Wisconsin-Stevens Point, Biology Department, Stevens Point, WI
•Tutored botany to undergraduate students

AFFILIATIONS:

2000-present American Chemical Society
2000-present AFFLIATE MEMBER, Mountain States Medical Research Institute
2000-present Idaho Academy of Science

AWARDS AND HONORS:

1986 Phi Eta Kappa Freshman Honor Society
1990 Department of Energy, Science and Engineering Research Semester Fellowship, Argonne, IL
1991 Brian Eagon Research Award, Biology Department, University of Wisconsin-Stevens Point
1993-1994 American Heart Association Predoctoral Fellowship
1995-1996 American Heart Association Predoctoral Fellowship
1997-1998 U.S. Department of Health and Human Services, National Heart, Lung, and Blood Institute Postdoctoral Training Fellowship
1998-2000 U.S. Department of Health and Human Services, National Institute on Alcohol and Alcohol Abuse Individual Postdoctoral Training Fellowship
2010 Finalist - Idaho Innovation Award

GRANTS

"STEM Education for All: Building a Vision for Sustaining Innovation and Prosperity." **Co Principle Investigator,** Period 9/01/09-8/31/11 NSF-MSP Start Partnership, The goal of this grant is to collect data from several sources across Idaho to address STEM concerns in the state.

"Biophysical and Biochemical of Protein Structure and Interactions." **Project Team Leader**, $150,000, Period 7/01/05-6/30/07. Office of Research Administration, Boise State University.

"Structure/function analysis of anthracycline reduction by human carbonyl reductase." Magnet Principle Investigator My portion is for about $376,000 Period 7/01/04-6/30/09. This is a subproject that is part of the Idaho BRIN renewal entitled Idaho-INBRE, NIH/NCRR P20-RR16454

"Synthesis of doxorubicin C14 benzyl ethers and evaluation as carbonyl reductase substrates and topoisomerase II inhibitors." Mountain States Tumor and Medical Research Institute. Co PI. $5000, 5/04 – 5/05.

"Anthracycline Reduction by Human Liver Carbonyl Reductase: Determination of the kinetic mechanisms and substrate/inhibitor specificities"
Principal Investigator $70,000 Period: 9/01/2003-8/31/04
Funding Agency: Subproject of NIH-BRIN Grant # P20RR16454
The goal of this grant is to quantitatively determine the kinetic mechanisms of anthracycline reduction by human carbonyl reductase. Structure/function studies will be used to understand what accounts for the inhibitor and substrate specificities of the enzyme. Another goal of this grant is to generate significant preliminary data for submission of an R01 proposal to the NIH.

“Anthracycline Specificities of Carbonyl Reductases”
Principal Investigator $100,000 Period: 7/01/2003 6/30/05
Funding Agency: NIH/NCI 1 R15 CA102119-01
The goal of this grant is to identify, purify and kinetically characterize the enzymes with anthracycline reductase activities that are present in rabbit heart.
"Mechanisms of Anthracycline Pharmacokinetics and Aging"
Co-Principle Investigator $557,400 Period: 10/1/2003-9/30/07
Funding Agency: VA Merit Review Grant
The major goals of this project are to study the effects of aging on the activity of enzymes involved in anthracycline metabolism and transport.

"Mechanistic Studies of the Peroxisomal Multifunctional Proteins I and II"
Principal Investigator $38,840 Period: 7/01/2001-6/30/2004
Funding Agency: Research Corporation Cottrell College Science Award No. CC5404
The goal of this grant is to understand the kinetic mechanisms of multifunctional proteins I and II, in order to gain insight into their roles in bifunctional protein deficiency.

“Inhibitor Specificities of Human Liver Carbonyl Reductase”
Principal Investigator $5000 Period: 5/12/2003-5/11/2004
Funding Agency: Mountain States Tumor and Medical Research Institute
The goal of this grant is to design and test human liver carbonyl reductase inhibitor candidates.

"Anthracycline Reductases from Rabbit Heart"
Principal Investigator $5000 Period: 7/01/2002-12/31/2003
Funding Agency: Boise State University Faculty Research Grant
The goal of this grant is to identify, purify and kinetically characterize the enzymes with anthracylcline reductase activities that are present in rabbit heart. Continue the work from the grant listed below.

"Purification and Characterization of Anthracycline Reductases from Rabbit Heart."
Principal Investigator $5000 Period: 7/01/2001-6/30/2002
Funding Agency: Moutain States Tumor Institute/Mountain States Medical Research Institute
The goal of this grant is to identify, purify and kinetically characterize the enzymes with anthracylcline reductase activities that are present in rabbit heart.

"Purification and Characterization of Recombinant Human Liver Carbonyl Reductase"
Principal Investigator $5000 Period: 7/01/2002-6/30/2003
Funding Agency: Mountain States Tumor Institute/Mountain States Medical Research Institute
The goal of this grant is to develop a recombinant expression system for human carbonyl reductase and map the substrate specificities of human carbonyl reductase for anthracyclines.

"Anthracycline Specificity of Recombinant Human Carbonyl Reductase."
Principal Investigator $5000 Period: 7/01/2001-6/30/2002
Funding Agency: Boise State University Faculty Research Grant
The major part of this grant was to develop an expression system for human carbonyl reductase and express, purify, and characterize the kinetics of anthracycline reduction.

PUBLICATIONS:

1. Geiser, U.; Wang, H. H.; Carlson, K. D.; Williams, J. M.; **Charlier, Jr., H. A.**; Heindl, J. E.; Yaconi, G. A.; Love, B. J.; Lathrop, M. W.; Schirber, J. E.; Overmyer, D. L.; Ren, J.; Whangbo, M. H. (1991)

"Superconductivity at 2.8 K and 1.5 kbar in κ -(BEDT-TTF)$_2$Cu$_2$(CN)$_3$: The First Organic Superconductor Containing a Polymeric Copper Cyanide Anion." *Inorganic Chemistry 30*, 2586-2588.

2. Schirber, J. E., Overmyer, D. L., Carlson, K. D., Williams, J. M., Kini, A. M., Wang, H. H., **Charlier, H. A.**, Love, B. J. Love, Watkins, D. M., and Yaconi, G. A. (1991) "Pressure-temperature phase diagram, inverse isotope effect, and superconductivity in excess of 13 K in κ -(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl, where BEDT-TTF is bis(ethylenedithio)tetrathiafulvalene." *Physical Review B 44*, 4666-4669.

3. Wang, H. H.; Geiser, U.; Williams, J. M.; Carlson, K. D.; Kini, A. M.; Mason, J. M.; Perry, T. J.; **Charlier, H. A.**; Streiby-Crouch, A. V.; Heindl, J. E.; Lathrop, M. W.; Love, B. J.; Watkins, D. M.; Yaconi, G. A. (1992) "Phase Selectivity in the Simultaneous Synthesis of the Tc = 12.8 K (0.3 kbar) Organic Superconductor κ -(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl or the Semiconductor (BEDT-TTF)Cu[N(CN)$_2$]$_2$." *Chemistry of Materials 4*, 247-249.

4. Kornelsen, K.; Eldridge, J. E.; Wang, H. H.; **Charlier, H. A.**; Williams, J. M. (1992) "Infrared Study of the Metal-Insulator Transition in the Organic Superconductor κ -(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl." *Solid State Communications 81*, 343-349.

5. **Charlier, H. A.**, Runquist, J. A., and Miziorko, H. M. (1994) "Evidence Supporting Catalytic Roles for Aspartate Residues in Phosphoribulokinase." *Biochemistry 33*, 9343-9350.

6. Misra, I., **Charlier, Jr., H. A.**, and Miziorko, H. M. (1995) "Avian Cytosolic 3-hydroxy-3-methylglutaryl-CoA Synthase: Evaluation of the Role of Cysteines in Reaction Chemistry." *Biochimica et Biophysica Acta 1247*,253-259.

7. **Charlier, Jr., H. A.**, Chakravarthy, N., and Miziorko, H. M. (1997) "Inactivation of 3-Hydroxy-3-methylglutaryl-CoA Synthase and Other Acyl-CoA-Utilizing Enzymes by 3-Oxobutylsulfoxyl-CoA." *Biochemistry 36*, 1551-1558.

8. **Charlier, Jr., H. A.**, and Plapp, B. V. (2000) "Kinetic Cooperativity of Human Liver Alcohol Dehydrogenase γ_2." *J. Biol. Chem.,275*, 11569-11575.

9. **Henry A. Charlier, Jr.**, Richard D. Olson, Carissa M. Thornock, Wendy K. Mercer, David R. Olson, T. Stephen Broyles, Dawn J. Muhlestein, Corianton L. Larson, Barry J. Cusack, and Susan E. Shadle (2005) "Investigations of calsequestrin as a target for anthracyclines: comparison of functional effects of daunorubicin, daunorubicinol, and trifluoperazine**."** Molecular Pharmacology 67(5):1505-1512.

10. **Henry A Charlier, Jr.**, Carri Albertson, Carissa Thornock, Lisa Warner, Tyler Hurst, and Robert Ellis. (2005) "Comparison of the effects of Arsenic (V), Cadmium (II), and Mercury (II) single metal and mixed metal exposure in Radish, *Raphanus sativus*, Fescue Grass, *Festuca ovina*, and Duckweed, *Lemna minor*." *Bulletin of Environmental Contamination and Toxicology,* In Press.

11. Slupe, A., Williams, B., Larson, C., Lee, L.M., Primbs, T., Bruesch, A.J., Bjorklund, C., Warner, D.L., Peloquin, J., Shadle, S.E., Gambliel, H.A., Cusack, B.J., Olson, R.D., and **Charlier, Jr., H.A.** (2005) "Reduction of 13-Deoxydoxorubicin and Daunorubicinol Anthraquinones by Human Carbonyl Reductase." Cardiovascular Toxicology, In Press.

12. R. D. Olson, H. A. Gambliel, R. E. Vestal, S. E. Shadle, **H. A. Charlier, Jr.**, B. J. Cusack (2005) "Doxorubicin Cardiac Dysfunction: Effects on Calcium Regulatory Proteins, sarcoplasmic reticulum and Triiodothyronine", Cardiovascular Toxicology 5:269-283.

13. Cusack, B.J., Gambliel, H., Musser, B., Hadjokas, N., Shadle, S., **Charlier, H.**, Olson, R.D. (2006) "Prevention of Chronic Anthracycline Cardiotoxicity in the Adult and Aged Fischer 344 Rat by Dexrazoxane and Effects on Iron Metabolism". *Cancer Chemotherapy and Pharmacology 58*(4), 517-526.
14. Berhe S., Slupe A., Luster C., **Charlier, Jr., H.A.**, Warner D.L., Zalkow L.H., Burgess E.M., Enwerem N.M., Bakare O. (2010) Synthesis of 3-[(N-carboalkoxy)ethylamino]-indazole-dione derivatives and their biological activities on human liver carbonyl reductase. *Bioorg. Med. Chem. 218*(1):134-41.

Patents
1. **Charlier, H.A.**, and Gerasimchuck, N. (2010) CYANOOXIME INHIBITORS OF CARBONYL REDUCTASE AND METHODS OF USING SAID INHIBITORS IN TREATMENTS INVOLVING ANTHRACYCLINES. US 7,727,967 B2
2. **Charlier, H.A.**, and Ewing, C. (2010) BIPHENYL INHIBITORS OF CARBONYL REDUCTASE. US 7,781,412 B2

National Meetings:

1. Runquist, J.A., **Charlier, H.A.**, and Miziorko, H.M. (1994) "Evidence for an Aspartate as Phosphoribulokinase's Catalytic Base." *The FASEB Journal 8*, A1346.

2. **Charlier, Jr., H. A.**, and Plapp, B. V. (1999) "Nonhyperbolic Kinetics of Human Liver Alcohol Dehydrogenase γ_2." *The FASEB Journal 13*, A1441.

3. **Charlier, H.A.**, Maupin, C.M., and Plapp, B.V. (2002) "Coenzyme Binding by Horse Liver Alcohol Dehydrogenase: Evaluating the Role of Charge at Position 228." Division of Biological Chemistry, 224th National Meeting of the American Chemical Society, August 18 – 22, *Biochemistry 41*, 8968.

4. Cheney, M., and **Charlier, H.A.** (2003) "Kinetic Characterization of Carbonyl Reductases From Rabbit Heart." National Council for Undergraduate Research, Salt Lake City Utah.

5. Hibberd, A.M., **Charlier, H.A.**, and Serpe, M. D.(2003) "A possible role for □-1,3-glucanases in intrusive growth of the nonarticulated laticifer cell". National Council for Undergraduate Research, Salt Lake City Utah.
Cheney, M., and Maupin, C.M. (2003) "Kinetic characterization of carbonyl reductase activities from rabbit heart cytosol." Division of Biological Chemistry, 226th National Meeting of the American Chemical Society, September 7-11, *Biochemistry 42*, 8594.

7. Thornock, C., **Charlier, H.A., Jr.**, Olson, R.D., Mercer, W.K., Broyles, T.S., Gambliel, H.A., Cusack, B.J., Shadle, S.E. (2003) "Anthracyclines inhibit calcium release from the sarcoplasmic reticulum and bind directly to calsequestrin." Division of Biological Chemistry, 226th National Meeting of the American Chemical Society, September 7-11, *Biochemistry 42*, 8594.

8. R.D. Olson, **H.A. Charlier**, C.Thornock, W.K. Mercer, T.S. Broyles, D.R. Olson, H. Gambliel, B. Cusack,S.E. Shadle. (2003) "The calsequestrin inhibitor trifluoroperazine disrupts cardiac musclefunction and inhibits SR Ca2+ release." 47th Annual Meeting of the Biophysical Society, San Antonio,TX, Biophysical Journal Supplement, February, 84, Number 2, Part 2 of2, 99a.

9. Susan E. Shadle, Dawn Muhlestein, Nico Cantone, Carissa Thornock, **Henry A. Charlier, Jr.**, Richard D. Olson. (2004) "Anthracyclines Bind to Calsequestrin and Alter Its Calcium Binding Properties." 48th Annual Meeting of the Biophysical Society, Baltimore, MD, Biophysical Journal Supplement, February.

10. Wendy K. Mercer, Nico Cantone, Dawn J. Muhlestein**, Henry A. Charlier Jr.**, and Susan E. Shadle. (2005) Anthracyclines affect calcium ion binding to calsequestrin. The 229th ACS National Meeting, in San Diego, CA, March 13-17, 2005

11. Williams, B., Larson, C.L., Slupe, A., Olson, K., Begic, S., Lee, L., and **Charlier, Jr, H.A.** (2005) Novel inhibitors of carbonyl reductase. The 229th ACS National Meeting, in San Diego, CA, March 13-17, 2005.

12. **Charlier, Henry A**., Slupe, Andrew, Williams, Berea, Larson, Corianton L., Lee, Laura, Warner, Don L., and Peloquin, Jeffrey M. (2005) "Anthraquinone reduction by human carbonyl reductase." Abstracts of Papers, 230th ACS National Meeting, Washington, DC, United States, Aug. 28-Sept. 1.

13. Slupe, A., Berhe, S., Bakare, O., Luster, C., **Charlier, Jr., H.A.** (2006) "Pyrazoloquinone substrates and inhibitors of carbonyl reductase" Abstracts of Papers, 231th ACS National Meeting, Atlanta, GA, March 26-30.

14. **Charlier, Jr., H.A.,** Warner, D., Slupe, A.M., Williams, B. Ward, L., Couch, A., Bakare, O., and Gerasimchuk, N.N. (2006) "Human carbonyl reductase: Identifying inhibitors using irrational drug design." Enzymology and Molecular Biology of Carbonyl Metabolism, 13th International Symposium, Nashville, Indiana, July 11-15, 2006.

15. Slupe, A.M., Luster, C., Warner, D.L., and **Charlier, Jr., H.A.** (2006) "Novel substrates and inhibitors of human carbonyl reductase" *1st Biennial* National IDeA Symposium of Biomedical Research Excellence (NISBRE), Washington, DC., July 20 – 22.

16. Berhe, S., Slupe, A., Luster, C., **Charlier, H.A.**, and Bakare, O. (2006) Synthesis and Carbonyl Reductase (CR) Inhibitory Activities of Indazole-4,7-dione Derivatives. Tenth Research Centers in Minority Institutions (RCMI) International Symposium on Health Disparities, San Juan, Peurto Rico, December 13 – 16.

17. **Charlier, H.A.,** Gerasimchuk, N.N., and Ward, L. (2007) Arylcyanooxime inhibitors of human carbonyl reductase. Abstracts of Papers, 234th ACS National Meeting, Boston, MA, United States, August 19-23.

18. Mayer, M.T. and Charlier, H.A. (2008) Binary and ternary complexes involving small molecules and carbonyl reductase. Abstracts of Papers, 235th ACS National Meeting, New Orleans, LA, United States, April 6-10.

19. Flaherty, B., Romano, A., Furnish, J., Slupe, A. M., and **Charlier, H.A.** (2008) Construction and preliminary characterization of polyhistidine tagged phosphotriesterase. Abstracts of Papers, 235th ACS National Meeting, New Orleans, LA, United States, April 6-10.
20. Ewing, C.K. and **Charlier, H.A.** (2008) Carbonyl reductase inhibition as a means to increase anthracycline efficacy. Abstracts of Papers, 235th ACS National Meeting, New Orleans, LA, United States, April 6-10.

21. Young, C. R. and **Charlier, H.A., Jr.** (2009) Determining the role for methionine 234 in substrate recognition in human carbonyl reductase. Abstracts of Papers, 237th ACS National Meeting, Salt Lake City, UT, United States, March 22-26.

22. White, A.B., Ewing, C.K., and **Charlier, H.A.** (2009) Determining the ability of resveratrol to inhibit human carbonyl reductase activity. Abstracts of Papers, 237th ACS National Meeting, Salt Lake City, UT, United States, March 22-26.

23. Morton, R., Ewing, C.K., Jorcyk, C., and **Charlier, H.A., Jr.** (2009) Investigating the role of carbonyl reductase in anthracycline drug resistance. Abstracts of Papers, 237th ACS National Meeting, Salt Lake City, UT, United States, March 22-26.

24. Parker, B.A., Coppola, J.M., **Charlier, H.A., Jr.**, and Hill, M.W. (2009) Hydrolysis of parathion in a liquid-liquid biphasic system. Abstracts of Papers, 237th ACS National Meeting, Salt Lake City, UT, United States, March 22-26.

25. Weaver, J.G. and **Charlier, H. A.** (2010) Chemistry outreach and recruiting at Boise State University: Igniting community interest and sparking student involvement. Abstracts of Papers, 239th ACS National Meeting, San Francisco, CA, United States, March 21-25.
26. Baggs, E.L.., Young, C., and **Charlier, H.A.** (2010) Development of a recombinant protein expression system for the production of human carbonyl reductase. Abstracts of Papers, 239th ACS National Meeting, San Francisco, CA, United States, March 21-25.

Statewide/Regional Meetings:
1. Misra, I., **Charlier, H.A.**, Miziorko, H. M. (1994) "3-Hydroxy-3-Methylglutaryl-CoA Synthase: Evaluation of the Role of Cysteines in Reaction Chemistry." Midwest Enzyme Chemistry Conference, Northwestern University, Chicago, IL.

2. **Charlier, Jr., H. A.**, and Plapp, B. V. (1999) "Nonhyperbolic Kinetics of Human Liver Alcohol Dehydrogenase γ_2: An abortive complex pathway." Midwest Enzyme Chemistry Conference, University of Illinois - Chicago, Chicago, IL.

3. **Charlier, Jr., H. A.,** and Maupin, C. M. (2001) "Horse Liver Alcohol Dehydrogenase: The Contribution of Lysine 228 to Catalysis." 43 rd Idaho Academy of Science Meeting, Albertson College of Idaho, Caldwell, ID.

4. Bjorklund, C., and **Charlier, Jr., H. A.** (2002) "Expression of Recombinant Human Liver Carbonyl Reductase in *Escherichia coli*." 44th Idaho Academy of Science Meeting, BYU Idaho, Rexburg, ID.

5. Maupin, C. M., and **Charlier, Jr., H. A.** (2002) "Horse Liver Alcohol Dehydrogenase: Contribution of Charge at Position 228 to Coenzyme Binding". 44th Idaho Academy of Science Meeting, BYU Idaho, Rexburg, ID.

6. Maupin, C. M., and **Charlier, Jr., H. A.** (2002) "Anthracycline Specificities of Carbonyl Reductases from Rabbit Heart." 44th Idaho Academy of Science Meeting, BYU Idaho, Rexburg, ID.

7. Williams, B., Larson, C. and **Charlier, Jr., H.A.** (2005) Inhibitors Of Human Carbonyl Reductase. 47th Annual Meeting and Symposium of the Idaho Academy of Science, April 7-9, 2005.

8. Slupe, A.M., Lee, L.M. and **Charlier, Jr., H.A.**(2005) Anthraquinone Substrates of Carbonyl Reductase. 47th Annual Meeting and Symposium of the Idaho Academy of Science, April 7-9, 2005.

PRESENTATIONS:

1995 Invited seminar, ""Evidence Supporting Catalytic Roles for Aspartate Residues in *Rhodobacter sphaeroides* Phosphoribulokinase." Given to the Department of Chemistry at the University of Wisconsin-Stevens Point, Stevens Point Wisconsin.

2003 Invited seminar, "Coenzyme binding by horse liver alcohol dehydrogenase: Evaluating the role of charge at position 228." Given to the Department of Chemistry at Washington State University, Pullman Washington.2005 "Talking to Enzymes: Learning to Control Carbonyl Reductase with Small Molecules." Seminar given at the Idaho INBRE Summer Research Conference, August, 2005.

COURSES TAUGHT

Undergraduate Offerings:

CHEM 111 - College Chemistry I
CHEM 112 - College Chemistry II
CHEM 431 - Biochemistry I
CHEM 432 - Biochemistry Laboratory
CHEM 433 - Biochemistry II
CHEM 286/386 - Seminar
CHEM 498 - Senior Seminar

Graduate Offerings:

CHEM 500 - Introduction to Chemical Research
BIOCHEM 510 - Advanced Protein Chemistry
BIOCHEM 512 - Intermediary Metabolism
CHEM 597 - Special Topics - Enzyme Kinetics

KENNETH A. CORNELL

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(i) Professional Preparation

Oregon State University	Microbiology	BS, 1983
Wichita State University	Microbiology	MS, 1985
Oregon Health Sciences University	Biochemistry/Molecular Biology	Ph. D, 1997
Portland VA Medical Center	Molecular Immunology	Postdoc, 1997-99

(ii) Appointments

2009-present	Associate Professor, Dept. Chemistry, Boise State University, Boise, ID
2004-2009	Assistant Professor, Dept. Chemistry, Boise State University, Boise, ID
2003-2004	Clinical Research Assistant Professor, Div. Vascular Surgery, OHSU, Portland, OR
2002-2004	Senior Scientist, AcryMed Inc., Portland, OR
2000-2004	Adjunct Assistant Professor, Dept. Chemistry, Portland State Univ. Portland, OR
2002-2003	Adjunct Instructor, Dept. Biology, Portland Community College, Portland, OR
2000-2002	Staff Scientist, Molecular Biology Group Leader, INTERLAB Inc, Portland, OR
1997-1999	Postdoctoral Fellow, Portland V.A. Medical Center, Portland, OR
1992-1997	Graduate Research Assistant, Biochemistry & Mol. Biology, OHSU., Portland, OR.
1988-1991	Research Associate, Arthritis & Rheumatic Diseases, OHSU, Portland, OR.
1985-1987	Science Teacher, U.S.Peace Corps, Sokoke Secondary School, Kilifi, Kenya.
194-1985	Graduate Research Assistant, Wichita State University, Wichita, KS.
1983	Microbiologist, Stayton Canning Company, Stayton, OR.
1982-1983	Research Technician, Dept. Crop Science, Oregon State Univ., Corvallis, OR.

(iii) Honors

1982	Mark M. Middlekauf Scholarship, Oregon State University.
1984	Biological Sciences Research Fellowship, Wichita State University.
1992,1993	V. A. Research Fellowship, Portland V.A.M.C.
1992	Tartar Trust Fellowship, Oregon Health Sciences University.
1992	Molecular & Cell Biology Fellowship, Oregon Health Sciences University.
1994-1996	NIH Molecular Hematology Predoctoral Fellowship, Dept. of Hematology, OHSU.

(iv) Selected peer-reviewed publications (in chronological order)

1. Bennett, RM, **Cornell**, KA, Merritt, MJ, Bakke, AC, Hsu, PH, and Hefeneider, SH (1991) Autoimmunity to a 28-30 kD cell membrane DNA binding protein: occurrence in selected sera from patients with SLE and Mixed Connective Tissue Disease. *Clin Exp Immunol* 86(3): 374-379.
2. Bennett, RM, **Cornell**, KA, Merritt, MJ, Bakke, AC, Mourich, D, and Hefeneider, SH (1992) Idiotypic mimicry of a cell surface DNA receptor: evidence for anti-DNA antibodies being a subset of anti-anti-DNA receptor antibodies. *Clin Exp Immunol* 90: 428-433.
3. Winter, RW, **Cornell**, KA, Johnson, LL, and Riscoe, MK (1993) Synthesis and testing of substituted phenylthioribose analogs against *Klebsiella pneumoniae*. *Bioorg & Med Chem Lett* 3 (10): 2079-2082.
4. Hefeneider, SH, Brown, LE, McCoy, SH, Bakke, AC, **Cornell**, KA, and Bennett, RM. (1993) Immunization of BALB/c mice with monoclonal anti-DNA antibody induces an anti-idiotypic antibody reactive with a cell-surface DNA binding protein. *Autoimmunity* 15: 187-194.
5. Winter, RW, **Cornell**, KA, Johnson, LL, Isabelle, LM, Hinrichs, DJ, and Riscoe, MK. (1995) Hydroxy-anthraquinones as antimalarial agents. *Bioorg & Med Chem Lett* 5(17): 1927-1932.
6. **Cornell**, KA, Winter, RW, Tower, PA, and Riscoe, MK. (1996) Affinity purification of 5-methylthioribose kinase and 5'-methylthioadenosine/S-adenosylhomocysteine nucleosidase from *Klebsiella pneumoniae*. *Biochem J.* 317: 285-290.

7. **Cornell**, KA, Swarts, WE, Barry, RA, and Riscoe, MK. (1996) Characterization of recombinant *Escherichia coli* 5'-methylthioadenosine/S-adenosylhomocysteine nucleosidase: analysis of enzymatic activity and substrate specificity. *Biochem. Biophys. Res. Commun.* 228: 724-732.
8. **Cornell**, KA, and Riscoe, MK (1998) Cloning and expression of *E. coli* 5'-methylthioadenosine /S-adenosylhomocysteine nucleosidase*. Biochem. Biophys. Acta*, 1396: 8-14.
9. **Cornell**, KA, Bouwer, HGA, Hinrichs, DJ, and Barry, RA (1999) Genetic immunization of mice against *Listeria monocytogenes* using plasmid DNA encoding listeriolysin O. *J. Immunol*., 163: 322-329.
10. Brown, JR, **Cornell**, KA, and Cook, PW (2000) Adenosine- and Adenine-nucleotide-mediated inhibition of normal and transformed keratinocyte proliferation is dependent upon dipyridamole-sensitive adenosine transport. *J. Invest. Derm.*, 115(5) 849-859.
11. Lee, JE, **Cornell**, KA, Riscoe, MK, and Howell, PL (2001) The crystal structure of *E. coli* 5'-methylthio-adenosine/S-adenosylhomocysteine nucleosidase reveals structural similarity to the purine mucleoside phosphorylases. *Structure* 9: 941-953.
12. Lee, JE, **Cornell**, KA, Riscoe, MK, and Howell, PL (2001) Expression, purification, crystallization and preliminary X-ray analysis of E. coli 5'-methylthioadenosine/S-adenosylhomocysteine nucleosidase. *Acta crystallographica* (D57) 150-152.
13. Winzer, K, Hardie, KR, Burgess, B, Doherty, N, Kirke, D, Holden, MTG, Linforth, R, **Cornell**, KA, Taylor, AJ, Hill, PJ, Williams, P (2002) LuxS: its role in central metabolism and the in vitro synthesis of 4-hydroxy-5-methyl-3(2H)-furanone. *Microbiology* 148: 909-922.
14. Lee, JE, **Cornell**, KA, Riscoe, MK, and Howell, PL (2003) Structure of *E. coli* 5'-methylthioadenosine/S-adenosylhomocysteine nucleosidase inhibitor complexes provide insight into conformational changes required for substrate binding and catalysis. *J. Biol. Chem.* 278: 8761-8770
15. Hinrichs, DJ, **Cornell**, KA, Bouwer, HGA, and Barry, RA (2003) Protective immunization of interferon γ knockout mice following intramuscular DNA vaccination. *Vaccine* 21(17-18): 2131-2141
16. Simon, BE, **Cornell**, KA, Clark, TR, Chou, S, Rosen, HR, and Barry, RA (2003) DNA vaccination protects mice against challenge with *Listeria monocytogenes* expressing the hepatitis C virus NS3 protein. Infect. Immun. 71(11): 6372-80.
17. Zhao, G, Wan, W, Mansouri, S, Alfaro, JF, Bassler, BL, **Cornell**, KA, and Zhou, ZS (2003) Chemical synthesis of S-ribosyl-L-homocysteine and activity assay as a LuxS substrate. *Biorg. and Med. Chem. Letts*. 13(22): 3897-900.
18. Ku, SY, Yip, P, **Cornell**, KA, Riscoe, MK, Howell, PL (2004) Crystallization and preliminary X-ray analysis of 5-methylthioribose kinase from *Bacillus subtilis* and *Arabidopsis thaliana*. Acta crystallogr.D. Biol Crystallogr. 60(Pt 1):116-9.
19. Lee, JE, Settembre, EC, **Cornell**, KA, Riscoe, MK, Sufrin, JR, Ealick, SE, Howell, PL (2004) Structural comparison of MTA phosphorylase and MTA/SAH nucleosidase explains substrate preferences and identifies regions exploitable for inhibitor design. Biochemistry. 43: 5159-5169.
20. Sauter, M, Sára Beszteri, S, **Cornell**, KA, Rzewuski, G (2004) Functional analysis of methylthioribose kinase genes in plants. Plant Phys. 136: 4061-4071.
21. Lee JE, Singh V, Evans GB, Tyler PC, Furneaux RH, **Cornell** KA, Riscoe MK, Schramm VL, Howell PL (2005) Structural rationale for the affinity of pico- and femtomolar transition state analogues of *E. coli* 5'-methylthioadenosine/s-adenosylhomocysteine nucleosidase. J. Biol Chem. 280(18):18274-82.
22. Lee JE, Smith GD, Horvatin C, Huang DJ, **Cornell** KA, Riscoe MK, Howell PL (2005) Structural snapshots of MTA/AdoHcy nucleosidase along the reaction coordinate provide insights into enzyme and nucleoside flexibility during catalysis. J. Mol. Biol. 352(3): 559-574.
23. Lee JE, Luong W, Huang DJ, **Cornell** KA, Riscoe MK, Howell PL (2005) Mutational analysis of a nucleosidase involved in quorum-sensing autoinducer-2 biosynthesis. Biochemistry 44(33):11049-57.
24. Parveen N, **Cornell** KA, Bono JL, Chamberland C, Rosa P, Leong JM (2006) Bgp, a secreted GAG-binding protein of *B. burgdorferi* strain N40, displays nucleosidase activity and is not essential for infection of immunodeficient mice. Infect. Immun. 74(5):3016-20.
25. Ku SY, **Cornell** KA, Howell PL (2007) Structure of *Arabidopsis thaliana* 5-methylthioribose kinase reveals a more occluded active site than its bacterial homolog. BMC Structural Biology. Oct 25;7:70.

26. Ku SY, Yip P, **Cornell** KA, Riscoe MK, Behr JB, Guillerm G, Howell PL (2007) Structures of 5-methylthioribose kinase reveal substrate specificity and unusual mode of nucleotide binding. J. Biol. Chem. 282(30): 22195-22206.
27. Rzewuski G, **Cornell** KA, Rooney L*, Burstenbinder K, Wirtz M, Hell R, Sauter M (2007) OsMTN encodes a 5' methylthioadenosine nucleosidase that is up-regulated during submergence-induced ethylene synthesis in rice (*Oryza sativa* L.). J. Exp. Botany. 58(6):1505-1514.
28. Siu KKW, Lee JE, Sufrin JR, Moffatt BA, McMillan M, **Cornell** KA, Isom C*, Howell PL (2008) Molecular determinants of substrate specificity in plant 5'-methylthioadenosine nucleosidases. J. Mol. Biol. 378(1):112-128.
29. **Cornell** KA, Primus S, Martinez JA, Parveen N (2009) Assessment of methylthioadenosine/S-adenosylhomocysteine nucleosidases of *Borrelia burgdorferi* as targets for novel antimicrobials using a novel high-throughput method. J. Antimicrob. Chemother. 63(6): 1163-1172.
30. Turner M, Eidemiller S, Martin B, Narver A, Marshall J, Zemp L, **Cornell** KA, McIntosh MJ, McDougal OM (2009) Structural basis for alpha-conotoxin potency and selectivity. Bioorg. Med. Chem. 17(16): 5894-5899.
31. Parveen N, **Cornell** KA (2011) Methylthioadenosine / S-adenosylhomocysteine nucleosidase, a critical enzyme for bacterial metabolism. Mol. Micro. 79(1):7-20.

(v) Service Activities

Director M.S. Program, Dept. Chemistry & Biochemistry, BSU, Boise, ID 2010-present
Director, Merck/AAAS Undergraduate Research program, BSU, Boise, ID 2008-2011
Grant Reviewer, WHO/TDR, Geneva, Switzerland, 2010-present
Grant Reviewer, Idaho Dept. Agriculture, Specialty Crops Program, Boise, ID 2011-present
Manuscript reviewer, Biochemical Pharmacology (2005- present), MBio (2010-present), Bioorganic and Medicinal Chemistry (2011-present)
Service Learning Advisory Panel, Boise State University, Boise, ID 2009-present
Chair, University Biosafety Committee, Boise State University, 2005-present
Chair, COAS Tenure & Promotion Review Committee, Boise State University, 2010
Chair, Molecular & Cell Biology section, AAAS - Pacific Division, 2008-2010
Secretary, Snake River Division, American Chemical Society, Boise, ID, 2007-2010
Symposia organizer, Infectious Diseases Symposia, 50th Annual Meeting of the Idaho Academy of Science, Nampa, ID 2008.
Symposia organizer, 88th, 89th,90th, 91st Annual Meeting AAAS PD, 2007-2010
Research mentor, Idaho INBRE Program, Boise, ID, 2005-present (10 students)
Research mentor, Idaho Upward Bound Program, Boise, ID, 2005, 2006 (3 students)
Member, University IACCUC Committee, 2006-2007
Senior thesis advisor, Dept. Chemistry, Boise State University, 2005-present (10 students)
Affiliate member, Mountain States Tumor & Medical Research Inst., Boise, ID, 2005-present

(vi) Collaborators

Dr. Arvin Farid, Dept. Civil Engineering, Boise State University, Boise, ID
Dr. P. Lynne Howell, Dept. Biochemistry, Univ.of Toronto / Hospital for Sick Children (Canada)
Dr. Owen McDougal, Dept. Chemistry, Boise State University, Boise, ID
Dr. Kristen Mitchell, Dept. Biology, Boise State University, Boise, ID
Dr. Barbara Moffat, Dept. Biology, University of Waterloo, Waterloo (Canada)
Dr. Raj Nagarajan, Dept. Chemistry, Boise State University, Boise, ID
Dr. Nikhat Parveen, Dept. Microbiology, University of New Jersey Medical School, Newark, NJ
Dr. Jean-Baptiste Roullet, Dept. Pediatric Metabolism, OHSU, Portland, OR
Dr. Margaret Sauter, Dept. Botany, Christian Albrechts University at Kiel (Germany)
Dr. Juliette Tinker, Dept. Biology, Boise State University, Boise, ID
Dr. Denise Wingett, Dept. Biology, Boise State University, Boise, ID

(vii) Master's Thesis Advisor
Kelli Pease (Biology)
Reese Knippel (Chemistry)

M.S. Advisory Committees
Alma Hodzic (grad 2007)
Ashley Masterson (grad 2009)
Jason Beseker (grad 2008)
Patrick Aranda (grad 2010)

(viii) Ongoing Research Support

W81XWH-09-1-0588 Dept. Defense/CDMRP Cornell (PI) Date: 09/09-08/12 ($940,000)
*A West Nile Virus Vaccine.*The goal of this project is to develop oral vaccines for West Nile Virus.
Role: PI

P20 RR01645 Idaho INBRE/NIH Bohach (PI) Date: 5/09-4/14 ($350,000)
Global Consequences of Interruption of Microbial Autoinducer Signaling. The goal of this project is to determine the role of MTA nucleosidase in AI-2 signaling in its effect on pathogenesis in *E. coli*.
Role: Magnet PI

CHE-0923535 NSF MRI Cornell(PI) Date: 08/09-07/12 ($597,000)
Acquisition of a Liquid Chromatography Tandem Mass Spectrometer. This project supports the purchase of a LC tandem mass spectrometer and a half-time technician for Boise State University.
Role: PI

Recently Completed Research Support

"Merck/AAAS Undergraduate Research Program", Merck/AAAS, Role: PI Date: 5/08-5/11
"Advanced Biomolecule Computer Modeling Curriculum", Idaho SBOE, Role: PI Date: 7/09-12/10
"A 21st Century Biochemistry Lab...", Idaho SBOE, Role: PI Date: 7/08-7/10
"Establishing Community Engagement ..." Boise State University, Role: PI Date: 1/08-1/11
"DNA Safeguard I" Agency: CDMRP Role: Co-PI. Date: 1/07-12/08
"Preparative Ultracentrifuge for COAS" NSF EPSCoR / BSU Role: PI Date: 09/06-8/07
"Targeted Gene Deletions in Methionine Salvage" MSTMRI. Role: PI Date: 05/07-9/08
"Analysis of Microbial Methionine Salvage" BSU FRAP Role: PI Date: 08/07-5/08
"Development of NpEFFF for Protein Purification" BSU Role: PI Date: 07/06-07/07
"Novel Burn Graft Biomaterials" NIH (R43 GM64847) Role: Co-PI Date:10/04–9/06
"Development of Novel Antimicrobial Catheters" NIH (R43AI061894) Role: PI Date:11/05–4/06

Curriculum Vitae: Kevin Feris
Microbial Ecologist
Department of Biology
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email: kevinferis@boisestate.edu

Professional Positions

2010 - current	Associate Professor, Department of Biology, Boise State University, Boise, ID
2005 - 2010	Assistant Professor, Department of Biology, Boise State University, Boise, ID
2003 - 2005	Postdoctoral research associate, Soil Microbial Ecology Lab, The University of California at Davis, Davis, CA.
2000 - 2003	Research Assistant, Molecular Microbial Ecology Lab, The University of Montana, Missoula, MT.
1997-98	Laboratory Technician: Neurobiology Lab, University of Alaska Anchorage, Anchorage, AK
1996	Laboratory Technician: Biogeochemistry Lab, University of Alaska Anchorage, Anchorage, AK

Education and Training

University of California at Davis
Postdoctoral Research Associate
2003 – 2005

University of Montana
Ph.D Microbial Ecology, 2003

University of Alaska Anchorage
B.S. Biology, 1995
Minor in Chemistry

Research Projects:

- Microbial Ecology:
    1. Determining the long-term ecological effects of heavy metal stress on riverine ecosystems.
    2. Assessing the role of terrestrial and aquatic microbial communities in carbon processing, hydrologic properties, and responses to global change.
- Alternative Energy Generation:
    1. Production of liquid fuels from lignocellulosic biomass. Development of novel nano-bio catalysts for accelerated conversion of lignocellulosic biomass to fermentable sugars

2. Optimization of algal-based advanced biofuels production systems for incorporation into Integrated Biorefineries of agricultural wastes

- NanoBioTechnology:
    1. Development of novel nanoscale metal oxide antimicrobials and assessment of their environmental toxicology.

Publications:

1. Gibbons, S. M., K. P. **Feris**, J. E. Gannon, M. A. McGuirl, S. E. Morales, A. Leedjärv, and P. W. Ramsey. 2011. Microcalorimetry establishes the cost and benefit of harboring cadmium efflux genes in Pseudomonas putida strain KT2440. Applied and Environ Microbiol **77**:108-113.
2. **Feris**, K., C. Otto, J. Tinker, D. Wingett, A. Punnoose, A. Thurber, M. Kongara, M. Sabetian, B. E. Quinn, C. Hanna, and D. Pink. 2010. Electrostatic interactions affect nanoparticle-mediated toxicity to the Gram-negative bacterium Pseudomonas aeruginosa PAO1. Langmuir **26** 4429–4436.
3. Wang, H., D. Wingett, M. H. Engelhard, K. **Feris**, K. M. Reddy, P. Turner, J. Layne, C. Hanley, J. Bell, D. Tenne, C. Wang, and A. Punnoose. 2009. Fluorescent dye encapsulated ZnO particles with cell-specific toxicity for cancer treatment and bio-medical applications. J Mater Sci: Mater Med **20**:11-22.
4. **Feris**, K. P., P. W. Ramsey, S. M. Gibbons, C. Frazar, M. C. Rillig, J. N. Moore, J. E. Gannon, and W. E. Holben. 2009. Hyporheic microbial community development is a sensitive indicator of metal contamination. Environ. Sci. Technol. **43**:6158-6163.
5. **Feris**, K., P. W. Ramsey, S. M. Gibbons, C. Frazar, J. N. Moore, J. E. Gannon, and W. E. Holben. 2009. Hyporheic microbial community development is a sensitive indicator of metal contamination. Environ Sci Technol **43**:6158–6163.
6. Wang, H., D. Wingett, M. H. Engelhard, K. **Feris**, K. M. Reddy, P. Turner, J. Layne, C. Hanley, J. Bell, D. Tenne, C. Wang, and A. Punnoose. 2008. Fluorescent dye encapsulated ZnO particles with cell-specific toxicity for cancer treatment and bio-medical applications. J Mater Sci: Mater Med **DOI 10.1007/s10856-008-3541-z**.
7. Hanley, C., J. Layne, A. Punnoose, K. M. Reddy, I. Coombs, A. Coombs, K. **Feris**, and D. Wingett. 2008. Preferential killing of cancer cells and activated human T cells using ZnO nanoparticles. Nanotechnology **19**:295103.
8. **Feris**, K., D. Mackay, N. de Sieyes, M. Einarson, K. Hristova, and K. Scow. 2008. Impact of Ethanol on Microbial Community Structure and Function During Natural Attenuation of Benzene, Toluene and o-Xylene in a Sulfate-Reducing Aquifer. Environ Sci Technol **42**:2289-2294.
9. Drenovsky, R. E., K. **Feris**, K. M. Batten, and K. Hristova. 2008. New and Current Microbiological Tools for Ecosystem Ecologists: Towards a Goal of Linking Structure and Function. Amer. Midland Naturalist **160**:140-159.
10. Reddy, K. M., K. **Feris**, C. Wang, and A. Punnoose. 2007. Selective toxicity of zinc oxide nanoparticles to gram positive and gram negative bacterial systems. Appl. Phys. Lett. **90**:3 pages.
11. Mackay, D., N. de Sieyes, M. Einarson, K. **Feris**, A. Pappas, I. Wood, L. Jacobson, L. Justice, M. Noske, J. Wilson, C. Adair, and K. Scow. 2007. Impact of Ethanol on the Natural Attenuation of MTBE in a Normally Sulfate-Reducing Aquifer. Environ Sci Technol **41**:2015-2021.

12. Ramsey, P. W., M. C. Rillig, K. P. **Feris**, W. E. Holben, and J. E. Gannon. 2006. Choice of methods for soil microbial community analysis: PLFA maximizes power compared to CLPP and PCR-based approaches Pedobiologia **50**:275-280.
13. Mackay, D., N. de Sieyes, M. Einarson, K. P. **Feris**, A. Pappas, I. A. Wood, L. Jacobson, L. G. Justice, M. N. Noske, K. Scow, and J. T. Wilson. 2006. Impact of Ethanol on the Natural Attenuation of Benzene, Toluene, and o-Xylene in a Normally Sulfate-Reducing Aquifer. Environ Sci Technol **40**:6123-6130.
14. Ramsey, P. W., M. C. Rillig, K. P. **Feris**, J. N. Moore, and J. E. Gannon. 2005. Mine waste contamination limits soil respiration rates: A case study using quantile regression. Soil Biology and Biochemistry **37**:1177-1183.
15. Ramsey, P. W., M. C. Rillig, K. P. **Feris**, N. S. Gordon, J. N. Moore, W. E. Holben, and J. E. Gannon. 2005. Relationship between communities and processes; new insights from a field study of a contaminated ecosystem. Ecology Letters **8**:1201-1210.
16. Ramsey, P. W., M. Rillig, K. P. **Feris**, J. N. Moore, and J. E. Gannon. 2005. Mine waste contamination limits soil respiration rates: a case study using quantile regression. Soil Biol. and Biochem. **37**:1177–1183.
17. Ramsey, P. W., P. Rice, M. C. Rillig, K. P. **Feris**, N. S. Gordon, J. N. Moore, W. E. Holben, and J. E. Gannon. 2005. The influence of heavy metals, acidity, and organic matter on plant and microbial communities in mine waste contaminated floodplain soil. Ecology Letters **8**:1201-1210.
18. **Feris**, K. P., K. Hristova, B. Gebreyesus, D. Mackay, and K. M. Scow. 2005. A Shallow BTEX and MTBE Contaminated Aquifer Supports a Diverse Microbial Community. Microbial Ecology **48**:589-600.
19. Holben, W. E., K. P. **Feris**, A. Kettunen, and J. H. A. Apajalahti. 2004. GC fractionation enhances microbial community diversity assessment and detection of minority populations of bacteria by DGGE. Appl. Environ. Microbiol. **70**:2263-2270.
20. **Feris**, K. P., P. W. Ramsey, M. Rillig, J. N. Moore, J. E. Gannon, and W. E. Holben. 2004. Determining Rates of Change and Evaluating Group-Level Resiliency Differences in Hyporheic Microbial Communities in Response to Fluvial Heavy-Metal Deposition. Appl. Environ. Microbiol. **70**:4756-4765.
21. **Feris**, K. P., P. W. Ramsey, C. F. Frazar, M. C. Rillig, J. E. Gannon, and W. E. Holben. 2004. Seasonal dynamics of shallow hyporheic zone microbial community structure along a heavy metal contamination gradient. Appl. Environ. Microbiol. **70**:2323-2331.
22. **Feris**, K. P., P. W. Ramsey, C. Frazar, M. Rillig, J. N. Moore, J. E. Gannon, and W. E. Holben. 2004. Seasonal Dynamics of Shallow-Hyporheic-Zone Microbial Community Structure along a Heavy-Metal Contamination Gradient. Applied and Environmental Microbiology **70**:2323-2331.
23. **Feris**, K. P., K. Hristova, B. Gebreyesus, D. Mackay, and K. M. Scow. 2004. A Shallow BTEX and MTBE Contaminated Aquifer Supports a Diverse Microbial Community. Microbial Ecology **48**:589-600.
24. **Feris**, K. P., P. W. Ramsey, C. F. Frazar, M. C. Rillig, J. E. Gannon, and W. E. Holben. 2003. Structure and seasonal dynamics of hyporheic zone microbial communities in free-stone rivers of the western United States. Microb Ecol **46**:200-215.

25. **Feris**, K., P. Ramsey, C. Frazar, J. N. Moore, J. E. Gannon, and W. E. Holben. 2003. Differences in hyporheic-zone microbial community structure along a heavy-metal contamination gradient. Appl. Environ. Microbiol. **69**:5563-5573.

Papers in review, revision, and preparation:

1. **Feris, K.**; Barnes, J. M.; Rae, C.; Sorensen, P.; Kiepert, A.; Moracco, D. Hydrogen production from low pH agricultural wastewater by novel acidotolerant purple non-sulfur bacteria. Submitted to Environ. Sci. and Technol., **in revision** for submission to *Internat. J. of Hydrogen Energy*.

Current Funding:

2010-2013 April 2010, Center for Advanced Energy Studies: "Design and Operational Improvements, and LCA in Anaerobic Digestion of Fermented Dairy Manure Using a 2-Stage process." PI: Erin Searcy (INL), Co-PIs: A Briones (UI), E Coats (UI), K Feris (BSU), D Keiser (UI), T Magnuson (ISU), A McDonald (UI), D Shrestha (UI). Total funding level: $592,000; Feris share of funding: $74,001.

2010-2013 April 2010, INL LDRD: "Specific biological responses to nano metal oxides." PI: James Hendrickson, Co-PIs: Kevin Feris, Robert Fox, Yoshiko Fujita, Gregory Bala, Steven Aust**.** Total funding level: $450,000; Feris share of funding: $123,279.

2008-2011 NSF Epscor RII award. Whole project lead PI: Greg Bohach, Co-PI: Von Walden. Collaborator: Kevin Feris. Total funding level $ 4,075,472, Feris share of funding: $214,159 (6-1-08 to 5-31-11). Funding acquired for new hire in Boise State Biology department: $189,150. Project title: Idaho EPSCoR RII: Water Resources in a Changing Climate.

2008-2011 Center for Advanced Energy Studies. Boise State PI: Kevin Feris, Co-PIs: Greg Bala (INL), Tim Magnusen (ISU), John Van Gerpen (UI). Total funding level $450,000 Feris share of funding: $81,000 (10-1-08 to 9-30-11). Project title: Development of Lignocellulosic Ethanol Production Potential in Idaho.

2008-2011 NSF MRI: PI: Denise Winget, Co-PIs: Sara Heggland, Nixon Jamee, Kevin Feris, Alex Punnoose. Total funding level: $503,775 (08-08-08 to 7-31-11), Project title: MRI: Acquisition of a FACS (Fluorescent Activated Cell Sorter) to Support Collaborative Research and Education in Biomolecular sciences and nanomaterials applications (DBI Proposal # 0821233).

Grants Pending:

June 2011, NSF Hydrologic Sciences: Title: "Collaborative Research: Novel interdisciplinary flume experiments to investigate the role of the hyporheic zone in

greenhouse gas generation. PI: Kevin Feris, Co-PI: Shawn Benner. Funding requested: $499,882, pending.

Feb 2011, NSF Environmental Engineering: Title: "A New Approach to Subsurface Characterization of Contaminated Waste Sites: MEGA-Broadband Electromagnetic Geophysics and Application to Monitoring DNAPL Biodegradation." PI: John Bradford, Co-PIs: Kevin Feris, Jodi Mead. Funding requested: $358,488. Pending.

Sept 2010 NSF Coupled Human and Natural Systems: Title: "CNH-Ex: Exploring the Biological and Socioeconomic Potential for Soil Carbon Sequestration in Semiarid Rangelands." PI: Marie-Anne DeGraaff, Co-PI: Kevin Feris, Scott Lowe, Kelly Coburn, Elizabeth Aldrich. Funding requested: $247,577. Pending.

Recent completed funding:

2007-2010	NSF Division of Ecological Biology: Collaborative Research Grant Project title: "Chronic Ecosystem Stress Project". PI: Kevin Feris. Funding Level: $128,759. (9-1-07 to 8-31-09). PIs for University of Montana portion of this collaborative project: Philip Ramsey, James Gannon
2009-2010	NSF REU Supplemental Funding: PI: Kevin Feris. Total funding level $7,000 (June 1, 2009 to May 31, 2010), Project title: Year 2 REU Supplemental support for Collaborative Research: Chronic Stress in Ecosystems Project (DEB Proposal # 0717449)
2007-2010	National Science Foundation: MRI panel: PI: Alex Punnoose, Co-PI's: Tomoko Fujiwara, Kevin Feris, Jerry Harris, Darryl Butt. Total funding level: $584,000 (9-1-07 to 8-31-10). Proposal title: MRI: Acquisition of an XPS system for Interdisciplinary Research and Education.
2008-2009	Inland Northwest Research Alliance: INRA Subsurface Biotechnology and Bioremediation Research Initiative. PI: Kevin Feris. Total funding level: $15,665 (3-1-08 to 3-31-09). Proposal title: INRA supplemental funding for Collaborative Research: Chronic Stress in Ecosystems Project.
2008	Center for Advanced Energy Studies Collaborative Research Grant. PIs: Kevin Feris (BSU) and Joni Barnes (INL). Proposal title: "Consolidated Bioprocessing of Agricultural Wastewater Treatment and Bioenergy Production. Funding level: $70,000 (4-27-07 to 8-31-08).
2006	INRA SSRI/SSGP Core Sequence Development and Instruction Summer 2006 and Academic Year 2006-07. PI: Kevin Feris. Funding level: $14,553. Proposal Title: Feris Proposal for INRA SSRI/SSGP Core Sequence Development and Instruction Summer 2006 and Academic Year 2006-07.
2006	Center for Advanced Energy Studies Mini Grant. PIs: Kevin Feris (BSU) and Joni Barnes (INL). Funding level: $26,000 (7-17-06 to 9-30-06). Proposal title: Development of a multi-species *Rhodopseudomonad* H_2 producing photosynthetic anaerobic microbial system.

2006 Boise State Faculty Research Grant. PI: Kevin Feris. Funding Level: $5000 (7-1-06 to 6-30-07). Proposal title: Impacts of Ethanol on Anaerobic Production of Tert-Butyl Alcohol (TBA) from Methyl Tertiary Butyl Ether (MTBE) in Groundwater.

2006 University of California Water Resources Center Research Grant: "Does the release of ethanol amended gasoline into anaerobic freshwater aquifers accelerate the biological transformation of methyl-tert-butyl ether (MTBE) to tert-butyl alcohol (TBA)?" $60,000 (7-1-05 to 6-30-07).

2005 NSF EPSCoR Equipment funds, 9-05 to 5-06. Funding level: $21,500. PI(s): Kevin Feris, Greg Hampikian. An Applied Biosystems 310 Prism Genetic Analyzer is Necessary Research Infrastructure for the Department of Biology.

2005 NSF EPSCoR Faculty Start Up Augmentation Program. $10,350 (9-31-05 to 5-31-06)

Student Training/Advising:
Graduate Students:

- *Patrick Sorensen graduated Spring 2011*. Patrick joined the lab in the Spring of 2009. Project: Assessing the responses of terrestrial microbial communities global change induced alterations in the hydrologic properties of a semi-arid ecosystem.
- *Daniel Stanaway*. Daniel joined the lab in the Spring of 2009. Project: Determining the effects of chronic heavy metal stress on whole system metabolism in the Clark Fork River. Projected graduation date: Fall 2011.
- *Brian Deis*. Use of whole cell encapsulation strategies for the development of a novel consolidated bioreactor for cellulosic ethanol production from regional lignocellulosic feedstocks. Project: Projected graduation date: Summer 2011.
- *Maxine Prior*. Development of third generation biofuels from anerobic digester effluent. Maxine is a MS student in the Agricultural and Biological Engineering program at the University of Idaho. I am her direct research advisor and she is performing her thesis research in my lab at Boise State.
- *Pamela Hess*. Pam joined my lab and the Biology graduate program during Fall 2006 with a B.S. in Geological Sciences. Pam has made significant research progress and is currently in the analysis/writing stage of her project. Projected graduation date: Fall 2009.

In addition, am currently or recently completed my duties a thesis committee member for the following Biology and Hydrology graduate students:

- Janet Layne (Biology)
- Matt Weaver (Hydrology)
- Cory Hanley (Biology, graduated Summer 2009)
- Jason Besecker (Biology, graduated Summer 2008)

Undergraduate students: Since my arrival at Boise State University in 2005 I have trained/advised a number of undergraduate researchers in my laboratory. Here I provide a list of these students and a short description of what they are currently doing.

- *Mariona Ribelles.* Mariona joined the lab during Fall 2005 as a paid undergraduate research assistant and has continued in that capacity since then. Currently: Mariona graduated Spring 2008 and has moved on to a Ph.D. program at the Universidad Barcelona.
- *Jason Bell.* Jason joined lab during December 2006 as a paid undergraduate research assistant and continued in the lab through the Summer of 2007. Project: Metal-oxide nanoparticles. After completing his B.S. in Biology Jason was admitted to the M.S. in Clinical Lab Science at Idaho State University. Currently: Jason graduated from this program in 2008 and is currently employed as a Clinical Lab Manager at the Walter Knox hospital in Emmett, ID.
- *Patrick Sorenson.* Patrick joined the lab in Summer 2007 and has worked on the photoheterotrophic H_2 production project. Currently: Patrick graduated in Spring 2008 and has returned to the lab as a MS student during the spring 2009 to study the effect of global climate change on plant-microbe interactions affected by changes in hydrologic regimes.
- *Araya Kiepert:* Araya joined the lab during the Spring 2008 to work on the photoheterotrophic H_2 production project. She graduated in Spring 2008 and stayed with the lab through the Summer 2008. Currently: Araya is currently employed in the local biotech industry and pursuing a number of graduate/professional school options.
- *Wee Wong.* Wee joined the lab during Summer 2006 as an INBRE research fellow. He continued his research in the lab during Fall 2007 for undergraduate research credit. Project: Nanobiotechnology: effect of metal oxide nanoparticles on riverine microbial communities. Currently: Wee is working in the biotech industry in Portland, OR and pursuing admission to the MS program at Portland State University.
- *Steve Lalor:* Steve joined the lab during the spring 2008 initially as a student assistant for Graduate student Pam Hess. He has blossomed from a typical lab newbie to a well trained and capable lab technician. If I am able to continue to support him for his time at Boise State I suspect that he will be motivated to continue his work in science and will move on to graduate school. Currently: Steve is still employed as an undergraduate research technician in my lab exploring the role of lateral gene transfer in maintaining community structure and function under chronic metal stress.
- *Dana Morraco.* Dana joined the lab in January 2007 to work on the photoheterotrophic H_2 production project. She remained with the lab through the fall semester of 2007. Currently: Dana is the Laboratory Coordinator and an Adjunct Instructor of Biology at Ripon College. Dana also owns and runs an organic farm.
- *Darla Morris.* Darla volunteered in the lab during the summer of 2008. She worked on our nanobio projects. Currently: Darla is completing her undergraduate degree and pursuing admission to medical school.
- *Dollie Thompson*. Dollie joined the lab in the spring of 2009 to work on our global change project. Currently: Dollie has a research internship for the summer at the Veterans Administration and plans on returning to the lab this fall.
- *Caitlin Otto*. Caitlin is being co-advised by Dr. Juliette Tinker and myself. She has been working on our nanobiotechnology project since the Summer of 2008. Currently: Caitlin is completing her internship this summer and will be attending graduate school this fall at Arizona State University.

- *Herbert Huttanus*. Bert joined the lab in the summer of 2009 to work on our global change project.

Teaching Experience:

- Biology 497/597, Microbial Ecology 3 credits. Students acquire a fundamental knowledge of microbial ecology by comparing and contrasting ecological interactions in microbial communities to those observed in macrobial communities.
- Biology 598/498 Special Topics: Central Metabolic Theory of Ecology and it's application in Microbial Ecology. Graduate seminar.
- Biology 415/415G Applied and Environmental Microbiology, 4 credits. An examination of the unique aspects of microbial metabolism and their utility in applied and environmental settings. Strong emphasis is placed on energetics of metabolism, community interactions, ecosystem services/properties and applications in industrial settings.
- Subsurface Microbiology Block Inland Northwest Research Alliance Subsurface Science Graduate Program Core Course. An examination of the communities, processes, metabolisms, and mechanisms of contaminant transformation in the subsurface. Emphasis on the physical, chemical, and hydrological controls on community structure and function and process rates.
- Biology 303: Bacteriology. BIOL 303 GENERAL BACTERIOLOGY (2-6-4)(F). An examination of concepts, problems, and techniques in bacterial and archael biology. Included are discussions of structure, metabolism, control, genetics, taxonomy, pathogenicity, ecology, and evolution. Laboratory topics include growth and physiology, microbial genetics, bacteriophages, and biotechnology.PREREQ: BIOL 301.
- Biology 598/498 Special Topics: Microbial Ecology of Fluvial Ecosystems. Graduate seminar discussing current microbial ecology literature with a focus on flowing water systems.
- Attended a training session on constructing grading rubrics for courses. *"Constructing Grading Rubrics for Writing Assignments While Making Your Life Easier at the Same Time."* This hands-on workshop presented the practical, applied use of grading rubrics and the advantages of using them.
- Biology 191: General Biology. Introduction to basic biological concepts including basic chemistry, hydrogen bonding, biological macromolecules, theremodynamics, enzymes, biological membranes, prokaryotic vs. eukaryotic cell anatomy, mitosis, meiosis, photosynthesis, respiration, evolution, community and ecosystem ecology, cancer biology, and Mendelian and Molecular genetics.
- B497 Research in the Biological Sciences. Guest Lecture in undergrad seminar: Presentation on Microbial ecology and bioremediation. August 31, 2005.
- Instructor: Soil Science 290, Macrobial Ecology vs. Microbial Ecology: Similarities and Differences in Ecological Patterns at Different Scales, University of California, Davis
- Invited lecture: Soil Science 290 Advanced methods in microbial ecology research, Title of lecture "Non-metric dimensional scaling analysis of DGGE and ITS patterns: Application of advanced statistical techniques to the analysis of microbial community structure."

- Guest Lecture: General Microbiology 3/2003, University of Montana
- Guest Lecture: Microbial Physiology 9/2002, University of Montana
- Co- Instructor: Microbial Ecology I. University of Montana
- Guest Lecture: Microbial Physiology 10/2001, University of Montana
- Guest Lecture: Fungal Biology 9/2001, University of Montana
- Developed laboratory course for Trends in Microbial Ecology, University of Montana
- Trained undergraduate students in molecular biology techniques for independent study project
- Guest Lecture: General Microbiology 10/98, University of Montana
- Laboratory instructor: University of Montana; Courses Taught: General Microbiology
- Laboratory instructor: University of Alaska Anchorage
- Courses Taught: General biology for majors, General biology for non-majors, Introductory Microbiology for the Health Sciences, and General Microbiology.

Presentations:

Dec 2010 Direct Quantification of Microbial Community Respiration along a Contamination Gradient using a novel Hydrologic "Smart" Tracer Daniel Stanaway[1], Roy Haggerty[2], Shawn Benner[1], Alejandro Flores[1], Kevin Feris. American Geophysical Union Fall Meeting. December 13th-17th, 2010. San Francisco, CA.

Dec 2010 Effect of Change in Precipitation on Soil Microbial Community Structure and Function in Semi-Arid Ecosystems. Patrick Sorensen, Matt Germino, and Kevin Feris. American Geophysical Union Fall Meeting. December 13th-17th, 2010. San Francisco, CA.

Sept. 2010 Sorensen P., Thompson D., Huttanus B., Lalor, S., Ingram L.,, Germino M., Feris K. Experimental Manipulation of Soil Moisture Regime Impacts Soil Microbial Community Abundance, Diversity, and Function in a Semi-Arid Sagebrush Steppe. NSF-EPSCoR Idaho Annual Meeting, Boise, ID.

August 2010 Sorensen P., Thompson D., Huttanus B., Lalor, S., Ingram L.,, Germino M., Feris K. Experimental Manipulation of Soil Moisture Regime Impacts Soil Microbial Community Abundance, Diversity, and Function in a Semi-Arid Sagebrush Steppe. International Society for Microbial Ecology. Seattle, WA.

April 2010 Sorensen P., Reinhardt K., Ingram L., Thompson D., Huttanus B., Germino M., Feris K. Experimental Manipulation of Precipitation Structures Microbial Communities in the Sagebrush Steppe. NSF-EPSCoR Annual Tri-State Consortium Meeting. Incline Village, NV.

October 2009 Sorensen P., Janzen B., Reinhardt K., Ingram L., Bachman S., Thompson D., Huttanus B., Germino M., Feris K. (October 2009) Understanding soil-atmosphere carbon exchange through soil microbial and plant community dynamics; opportunities for predicting ecosystem response to global climate change. NSF-EPSCoR Annual National Meeting, Washington DC.

August 2009 Sorensen P., Thompson D., Huttanus B., Ingram L.,, Germino M., Feris K. (August 2009) Experimental manipulation of precipitation regime and

vegetation type alter microbial community structure and function at the Protective Cap Barrier Experiment. NSF-EPSCoR Idaho Annual Meeting, Moscow, ID.

May 2009 "Sequence Analysis of Putative ATPas Divalent Metal Cation efflux pumps from a suite of novel metal tolerant isolates recovered from the Clark Fork River, MT" Kevin P. Feris, Steve Lalor, Sean M. Gibbons, James E. Gannon, and Philip Ramsey. American Society for Microbiology, General Meeting. May 17th-21st, 2009. Philadelphia, PA.

August 2008 "Ecosystem processes and microbial community structure along a heavy metal contamination gradient in river sediment" Philip Ramsey, Sean Gibbons, **Kevin Feris**, and James Gannon 12th International Symposium on Microbial Ecology - August 17-22, 2008, Cairns, Australia.

August 2008 "Effects of Long-Term Heavy Metal Stress on Hyporheic Microbial Community Structure and Ecosystem Function: How the Cost of Metal Tolerance Shapes Community Composition". **Kevin P. Feris**, Mariona Nadal Ribelles, Philip Ramsey, and James Gannon. 12th International Symposium on Microbial Ecology - August 17-22, 2008, Cairns, Australia.

April 2008 "Effects of long-term heavy metal stress on hyporheic microbial community structure of the Clark Fork River, MT" Mariona Nadal-Ribelles and **Kevin Feris**, Boise State University, Department of Biology Boise, ID 83725. Undergraduate Research Symposium, April 14th, 2008, Boise, ID.

June 2008 "Riparian Ecosystem Consequences -a microbial perspective. or predicting and quantifying natural resource damage in chronically stressed ecosystems" J. Gannon, P.R. Ramsey, **K. Feris**, J. Moore, W. Woessner and M. Rillig Students: Chris Frazer, Bruce Wielinga, O.S. Moynahan. NIEHS sponsored international symposium on Mine-tailing. June 4-6 University of Arizona

June 2007 "Antimicrobial Effects and Mechanisms of Toxicity of Metal Oxide Nanoparticles". Kevin Feris, Jason Bell, Madhu Kongara, Isaac Coombs, Hua Wang, Cory Hanley, Alex Punnoose, Denise Wingett. AAAS Regional Meeting Boise ID, June 17th-21st, 2007.

June 2007 "Assessing Microbial Response to Nutrient Loading in Natural Stream Systems in the Dry Creek Experimental Watershed, Idaho". Hess, Pam; Nadal, Mariona; Feris, Kevin. AAAS Regional Meeting Boise ID, June 17th-21st, 2007.

June 2007 "Development of a *Rhodopseudomonad* H_2 Producing Microbial System Driven by Agricultural Wastewater" Kevin Feris, Dana Moracco, Joni Barnes, Cathy Rae. AAAS Regional Meeting Boise ID, June 17th-21st, 2007.

May 2007 **"**Selective toxicity of zinc oxide nanoparticles to gram-positive and gram-negative bacterial systems." K. Feris, K. M. Reddy, Jason Bell, Denise Wingett, and Alex Punnoose. ASM General Meeting, May 21-25th, 2007 Toronto CA.

May 2007 "Evaluation of potential toxicity issues and nanomedicine based applications of ZnO nanoparticles". D.G. Wingett, **K. Feris**, C. Hanley, K. Reddy, H. Wang, and A. Punnoose. Boise State University, Departments of Biology and Physics, Boise, ID 83725. Keystone Symposium, in Biomedicine.

March 2007 "Linking Impacts of Ethanol on Subsurface Microbial Ecology and Anaerobic Transformations of BTEX". Kevin Feris, *Boise State University, Boise, ID.* The 17th Annual AEHS Meeting & West Coast Conference on Soils, Sediments and Water March 19th - 22nd, 2007 Marriott Mission Valley, San Diego, California

August 2006 Wee Seng Wong and **Kevin Feris**. "Detection and Characterization of the Microorganisms in a PCE Contaminated Groundwater Plume via Molecular Analyses." 5th Annual INBRE research conference. North Idaho College in Coeur d'Alene, Idaho (August 6 - 8).

October 2005 **Kevin P. Feris**, Doug Mackay, Murray Einarson, Nick de Sieyes, Lisa Jacobsen, Mark Knoske, Larry Justice, Krassimira Hristova, and Kate M. Scow. "Impacts of Ethanol and BTX on Microbial Populations, Processes and Community Composition in a Sulfate-Reducing Contaminated Aquifer." Geological Society of America Annual Meeting, Salt Lake City, UT. October 16th-20th, 2005. Invited lecture in session on "Quantifying Controls on Microbial Reaction Rates in Subsurface Environments".

August 2005 **Kevin P. Feris**, Doug Mackay, Murray Einarson, Nick de Sieyes, Lisa Jacobsen, Mark Knoske, Larry Justice, Krassimira Hristova, and Kate M. Scow. "Impact of a Controlled Ethanol Release on In Situ Biodegradation of BTX and MTBE and on Population Densities and Community Composition of Archaea and Bacteria". The Joint International Symposia for Subsurface Microbiology (ISSM 2005) and Environmental Biogeochemistry (ISEB XVII), Jackson Hole, WY, August 15-19, 2005.

August 2005 Nick de Sieyes, Doug Mackay, Murray Einarson, MarkNoske, Larry Justice, Lisa Jacobson, **Kevin Feris**, and Kate Scow. "Degradation rates of benzene, toluene and oxylene in a normally sulfate-reducing aquifer: Impact of ethanol in a controlled field experiment". NGWA August 18, 2005, Costa Mesa, CA.

June 2005 **Kevin P. Feris**, Doug Mackay, Murray Einarson, Nick de Sieyes, Lisa Jacobsen, Mark Knoske, Larry Justice, Krassimira Hristova, and Kate M. Scow. "Increased Archaeal Cell Densities and Methane Production in Response to a Controlled Field Release of Ethanol and Benzene, Toluene, and Xylene at Vandenberg Air Force Base, CA: Implications for Using ETOH as a Fuel Oxygenate." General Meeting American Society for Microbiology, Atlanta, Georgia, June 6th – 9th, 2005.

May 2005 **Kevin P. Feris**, Doug Mackay, Murray Einarson, Nick de Sieyes, Lisa Jacobsen, Mark Noske, Larry Justice, Krassimira R. Hristova, and Kate M. Scow. "Presence and Abundance of Bacteria and Archaea During a Controlled Field Release of Ethanol and Benzene, Toluene, and Xylene at

Vandenberg Air Force Base, California. **2005 NGWA Conference on MTBE and Perchlorate: Assessment, Remediation, and Public Policy**. May 26-27, 2005, San Francisco, CA.

May 2005 Douglas Mackay, Murray Einarson, Nick de Sieyes, Mark Noske, Larry Justice, Lisa Jacobson, Isaac Wood, **Kevin Feris**, and Kate Scow. "In Situ Production and Degradation of TBA in a MTBE-Contaminated, Normally Sulfate-Reducing Aquifer Impacted by an Experimental Ethanol Release". **2005 NGWA Conference on MTBE and Perchlorate: Assessment, Remediation, and Public Policy**. May 26-27, 2005, San Francisco, CA.

Sept. 2004 Scow, K. M.; Hristova, K.; **Feris, K. P**. "Dynamics and Composition of Microbial Communities in Contaminated Groundwater". **3rd annual Microbial Observatories Principal Investigators Workshop**. Bozeman MT, September 12-14,2004.

August 2004 **Feris, K. P.**; Wood, I. A.; Hristova, K.; Gebreyesus, B.; Mackay, D.; Scow, K. M.; "Rapid structural changes in, and reduced BTEX degradation rates by, aquifer microbial communities in response to simultaneous exposure to ETOH and BTEX: Implications for using ETOH as a fuel oxygenate." **10th Annual Symposium for the International Society for Microbial Ecology**. Cancun, Mexico, August 22 – 27, 2004.

Sept 2003 Hristova, K. R.; Gebreyesus, B.; Scow, K. M.; **Feris, K. P**.; "Linking Microbial Community Structure and Function in Contaminated Aquifers". **Second Microbial Observatories Principal Investigators' Workshop Building a National Network**, Washington DC September 14-16, 2003.

July 2003 **Feris, K.P.**; Ramsey, P. W.; Rillig, M.; Moore, J. N.; Gannon, J. E.; Holben, W. E. "Determining rates of change in hyporheic microbial communities and evaluating group-level resiliency differences in response to fluvial heavy metal deposition" **Gordon Research conference: Applied and Environmental Microbiology**, New London, CT. July 27-31, 2003.

February 2003 **Feris, K.P**. and Holben, W.E. The Structure of Hyporheic Microbial Communities: a New Tool For Monitoring Heavy Metal Contamination in Lotic Environments. **Molecular Biology for the Environment an EC-US hands-on Course in Environmental Biotechnology.** Madrid, Spain. February 1 – 16th, 2003.

May 2002 **Feris, K.P**. and Holben, W.E., A Molecular Analysis of Hyporheic Microbial Communities in Three Free-Stone Rivers of Western Montana. **102nd Annual Congress for the American Society for Microbiology**. Salt Lake City, UT, USA. May 19-23, 2002.

August 2001 **Feris, K.P.;** Ramsey, P. W.; Harris, J.; Moore, J.N.; Gannon, J. E.; and Holben, W. E., Molecular Characterization of Microbial Communities inhabiting metal impacted and pristine river sediments. **9th Annual Symposium for the International Society for Microbial Ecology**. Amsterdam, The Netherlands, August 26 – 30, 2001.

May 2001 **Feris, K.P**. and Holben, W. E., The effects of metal contamination on microbial communities in the Clark Fork River. Presented at the first **US-**

Egypt Workshop on Microbial Ecology, The National Research Center, Cario, Egypt. May 6 – 10, 2001.

April 2001 **Feris, K.P**. and Ramsey, P.W., The Effects of heavy metal contamination on the hyporheic microbial communities in the Clark Fork River. **Departmental Seminar, Division of Biological Sciences, The University of Montana**

May 1999 **Feris, K. P.,** and W. E. Holben. 1999. Microbial Community Similarities Between Two Geographically Distinct Microbially Degraded Oil Fields. Presented at the **99th General Meeting American Society for Microbiology**, Chicago, IL, May 30 - June 3, 1999.

April 1999 **Feris, K**. and Holben, W. "Common Distributions of Sulfur Reducing Microbial Communities in a Deep Sub-surface Hydrocarbon Saturated Environment; A Potential Hydrocarbon Degrading Consortium" **Montana Academy of Sciences regional meeting, Butte, MT**.

Journal Reviewer:

2007-current Science of the Total Environment
2007-current Hydrobiologia
2007-current Frontiers in Ecology and the Environment
2006-current Soil Science Society of America Journal
2006-current Water Research
2006-current Chemosphere
2006-current Geomicrobiology
2003 – current Applied and Environmental Microbiology
2003 – current Environmental Science and Technology
2003 – current Microbial Ecology
2003 – current Environmental Microbiology
2003 – current Biodegradation
2004 – current FEMS Microbial Ecology
2005 – current Journal of Environmental Management
2005 – current Journal of Contaminant Hydrology

Professional Memberships:

2010 – current American Geophysical Union
2006 - current International Society for Hydrogen Energy
2005 – current Geological Society of America
2005 – current National Groundwater Association
2003 - current Member of the International Society for Microbial Ecology
2003 - current Member of the American Society for Microbiology
2001 - 2003 Student member of the International Society for Microbial Ecology
1998 - 2003 Student member of the American Society for Microbiology
1998 - Member of the Montana Academy of Sciences
1998 - 2000 Biochemistry/Microbiology representative for the Graduate Student Committee, University of Montana
1993-95 Member of National Golden Key Honor Society

Community and Campus involvement:

2010	Chair: Ecosystem Ecologist Search Committee for Department of Biological Sciences, Boise State University
2006 -	Science Fair Judge: Riverstone School. Riverstone Invention Convention.
2007-2008	Boise State University Focus the Nation 2008 steering committee member.
2007-2008	Director of Research Symposium for Focus the Nation event at Boise State University Jan 30-31st, 2008.
2007	NSF Panel member: NSF Bio and Hydrogen Panel Directorate for Engineering, Division of Chem., Bioeng., Environ., Transport Syst. May 29-May 31st, 2007.
2007	Proposal Reviewer for NSF Ecological Biology Program (proposal submission date 7-9-2007).
2007	Technical Session Chair 2007 Environmental Sensing Symposium. October 25-26, 2007 Boise State University, Boise, ID.
2007	Biological sensors Session Chair, 2007 Environmental Sensing Symposium. October 25-26, 2007 Boise State University, Boise, ID.
2007	Science Fair Judge: Riverstone School. Riverstone Invention Convention. February 14, 2007.
2006-2009	Board member Northwest Science Association.
2006	Member of College of Arts and Sciences Tenure and Review Committee
2006 - current	Member of BSU Biology Graduate Studies Committee
2005-2006	Member of BSU Biology Department Research committee
2006	Member of search committee for the Systematist search.
2005-	Member of Graduate student research grant review committee
2005 -	Member of Research Committee, Department of Biology, Boise State University
2002	Volunteer: Global Justice Action Summit
2001 – 2002	Biochemistry/Molecular-Microbiology Graduate student association representative to the campus wide Graduate Student Association, University of Montana,.
2000 -2001	Member of the Graduate Student Complaint Committee
1999	Science Fair Judge, The University of Montana Science Fair, April 12, 1999.

Honors and Awards:

2008	Idaho Business Review 40 under 40.
1998 - 99	Super Teaching Assistantship, University of Montana
1994	University of Alaska Anchorage Academic Tuition Waiver

Daniel Fologea

POSITIONS AND EMPLOYMENTS

2011 - **BOISE STATE UNIVERSITY** Boise, ID, USA
- Assistant Professor, Department of Physics

2004-2011 **UNIVERSITY OF ARKANSAS** Fayetteville, AR, USA
- 2010 - 2011 Research Assistant Professor, Department of Biological Sciences
- 2006 - 2010 Research Associate, Department of Biological Sciences, Supervisors: Prof. Greg Salamo, and Prof. Ralph Henry
- 2004 - 2006 Research Associate, Physics Department

1993-2003 **NATIONAL INSTITUTE OF PHYSICS AND NUCLEAR ENGINEERING** Bucharest, Romania
- 2000 - 2003 Department Head, Life and Environmental Physics
- 1993 - 2000 Researcher, National Institute of Physics and Nuclear Engineering

2001-2004 **UNIVERSITY OF BUCHAREST** Bucharest, Romania
- 2001 - 2004 Associate Professor (Biochemistry, Genetics, Radiobiology) Faculty of Physics - Biophysics Department
- 2003 - 2004 Senior Researcher, Faculty of Biology, Department of Genetics

EDUCATION

2002 **UNIVERSITY OF BUCHAREST** Bucharest, Romania
- PhD Physics/Biophysics, thesis title: Electroporation: Mechanisms and Applications

1999 **UNIVERSITY JOSEPH FOURIER** Grenoble, France
- 3rd cycle, Biolectrochemistry

1988-1993 **UNIVERSITY OF BUCHAREST** Bucharest, Romania
- Msc/Bsc Physics/Biophysics

RESEARCH SKILLS AND INTERESTS

- **MAJOR RESEARCH SKILLS**
  -planar bilayer lipid membranes formation and characterization
  -protein reconstitution in artificial bilayer lipid membranes
  -electrical and optical characterization of transmembrane transporter insertion and functioning
  -liposome preparation, loading, functionalization, proteoliposomes, liposomes for drug delivery
  -bioconjugation
- **BIOPHYSICAL TECHNIQUES MASTERED**: Electrophysiology, Patch Clamp, Dynamic Light Scattering, Zeta Potential, Spectrophotometry, Fluorescence, Microscopy (Fluorescence and Optical), Electrophoresis, Macromolecule Translocation through Artificial and Natural Pores
- **GENERAL RESEARCH INTERESTS:** Cell Membrane Biophysics, Pore Forming Proteins, Ion-Channel Electrophysiology, AntiMicrobial Peptides, Gene Transfer by Electroporation, Biosensing, Stochastic Sensing based on Artificial and Natural Nanopores, Drug Delivery using Liposomal Carriers, Biomedical Applications of Nanotechnology , Nanotoxicology

OTHER SKILLS:

- Computer hardware and software: Windows (all platforms), Linux, Office, Data Analysis, very good knowledge of electronics and computer interfacing
- Languages: English, French, Russian, Romanian (native)

SELECTED PUBLICATIONS

J. Uplinger, B. Thomas, R. Rollings, **D. Fologea**, D. McNabb, J. Li, Metallic Ion Binding on DNA Translocation in Nanopores, Biophysical Journal, in press, 2011

B. Ledden, **D. Fologea**, D. Talaga, J. Li, Sensing Single Protein Molecules with Solid-state nanopores. In: Nanopores: Sensing Fundamental Biological Interactions at the Single Molecule Level, S. Iqbal and R. Bashir (Eds.), Springer, 2011

D. Fologea, E. Krueger, R. Al Faori, R. Lee, Y. Mazur, R. Henry, M. Arnold and G. Salamo, Multivalent ions control the transport through lysenin channels, Biophysical Chemistry, 152, 40-45 , 2010

D. Fologea, E. Krueger, R. Lee, M. Naglak, Y. Mazur, R. Henry, G. Salamo., Controlled Gating of Lysenin Pores, Biophysical Chemistry, 146, 25-29, 2010

N. Marty , D. Rajalingam, A. Kight, N. Lewis, **D. Fologea,** T. K.Suresh Kumar, R. Henry, and R. Goforth, The membrane binding motif of Chloroplast signal recognition particle receptor (CPFTSY) regulates GTPASE activity, Journal of Biological Chemistry, 284, 14891-14903, 2009

D. Fologea, E. Brandin, J. Uplinger, D. Branton, J. Li, DNA conformation and base number simultaneously determined in a nanopore, Electrophoresis, 28, 3186-3192 , 2007

D. Fologea, B. Ledden, D. S. McNabb, and J. Li, Electrical Characterization of protein molecules by a solid state nanopore, Applied Physics Letters, 91, 053901, 2007

D. Fologea, M. Gershow, B. Ledden, D. S. McNabb, J. A. Golovchenko, and J. Li, Detecting Single Stranded DNA with a Solid State Nanopore, Nanoletters, 5(10), 1905-1909, 2005

D. Fologea, J. Uplinger, B. Thomas, D. S. McNabb, J. Li, Slowing DNA Translocation in a Solid-State Nanopore, Nanoletters, 5(9), 1734-1737, 2005

S. Cosnier, **D. Fologea,** S. Szunerits, R. S. Marks, Poly(dicarbazole-N- hydroxysuccinimide) film: a new polymer for the reagentless grafting of enzymes and redox mediators , Electrochemistry Communications, 2, 827-831, 2000

S. Cosnier, R. Marks, J. P. Lellouche, K. Perie, **D. Fologea,** S. Szunerits , Electrogenerated poly(chiral dicarbazole) films for the reagentless grafting of enzymes, Electroanalysis, 12, 1107-1112, 2000

G. Cogalniceanu, **D. Fologea,** A. Brezeanu, M. Radu – "High voltage short duration pulses promote adventive shoot differentiation from intact tobacco seedlings, Electro and Magnetobiology, 19(2), 177-187, 2000

D. Fologea, A. Brezeanu, M. Radu, P. Cornea, I. Vatafu - Gene transfer by electroporation into tobacco intact petiole tissue, Electro - Magnetobiol., 18, 1, 1-6, 1999

D. Fologea, T. Vassu Dimov, I. Stoica, O. Csutak, M. Radu, Increase of *S. Cerevisiae* plating efficiency after treatment with bipolar electric pulses, Bioel. and Bioen., 46, 285-287, 1998

G. Cogalniceanu, M. Radu, **D. Fologea,** N. Moisoi, A. Brezeanu, Stimulation of tobacco shoot regeneration by alternating weak electric field, Bioelectrochemistry and Bioenergetics 44, 257-260, 1998

Ileana Petcu, **D. Fologea,** M. Radu, Kinetic of electroinduced pores as a probe of membrane modification produced by ionizing radiation, Bioelectrochemistry and Bioenergetics, 42, 179-185, 1997

2010 - Editorial Board Member, Journal of Membrane Science and Technology

PATENTS

D. Fologea, G. Salamo, R. Henry, M. Borrelli, P. Corry, Method of controlled drug release from a liposome carrier, Pub #: WO/2010/114901.

Curriculum Vitae
Jennifer S. Forbey (previously Jennifer S. Sorensen)

PROFESSIONAL PREPARATION

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Mesa State College, Grand Junction, CO	B.S.	1997	Biology
University of Utah, Salt Lake City, UT	Ph.D.	2003	Biology
Australian National Univ, Univ. Tasmania,	NSF, PostDoc	2003-04	Biology
Pharmacokinetics and Toxicokinetics for the Industrial Scientist Training		2006	Pharmacokinetics
Pharmacokinetics for Pharmaceutical Scientists Course		2007	Pharmacokinetics

APPOINTMENTS

2008-present	Assistant Professor, Dept of Biological Sciences, Boise State University, Boise, ID
2007-present	Pharmacokinetic Consultant, Rosa Pharmaceuticals, INC
2007	Instructor, Pharmacokinetics and Pharmacodynamics, Dept of Pharmacology and Toxicology, University of Utah, SLC, UT
2007-2008	Research Assistant Professor, Dept Pharmaceutics and Pharmaceutical Chemistry, University of Utah, SLC, UT
2007	Instructor, Global Crises in Natural Resources, Dept of Biology, University of Utah, SLC, UT
2005-2007	Scientist I, Pharmacokinetist, NPS Pharmaceuticals, SLC, UT
2003-2007	National Science Foundation International Research Postdoctoral Fellow (Australia and New Zealand)
2004-2005	Assistant Professor, Oregon State University, Dept of Fisheries and Wildlife, Cascade Campus, Bend, OR
2002-2003	Graduate Research Fellow, University of Utah, SLC, UT
2001-2002	University Teaching Assistantship Fellow, University of Utah, SLC, UT
1999-2001	Dept of Biology Teaching Assistant, University of Utah, SLC, UT

PUBLICATIONS (J.S. Sorensen/Forbey authorship in bold, undergraduate authorship indicated with *)

23. **Forbey, JS**, MD Dearing and WJ Foley. Invited manuscript in review at Oecologia. Vertebrate Herbivores in Terrestrial and Aquatic Systems: A Pharm-Ecological Perspective.
22. **Forbey, JS** and MD Hunter. Invited Chapter *in press* for the British Ecological Society. The herbivore's prescription: A pharm-ecological perspective on host plant use by vertebrate and invertebrate herbivores.
21. **Forbey, J.S.**, A.L. Harvey, M.A. Huffman, F. Provenza, R. Sullivan, D. Tasdemir. 2009. Exploitation of secondary metabolites by animals: A response to homeostatic challenges. Integrative and Comparative Biology. 49(3):314-328.
20. **Forbey, JS** and WJ Foley. 2009 A pharmacological approach to understanding plant-herbivore interactions: an introduction to the Pharm-Ecology Symposium. Integrative and

Comparative Biology. 49(3):267-273.

19. Sotka, E.E., **J.S. Forbey**, M.H. Horn, A.G.B. Poore, D. Raubenheimer and K.E. Whalen. 2009. The emerging role of pharmacology in understanding marine and freshwater consumer-prey interactions. Integrative and Comparative Biology. 49(3):291-313.
18. Shipley, L.A., B. Moore and **J.S. Forbey**. 2009. Revisiting the dietary niche: when is a mammalian herbivore a specialist? Integrative and Comparative Biology. 49(3):274-290.
17. Simpson, S.J., Raubenheimer, D, Charleston, M., Clissold, F., **Working Group**[1]. 2009. Modeling nutritional interactions: from individuals to communities. Trends in Ecology and Evolution. 25(1): 53-60. Online 17 August. doi:10.1016/j.tree.2009.06.012
[1] The Working Group comprised of several contributors, including J.S. Forbey. However, TREE limits the number of authors to five.
16. Dearing, M.D., **J. S. Forbey**, J. D. McLister, L. Santos*. 2008. Ambient temperature influences diet selection and physiology of an herbivorous mammal, *Neotoma albigula*. Physiological Biochemical Zoology. 81(6): 891–897.
15. McLean, S., R.R. Boyle, S. Brandon, N.W. Davies and **J.S. Sorensen**. 2007. Pharmacokinetics of 1,8-ciniole, a dietary toxin, in the brushtail possum (*Trichosurus vulpecula*): significance for feeding. Xenobiotica. 37(9):903-922.
14. **Sorensen, J.S**., K.C. Forbey, R. Tanquay and B. McLeod. 2007. Tissue distribution of cytochrome P450 3A (CYP3A) in brushtail possums (Trichosurus vulpecula) exposed to Eucalyptus terpenes. Comparative Biochemistry and Physiology C. Toxicology and Pharmacology. 145(2):194-201.
13. **Sorensen, J.S**. and M.D. Dearing. 2006. Efflux transporters as a novel herbivore countermechanism to plant chemical defenses. Journal of Chemical Ecology. 32(6):1181-96.
12. **Sorensen, J.S.**, M. Skopec and M.D. Dearing. 2006. Application of pharmacological approaches to plant-mammal interactions. Journal of Chemical Ecology. 32(6):1229-46.
11. Marsh, K.J., I.R. Wallis, S. McLean, **J.S. Sorensen** and W.J. Foley. 2006. Conflicting demands on detoxification pathways influence how common brushtail possums choose their diets. Ecology. 87:2103-2112.
10. **Sorensen, J.S**., J. D. McLister and M.D. Dearing. 2005a. Plant secondary metabolites compromise the energy budgets of specialist and generalist mammalian herbivores. Ecology. 86: 125-139.
9. **Sorensen, J.S**., J.D. McLister and M.D. Dearing. 2005b. Novel plant secondary metabolites impact the performance of a specialist more than a generalist (*Neotoma* spp.). Ecology. 86: 140-154.
8. Dearing, M.D., J.D. McLister and **J.S. Sorensen**. 2005. Woodrat (*Neotoma)* herbivores maintain nitrogen balance on a low nitrogen, high phenolic forage, *Juniperus monosperma*. Journal of Comparative Physiology B: Biochemical, Systematic, and Environmental Physiology. 175(5): 349-355.
7. **Sorensen, J.S**., E. Heward*, and M.D. Dearing. 2005c. Plant secondary metabolites alter the feeding patterns of a mammalian herbivore (*Neotoma lepida*). Oecologia. 146:415-422.
6. McLister, J.D., **J.S. Sorensen** and M.D. Dearing. 2004. The effect of juniper (*Juniperus monosperma*) consumption on the cost of thermoregulation in the woodrats *Neotoma albigula* and *Neotoma stephensi* depends upon acclimation temperature. Physiological and Biochemical Zoology. 77(2): 305-312.
5. **Sorensen, J.S.**, C.A. Turnbull* and M.D. Dearing. 2004. A specialist herbivore (*Neotoma*

stephensi) absorbs fewer plant toxins than a generalist (*Neotoma albigula*). Physiological and Biochemical Zoology. 77(1): 139-148.
4. Lamb, J. G., P. Chaterjie, P. Marick, **J. S. Sorensen**, S. Haley, and M. Denise Dearing. 2004. Liver biotransforming enzymes in woodrats *Neotoma stephensi* (Muridae). Comparative Biochemistry and Physiology C. 138(2): 195-201.
3. **Sorensen, J.S.** and M.D. Dearing. 2004. Physiological limitations of dietary specialization in herbivorous woodrats (Neotoma spp.) *in* Animals and Environments: Proceedings of the Third International Congress of Comparative Physiology and Biochemistry ISC1275. Ed. S. Morris and A. Vosloo. Elsevier. Pp 313-320.
2. **Sorensen, J.S**. and M.D. Dearing. 2003. Elimination of plant toxins: an explanation for dietary specialization in mammalian herbivores. Oecologia. 134: 88-94.
1. Lamb, J.G., **J.S. Sorensen**, and M.D. Dearing. 2001. Comparison of detoxification enzyme mRNAs in woodrats (*Neotoma lepida*) and laboratory rats. Journal of Chemical Ecology. 27(4): 845-857.

FUNDING

Current Support

Award $75,000 1/15/11 - 1/15/13 10% effort
Idaho Office of Species Conservation 2011 Forbey (PI)
Assessing the Dietary Quality of Sagebrush in Sage-Grouse Winter and Breeding Habitats
The overall purpose of this project is to identify the nutritional importance of different sagebrush species in the sage-grouse diet and determine how diet quality influences reproductive success in sage-grouse at various sites in Idaho. The research will meet some of the population and habitat objectives outlined in the Idaho Sage-grouse Conservation Plan and will improve our understanding of sage-grouse distribution and population trends.

Award $5,000 12/22/10 - 8/31/11 5% effort
Idaho EPSCoR REU program 2010-11 Forbey (subaward); Kristina Gehlken undergrad
Developing Tools to Remotely Sense the Quality of Sagebrush in Response to Climate Change
This research will develop spectral biomarkers for dietary attributes in sagebrush. The undergraduate will use NIR models and remote sensing capabilities to develop models that can predict the dietary quality of sagebrush in the field. These models will provide a rapid, predictable tool to define and assess shifts in the nutritional and chemical attributes of plants across landscapes related to changes in climate.

Award ID: LO9AC15385 $13,940 06/01/09 - 06/01/10 10% effort
BLM-CESU Forbey (PI)
Nutritional and chemical quality of winter diets selected by sage-grouse
This research will investigate both nutritional and chemical factors that drive selection of sagebrush for food by sage-grouse during the winter. The ultimate goal is to identify functional habitat use by sage-grouse and will provide land managers with insight based on nutritional ecology of sage-grouse that will compliment existing efforts to conserve and restore quality sagebrush habitat.

Award ID: LO9AC16253 $38,988 02/01/10 - 09/30/11 10% effort
BLM-Challenge Cost Share Forbey (PI)
Nutritional and chemical quality of winter diets selected by pygmy rabbits

The purpose of this project is to gain an understanding of how the chemical and nutritional quality of sagebrush influences the diet selection and potential habitat use of pygmy rabbits in the sagebrush steppe.

PRESENTATIONS, CONFERENCES AND WORKSHOPS

2010	Invited Symposium Speaker: British Ecological Society Annual Symposium 2010: "The integrative role of plant secondary metabolites in ecological systems." University of Sussex, UK, 12 – 14 April, 2010. Invited by Dr. Glenn Iason (Macaulay Institute, Aberdeen, UK). "The herbivore's prescription: A pharmacological perspective on host plant use by herbivores"
2009	Conference Organizer: Society for Integrative and Comparative Physiology Symposium host: "PharmEcology: Integrating Ecological Systems and Pharmacology", Jan 3-7, 2009; http://www.sicb.org/meetings/2009/index.php3. Supported by NSF0827239, JS Forbey, PI
2008	Invited Speaker: Department of Natural Resource Sciences, Washington State University and Department of Fish & Wildlife Resources, University of Idaho, "Behavioral, physiological and biochemical offenses of mammalian herbivores against plant chemical defenses"
2008	Presentation: Pediatric Academic Societies' Annual Meeting in Honolulu, Hawaii, May 3-6, Hawaii Convention Center, "Morphine analgesia and developmental kinetics in 3 to 18 year old children"
2008	Presentation: 5th Annual Pediatric Research Conference, University of Utah, Salt Lake City, UT, "Morphine analgesia and developmental kinetics in 3 to 18 year old children"
2008	Invited Poster: Regional Center for Excellence National Meeting for Biodefense and Emerging Infectious Diseases Research, Chicago, IL "The Translational Critical Path Initiative (TCPI) Catalyzes Discoveries into Products"
2007	Workshop: Working Group 29: Herbivory; ARC/NZ Vegetation Function Network; Workshop at The University of Sydney
2007	Invited Speaker: Department of Biology, Boise State University, "Ecology Meets Pharmacology: Mechanisms and Consequences of Toxin Exposure in Mammalian Herbivores"
2007	Invited Speaker: Annual Rocky Mountain Regional Center for Excellence for Biodefense and Emerging Infectious Diseases Research, Fort Collins, CO. "From Ideas to Products: How the Translational Development Subcommittee, Intellectual Property Subcommittee and Cores Work For You"
2006	Invited Lecture: University of Utah, "Preclinical Research in Drug Discovery and Development", Salt Lake City, UT
2005	Invited Symposium Speaker: International Mammalogical Congress, Symposium for Defensive Strategies Against Plant Secondary Metabolites in Mammals, "Overlapping lessons from human-drug interactions and plant-herbivore interactions", Sapporo, Japan
2005	Invited Speaker: NPS Pharmaceuticals, "Pharmacological foundations in ecology: the complementary nature of human-drug interactions and plant-herbivore interactions", Salt Lake City, UT

2005 Invited Speaker: Department of Biological Science, California State University, "Toxin tolerance in mammalian herbivores: mechanisms, constraints and implications for human benefit", Fullerton, CA

2005 Invited Speaker: Department of Biological Science, University of Montana, "Trade-offs of dietary specialization in a mammalian herbivore", Missoula, MT

2004 Invited Symposium Speaker: Plant-Animal Interactions Gordon Research Conference, "The importance of regulated absorption of plant secondary metabolites by herbivores", Ventura Beach, CA

2004 Invited Speaker: AgResearch Invermay & University of Otago, "The role of regulated absorption of toxins in herbivores and the biocontrol of brushtail possums", Dunedin, New Zealand

2004 Invited Speaker: Third International Conference of Comparative Physiology & Biochemistry in Africa: Animals and Environments, "Mammalian herbivores modify foraging patterns to regulate exposure to plant secondary metabolites", Ithala Game Reserve, KwaZulu-Natal, South Africa

2004 Invited Speaker: James Cook University, School of Tropical Biology, "No free toxic lunch- tradeoffs of dietary specialization in mammalian herbivores", Cairns, Queensland, Australia

SYNERGESTIC ACTIVITIES

2010-present Faculty mentor for undergraduates involved in NSF STEP, NSF EPSCoR, NIH INBRE, NSF LSAMP programs

2010-present Elected as member of Sigma Xi, The Scientific Research Society.

2009 Student mentor program for undergraduates, graduates and postdocs at the Society for Integrative and Comparative Physiology Symposium: "PharmEcology: Integrating Ecological Systems and Pharmacology"

2005-present Ad hoc Reviewer for *Ecology, Oecologia, Journal of Chemical Ecology, Journal of Veterinary Pharmacology and Therapeutics, Biochemical Systematics and Ecology, Zoology*

2008 Volunteer field leader for Small Mammal Trapping during BioBlitz, Boise, ID

COLLABORATORS AND OTHER AFFILIATIONS

Collaborators: J. Bryant (University of Alaska); R. Boyle (University of Tasmania); M.D. Dearing (University of Utah); J. Connelly (Idaho Department of Fish and Game); W.J. Foley (Australian National University); S. Haley (University of Utah); M Horn (California State University, Fullerton); K. Keilland, University of Alaska, Fairbanks; J.G. Lamb (University of Utah); K.J. Marsh (Australian National University); S. McLean (University of Tasmania); B. McLeod (AgResearch Invermay); J.D. McLister (Indiana University South Bend); A. Poore (University of New South Wales); R. Proteau (Oregon State University); J. Rachlow (University of Idaho); D. Raubenheimer (Massey University); L. Shipley (Washington State University); R. Tanquay (Oregon State University); C.A. Turnbull (Westminster College); M. Wisdom (Eastern Oregon USDA Forest Service)

Graduate and Postdoctoral Advisors: Ph.D. Advisor: M.D. Dearing (University of Utah); Postdoc Advisors: W.J. Foley (Australian National University); S. McLean (University of Tasmania); B. McLeod (AgResearch Invermay)

Thesis Advisees (5): Major advisor for Amy Ulappa Jamie Utz, Graham Frye; Thesis Committee Member: John Okeeffe; Robert Miller, Jessie Sherburne, and Katie Oelrich
Postdoctoral Scholars Sponsored: Dr. Xinzhu Pu from China Aug 2010-Oct 2011

Morgan Giddings, Ph.D.

212 Wild Turkey Trail, Chapel Hill, NC 27516

Tel: 919-969-1473 *giddings@unc.edu*

EDUCATION

Post-doctoral training , University of Utah, Salt Lake City, UT **1998-2001**
Department of Human Genetics
Bioinformatics and Proteomics, Prof. Raymond F. Gesteland's laboratory

Post-doctoral training , University of Wisconsin, Madison, WI **1997-1998**
Department of Chemistry
Focus on Bioinformatics, Prof. Lloyd M. Smith's laboratory

Ph.D., University of Wisconsin, Madison, WI **1991-1997**
Department of Chemistry, Advisor Prof. Lloyd M. Smith
Thesis title "Computational Methods in Automated DNA Sequencing"

M.S. University of Wisconsin, Madison, WI **1989-1991**
Department of Computer Science
Focus on artificial intelligence, computer vision, and numerical methods

B.S., University of Utah, SLC, UT **1985-1989**
Physics Department
Cum Laude degree in Physics, with a minor Computer Science

PROFESSIONAL EXPERIENCE

Associate Professor, The University of North Carolina at Chapel Hill, Chapel Hill, NC **2009-present**

*School of Medicine, Department of Microbiology and Immunology and joint appointment in Biomedical Engineering***.** Focus on bioinformatics, proteomics, and genomics. Supervising a diverse research group of 11 people including bench and computational post-docs, graduate students, and staff.

Adjunct Associate Professor, The University of North Carolina at Chapel Hill, Chapel Hill, NC **2009-present**
Department of Computer Science
Appointed *By* vote of comp Sci faculty

Adjunct Assistant Professor, The University of North Carolina at Chapel Hill, Chapel Hill, NC **2007-2009**
Department of Computer Science,
Appointed by unanimous vote of computer science faculty.

Assistant Professor, The University of North Carolina at Chapel Hill, Chapel Hill, NC **2002-2009**
Departments of Microbiology & Immunology and Biomedical Engineering
Focus on bioinformatics, proteomics, and genomics. Supervising a diverse research group of 11 people including bench and computational post-docs, graduate students, and staff.

Research Associate, University of Utah, SLC, UT **1998-2001**
Department of Human Genetics, Gesteland-Atkins Labs
Bioinformatics research in antisense prediction, recoding event analysis, and proteomics. Supervision of three employees and two graduate students.

Director, FFFRactionation Inc, SLC, UT **1997-2001**
The company produced instruments for particle separations based on Field Flow Fractionation technologies. It was sold in 2001.

Co-Founder and President, R3 Inc., Poynette, Wisconsin **1993-1995**
The company was formed to explore the feasibility of manufacturing kayaks and related products from recycled plastics. I performed strategic planning, fund-raising, managing personnel, and performing research on manufacturing goods using post-consumer plastics. Poynette, WI.

Consultant, Third Wave Technologies, Madison, Wisconsin **1993-1997**
The company produces various RNA-based diagnostic kits. I developed software to model RNA folding and structure.

Independent Research, SLC, UT **1990-1992**
Work with Dr. Nigel Bamford, developing software to analyze EEG traces using fractal calculations to predict seizure foci in epileptic patiens. Presented and won first place in the resident research competition at the annual Tri-State Pediatric Neurology Society Meeting, 1996.

Programmer, University of Utah **1987-1990**
Department of Chemistry, under supervision of Dr. J. C. Giddings
Developing deconvolution methods for particle separation in field flow fractionation.

Tutor, University of Utah, SLC, UT **1986-1987**
University of Utah Tutoring Center.
Tutoring fellow students in physics, math and computer science

OTHER EXPERIENCE AND PROFESSIONAL MEMBERSHIPS

Member, US HUPO **2006-present**

Member, AAAS **1999-present**

International Society for Computational Biology **1999 - 2007**

Wrote a funded DOE proposal as a graduate student: **1996**
Data analysis system for DNA sequencing (PI: L. Smith)

Co-author of funded proposal to the State of Wisconsin: **1994**
Recycling feasibility grant for kayak manufacturing.

Independent research analyzing EEG traces with fractal dimension for seizure foci. **1990 - 1992**

HONORS AND AWARDS

K22 Genome Scholar Award, NIH/NHGRI **2000**

BIBLIOGRAPHY

Books and Chapters

1. Jefferys, S.R. and Giddings, M.C. 2010. Automated data integration and determination of posttranslational modifications with the protein inference engine. Methods in Molecular Biology volume – "Bioinformatics for Comparative Proteomics". *In press.*
2. Holmes, M.R., and Giddings, M.C. "Using GFS to identify encoding genomic loci from protein mass spectral data," Chapter 13: Unit 13.9, in Current Protocols in Bioinformatics, March **2008**.
3. Giddings, M.C., Ramkisoon, K. R., and Holmes, M. R. "Proteomics and Protein Identification," Chapter 17, Pages 445-474, in Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins 3rd Edition, **2005**, Eds. Baxevanis, A. and Oulette, F., Wiley and Sons, NY, NY. This is one of the best-selling bioinformatics books, and we received strong praise for our contribution.
4. Giddings, M.C., Genome Fingerprint Scanning for Protein Identification and Gene Finding. Drug Discovery Today: TARGETS, Volume 3, Issue 2, Supplement 1 , April **2004**, Pages 56-62 doi:10.1016/S1741-8372(04)02411-9
5. M.V. Buchanan, F.W. Larimer, H.S. Wiley, S.J. Kennel, T.J. Squier, J.M. Ramsey, K.D. Rodland, G.B. Hurst, R.D. Smith, Y. Xu, D. Dixon, M.J. Doktycz, S. Colson, R. Gesteland, C. Giometti, M. Young, and M. Giddings. **2002**. Genomes to Life "Center for Molecular and Cellular Systems": A Research Program for Identification and Characterization of Protein Complexes. Omics, A Journal of Integrative Biology. 6(4):287-304

6. Khatun, J., Miller, J.A., Wisz, M., Yang, D., Holmes, M., and Giddings, M.C., Genome Fingerprint Scanning, A comprehensive Open Source Software System for Protein Identification using Unannotated Genome Sequence Data. Invited book chapter for *Current protocols in Bioinformatics* (Invited by John Yates, Scripps).

Refereed Papers/Articles

Original Research

1. Su, H.C., Ramkissoon, Ramkissoon, K., Doolittle, J., Clark, M., Khatun, J., Secrest, A., Wolfgang, M., and Giddings, M.C. **2010**. The development of ciprofloxacin resistance in *Pseudomonas aeruginosa* involves multiple response stages and multiple proteins. *Antimicrob Agents Chemother. In press*
2. Miller, J.A., Parker, M., Bourret, R.B., and Giddings, M.C. **2010**. An Agent-Based Model of Signal Transduction in Bacterial Chemotaxis. *PLoS One*, 5(5): e9454.
3. Maier, C.W., Long, J.G., Hemminger, B.M., and Giddings, M.C. **2009**. Ultra-Structure database design methodology for managing systems biology data and analyses. *BMC Bioinformatics*, 10:254. **Noted as "Highly Accessed Paper" on BMC website.**
4. Wilkinson, K.A., Vasa, S.M, Deigan, K.E., Mortimer, S.A., Giddings, M.C., and Weeks, K.M. **2009**. Influence of nucleotide identity on ribose 2'-hydroxyl reactivity in RNA. *RNA*, 15(7): 1314-1321. http://rnajournal.cshlp.org/content/15/7/1314
5. Vasa, S.M., Guex, N., Wilkinson, K.A., Weeks, K.M., and Giddings, M.C. **2008**. ShapeFinder: A software system for high-throughput quantitative analysis of nucleic acid reactivity information resolved by capillary electrophoresis. *RNA*, 14(10): 1979-90.
6. Wilkinson, K.A., Gorelick, R.J., Vasa, S.M. Guex, N., Rein, A., Mathews, D. Giddings, M.C. and Weeks, K.M. **2008**. High-throughput SHAPE analysis reveals structures in HIV-1 genomic RNA strongly conserved across distinct biological states. *PLOS Biology*, 6(4): e96.
7. Khatun, J., Hamlett, E.D., and Giddings, M.C. **2008**. Incorporating Sequence Information into the Scoring Function: A Hidden Markov Model for Improved Peptide Identification. *Bioinformatics*, 24(5): 674-81.
8. Yang, D., Ramkissoon, K., Hamlett, E., and Giddings, M.C. **2008**. High-Accuracy Peptide Mass Fingerprinting Using Peak Intensity Data With Machine Learning. *Journal of Proteome Research.* 7 (01), 62–69.
9. Da Costa, KA, Miller, J.A., Giddings, M.C., Cui, Z., and Zeisel, S.H. **2008.** Characteristic changes in plasma phosphatidylcholine species in humans depleted of choline. *FASEB*, 22:1092.8.
10. Su, H.C., Hutchison III, C.A., and Giddings, M.C. **2007**. Mapping phosphoproteins in *Mycoplasma genitalium* and *Mycoplasma pneumoniae*. *BMC Microbiology*, 7:63.
11. Khatun J, Ramkissoon K, Giddings MC. **2007**: Fragmentation Characteristics of Collision-Induced Dissociation in MALDI TOF/TOF Mass Spectrometry. *Anal. Chem.* 79: 3032-3040. Journal has ISI Impact Factor of 5.6.
12. Crayton ME, 3rd, Powell BC, Vision TJ, Giddings MC. **2006**. Tracking the evolution of alternatively spliced exons within the Dscam family. *BMC Evol Biol*, 6:16. **Noted as "Highly Accessed Paper" on BMC website.**
13. Wisz MS, Suarez MK, Holmes MR, Giddings MC. **2004**: GFSWeb: a web tool for genome-based identification of proteins from mass spectrometric samples. *J Proteome Re*s, 3:1292-1295.
14. Holmes, M.R. and Giddings, M.C. **2004**. Prediction of posttranslational modifications using intact-protein mass spectrometric data. *Analytical Chemistry.* 76(2):276-82.
15. Giddings, M.C., Shah, A.S., Gesteland, R.F., and Moore, B. **2003**. Genome-Based Peptide Fingerprint Scanning. *Proc. Nat. Acad. Sci.* USA. 100(1):20-25. This work was begun at the

University of Utah primarily with the support of my genome scholar award, HG00044. **This paper was recommended on Faculty of 1000.**

16. Giddings, M.C., Shah, A.S., Frier, S.F., Atkins, J.F., Gesteland, R.F., and Matveeva, O.V. **2002**. Artificial Neural Network Prediction of Antisense Oligodeoxynucleotide Activity. *Nucleic Acids Res.* 30(19):4295-4304. According to Google Scholar, Cited over 20 times.
17. Shah, A.S., Giddings, M.C., Parvaz, J.B., Gesteland, R.F., Atkins, J.F., and Ivanov, I.P. **2002**. Computational Identification of Putative Programmed Translational Frameshift Sites in Protein-Encoding Nucleotide Sequences. *Bioinformatics*. 18(8): 1046-1053
18. Baranov, P.V., Gurvich, O.L., Fayet, O., Prére, M.F., Miller, W.A., Gesteland, R.F., Atkins, J.F., and Giddings, M.C. **2001**. Recode: A Database of Frameshifting, Bypassing and Codon Redefinition utilized for gene expression. *Nucleic Acids Research.* 29(1):264-267.
19. Williams P.S., Giddings M.C., Giddings J.C. **2001**. A data analysis algorithm for programmed field-flow fractionation. *Analytical Chemistry.* 73(17): 4202-11
20. Giddings, M.C., Matveeva, O., Atkins, J., and Gesteland, R. **2000**. ODNBase - A web database for antisense oligonucleotide effectiveness studies. *Bioinformatics*. 16(9):843-844.
21. Matveeva, O.V., Tsodikov, A.D., Giddings, M.C., Freier, S.M., Wyatt, J.R., Spiridonov, A.N., Shabalina, S.A., Gesteland, R.F., and Atkins, J.F. **2000**. Identification of sequence motifs in oligonucleotides whose presence is correlated with antisense activity, *Nucleic Acids Res.* 28(15): 2862-2865
22. Giddings, M.C., Severin, J., Westphall, M., Wu, J., and Smith, L.M. **1998**. A software system for data analysis in automated DNA sequencing. *Genome Research.* 8(6):644-665
23. Yin, Z., Severin, J., Giddings, M.C., Huang, W., Westphall, M.S., and Smith, L.M. 1996. Automatic matrix determination in 4-dye fluorescence-based DNA sequencing. *Electrophoresis*. 17, 1143-1150.
24. Chen, D., Peterson, M.D., Brumley, R. L. Jr., Giddings, M.C., Buxton, E.C., Westphall, M., Smith, L., and Smith, L.M. **1995**. Side excitation of fluorescence in ultrathin slab gel electrophoresis. *Analytical Chemistry.* 67(19), 3405-3411.
25. Giddings, M.C., Brumley, R.L., Haker, M., and Smith, L.M. **1993**. An adaptive, object-oriented strategy for base calling in DNA sequence analysis. *Nucleic Acids Res.* 21(19), 4530-4540.

Other Peer Reviewed Articles

1. Wisz MS, Khatun J, Giddings MC: Computational methods enabling genome-based protein identification from large, complex genomes using mass spectrometry data. In: *Third IEEE Workshop on Genomic Signal Processing and Statistics (GENSIPS)*: 5/22/05 2005; Newport, RI: IEEE Signal Processing Society; 2005. This paper was reviewed by two anonymous peers and revised according to their instructions before acceptance into the proceedings.

Editorials or Letters

1. Giddings, M.C. **2008.** On the process of becoming a great scientist. *PLoS Comput Biol* 4(2): e33.

Unpublished Oral Presentations and/or Abstracts

1. "Using Proteomic Data To Annotate The Human Genome," Midwestern Mass Spectrometry Discussion Group, Washington University St Louis, Sept 2010, Invited
2. "Using proteins to find out which transcript are translated, to locate new genes, and to find new splice variants", ENCODE Consortium International Teleconference, August 2010.
3. "Using proteins to annotate the human genome", ENCODE Consortium, CRG, ICSD & the La Caixa Foundation, Barcelona, Spain, July 2010.

4. “Why Protein are like Birds, and T-cells like sheepdogs”, Boise State University, June 2010, Invited.
5. “Modeling Biology with Equations is Like Strapping a V8 Engine to a Horse Drawn Buggy”, UNC-Charlotte Bioinformatics and Genomics Spring 2010 Seminar, UNC-Charlotte, Charlotte, NC, March 2010, Invited.
6. “The fractal self-similarity of protein behavior”, University of Tennessee at Knoxville Seminar, Knoxville, TN, Jan 2010, Invited.
7. “The fractal self-similarity of protein behavior”, Biochemistry & Biophysics Seminar Series, UNC-Chapel Hill, Chapel Hill, NC, January 2010, Invited.
8. **“**Systems examinations of antimicrobial resistance**”,** M&I Spring Seminar**,** UNC-Chapel Hill, Chapel Hill, NC, April 2009, Invited**.**
9. “Ultra-Structure: a system for managing complexity and heterogeneity in systems biology research”, EPA Seminar, April 2009.
10. “Mining post-translational modifications from mass spec data sets: There is much left to learn”, WUSTL, Saint Louis, MO, November 2008, Invited.
11. "Proteogenomic mapping for the human genome: technologies and challenges for identifying protein-coding sequences", College of Computing and Informatics, UNC-Charlotte, Charlotte, NC, April 2008, Invited.
12. "Persister Cells: The Perfect Defense Against Antibiotics", Microbiology and Immunology Seminar, UNC-Chapel Hill, Chapel Hill, NC, January 2008, Invited.
13. “Modeling emergent behavior in bacterial chemotaxis with agents and scapes”, UNC Theoretical and Systems Biology Seminar, March 2007, Invited.
14. “HMMScore: An HMM Model for Improved Peptide Identification using MS/MS”, The Human Proteome Organization (HUPO) 5th Annual Congress 2006, Long Beach, CA, October 2006 (abstract selected for talk).
15. “All you ever wanted to know about software for biology”, Carolina Center for Genome Sciences Faculty Meeting, April 2006, Invited.
16. “Examination of differential ribosomal protein modification and substitution in antibiotic resistant E. coli by top-down/bottom-up mass spectrometry”, US HUPO 2006, Boston, MA. March 2006. (abstract selected for talk)
17. “It’s all just a computer program”, Triangle Complexity Seminar, UNC-Chapel Hill, Chapel Hill, NC, December 2005, Invited.
18. “Proteomic Analysis of Compensatory Mutations in the Ribosomes of Drug Resistant Bacteria”, York University, Nov 2005, Invited.
19. “Proteomic Analysis of Compensatory Mutations in the Ribosomes of Drug Resistant Bacteria”, NC A&T University, Nov 2005, Invited.
20. “Linking Proteome to Genome Using Genome Fingerprint Scanning”, PittCon, Invited Symposium Speaker, Feb 2005
21. “Proteomics and the Challenge of Post-Genome Complexity: Informatics as the Glue”, University of New Orleans, Feb 2005, Invited.
22. “Computational Methods in Proteomic Analysis”, Wisz, M. and Giddings, M.C., August 2004, Intelligent Systems for Molecular Biology ’04, half-day tutorial competitively selected of 13 from 65 submissions. Ranked by attendees as the 3rd best tutorial that year (of 13).
23. “Wrangling With Genome Complexity via Bioinformatics & Proteomics”, October 2003, CIBM Program Retreat, Invited alumnus speaker, UW-Madison, Madison, WI
24. “Genome Analysis by Proteomics”, September 2003, Apple High Performance Computing Seminar at MCNC, Invited.

25. "Data Driven Proteomics: Towards Protein-Based Annotation of Microbial Genomes", May 2003, Cold Spring Harbor Genome Informatics Meeting (poster).
26. "Data Driven Proteomics: From Protein to Gene and Back Again", Giddings, M., March 2003, PittCon 2003, Orlando FL, Invited.
27. "Development of Data-Driven Proteomics for the Study of Microbial Genome Plasticity", Giddings, M., March 2003, Oak Ridge National Laboratories, Knoxville, TN, Invited.
28. "Data Driven Proteomics: From Protein to Gene and Back Again", Giddings, M., May 2002, Pacific Northwest National Laboratories/Batelle, Richland, WA, Invited.
29. "Data Driven Proteomics: From Protein to Gene and Back Again", Giddings, M. NCSU Bioinformatics Seminar, May 2002, NCSU, Invited.
30. "Data Driven Proteomics: From Gene to Protein and Back Again", Giddings, M. Coulter Seminar, April 2002, UNC-CH, Invited.
31. "Proteomics for Identification of Multiple Products From Single Genes", Giddings, M. University of Utah Department of Medical Informatics, May 2001, University of Utah Department of Pharmacology, November 2001, and Applied Biosystems, December 2001, Invited.
32. "A Proteomic System for Tracking and Identifying Yeast Mitochondrial Proteins", Holmes, M., Gesteland, R., and Giddings, M., ISMB '00, San Diego, CA (poster).
33. "Sense, Antisense, and Neurons", University of Wisconsin Department of Computer Science, April, 2000, Invited.
34. "Analysis of Antisense Oligodeoxynucleotides Based on Sequence Motif Content to Predict Effectiveness," RECOMB 2000, Tokyo, Japan (poster).
35. "Basefinder: A flexible, modular, cross platform software architecture for trace processing, analysis, and base calling," Second International Conference on Automation in Mapping and Sequencing, Heidelberg, Germany, March 1997, Invited.
36. "Basefinder: A flexible, modular, cross platform software architecture for trace processing, analysis, and base calling," DOE Human Genome Contractors Meeting 1997, Santa Fe NM (poster).
37. "Adaptive Base Calling: an Object Oriented Approach," Hilton Head Genome Sequencing & Analysis Conference IV, September 1992 (poster).
38. "Comparison of Gold's Ratio method and Jansson's method for deconvolution of Sedimentation FFF fractograms," First International Workshop and Conference on Field Flow Fractionation, Park City Utah, June 1989 (poster).
39. "Deconvolution of Sedimentation FFF fractograms utilizing Gold's Ratio Method," Fine Particle Society Meeting, Santa Clara, CA, 1988, Invited.

Other Un-refereed Works

1. BaseFinder Version 6. Downloadable from http://bioinfo.med.unc.edu/Downloads/index.html. This software was originally developed by me from 1991-1997 while a graduate student in Dr. Lloyd Smith's lab at UW-Madison, bringing it to version 5. Development was resumed in 2005 by my lab, after beginning a collaboration with Dr. Kevin Weeks, UNC Chemistry Dept. We have thoroughly updated the software, fixed substantial bugs, significantly enhanced the user interface, and added new processing/analysis tools for analysis of RNA structure data produced by SHAPE chemistry, resulting in Version 6. It is in extensive use by the Weeks lab, and there is substantial interest in the community for this tool once the SHAPE-capable version is released. This development effort is supported by an R01 grant AI068462 (Weeks, PI).
2. Genome-based peptide Fingerprint Scanning (GFS), Version 2. http://gfs.unc.edu. Version 2, released June 2007, represents a substantial upgrade to the software, including: Capability for large-genome processing, analysis of tandem mass spectrometry (MS/MS) data, cluster-

distribution capability, shotgun/bottom-up data analysis, many bug fixes, a new user interface on our website, and more. **Over 40,000 lines of code.** We have had strong interest from many groups since its announcement, 3 of whom are now using it (in Washington state, France, and California). This software development is supported by an R01 grant, RR20823 (Giddings, PI).

3. Protein Cleavage and Modification Engine. http://proclame.unc.edu. Released 2004. This software predicts post-translational modifications on proteins from intact mass spectrometry data. Since original publication in *Analytical Chemistry*, software has undergone numerous improvements in user interface, usability, flexibility, and speed. We also have developed a standalone version that can be used as part of a high-throughput pipeline at the request of collaborators at Pacific Northwest National Laboratories. The next version is being worked on, and will incorporate use of Markov Chain Monte Carlo methods.
4. Genome-based peptide Fingerprint Scanning (GFS), Version 1. http://gfs.unc.edu. Version 1 provided a novel means for identifying proteins from mass spectrometry data, by directly searching whole genome sequences, bypassing the limitations (or absence of) annotations. However, it had several limitations: it could only process peptide mass fingerprint data, it could only work on small genomes (yeast or smaller), and was not cluster capable. Nontheless, there was substantial interest and use in the community.

TEACHING RECORD

Lecturer, UNC Chapel Hill, GMB 643 **2007-present**
I was one of the founding members of this new course, intended to introduce biologists to informatics methods. I taught three lectures on proteomic data analysis, and supervised a student project in this area.

Instructor, UNC Chapel Hill, GNET 210/711 **2003-present**
"Sequence Analysis Methods". This one credit hour module that I developed covers information theory and DNA/RNA sequence analysis methods, including hidden Markov models, stochastic grammars, and neural networks. It is comprised of nine lectures of one and a half hours each, homework assignments, and a final exam. It is the lead module in the series of 7 BCB modules, which were the brainchild of Dr. Todd Vision and Myself. This module consistently receives excellent ratings from students.

Instructor, UNC Chapel Hill, GNET 310 **2005**
Program in Bioinformatics and Computational Biology Colloquium
I led this one credit hour course with a focus on papers from the computational proteomics field.

Lecturer, UNC Chapel Hill, Microbiology 135 **2004**
This course provides an introduction to microbiology. I gave 2 lectures and a homework assignment on the topics of bioinformatics and proteomics.

Lecturer, UNC Chapel Hill, BME 101 **2002-2004**
Annual lecture on Microbial Proteomics for this survey course.

Lecturer, UNC Chapel Hill, Biology 162 (Computational Genetics) **2002**
"Neural Network Models for Bioinformatics".

Instructor, University of Wisconsin-Madison, Comp Sci 302 **1989-1990**
I was solely responsible for teaching a 3 credit hour introductory programming course (CS 302) in 'C' and FORTRAN. Two semesters. University of Wisconsin Department of Computer Sciences.

TA/Lab instructor, University of Wisconsin-Madison **1990-1991**
"Introduction to Computers" course, required for non computer science majors. University of Wisconsin Department of Computer Sciences.

RESEARCH MENTORSHIP & THESIS COMMITTEES

Post-Docs

Dr. Serguei Simonov **2010-present**

Dr. Simonov received his PhD from the Russian Academy of Science Computing, department of Mathematics/ Computer Science, where he specialized in the Theory of programming high-performance computations. He will assist in the coordination of the data analysis pipeline for our ARRA funded project, Generating and Managing Large Scale Proteogenomic Data for ENCODE Cell Lines, and will be involved in the 'top-down' mass spectrometric experiments for gaining more complete transcript coverage.

Dr. Maarten Leerkes **2009-present**
Dr. Leerkes received his PhD in 2004 for developing computational methods for transcriptome and genome analysis, and has since worked as a post doctoral scholar at the NCI building pipelines for transcription analysis, and since 2008 as the senior manager for Bioinformatics at Theranostics Health, developing phosphoproteomic data analysis pipelines. He is currently working on the data analysis pipeline for our ARRA funded project, Generating and Managing Large Scale Proteogenomic Data for ENCODE Cell Lines.

Dr. Hsun-Cheng Su **2005-present**
Dr. Su is a former post-doc of Dr. Clyde Hutchison's lab, who joined my lab when Dr. Hutchison joined the Venter Institute. With extensive molecular biology experience, Dr. Su is presently heading up my wet lab, including an examination of antibiotic tolerance and resistance in P aeruginosa. In 2008, Dr Su was promoted to research associate.

Dr. Jainab Khatun **2004-present**
Dr. Khatun has diverse training including physics, math, computer science, and biochemistry. She is presently developing new algorithms for improved analysis accuracy of mass spectrometry data. In 2008 she was promoted to Research associate.

Dr. Rajarajeswari Balasubramaniyan **2006 - 2007**
Dr. Balasubramaniyan is now in a post-doc position with Dr. Cynthia Gibas at UNC-Charlotte.

Dr. Mack Crayton **2003 - 2005**
Dr. Crayton is now faculty at Xavier University of New Orleans

Dr. Michael Wisz **2002 - 2005**
Dr. Wisz co-founded a start-up company, Emergent Inc., and is the Chief Technology Officer

Current Graduate Students

Stuart Jefferys **2005-present**
Curriculum in Genetics and Molecular Biology and Bioinformatics and Computational Biology Program, 3rd year, developing a Markov Chain Monte Carlo approach for analyzing post-translational modifications on proteins.

Former Graduate Students

Kevin Ramkissoon **2003 - 2009**
Microbiology & Immunology and IBMS. (present position)

Suzy Vasa **2006 - 2009**
Biomedical Engineering and Bioinformatics and Computational Biology Program, performed her thesis work under my supervision, graduated and now working as a Research Bioinformatician at SRA International http://www.linkedin.com/companies/sra-international.

Jameson Miller **2005 - 2008**
Computer Science and Bioinformatics and Computational Biology Program. In his fourth year, Jameson was offered and accepted a position at Microsoft Research, so he did not complete his PhD.

Dongmei Yang **2003 - 2004**
Computer Science Master's Student (University of North Texas), performed her thesis work under my supervision, now a full-time staff member of my lab.

Chris Maier **2005 - 2006**
Information and Library Science masters student, performed his thesis work under my supervision, graduated and now holding a staff position in my lab.

Kristen Dang **2002 - 2004**
Biomedical Engineering Student, Kristen is now working on her Ph.D. under direction of Dr. Christina Burch at UNC

Thesis Committees

Amy Webb **2007-present**
Curriculum in Genetics and Molecular Biology, supervisor Dr. Kirk Wilhelmsen.

Andrea O'Hara **2007-present**
Curriculum in Genetics and Molecular Biology, supervisor Dr. Dirk Dittmer, studying small RNA molecules associated with viral infection.

Suja Thomas **2006 - 2010**
Biomedical Engineering, supervisor Dr. Todd Vision, studying new methods for phylogenetic inferencing. She received her Phd in 2010.

Bradford Powell **2002 - 2005**
MD/PhD program and Curriculum in Genetics and Molecular Biology. Dr. Powell recently finished his MD training and is in a pediatric residency at U. Florida Gainesville.

Greg James **2001 - 2002**
University of Utah Biomedical Engineering Dept. Master's thesis committee member. Greg is now working for Applied Biosystems.

GRANTS
(Active)

NIH/NCRR 5-R01-RR020823-04-06 (295k/yr, 25% effort) **9/01/09 – 10/31/11**
PI: Giddings, Software to Identify Post-translational Modifications From Proteomic Data Sets
This award is a Recovery Act Administrative Supplement, NCRR ARRA Supplement to grant 5 R01 RR020823 - *Software to Identify Post-translational Modifications from Proteomic Data Sets*. The major focus of this supplement is to accelerate progress on this work by developing a complete software package with user interfaces, installer & help manual and generating an extensive data set for thorough vetting & testing of the program.

NIH/NHGRI 1 RC2 HG005591-01 (800k/yr, 20% effort) **9/26/09 – 6/30/11**
Co PI: Giddings, Generating and Managing Large Scale Proteogenomic Data for ENCODE Cell Lines
The purpose of the award is to generate, manage, analyze and disseminate large scale data sets for protein-based annotation of the human genome. Working in concert with other investigators in the ENCODE (ENCyclopedia Of DNA Elements) Dr. Giddings' team will be working to produce a complete map of the genes on the human genome, that can be used to address a variety of human disease states.

2 R01 HG003700-04 (450k/yr, 32.5% effort) **04/10/09 - 03/31/12**
PI: Giddings, Developing Proteogenomic Mapping for Human Genome Annotation
This is a competing continuation of our genome annotation project, using proteomic data to inform where genes located on the human genome, and which /when transcripts get translated into proteins.

NIH/NCRR 2 R01 RR020823 (225k/yr, 32.5% effort) **12/15/07 – 11/30/11**
PI: Giddings, Software to Identify Post-translational Modifications From Proteomic Data Sets
This competitive renewal of R01 RR020823 is to combine our software packages PROCLAME and GFS to identify post-translational modifications from heterogeneous mass spectrometry-derived data sets.

NIH/NHLBI 1 P50 HL 084934-01 (5% effort) **9/15/06-7/31/11**
PI: Boucher, SCCOR in Host Factors in Chronic Lung Disease, Core D: Diagnostic Molecular Microbiology Core.
The goal of the Diagnostic Molecular Microbiology Core is to provide sensitive and reproducible methods for detecting, identifying and quantifying polymicrobial infections in respiratory specimens. Specifically, the Core will develop a high-throughput technique termed terminal restriction fragment length polymorphism (T-RFLP) to identifying bacterial species and measuring bacterial community diversity associated with respiratory disease. In addition, the Core will provide comprehensive multiplex RT-PCR assays for the identification of respiratory

viruses and provide reagents and methods for quantifying viral infections and for conducting viral challenge studies.

(Completed)

NIH/CFAR R01 AI068462-01 (250k/yr, 10% effort) **2/1/06 - 1/31/11**
PI: Weeks, Structure of the HIV-1 Genome
This proposal is to further develop the SHAPE RNA structure determination chemistry co-jointly with software development of BaseFinder (Giddings lab), applying them together to determine the complete structure of the HIV-1 viral genome. This is listed as "completed" because we finished the collaboration on this work.

NIH/NHGRI, R01 HG003700 (317k/yr, 25% effort) **9/16/05 - 6/30/09**
PI: Giddings, Developing Software for Protein-Based Gene Finding. Collaboration with Dr. M. Brent, Washington University
The major focus of this proposal is to combine our protein identification software GFS with gene-finding Software TWINSCAN to produce a reliable, automated protein-based gene finding system.

NIH/NCRR, R01 RR20823-01 (250k/yr, 30% effort) **9/24/04 - 8/31/08**
PI: Giddings, Developing Genome Fingerprint Scanning for Proteomics
This project is to develop our Genome Fingerprint Scanning (GFS) software as a community resource for genome-based identification of proteomic samples. This is to continue work begun under my K22 award, HG00044 after completion.

Amer. Heart Association 051537OU (20k/yr, 0% effort, supervisor) **7/1/05 - 6/30/07**
Sponsor, Investigation of Adaptive Evolution in Enterococci-curbing the Emergence and Persistence of Antibiotic Resistance. PI: Ramkissoon
The goal of the proposed research is to investigate the specific mechanisms of compensatory evolution in Enterococcus faecium that exhibit resistance to the clinically important antibiotic streptomycin.

NIH/NHGRI HG00044, Genome Scholar Award **1/01/00-12/31/04**
PI: Giddings, Computational methods for proteomic analysis.
Development of computational analysis methods for support of high-throughput proteomics, with focus on their role in furthering the study of genomes.

NSF/MCB **8/1/04-7/31/05**
Developing Genome Fingerprint Scanning for Tetrahymena
This grant was to develop GFS as a resource specifically to serve the Tetrahymena research community, by developing and supporting the website for Tetryahymena research usage.

DOE/UT-Battelle subcontract 4000018979 **10/4/02-9/30/05**
PI: Buchannan, Sub-project in Giddings Lab: Data Driven Proteomics for the Genomes to Life Program (Sub with UT-Battelle/ONL)
The focus of this work is to apply data driven proteomics tools to the data obtained in the genomes to life program implemented at ORNL and at PNL.

PROFESSIONAL SERVICE

Technical Program Committee, GENSIPS **2004-2007**
Annual Genome Signal Processing conference sponsored by IEEE.

Reviewer, NIH Study Sections **2002, 2005**
- Served on BDMA study section in October 2005, was invited to return as permanent member, but declined due to pre-tenure obligations.
- Served on Bioanalytical Chemistry study section in 2002, invited to return, but declined due to pre-tenure obligations.

Reviewer, NSF Panels **2003**
Reviewer for two panels involving Computational Biology and Bioinformatics Proposals

Program Committee, Technology for Life Conference **2004**
NC Symposium on Biotechnology & Bioinformatics
Session chair, Genomics and Proteomics

Reviewer, Various Journals **ongoing**
Regular reviewer for *Bioinformatics*. Ad hoc reviews performed for *Journal of Proteome Research*, *Nucleic Acids Research*, *Nature Biotechnology*, *BMC Bioinformatics*.

PROFESSIONAL SERVICE, UNC

Program in Bioinformatics and Computational Biology **2002-2009**
- *Co founder*, 2002
- *Member of Curriculum and Progression Committee*, 2002-present
- *Member BCB Executive Committee*, 2006-2009.
- *Student Progression Director*, 2006-2009, In charge of tracking progress of all students, developing a plan of study for them, and obtaining feedback for program improvement.
- *Admissions Committee, 2002-2003*

Computational Resource Coordinating Committee for Genomics and Bioinformatics **2002-2003**
Member of committee convened by Vice Chancellor Waldrop to identify computational resource needs for the campus.

Michael J. Hooker Proteomics Facility **2002-2009**
Computational Advisor

Biomedical Engineering Department **2002-2009**
- Curriculum Committee, 2002-03
- Admissions Committee, 2002-03
- Computer Resources Committee, 2004-2009

Dept. of Genetics, Search committee for senior bioinformatics researcher **2004**
Chaired by Prof. Pat Sullivan

Jeffrey W. Habig

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Phone: (208) 863-1555 E-mail: jeffreyhabig@boisestate.edu

Education

Howard Hughes Medical Institute **10/03 – 07/08**
Postdoctoral research fellow
University of Utah

University of Wisconsin - Madison **09/98 – 09/03**
Ph.D. in Cancer Biology and Virology
McArdle Laboratory for Cancer Research

Colorado State University - Pueblo **02/96 – 05/98**
(formerly University of Southern Colorado)
Biology, chemistry, and physics curriculum

Gustavus Adolphus College **09/87 – 05/91**
B.A. in Computer Science with a minor in Philosophy

Professional / Research Experience

Research Assistant Professor **2011-present**

- LC/MS-based identification of cellular factors involved in stable inheritance of the Epstein-Barr virus genome during replication of latently infected B lymphocytes. PI on grant funded by MSTMRI and collaborating with group at UW-Madison.
- Identification of cellular proteins associated with capsids and virions from secreted hepatitis B virus using LC/MS-based proteomic approaches.
- Using computational biology (agent-based modeling and evolutionary search techniques) to elucidate plausible biological mechanisms underlying the complex process of regeneration in the flatworm, planaria. Co-PI on NSF grant with collaborators at BSU and Tufts University.

Director of Mass Spectrometry Facility **2011-present**
Department of Chemistry and Biochemistry, Boise State University

- Support research utilizing LC/MS techniques.
- Proteomic and metabolomic analysis of the methionine salvage pathway in bacterial pathogens in collaboration with Dr. Ken Cornell.

Research Scientist **2008-2010**
Crowley Davis Research, Inc.

- Research and development of cell-based computational modeling and virtual wet-bench platform for use as a research and educational tool.
- Developing models of the hallmarks of cancer and introducing them into high school and undergraduate classrooms in collaboration with the University of Minnesota, Masonic Cancer Center.

- Developing models in the areas of regeneration, development, and cell-fate determination in collaboration with the University of Minnesota, Harvard University, Tufts University, and the Environmental Protection Agency.
- Developing a model of cell-fate determination during vulva development in the nematode, *C. elegans*.
- Combining evolutionary search techniques (genetic algorithms) with pathway, cell, and tissue modeling.
- Participating in management team to develop business and investment plans, marketing strategies, and grant proposals.

Postdoctoral Fellow **2003-2008**

Dr. Brenda Bass, Howard Hughes Medical Institute (University of Utah)

- Investigated the intersection and competition of cellular pathways (e.g. RNAi, miRNA, and ADARs) for dsRNA within cells of the nematode, *C. elegans*.
- Combined microarrays, bioinformatics, and molecular biology to establish a relationship between RNAi and the innate immune response in *C. elegans*, and to show proper X-chromosome regulation is dependent upon the microRNA-processing enzyme, Dicer.
- Generated an *in vivo* animal model to study the individual steps involved in RNA interference in *C. elegans.* This model has led to the characterization of the double-stranded RNA binding protein, RDE-4, as a sensor to activate RNAi in the presence of low concentrations of double-stranded RNA. It has also led to the identification of the rate-limiting step of RNAi, showed that double-stranded RNA processing is affected by environmental conditions, and showed that siRNAs can enter into the miRNA pathway in *C. elegans*.
- Presented research findings at scientific meetings: Diverse Roles of RNA in Gene Regulation Keystone Conference in Keystone Colorado, 2005; The Biology of Post-transcriptional Gene Regulation Gordon Conference in Oxford, UK 2006.
- Presented research findings in the Biochemistry Department seminar series, the *C. elegans* research in progress seminar series, and weekly lab meetings.

Graduate Student **1998-2003**

Dr. Dan Loeb, University of Wisconsin - Madison

- Investigated the molecular mechanism of replication and reverse transcription of the cancer causing hepatitis B virus (HBV), using *in vitro* cell culture systems and the Peking duck animal model; identified and characterized intramolecular interactions and sequences within the viral genome that contribute to multiple steps during viral replication.
- Presented research findings at the International Molecular Biology of HBV Meetings: Oral presentation in 1999 and poster presentation in 2001. Presented research findings during the Oncology Departmental seminar series, as well as during weekly lab meetings.
- Wrote and published four first-author manuscripts.

Summer research program (REU) **summer 1998**

Dr. Thomas Day, Arizona State University

- Investigated the effect of changes in growth temperature on rates of photosynthesis and respiration of the two vascular plants native to Antarctica.
- Presented research at ASU departmental symposium.

Student in Master's program **1997-1998**
Dr. Dan Caprioglio, Colorado State University-Pueblo

- Investigated the role of an aminopeptidase, YIN-7, in the budding yeast, *Saccharomyces cerevisiae*, using molecular biology approaches including flow cytometry.
- Presented research at two scientific meetings (CO Springs, Grand Junction)

Executive Director and Incorporator **1996-1998**
Greater Arkansas River Nature Association, Salida, CO (www.garna.org)

- Helped establish a nature association that served as an interdisciplinary scientific organization designed to support governmental agencies in fundraising, stewardship, and natural resource education.
- Conducted meetings of the Board of Directors.

Systems Software Analyst **1991-1995**
West Publishing Company, Eagan, MN

- Contributed to design and maintenance of the software framework.
- Trained and supported a large group of application programmers.

Teaching experience / Academic appointments

Boise State University **Boise, ID** **2009-present**
Adjunct Faculty – Biology Department

- Taught the core Cell Biology course multiple times. This course was designed to introduce students to molecular, cellular, and developmental processes with a focus on analytical and critical thinking.
- Taught a special topics course in Virology. The course covered the molecular biology and pathogenesis of viruses. Course focused on critically reading and understanding primary literature. Student projects included Perl programming, physician/technician shadowing, and literature reviews related to virology.

Westminster College **Salt Lake City, UT** **Fall 2007**
Adjunct Faculty – Biology Department
Taught a course called "The Natural World" to undergraduate, non-science majors at a local liberal arts college. The course was designed to provide students with an appreciation of science and its impact on society. It was a unique opportunity as I team taught the course with an instructor trained in a separate discipline, riparian ecology.

University of Utah **Salt Lake City, UT** **Fall 2006**
Adjunct Faculty – Department of Biochemistry
Designed and team-taught course on the emerging "Mechanisms of Post-Transcriptional Gene Regulation."

University of Wisconsin - Madison **Madison, WI** **Spring 2002**
Teaching Assistant – BioCore undergraduate research program

Assisted in an honors biology track course for undergraduates. Course used primary literature to introduce students to the fields of (1) cancer immunology (2) host/pathogen interactions (3) cellular aging and (4) cervical cancer. I held two weekly discussion sessions, prepared and graded quizzes, tests, and worksheets.

Colorado State University - Pueblo **Pueblo, CO** **1997 – 1998**
Teaching Assistant – Chemistry department
Taught the lab sections for "Introduction to Chemistry" and "General Chemistry". Responsibilities included lecturing, overseeing experimentation, and assessment.

US Forest Service **Pueblo, CO** **Summer 1997**
Community education – Taught bear and mountain lion safety courses for the USFS in campgrounds and remote backpacking sites.

Greenway & Nature Center **Pueblo, CO** **1996 – 1998**
Community education outreach - Managed the local chapter of the RiverWatch program in association with the USGS. Monitored the chemical and biological health of the Arkansas River, and trained volunteers to conduct chemical and biological assays.
- Served as an instructor for summer eco-camps designed to introduce students to their natural surroundings.

Mentoring experience

Boise State University **Boise, ID** **2009 – present**
Advisor
Currently mentoring a research student who is interested in pursuing medical school. Shared my experiences, advised, and wrote letters of recommendation for students interested in pursuing graduate, medical, or technical school.

Crowley Davis Research **Eagle, ID** **Summer 2009**
Scientific mentor
Co-mentored two summer interns for the summer. Oversaw experimentation and modeling of tissue development.

University of Utah **Salt Lake City, UT** **1999 – 2006**
Scientific mentor
Mentored the research of several first-year graduate students, and a technician. Co-authored separate manuscripts with a graduate student, a technician, and a post-doctoral fellow.

University of Wisconsin – Madison **Madison, WI** **1999 – 2006**
Scientific mentor
Mentored the research of an undergraduate student whose work served as the foundation for a future publication and helped her gain acceptance into medical school at Cornell. Also mentored several first year graduate students.

Publications

Dokken N, **Habig JW**, Otter T, and Pennell CA, Interactive computer simulations for teaching tumor immunology, The Journal of Immunology, 2009, 182, 37.8. (Abstract and supplemental materials available online)

Habig JW, Aruscavage PJ, Bass BL (2008) In *C. elegans*, High Levels of dsRNA Allow RNAi in the Absence of RDE-4. PLoS ONE 3(12): e4052.

[*]Welker N, [*]**Habig JW**, and Bass BL, Genes misregulated in *C. elegans* deficient in Dicer, RDE-4 or RDE-1, are enriched for innate immunity genes. *RNA*, 2007,13:1-13. ([*]**authors contributed equally**).

[*]**Habig JW**, [*]Dale T, and Bass BL, miRNA Editing – We Should Have Inosine This Coming. *Molecular Cell*, 2007, 25:792-793. ([*]**authors contributed equally**).

Habig JW and Loeb DD, Sequence identity of the direct repeats, DR1 and DR2, contributes to the discrimination between primer translocation and *in situ* priming during replication of duck hepatitis B virus. *Journal of Molecular Biology*, 2006, 364(1):32-43.

Habig JW and Loeb DD, Template switches during plus-strand DNA synthesis of duck hepatitis B virus are influenced by the base composition of the minus-strand terminal redundancy. *Journal of Virology*, 2003, 77:12412-20.

Habig JW and Loeb DD, The conformation of the 3' end of the minus-strand DNA makes multiple contributions to template switches during plus-strand DNA synthesis of duck hepatitis B virus. *Journal of Virology*, 2003, 77:12401-11.

Habig JW and Loeb DD, Small DNA hairpin negatively regulates *in situ* priming during duck hepatitis B virus reverse transcription. *Journal of Virology*, 2002, 76:980-9.

Patent Applications

Application Number 61/271,265, **Habig, JW** and Otter T (Crowley Davis Research, Inc.), Cell-Based Models And Methods For Cellular Nutrient Uptake And Stress Responses. Utility 7/16/2009. (unpublished)

Application Number 12/554,870, **Habig, JW**, et al. (Crowley Davis Research, Inc.), Systems And Methods For Cell-Centric Simulation Of Biological Events And Cell Based Models Produced Therefrom. Utility 9/4/2009. (unpublished)

Application Number 61/239,021, **Habig JW** and Otter T (Crowley Davis Research, Inc.) Educational Systems And Methods Relating To Virtual Modeling Of Biological Systems And Processes. Provisional 9/1/2009. (unpublished)

Awards and Professional Activities

- Received notification of acceptance of our NSF CDI grant entitled “A computer framework for modeling complex pattern formation” (CoPI - awaiting official award 2011 - 2014).
- Recipient of a grant from Mountain States Tumor & Medical Research Institute (2011-2012).
- Elected member of the Mountain States Tumor & Medical Research Institute (MSTMRI, 2011)
- Selected to be pre-med summer fellowship mentor (summer 2011)
- Current member of the Association of Biomolecular Resource Facilities (ABRF).
- Invited speaker: Environmental Protection Agency (cell fate modeling, 2009).
- Invited speaker: Boise Science Café (stem cells, 2009).
- Invited speaker: Treasure Valley Math and Science Center (cancer mechanisms, 2009).
- Invited speaker: Boise State University (modeling as a tool in research and education, 2009).
- Member of American Society for Cell Biology (2008 – present).
- Manuscript review for peer-reviewed journals.
- NIH cancer training grant (1998-2003).
- Recipient of two travel awards and oral presentation award for the International Meeting on the Molecular Biology of Hepatitis B Virus.
- Co-founder of the McArdle Laboratory for Cancer Research Student and Postdoc Data Club.
- Co-founder of the “Howard Temin Lecture Series” at the University of Wisconsin – Madison.
- Member of the American Association for the Advancement of Science (1998 – 2006).
- Recipient of “Best Student Oral Presentation” award at Tri-Beta Regional Scientific Conference (Summer 1998, CO Springs).
- Guest lecture: Programmed cell death (USC, 1998).

Technical Skills

- **Molecular Biology:** HPLC and mass spectrometry, microarray probing and analysis (Affymetrix), total and poly(A) RNA isolation (RNase Free conditions), RT-PCR, real-time quantitative PCR (Roche Lightcycler), RNA interference (RNAi), RNase protection, northern and Southern blotting, miRNA and siRNA isolation and detection, *in vitro* transcription and translation, DNA and plasmid isolation, molecular cloning (Gateway cloning and site directed mutagenesis), DNA and RNA sequencing, primer extension, expression and purification of recombinant proteins from bacteria, western blotting, gel shifts, thin layer chromatography, and radioisotope usage.
- **Cellular and Animal Biology:** maintenance and propagation of tissue culture cell lines, transfection of cell lines, fluorescent microscopy, virus production and purification, flow cytometry of yeast (FACS) and fluorescent sorting of whole worms (Worm sorter), genetic screens, generating transgenic worms (mating and

microinjection), and maintaining *C. elegans* transgenic strains, bacterial and fungal pathogen and longevity studies.

- **Computer Skills:** Bioinformatics and genomics software development in the scripting languages Python/Perl/Bioperl; Scientific applications include LaserGene, Roche LightCycler, ImageQuant, NCBI Blast/GenBank, GeneSifter, Bioconductor/R, mFold, DNAFold, Babelomics/GO, Wormbase, and modeling software (Endogenics); Blackboard educational package.

Greg Hampikian
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208-781-0438

Education

Ph.D. Genetics, The University of Connecticut, 1990
M.S. Genetics, The University of Connecticut, 1986
B.S. Biological Sciences, The University of Connecticut, 1982

Experience

2006-present
Professor of Biology, with a joint appointment in Criminal Justice, Boise State University (BSU), (Associate Professor, August 2004-2006).
Graduate and undergraduate courses: Forensic Biology, DNA Evidence in Cold Cases, Advanced DNA Analysis, Biotechnology, Cell Biology, Genetics.

2006-present
Founder and Director of the Idaho Innocence Project at Boise State University. Volunteer position. Raised more than $300,000 through grants and donations, organized a Legal Advisory Board with leading lawyers, supervise staff: a full time lawyer, six volunteers, and student interns. Currently working on 10 Idaho cases.

2002-present
DNA Expert for the Georgia Innocence Project
Analyze forensic evidence, assist in legal proceedings, testify, work with and train students. Involved in four exonerations, two of which resulted in the arrests of new suspects more than 20 years after the crime.

1993-2004
Professor, Biology, Clayton State University (CSU)
(Assistant Professor 1993-97, Associate Professor, 1997-2003)
Coordinated the Forensic Science Track for biology major. Courses: Biotechnology, Biotechnology Lab, Genetics, Human Genetics (on-line), Recombinant DNA Laboratory, Bioregulatory Affairs, Microbiology, Microbiology Lab, Anatomy and Physiology (A&P) sequence, A&P Labs, Sex and Reproduction, Introductory Biology (majors and non-majors sequence), Introductory Biology Labs, Biotechnology for teacher education students.

2004
Chair of the Georgia Academic Advisory Committee for Biological Sciences
The Committee included department heads of all Georgia public colleges and universities; coordinated curriculum review, organized corporate partnerships, and responded to the ~~-~~evolution challenge" in public schools.

2003-2004
Grants Coordinator for the School of Arts and Sciences, CSU
Organized a consortium of six area school systems, wrote two multimillion dollar NSF Math/Science Partnerships proposals.

2001-2002
Biology Coordinator, Natural Science Department, CSU
Wrote a successful degree proposal for new Bachelor of Science in Biology, which includes tracks in Forensic Science, Biotechnology/Biocomputing, Bioregulatory Affairs/Science Management. Hired five new faculty members.

2000
First Presidential Faculty Fellow, CSU
Helped coordinate new majors proposals; acted as faculty liaison to campus departments.

1997- 1998
National Science Foundation Research Opportunity Award, Georgia Tech, Biochemistry Dept., Research Faculty Member
Enzymatic nucleotides, and chromatin structural changes caused by anti-cancer drugs, with Loren Williams.

1994-1995
Visiting Scientist, Emory University and **The Centers for Disease Control and Prevention (CDC), Atlanta**
Sex-determination in malarial mosquitoes with John Lucchesi, Biology Department Chair, Emory University; and Frank Collins of the CDC.

1992
Worcester Foundation for Experimental Biology, Postdoctoral Associate with William Crain
Gene expression in mouse embryogenesis, toxicity of antisense therapies on pregnant mice.

1990-1991
U.S. National Science Foundation, **Postdoctoral Fellow with Jennifer Graves, La Trobe University, Australia**
The sequence and expression of mammalian sex-determining genes.

1986-1990
Ph.D. thesis with Linda Strausbaugh, **The University of Connecticut**
Transcriptional regulation of tagged histone genes in relation to the cell cycle in synchronized culture cells. Instructor in the Summer Institute of Molecular

Biology, secured all funding for course from corporate sponsors.

1985-1986
Master's research with Paul Goetinck, University of Connecticut.
Cartilage Link protein c-DNA.

1983-1984
Yale University, School of Medicine, New Haven, Conn.
Research assistant, human keratins and drug response, psoriasis research with Joseph McGuire, Head of Pediatric Dermatology.

Publications

Bourland, W., Vdacny, P, Davis, M., and Hampikian, G., Morphology, Morphometrics and Molecular Characterization of Bryophrya gemmea n. sp. (Ciliophora, Colpodea): Implications for the Phylogeny and Evolutionary Scenario for the Formation of Oral Ciliature in Order Colpodida, Journal of Eukaryotic Microbiology (in press, 2011).

Davis, M., Novak, S., Hampikian, G., Mitochondrial DNA analysis of an immigrant Basque population: loss of diversity due to founder effects, American Journal of Physical Anthropology (2011, in press).

Karalova, E. M., Sargsyan, Kh.V., Hampikian G.K., Voskanyan , H. E., Abroyan L. O. , AvetisyanA. S., Hakobyan, & L. A, Arzumanyan , H.H., Zakaryan H. S., Karalyan, Zaven A., Phenotypic and cytologic studies of lymphoid cells and monocytes in primary culture of porcine bone marrow during infection of African swine fever virus, In Vitro Cell. Dev. Biol.—Animal, published online December 24, 2010, (in press, 2011).

Bullock, C., Jacob, R., McDougal, O., Hampikian, G., Andersen, T. DockoMatic - Automated Ligand Creation and Docking, *BMC Research Notes* 2010, 3**:**289.

Abu B. Kanu, Greg Hampikian, Simon D. Brandt, Herbert H. Hill Jr., Ribonucleotide and ribonucleoside determination by ambient pressure ion mobility spectrometry, Analytica Chimica Acta *658 (2010) 91–97.*

D. E. Krane, et al. (39 authors) —Time for DNA Disclosure", Science, Vol. 326. no. 5960, pp. 1631 – 1632, 18 December, 2009.

Lucian A. Lucia, Lambrini Adamapoulos, Jason Montegna, Greg Hampikian, Dimitris S. Argryopoulos, John Heitmann (2007), —A Simple Method to Tune the Gross Antibacterial Activity of Cellulosic Biomaterials, Carbohydrate Polymers 69"; 805–810.

Greg Hampikian and Tim Andersen (2007), "Absent Sequences: Nullomers and Primes," Pacific Symposium on Biocomputing, 12:355-366.

K. Moeller, J. Besecker, G. Hampikian, A. Moll, D. Plumlee, J. Youngsman and J.M. Hampikian, (2007), "A Prototype Continuous Flow Polymerase Chain Reaction LTCC Device," Materials Science Forum Vols. 539-543 pp. 523-528.

G. Hampikian, (2005), "The Future of Forensic DNA," The Canadian Journal of Police and Security Services, (Spring, 2005).

M. Crayton, C. Ladd, M. Sommer, G. Hampikian, L. Strausbaugh, (2004), "An organizational model of transcription factor binding sites for a histone promoter in D. melanogaster," In Silico Biology 4, 40-45 (October, 2004).

"Ex to Freedom," Johnson and Hampikian (University of Georgia Press, 2003): Calvin C. Johnson, Jr.'s autobiography (written by Hampikian). The true story of a man who served 16 years in Georgia prisons for a rape he did not commit until DNA evidence freed him. Afterward by Barry Scheck.
Awarded the 2004 Silver Medal in biography, (ForeWord Magazine's Book of the Year Awards).

- Nominated for the 2004 Robert F. Kennedy Book Award.
- Nominated for the 2004 African American Literary Awards.

P. Henderson, D. Jones, G. Hampikian, Y. Kan, and G. Schuster (1999), "Long-distance charge transport in duplex DNA: The polaron-like hopping mechanism," Proceedings of the National Academy of Sciences, USA, Vol. 96, Issue 15, 8353-8358, July 20, 1999.

G. Hampikian, J. Graves, D. Cooper, (1994), "Sex- determination in the marsupial" in Molecular Genetics of Sex Determination, (Ed. S. Wachtel), Academic Press.

M. Gaudette, G. Hampikian, V. Metelev, S. Agrawal and W. Crain, (1993), "Effect on embryos of phosphorothioate modified oligos. into pregnant mice," Antisense Res. & Dev., 3:391-397.

J. Graves, J. Foster, G. Hampikian, F. Brennan, (1993), "Sex- determination in marsupial mammals," in Sex Chromosomes and Sex Determining Genes, (Editors, K. Reed and J. Graves) Gordon and Breach, Melbourne.

J. Foster, F. Brennan, G. Hampikian, P.N. Goodfellow, A. Sinclair, R. Lovell-Badge, L. Selwood, M. Renfree, D. Cooper and J. Graves, (1992), "Evolution of sex determination and the Y chromosome: SRY- related sequences in

marsupials," Nature: 359:531-533.

F. Deak, Y. Kiss, K. Sparks, S. Argraves, G. Hampikian and P. Goetinck (1986), —Amino acid sequence of chicken cartilage link protein from c-DNA clones," Proc. National Academy of Science, U.S.A.: 83:3766- 3770.

Patent Applications

US Patent application: Magnetomechanical Transducer, and Apparatus and Methods for Harvesting Energy, Hampikian and Mullner inventors, filed by Boise State University, 2006.

US Patent application: a DNA marker to be added to samples as a safeguard. The oligomers are based on sequences not found in GenBank, and can be coded to contain a wide variety of information, Hampikian inventor, Dec. 23, 2003.

Professional Memberships

- American Academy of Forensic Sciences, workshop leader.
- International Society for Forensic Genetics, presenter.
- International Society for Computational Biology.
- American Society of Microbiologists: Editor for education Newsletter (1999-2002), Editor for image archives (1999-2003); Moderator of the Molecular Biology and Biotechnology Education Listserve (1999-2003).
- American Society for Cell Biology, presenter, education committee member, pre-doctoral grants reviewer.

Recent Professional Education

Tutorial Workshops, 2011 Pacific Symposium on Biocomputing, Hawaii: —Mining the Pharmacogenetics Lierature," and, —Identification of Aberrant Pathway and Network Activity from High Throughput Data", Hawaii, January 3-7, 2011

Familial Search Workshop, International Symposium on Human Identification, San Antonio Texas, October 14, 2010

Low Copy Number Analysis Workshop, Ethics and Forensic Science, International Symposium on Human Identification, San Antonio Texas, October 11, 2010

SNP analysis of physical characteristics (ie., eye color) as well as ancestry. HITA/AABB Workshop, International Symposium on Human Identification, San Antonio Texas, October 10, 2010

Ethics and Forensic Science, International Symposium on Human Identification, Las Vegas, October 15, 2009.

Post-conviction DNA Case Management Symposium, US Department of Justice, Office of Justice Programs, National Institute of Justice, invited participant, Tampa, Fla., January 23-24, 2009.

Tutorial Workshops, 2009 Pacific Symposium on Biocomputing, Hawaii: "Open Science: Tools, Approaches and Implications", "Post-Transcriptional Gene Regulation: RNA-Protein Interactions", "RNA Processing" and "mRNA Stability and Localization," 2009.

Applied Biosystems Gene Mapper & ID-X Software Training, Boise State University, May 26-29, 2009.

DNA Mixture Interpretation: Principles and Practice in Component Deconvolution and Statistical Analysis, American Academy of Forensic Sciences workshop, Washington, D.C., Feb. 19, 2008.

Mixture Interpretation Workshop, taught by Gary Schutler, Ph.D., Northwest Association of Forensic Science, Boise, Idaho, 2008.

Forensic Population Genetics Workshop, 19th International Symposium on Human Identification, Hollywood, CA, 2008.

2008 Pacific Symposium on Biocomputing, Hawaii, 2008
Tutorial Workshops: "Multiscale Modeling and Simulation", "Computational Tools for Next-Generation Sequencing."

Applied Statistics Workshop, 18th International Symposium on Human Identification, (covered DNA Mixtures, Statistics, Parentage and Kinship, Pedigree Analysis), Hollywood, CA, 2007.

Pacific Symposium on Biocomputing, Hawaii, 2007: "Computational Proteomics."

DNA Statistics, 17th International Symposium on Human Identification, Workshop, Nashville, TN, 2006.

Advanced Topics in STR DNA Analysis, American Academy of Forensic Sciences, workshop, Seattle, WA, Feb. 20, 2006.

Li-Cor DNA sequencing training for the Li-Cor 4300, Boise State University, 2005.

On-site evaluator training Forensic Science Education Programs Accreditation

Commission (FEPAC), American Academy of Forensic Sciences workshop, New Orleans, 2005.

—Symposium: Emerging and Enabling Technologies for Biological and Chemical Detection" and —Federal Bio-Chem Detection R&D Opportunities," 15.5 hours, Information Forecast, Washington, DC, 2005.

Forensic Human Mitochondrial DNA Analysis, American Academy of Forensic Sciences workshop, Dallas, Texas, 2004.

Forensic Science for Medicolegal Professionals Course (co-organizer), Atlanta, 2004.

Mass Fatalities Incident Response Planning Course, (Local coordinator), Atlanta, 2004.

Science in the Courtroom for the 21st Century: Issues in Forensic DNA, Chicago, 2004.

Legal Communication in the 21st Century, 3-hour course, Clayton State University, 2003.

Grants, Contracts and Awards

Department of Justice, PI, Wrongful Prosecution Review Program, $195,705 2010-2012.

Department of Defense, PI, DNA Safeguard, DNA barcodes to protect forensic samples, new anticancer compounds, $1,100,000, 2010-2011.

Angora Ridge Foundation, PI, Idaho Innocence Project, $70,000, 2008-2009.

Department of Defense, PI, DNA Safeguard, DNA barcodes to protect forensic samples, new anticancer compounds, $1,200,000, 2009.

IOLTA Grant, PI, Idaho Innocence Project, $25,000, 2008.

Department of Defense, PI, DNA Safeguard, DNA barcodes to protect forensic samples, $1,000,000, 2006-2008.

Environmental Protection Agency, Co-PI, —Developing and demonstrating multi-purpose sensor to detect and analyze contaminants," Biosensors and LTCC Devices to Detect Biowarfare and Biosafety agents, Co-PI responsible for $150,000 of a $1,590,000 grant, 2005.

National Science Foundation, Co-PI, NSF-Idaho EPSCoR Instrumentation Acquisition Program, $30,000 for ABI 310 Capillary Electrophoresis, Ferris and Hampikian, 2005.

Environmental Protection Agency, **PI**, seed grant, Biosensors, PCR Detection of Biowarfare and Biosafety Agents using Novel Materials, $22,000, 2004.

Li-Cor Education Award Program, PI, $50,000 match for new sequencer, (matched by departments of Biology, Chemistry, and Materials Science), 2004-2005.

Improving Teacher Education, **PI**, the Biotechnology and Forensic Science Curriculum, program included funding for 22 teachers and 300 student participants. Teachers spent 50 hours in an intensive laboratory experience over the summer, and the students spent a full day at the University preparing DNA fingerprints, $35,000, 2004-2005.

National Science Foundation, Education Specialist, Loblolly Pine Genome sequencing project. Coordinated the education portion of this successful $1.2 million grant. Students and faculty from CSU, as well as teachers and high school students participated with faculty from the Institute of Paper Science and Technology, PI John Cairney, 2003.

Improving Teacher Education, PI, the Biotechnology and Forensic Science Curriculum, $35,000, 2003-2004.

Eisenhower Award, Forensic Science with Molecular Botany, **PI** for High and Middle School teachers, 22 teachers participated, 250 students worked in campus laboratories to develop DNA fingerprints, $26,000, 2002-2003.

Eisenhower Award, PI of Forensic Science Curriculum and DNA fingerprinting for High School teachers, $23,000, 2001-2002.

National Science Foundation, Research Opportunity Award, to work with Dr. Loren Williams of Georgia Tech on enzymatic nucleic acids and intercalating agents, $19,000, 1998.

Georgia Board of Regents Model Technology Grant, PI
Computer Modules for Biotechnology, $20,000, 1998.

Faculty Development Grant (CSU), PI, to develop Computer Activities for Microbiology Lab, $2,250, 1998.

Georgia Board of Regents Model Technology Grant, PI, to develop videos for on-line Human Genetics course, $18,000, 1998.

Eisenhower Award, Co-PI, Strengthening Elementary Teachers Knowledge of Math, Science and Technology, $32,000, 1997-98.

Faculty Development Grant (CSU), PI, to develop Web-Based Activities Bridging College and Pre-College Science, $2,600, 1997.

Eisenhower Award, PI, the Molecular Biology Laboratory for Educators, summer course for teachers, $17,000, 1996-97.

National Science Foundation USA, Instrument and Laboratory Improvement, **PI**, The Cooperative Laboratory in Biotechnology, Clayton State College, matched by: **Board of Regents Technology Grant,** $60,000, 1994-97.

Eisenhower Program Summer Institute in Math and Science Excellence, co-authored proposal, recruited faculty participants who were funded for $70,000, 1995.

National Science Foundation U.S.A., Postdoctoral Fellowship Centers of Foreign Excellence, twenty-five awarded nationally. Sex-determination research, La Trobe University, $45,000, 1991-92.

Howard Hughes Medical Institute, scholarship to attend the Cold Spring Harbor Laboratory course, Large DNA Molecules, $1,500, 1990.

Corporate Support and Partnerships

New England Biolabs Honorarium and travel for Idaho Innocence Project, $2000, 2009.

Bio-Rad Forensic Biology for Teachers, Atlanta Georgia, Two Day Laboratory, $12,000, 2009.

TTDC Co-development of novel therapeutics: delivery of insulin and small peptide drugs, 2009.

Bio-Rad Child ID Clinic, DNA fingerprints for parents and children, $2,000, 2006.

Qiagen Travel grant for participation at the AAFS 2006 meeting, $2,000, 2006.

Bio-Rad Stipends and molecular biology kits for Forensic DNA Education, $25,000, 2005.

Qiagen EZ-1 robot for processing DNA from human remains, graduate student support, materials, $25,000, 2005.

Kodak DC210 system in DNA analysis, $7,000, 1998.

New England Biolabs Molecular biology education, $6,500, 1998.

Kodak EDS digital analysis of DNA for beta test, $6,000, 1996.

New England Biolabs Molecular biology education, $3,000, 1996.

Fisher Scientific Support for biotechnology at CSU, $4,000, 1996.

Stratagene, Clontech, New England Biolabs, Biorad, and Pharmacia Summer Institute in Molecular Biology, $27,000, 1987-90.

Meetings organized, professional workshops and courses offered

Wyoming Public Defenders, —Forensic DNA Analysis," October 3, 2008.

Alaska Innocence Project, —DNA in Post Conviction Testing," September 12, 2008.

Ada County Sheriff's Office, 3-hour DNA workshop for crime lab personnel, March 21, 2008.

Nampa Crime Lab, 3-hour DNA workshop for crime lab personnel, February 14, 2008.

National Bar Association, Atlanta, GA —DNA in Cold Cases, and Postconviction," panel discussion with Atlanta Police cold case squad, August 7, 2007.

Georgia Innocence Project, —DNA Evidence: Intern Training Workshop," Atlanta, Georgia, July 10, 2007.

Boise Association of Legal Professionals, —DNA for the legal professional," April 27, 2007.

I**nnocence Network Conference 2007, Harvard University, "**Advanced DNA: What You Need to Know About Y-STR and Mitochondrial DNA Testing**,"** Panelists: Greg Hampikian (Idaho Innocence Project, Georgia Innocence Project), Cassie Johnson (Orchid Cellmark Laboratory), Nina Morrison

(Innocence Project), March 25, 2007.

American Academy of Forensic Scientists: —DNA 101," Greg Hampikian, Carll Ladd and Eric Carita (Connecticut State Police Forensic Lab), American Academy of Forensic Sciences, 59th Annual meeting, San Antonio, 3.75 CE Units, February 20, 2007.

Boise State University, "Hands-on Forensic Biology and DNA Fingerprinting." This course was approved by the Idaho State Bar, Idaho Nurses Association, and the State of Idaho Peace Officer Standards and Training for Continuing Education Credits, 8.5 hour lab course, 10 participants including coroners, police officers, lawyers, October 20, 2006.

American Academy of Forensic Scientists, "DNA for the Non-scientist," 2-hour workshop offered with Anjali Swienton, February 21, 2006.

The University of Connecticut, Director and Instructor of —Forensic Science for Educators," graduate course, Molecular and Cell Biology 396-40, Variable Credits (2-3). Course for 16 teachers funded by Bio-Rad, with Professor Linda Strausbaugh, July 7-9, 2005.

Continuing Legal Education (CLE) workshop, Atlanta, GA, —Forensic DNA for Lawyers," June 7, 2005.

Renaissance Institute, —Solving Crimes with DNA: How Science Convicts and Exonerates," invited presentation**,** Boise, ID, Sept. 28, 2005.

Sun Valley, ID CLE workshop: —DNA evidence interpretation," for the Idaho Criminal Defense Lawyers, Annual Meeting. Two workshops given, 2-hours, 60 participants, March 11, 2005.

Federal Defenders of Eastern Washington and Idaho, CLE workshop: —DNA evidence: cases in point," 1 hour (CLE), 24 participants, Boise, ID, August 18, 2004.

Forensic Science Program for Medicolegal Professionals, Atlanta, GA, Co-organizer and presenter. The program addressed: Forensic Pathology, Forensic Anthropology, Death Scene Processing, Forensic Photography, DNA Analysis, Blood Spatter Analysis, Child Abuse & Neglect, Gunfire Related Deaths, Weapons of Mass Destruction, Court Room Presentation of Evidence, Atlanta, May 3-7, 2004.

CSU Laboratory Workshop, Atlanta, GA, "Forensic DNA," 2004.

NSTA Annual Convention, laboratory course: —Forensic Biotechnology

Laboratory for Teachers," Hampikian and Burke, Atlanta, April, 2004.

GA Indigent Defense Council, Atlanta, GA (Sci-Trek), —DNA Basics," Continuing Legal Education (CLE for lawyers), September, 2003.

Georgia Indigent Defense Council, Atlanta, GA, –DNA evidence: emerging technologies for legal professionals," continuing legal education (CLE) course for lawyers, 2003.

GA Indigent Defense Council, Thomaston, GA, CLE workshop: —DNA: The Law & The Science," (CLE for lawyers), 2003.

Amer. Soc. for Microbiology, **(Pomona, CA),** Education Division meeting, Computer workshop: —Technology seminar for microbiology teaching academics," invited presentation, workshop for members, 2000.

Presentations, panels and posters

Federation of European Biochemical Societies, Yerevan, Armenia, February 16-20, 2011, Genomic Instability advanced lecture course, invited speaker, panel moderator.

Griffith College of Law, Dublin, Ireland, Cold Case and Postconviction DNA Testing, March 2-5, 2010.

XIII International Congress of Protistology, Búzios, Rio de Janeiro State, Brazil, Bourland, W.A., Davis, M., Hampikian, G. 2009. Caudal cirri are present in *Pleurotricha lanceolata* (Ehrenberg, 1835) Stein, 1859 (Ciliophora, Spirotrichea).. Abstract BC-02, Journal of Eukaryotic Microbiology supplement.

College of Idaho, "Writing Biography," Prison Experience course, January 27, 2010.

Pacific Symposium on Biocomputing, Hawaii 2009, Keynote presentation**:** *"'DNA Don't Lie':* How Bioinformatics freed some of my best friends, and sent the guilty to prison."

College of Idaho, "DNA as Narrative," Prison Experience course, Feb. 2, 2009.

American College of Trial Lawyers (ACTL), Idaho, —New Uses of DNA Evidence," Arid Club, ACTL Fellows and their guests, June 28, 2008.

International Society for Environmental Epidemiology (ISEE), Central & Eastern Europe Conference on Health and the Environment, –New sensor

developments at the Boise State University Center for Environmental Sensing," Gribb, M.M., G. Hampikian, W. Kuang, D. Plumlee, and D. Russell, poster presentation by Gribb, Cluj-Napoca, Romania, October 19-22, 2008.

DNA in Forensics: Bi-annual meeting of the International Society for Forensic Genetics (ISFG), Greg Hampikian and Michael Davis, "Basque DNA in Idaho: the Origin and Frequency of Mitochondrial Haplotypes in Immigrants to a Northwestern American State," Ancona, Italy, oral presentation by G. Hampikian, May 29, 2008.

University of Washington Law School, panel discussion with "Hurricane" Ruben Carter on the Burns Rafay case, March 4, 2008.

NCBI, National Institutes of Health: "Novel Applications in Forensic DNA: Nullomers, Primes," research seminar, Bethesda Maryland, February 20, 2008.

College of Idaho, "Forensic non-fiction," invited talk, Feb. 13, 2008.

18th International Symposium on Human Identification, "STR Variation in the Immigrant Basque Population of Southwest Idaho," Micheal Davis, Jayita Goswami and Greg Hampikian, poster presentation, Hollywood, CA, 2007.

American Academy of Forensic Sciences, Annual Meeting, Michael Davis and Greg Hampikian, "Median Network Analysis of mtDNA Haplotypes in the Basques of Southern Idaho," poster, San Antonio, Texas, 2007.

American Society of Microbiology 107th General Meeting, Jason R. Besecker, Korey Moeller, Ken Cornell, and Greg Hampikian, "Development of a Bioterrorism Agent Multiplex PCR for Use in a Novel Ceramic Biodetector," Toronto, Canada, May 21-25, 2007.

American University in Paris, "DNA and Justice," College Lecture, and 2 laboratory presentations, October 23, 24, 2007.

Centre Technique De La Gendarmerie Nationale, Institut de researche criminelle de la gendarmerie Nationale, Cergy Pontoise, France, research presentation, October 21, 2007.

American Society of Microbiology 107th General, Toronto, Canada, poster Jason R. Besecker, Korey Moeller, Ken Cornell, and Greg Hampikian, "Development of a Bioterrorism Agent Multiplex PCR for Use in a Novel Ceramic Biodetector," May 21-25, 2007.

Proceedings of the International Conference on Ceramic Interconnect and Ceramic Microsystems Technologies, Denver, CO, poster, K. Moeller, J.

Besecker, J.M. Hampikian, A. Moll, D. Plumlee, J. Youngsman, G. Hampikian, —A Prototype Continuous Flow Polymerase Chain Reaction LTCC Device," April 25-27, 2006.

New Horizons in Forensic Science, 2005 International Forensic Science Symposium, Taipei, Taiwan, "DNA Freeing the Innocent: Two Exonerations after 17 Years in Prison," invited presentation, November 8, 2005.

Biomedical Research Infrastructure Network (BRIN) Workshop, —DNA analysis in the application of justice", Boise State University, July 23, 2005.

The Center for Advanced Genetics Technologies at the University of Connecticut, —Ethics in the genetics class: But why is it wrong?," Invited seminar for —Forensic Science for College Educators," Storrs, CT, July 12, 2005.

NAACP Legal Defense Fund, Airlie, Virginia, —DNA and the Death Penalty," July 23, 2005.

Court TV, —Idaho and Georgia Innocence Projects," invited presentation for producers and reporters, Manhattan, July 11, 2005.

Innocence Project at the Benjamin N. Cardozo School of Law, New York, —Forensic DNA: questions and answers on current Innocence Project cases," July 11, 2005.

Bioinformatics Workshop, Idaho State University —Forensic DNA databases: Opportunities and limits," Invited talk, Pocatello, ID, June 21-22, 2005.

Georgia Innocence Project, —DNA evaluation in post-conviction cases," seminar for law interns, Atlanta, June 8, 2005.

University of Connecticut, —DNA fingerprints and civil rights," invited Talk for the, DNA and Civil Liberties course, in conjunction with the dedication of the new Center for Applied Genetics Technology forensic laboratory, April 29, 2005.

105th General Meeting of the American Society for Microbiology, Atlanta, GA, —Aromatic Inhibition of Bacterial Growth by Volatiles from Extracts of Ginger, Wintergreen, Cinnamon, Patchouli, Eucalyptus, Geranium, and other Plant Sources, Alone and in Combination," G. Hampikian, N. DeWane, A. Brooks, and J. Strong, poster, 2005.

BSU College of Engineering —Cell Biology for Engineers," guest lecture for Biocompatability and Environmental Degradation, MSE 497/597, January 19, 2005.

BSU Department of Chemistry, —DNA: Molecular truth Serum, Seminar, January, 28, 2005.

BSU College of Business, —Forensic Technology," guest lecture for Emerging Technology Entrepreneurship, MBA 585, January 24, 2005, (appointed to the MBA 585 Scientific Advisory Board, spring 2005).

Faculty of University of Paris, Departement des Menaces Criminelles Contemporaines —DNA, Justice and Science," December 10, 2004.

Bioinformatics Seminar, BSU, —Telomers and Primes," November, 2004.

Federal Defenders of Eastern Washington and Idaho, —DNA evidence: cases in point," August 18, 2004.

Biomedical Research Infrastructure Network (BRIN) Workshop, —Applications of molecular biology in Forensic Science," BSU, August, 2004.

MARTECH (Materials Research and Technology), Florida State University, —Natural Born Killers: Bioactive Surfaces," Lucia, L.A., Montegna, J., Hampikian, G.; Presented by L. Lucia, Tallahassee, FL, June 2004.

Boise State University, —DNA in the Courtroom," invited talk, April 2004.

Science in the Courtroom CLE Course, Atlanta, GA —DNA evidence and exonerations," April 22, 2004.

Georgia State University, —DNA and the first test of the new Georgia preservation law," Biology Department Seminar, February 20, 2004.

Harvard University, —Forensic DNA: freeing the innocent and rewriting history," June 2003.

University of Connecticut, Forensic Science Seminar Series, —Biotechnology and the Innocence Movement," 2003.

Georgia Innocence Project, —Evaluating DNA fingerprints for appeals," May 2003.

Georgia State University, —Using DNA to solve crimes and free the innocent," Biology Seminar, April 25, 2003.

Georgia State University, —DNA in the courtroom: the evidence of presence," Guest lecture for Introduction to Law 3020 class at the J. Mack Robinson College

of Business, April 17, 2003.

Mercer University, —Arts and Sciences, writing in a bicameral mind," Senior University Program, Atlanta, GA, April 2, 2003.

The Materials Information Society ASM, Georgia chapter, Georgia Tech, —DNA, the ultimate memory material," December 12, 2002.

American Society for Cell Biology (ASCB), San Francisco, —Using forensic science to introduce biotechnology in the High School curriculum," invited presentation, ASCB General Meeting, 2002.

The Pacific Symposium on Biocomputing, **Honolulu, Hawaii,** —Engineering stability in t-RNA," supported by PE Biosystems travel award, 2000.

Georgia Association of Science Teachers —Forensic science curriculum, on the Web," presentation by Penland and Hampikian, 2000.

American Society for Microbiology, Los Angeles, —Biotechnology reports: electronic reports contrasting popular press and peer-reviewed research," presentation, 2000.

American Society for Microbiology (99th general meeting, Chicago), —Virtual tools for the microbiology laboratory," Hampikian and McClain, computer presentation, 1999.

Gordon Conference on Microbiology Education, —Maximizing digital interdependence in the microbiology class and laboratory," New London, CT, poster, 1999.

American Society for Microbiology (5th Undergraduate Education Conference, Atlanta), —Web-based student-generated microbiology curriculum," Hampikian and McClain, 1998.

Collaborative Approach in Improving Science Education and Research (CAISER) consortium, Emory University, —Collaborative Microbiology and the Web," Hampikian and McClain, Atlanta, GA, 1998.

Georgia Association of Teacher Educators, —A cooperative curriculum for elementary science, Clayton State (science and math), The GA Environmental Protection Div., and North Fayette Elementary," 1998.

College of Charleston Biology Seminar Series, —Variety is the rule: lessons in sex-determination from marsupials to mosquitoes," 1997.

Kodak Digital Research Center, —Use of Biomax software in molecular biology teaching laboratories," New Haven, CT, 1997.

Georgia Institute of Technology, Biochemistry Department, —Trapping enzymatic nucleotides using PCR," 1997.

6th International Congress on Cell Biology (ASCB), —Digital electrophoresis analysis, educational applications," Hampikian and Zarzaka, poster, 1996.

Georgia Conference on College and University Teaching, —Mastering technology through student interdependence," computer video presentation, 1996.

The American Institute of Biological Sciences, —The Cooperative Laboratory in Biotechnology," San Diego, invited speaker, 1995.

Emory University —Experiments on sex-determination in the mosquito," research talk, Biology Department, 1995.

Centers for Disease Control and Prevention (CDC), —Sex-determination and the prevention of malaria: reproducing the work of Bridges in the mosquito," hosted by Dr. Nora Berzansky and Dr. Frank Collins, 1995.

Georgia Conference on College and University Teaching, —Active learning approaches in critical thinking," computer video presentation, 1995.

Piedmont College Graduate Education Program, —2,000 years of biology in 4 hours," invited talk, 1995.

Emory University —Sex-determination mechanisms, a molecular view," invited talk, 1993.

Boden Conference on Mammalian Sex Chromosomes and Sex Determining Genes, —cDNA cloning of the marsupial testis-determining gene," Threadbow, Australia, seminar, 1992.

Imperial Cancer Research Fund, London, —Comparing the sex-determining genes of mammals," invited talk, 1992.

Institut Pasteur, Paris, —Sequence analysis of the testis-determining region," invited talk, 1992.

MRC Human Genetics Unit, Edinburgh, Scotland, —Possible roles of SRY deduced from DNA motifs," invited talk, 1992.

Massachusetts General Hospital, Harvard University, —Lessons from the marsupial Y chromosome," Cambridge, invited talk, 1992.

American Cyanamid, —Editing SRY, analysis of c-DNA and genomic clones," NY, invited talk, 1992.

USDA, Bethesda, MD, —Controlling gender, the prospects for transgenic regulation," invited talk, 1992.

Worcester Foundation for Experimental Biology, —Cloning and analysis of the marsupial SRY," invited talk, MA, 1992.

The Genome Conference, Lorne, Australia, —Cell-cycle expression of *D. melanogaster* histone genes," G. Hampikian, C. Ladd, L. Strausbaugh, poster, 1991.

La Trobe University Seminar Series, —Insect sex-determination," presentation, Australia, 1991.

30th Annual Drosophila Conference, —Histone expression in transformed culture cells," New Orleans, poster,1989.

Undergraduate Research Presentations:

BSU undergraduate research conference, —Finding the needle not in the haystack: 'nullomers' and 'primes,' short sequences absent from species and groups of species," Ben Noland (undergraduate, computer sciences), Tim Anderson, Amit Jain, and Greg Hampikian, BSU, poster, 2005.

BSU undergraduate research conference, —Analysis of the forensic science outreach program," Chuck Cato, Becky Munoz, (undergraduates), Holli Shultz (graduate student in biology) and Greg Hampikian, poster, 2005.

American Society for Microbiology, general meeting, Orlando, Florida, —Inhibition of bacterial growth by spice vapors," Hampikian, Kicklighter and Powell, poster and press conference panel, 2001.

American Society for Microbiology, 5th Undergraduate Education Conference, Atlanta, GA, —Comparison of digital gel analysis systems," Hampikian and Hardwick (undergraduate presenter), 1998.

Examples of School Outreach

National educational outreach directed by Greg Hampikian

- **Georgia Science Teachers,** Forensic DNA and Biotechnology Workshop, Sept. 15 and 16, 2008, Georgia State University, 20 teachers from Georgia Schools, *Sponsoring Institutions:* Georgia State University's Bio-Bus Program; Boise State University Outreach; Bio-Rad; Howard Hughes Medical Institute's Undergraduate Science Education Division. The High School Curriculum in Forensic Science has received national recognition from Good *Morning America, The Wall Street Journal, Fox news* and others.

- **Atlanta Area Science Teachers,** Forensic DNA and Biotechnology Workshop, Sept. 17 and 18, 2007, Georgia State University, 27 teachers from Georgia Schools, *Sponsoring Institutions:* Georgia State University's Bio-Bus Program; Boise State University Outreach; Bio-Rad; Howard Hughes Medical Institute's Undergraduate Science Education Division.

- **AAAS** American Association for the Advancement of Science, 88th Pacific Northwest Annual Meeting, Molecular Biology for High School Teachers, 2 Day workshop with Bio-Rad, June 20 and 21, 2007 teachers from around the Northwest.

- **Atlanta Forensic Science Day,** in conjunction with the US Army Criminal Investigation Laboratory, 500 Students, 26 teachers, participated in the first Forensic Science Day, May 25, 2005, (program repeated in 2006). The Forensic Science Day follows 50 hours of laboratory activities for teachers, and is followed by sustained contact between teachers and university and forensic experts. With support from BIO-RAD.

- **Connecticut,** Forensic Science and Biotechnology for Teachers in Conjunction with Center for Applied Genetics Technology, sponsored by BIO-RAD, University of Connecticut, 30-hour intensive lab course, 22 teachers, July 7-10, 2005.

- **Confratute, teachers conference,** —Forensic activities," workshop for teachers of gifted children, Storrs, CT, 48 teachers, July 12, 2005.

- **University of Connecticut, "**Undergraduate educators workshop in forensic science," laboratory course, Department of Molecular and Cell Biology, 12 undergraduate professors, July 12-14.

- **NSTA** Short course: —Forensic Biotechnology Laboratory for Teachers," National Science Teachers Association Annual Convention, laboratory course, Hampikian and Burke, Atlanta, April, 2004, 6 hours, 23 teachers from around the country.

Idaho Science Teachers Workshops/Presentations

- Idaho Science Teachers, annual meeting keynote, 160 teachers, Oct. 6, 2006.
- Treasure Valley Science Teachers Workshop, Vallivue High School, Caldwell, 20 teachers, Oct. 18, 2005.
- Forensic Science and Evolution in the High School Classroom, October 6 and 7, 2005 at Boise State, sponsored by a grant from Bio-Rad, 7 teachers.
- —DNA Evidence: Molecules of Truth," for —Biology Labs Workshop for AP High School Teachers," 8 teachers, May 20, 2005.

Examples of over 40 Workshops for Idaho Partnership Schools can be seen at http://biology.boisestate.edu/hampikian

Student Development

Forensic Science Club: BSU (Faculty Sponsor), founded 2005. Served as faculty advisor, 2005-2006.

Clayton State Science Association: first faculty sponsor of this popular campus group, 1996-2002, 35 regular members.

Clayton State Biology Research Scholars: initiated program, sponsored student researchers at the CDC, 1994-1996.

Frontiers in Science Seminar Series: developed and secured funding to invite visiting scientists to the CSU campus, secured grants totaling over $10,000 to support this program. Invited 20-30 speakers each year (1996-2004). Format: students interview speakers, read papers in preparation, perform introductions, and follow-up with visits to the speaker's lab and a written report. Many students have gone on to fellowships, jobs, or graduate school with their guests, 1996-2004.

Conflict and Consensus Program: an —anti-debate" format developed at CSU in which opposing parties of local and national renown are brought to common ground, mediated by student teams. The program has been incorporated into the critical thinking curriculum. Participants have included presidential candidate Allen Keyes, and Pulitzer-Prize winner Cynthia Tucker (Atlanta Journal, PBS). Secured grants of more than $11,000 to support this program.

Curriculum Development

Forensic Evidence in Cold Cases: Criminal Justice course with graduate and undergraduate sections (2008-), service learning component added in 2009.

Biotechnology: graduate seminar course covering breaking developments in

applied biotechnology, 2008.

Advanced DNA Analysis: course with graduate and undergraduate sections focusing on new applications of DNA analysis, 2005.

Forensic Science Training: produced DVD series with JPM productions, 2005.

Forensic Biology: course with graduate and undergraduate sections, also crosslisted in Criminal Justice, 2004.

Forensic Science for Teachers: course for teachers organized in conjunction with the US Army Criminal Investigation Laboratory at Fort Gillem, Eisenhower funded, 2001.

Bioregulatory Affairs: a unique university course developed for Applied Biology major, Fall, 2001.

Applied Biology Major: proposal author for new University BS program, approved 2000.

Sex and Gender: undergraduate course, 1999-2001.

Human Genetics: Web-based course, 1998-2004.

Forensic DNA Science for High School Students: host 50-80 high school students each year for a full day of DNA fingerprinting, and molecular biology laboratories, 1997-2004.

Science internship program: developed and coordinate program, supervised students each semester, oversaw outplacement of all biology interns, 1997-2004.

The Cooperative Laboratory in Biotechnology: course for teacher education students covering basic cloning and gene analysis, 1994-2004.

Forensic DNA Teaching Curriculum: high school curriculum developed with Dr. Henry Lee and area high school teachers, 1994.

Current Committee Work

Chair, Concordia Law School in Boise, Chair of Committee on Relationships with Government, Other Educational Institutions and the Community.

Member, Graduate Studies Committee, Biology Department, Boise State University.

Member, BSU College of Arts and Sciences Outreach Committee.

Grant reviewer, BSU College of Arts and Sciences, for faculty grants Biology

Member, Biology Undergraduate Committee, scholarship committee: rewrote scholarship application.

Charles Hanna

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Education

Ph.D. Physics, Stanford University, 1990
M.S. Physics, Yale University, 1982
B.S. Mathematics and Physics, Yale University, 1982

Employment

(2009 – present) Chair of Physics, Boise State University
(2004 – 2009) Associate Chair of Physics, Boise State University
(2004 – present) Professor of Physics, Boise State University
(2001 – 2004) Associate Professor of Physics, Boise State University
(1996 – 2001) Assistant Professor of Physics, Boise State University
(1993 – 1996) Postdoctoral Researcher, Indiana University
(1990 – 1993) Postdoctoral Researcher, IBM Research Division

Research Interests (primarily theory and computation)

Nanoscale physics and biophysics
Bose-Einstein condensation
Quantum effects in low dimensional and nanoscale electron and boson systems
Effects of interactions between electrons in semiconductor structures
Quantum Hall effect, especially in multi-component systems
Many-body theory and statistical physics

Grants, Awards, and Honors

- "Interactions in Quantum and Biophysical Systems," NSF Grant No. DMR-0605652, $100,000, 08/15/2006 - 07/31/2008
- W. F. James Chair Professor of Pure and Applied Sciences, St. Francis Xavier University, 2005–2006
- 2005 University Foundation Scholar Award for Research, Boise State University
- Finalist, 2004 University Foundation Scholar Award for Research, Boise State University
- Finalist, 2003 University Foundation Scholar Award for Research, Boise State University
- 2002 Award for Distinguished Research in Science, College of Arts and Sciences, Boise State University
- "Idaho EPSCoR Research Infrastructure Improvement Grant," NSF Grant No. EPS-0132626 (Boise State Project Coordinator for five investigators), $1.2 million total, 02/01/02-01/31/05
- "Broken-symmetry states of confined interacting electrons," NSF Grant No. DMR-0206681, $105,000, 07/01/02-06/30/06
- "Nanoscale magnetism in quantum dots," Research Corporation Grant No. CC5666, $23,683, 07/01/03-06/30/06

- "Quantum coherence and many-body interactions in inorganic and organic nanoscale electronic devices," Australian Research Council Grant No. DP0558769 (Partner Investigator), 2005-2008
- "Upgrading the Magnetization Measurement Capabilities of an Existing Magnetometer," Agency: NSF-Idaho-EPSCoR Instrumentation program; Amount: $70,000; Duration: 01/02/04 – 12/31/04; PI: A. Punnoose; co-PIs: C. B. Hanna, W. B. Knowlton, A. Moll, and D. Warner.
- "Proximity effects and new correlated phases in closely spaced quantum electronic devices," Australian Research Council Grant No. DP0210800 (Partner Investigator), 2001-2003
- "Correlated electrons in multilayer semiconductors," NSF Grant No. DMR-9972332, $109,000, 07/01/99-06/30/02
- ITP Scholar Award, UC Santa Barbara, 1997-2000
- "Multilayer semiconductor structures in the quantum Hall regime," Research Corporation Cottrell College Science Award No. CC-4407, $35,000, 1997-1999
- Faculty Research Grant, Boise State University, 1997
- Faculty Research Associates Grant, Boise State University, 1997
- ARCS Fellowship, Stanford University, 1987
- DeForest Prize for Creative Achievement in Physics, Yale University, 1982

Refereed Publications

*Indicates student collaborators

1. A. Thurber, D. G. Wingett, J. W. Rasmussen, J. Layne*, L. Johnson, D. A. Tenne, J. Zhang, C. B. Hanna and A. Punnoose, "Improving the selective cancer killing ability of ZnO nanoparticles using Fe doping", *Nanotoxicology* (in press, 2011).
2. A. P. Thurber, G. L. Beausoleil II*, G. A. Alanko*, J. J. Anghel*, M. S. Jones, L. M. Johnson, J. Zhang, C. B. Hanna, D. A. Tenne and A. Punnoose, "Magnetism of ZnO nanoparticles: Dependence on crystalline size and surfactant coating", *Journal of Applied Physics* **109** 07C305 (2011).
3. L. M. Johnson, A. Thurber, J. Anghel*, M. Sabetian*, M. H. Engelhard, D. A. Tenne, C. B. Hanna, and A. Punnoose, "Transition metal dopants essential for producing ferromagnetism in metal oxide nanoparticles" *Physical Review B* **82** 054419 (2010).
4. J. Zhang, A. Thurber, D. A. Tenne, J. W. Rasmussen, D. G. Wingett, C. B. Hanna, and A. Punnoose, "Enhanced dye fluorescence in novel dye-ZnO nanocomposites" *Advanced Functional Materials* **20** 4358-4363 (2010).
5. "Correlation between saturation magnetization, bandgap, and lattice volume of transition metal (M=Cr, Mn, Fe, Co, or Ni) doped $Z_{n1-x}M_xO$ nanoparticles"
   J. Anghel*, A. Thurber, D. A. Tenne, C. B. Hanna, and A. Punnoose, *Journal of Applied Physics*, 107, 09E314 (2010)
6. J. Zhang, A. Thurber, C. B. Hanna, and A. Punnoose, "Highly shape-selective synthesis, silica coating, self-assembly, and magnetic hydrogen sensing of hematite nanoparticles", *Langmuir* **26** 5273-5278 (2010).
7. "Crucial roles of charged saccharide moieties in survival of gram negative bacteria against protamine revealed by combination of grazing incidence x-ray structural characterizations and Monte Carlo simulations"
   Rafael Oliveira, Emanuel Schneck, Bonnie Quinn, Oleg Konovalov, Klaus Brandenburg,

Thomas Gutsmann, Tom Gill, Charles Hanna, David Pink, Motomu Tanaka, *Phys. Rev. E*, 81, 041901 (2010)

8. "Electrostatics Interactions Affect Nanoparticle-Mediated Toxicity to the Gram-Negative Bacterium *Pseudomonas aeruginosa* PA01"
   Kevin Feris, Caitlin Otto*, Juliette Tinker, Denise Wingett, Alex Punnoose, Aaron Thurber, Madhu Kongara, Maryam Sabetian*, Bonnie Quinn, Charles Hanna, and David Pink, *Langmuir* **26** (6), 4429-4436 (2010)
9. "Modeling the solid-liquid phase transition in saturated triglycerides"
   D.A. Pink, C.B. Hanna, C. Sandt, A.J. MacDonald*, R. MacEachern*, R. Corkery, D. Rousseau. *Journal of Chemical Physics* 132, 054502 (2010)
10. "Physical Mechanisms of Bacterial Survival Revealed by Combined Grazing-Incidence X-ray Scattering and Monte Carlo Simulation"
    R.G. Oliveira, E. Schneck, B.E. Quinn, O.V. Konovalov, K. Brandenburg, U. Seydel, T. Gill, C.B. Hanna, D.A. Pink, and M. Tanaka,
    Comptes Rendus Chimie **12** (1-2), 209-217 (2009). </font
11. "The Influences of Cell Type and ZnO Nanoparticle Size on Immune Cell Cytotoxicity and Cytokine Induction"
    Cory Hanley*, Aaron Thurber, Charles Hanna, Alex Punnoose, Jianhui Zhang, and Denise G. Wingett, *Nanoscale Research Letters* **4** (12), 1409-1420 (2009).
12. "Physical Mechanisms of Bacterial Survival Revealed by Combined Grazing-Incidence X-ray Scattering and Monte Carlo Simulation"
    R.G. Oliveira, E. Schneck, B.E. Quinn, O.V. Konovalov, K. Brandenburg, U. Seydel, T. Gill, C.B. Hanna, D.A. Pink, M. Tanaka. *Comptes Rendus Chimie* 12, Issues 1-2, 209-217 (January-February 2009)
13. "Case for Discotic Liquid Crystals in Molten Triglycerides"
    R.W. Corkery, D. Rousseau, P. Smith, D. A. Pink, C.B. Hanna, *Langmuir* 23, 7241 (2007)
14. "Modelling electrostatic interactions in complex soft systems"
    D.A. Pink, C.B. Hanna, B.E. Quinn, V. Levadny, G.L. Ryan, L. Filion, A.T. Paulson, *Food Research International* 39, 1031 (2006)
15. "Van der Waals interactions with soft interfaces"
    C.B. Hanna, D.A. Pink, B.E. Quinn, *J. Phys.: Condens. Matter* 18, 8129 (2006)
16. "Evolution of the bilayer $\nu = 1$ quantum Hall state under charge imbalance,"
    W.R. Clarke, A.P. Micolich, A.R. Hamilton, M.Y. Simmons, C.B. Hanna, J.R. Rodriguez*, M. Pepper and D.A. Ritchie,
    Preprint cond-mat/0403490, accepted as a Rapid Communication to Phys. Rev. B (2004).
17. "Measuring the condensate fraction of rapidly rotating trapped boson systems: off-diagonal order from the density,"
    J. Sinova, C.B. Hanna, and A.H. MacDonald,
    Phys. Rev. Lett. **90**, 120401/1-4 (2003).
18. "Rippled state of double-layer quantum Hall systems,"
    C.B. Hanna,
    Phys. Rev. B **66**, 165325/1-10 (2003).
19. "Quantum melting and absence of Bose-Einstein Condensation in two-dimensional vortex matter,"
    J. Sinova, C.B. Hanna, and A.H. MacDonald,
    Phys. Rev. Lett. **89**, 030403/1-4 (2002).

20. "Exchange-driven bilayer-to-monolayer charge transfer in an asymmetric double-quantum-well,"
A.R. Hamilton, M.Y. Simmons, C.B. Hanna, J.C. Díaz-Vélez*, M. Pepper, and D.A. Ritchie,
Physica E **12**, 304-306 (2002).
21. "Broken-symmetry states in quantum Hall superlattices,"
C.B. Hanna, J.C. Díaz-Vélez*, and A.H. MacDonald,
Phys. Rev. B **65**, 115323/1-8 (2002).
22. "Incommensurate ground state of double-layer quantum Hall systems,"
C.B. Hanna, A.H. MacDonald, and S.M. Girvin,
Phys. Rev. B **63**, 125305/1-12 (2001).
23. "Eliminating non-logical states from linear quantum-dot cellular automata,"
J.C. Lusth, C.B. Hanna, and J.C. Díaz-Vélez*,
Microelectronics Journal **32**, 81-84 (2001).
24. "Double-layer systems at zero magnetic field,"
C.B. Hanna, D. Haas* and J.C. Díaz-Vélez*,
Phys. Rev. B **61**, 13882-13913 (2000).
25. "Properties of the soliton-lattice state in double-layer quantum Hall systems,"
C.B. Hanna, A.H. MacDonald and S.M. Girvin,
Physica B **249-251**, 824-827 (1998).
26. "Spontaneous coherence and the quantum Hall effect in triple-layer electron systems,"
C.B. Hanna and A.H. MacDonald,
Phys. Rev. B **53**, 15981-15990 (1996).
27. "Effect of spin degeneracy on scaling; in the quantum Hall regime,"
C.B. Hanna, D.P. Arovas, K. Mullen, and S.M. Girvin,
Phys. Rev. B **52**, 5221-5232 (1995).
28. Comment on "Contribution of quantum-well states to the RKKY coupling in magnetic multilayers" and reply,
P. Bruno, C.B. Hanna, * B.A. Jones,
Phys. Rev. Lett. **72**, 3627-3628 (1994).
29. "Quantum-well contributions to the RKKY coupling in magnetic multilayers,"
B.A. Jones, and C.B. Hanna,
in *Magnetic Ultrathin Films*. Multilayers and Surfaces, Interfaces and Characterization-Symposium. 1993: 165-9 Mater. Res. Soc, Philadelphia, PA, USA 1993
30. "Contribution of quantum-well states to the RKKY coupling in magnetic multilayers,"
B.A. Jones and C.B. Hanna,
Phys. Rev. Lett. **71**, 4253-4256 (1993).
31. "Correlation energy of the anyon gas,"
C.B. Hanna and A.L. Fetter,
Phys. Rev. B **47**, 3280-3289 (1993).
32. "Electrodynamics of a quantum Hall liquid,"
C.B. Hanna and D.H. Lee,
Phys. Rev. B **46**, 16152-16155 (1992).
33. "Single-particle excitation spectrum of the anyon gas,"
A.L. Fetter and C.B. Hanna,
Phys. Rev. B **46**, 9063-9069 (1992).

34. "Quantum mechanics of the fractional-statistics gas: random-phase approximation," Q. Dai, J.L. Levy, A.L. Fetter, C.B. Hanna, and R.B. Laughlin, Phys. Rev. B **46**, 5642-5677 (1992).
35. "Conservation laws and anyons: Hartree approximation," A.L. Fetter and C.B. Hanna, Phys. Rev. B **45**, 2335-2351 (1992).
36. "Anyons and superconductivity: random phase approximation," A.L. Fetter, C.B. Hanna, and R.B. Laughlin, Int. J. Mod. Phys. B **5**, 2751-90 (1991).
37. "Quantum mechanics of the fractional-statistics gas: particle-hole interaction," C.B. Hanna, R.B. Laughlin, and A.L. Fetter, Phys. Rev. B **43**, 309-319 (1991).
38. "Random-phase approximation in the fractional-statistics gas," A.L. Fetter, C.B. Hanna, and R.B. Laughlin, Phys. Rev. B **39**, 9679-9681 (1989).
39. "Dilute Fermi liquid of heavy polarons in copper oxide superconductors," R.B. Laughlin and C.B. Hanna, in S.A. Wolf and V.Z. Kresin, Novel-Superconductivity. Proceedings of the International Workshop on Novel Mechanisms of Superconductivity. 1987: 553-62 Plenum, New York, NY, USA 0306426919 1987.
40. "Mechanism of current modulation by optic phonons in heterojunction tunneling experiments," C.B. Hanna, E.S. Hellman, and R.B. Laughlin, Phys. Rev. B **34**, 5475-5483 (1986).
41. Comment on "Oscillations in the current-voltage characteristics of GaAs-AlGaAs tunnel junctions" and reply, C.B. Hanna, R.B. Laughlin, and J. Ihm, Phys. Rev. Lett. **56**, 2547-2548 (1986).
42. "One dimensional polaron effects and current inhomogeneities in sequential phonon emission," E.S. Hellman, J.S. Harris, C.B. Hanna, and R.B. Laughlin, Physica B+C **134B**, 41-46 (1985).

Sessions Chaired

1. "Metal-Insulator Phase Transition IV," Session J21 of the 2002 Annual American Physical Society March Meeting
2. "Integer Quantum Hall Effect – Theory," Session I26 of the 1993 Annual American Physical Society March Meeting

Invited Talks

1. **Dalhousie talk**
2. **James Chair talk**
3. "Rapidly Rotating Bose-Einstein Condensates," St. Francis Xavier University, Department of Physics, 11/05/2004
4. "Bose-Einstein Condensates in the Quantum Hall Regime," Washington State University, Department of Physics, 9/21/2004

5. "Bose-Einstein Condensates in the Lowest Landau Level," 13th Gordon Godfrey Workshop on Recent Advances in Condensed Matter Theory, 12/4/2003
6. "Nanoscale Physics of Confined Electron and Boson Systems," University of Idaho, Idaho EPSCoR Meeting, 9/22/2003
7. "Electronic Exchange in Multilayer Semiconductors," University of Idaho, Department of Physics, 4/23/2001
8. "Spontaneous Interlayer Coherence," University of Georgia, Department of Physics, 1/18/01
9. "Spin and Localization in the Quantum Hall Effect," Louisiana State University, Department of Physics, 4/11/94
10. "Spin Degeneracy and Scaling in the Integer Quantum Hall Effect," Purdue University, Department of Physics, 11/18/94
11. "Quasiparticle Charge in a Quantum Hall Liquid," Princeton University, Institute for Advanced Study, 1/27/93
12. "Fractional Charge in the Fractional Quantum Hall Effect," Harvard University, Department of Physics, 2/13/92
13. "Anyon Superconductivity," University of California at Berkeley, Department of Physics, 5/1/91
14. "Superconductivity in the Fractional-Statistics Gas," Imperial College, Department of Mathematics and Physics, 10/17/89

Contributed Talks

*indicates student collaborators

1. C.B. Hanna, A.J. Sup*, and A.H. MacDonald, "Quantum Theory of LLL Cold-Atom Vortices," to appear in Bull. Am. Phys. Soc. **50** (2005).

   (Abstract H36.007, APS March Meeting, Los Angeles, March 22, 2005.)
2. C.B. Hanna, A.J. Sup*, J.C. Díaz-Vélez*, J. Sinova, and A.H. MacDonald, "Collective Excitations of Rapidly Rotating Bose-Einstein Condensates," Bull. Am. Phys. Soc. **49**, 951 (2004).

   (Abstract P28.002, APS March Meeting, Montreal, March 24, 2004.)
3. J.R. Rodriguez*, J.C. Díaz-Vélez*, and C.B. Hanna, "Generalized capacitances of double-quantum-well systems," Bull. Am. Phys. Soc. **48**, 179 (2003).
   (Abstract B23.015, APS March Meeting, Austin, March 3, 2003.)
4. J. Sinova, C.B. Hanna and A.H. MacDonald, "Measuring the condensate fraction of rapidly rotating trapped boson systems: off-diagonal order from the density," Bull. Am. Phys. Soc. **48**, 128 (2003).
   (Abstract A34.002, APS March Meeting, Austin, March 3, 2003.)
5. J. Sinova, C.B. Hanna and A. H. MacDonald, "Absence of Bose-Einstein Condensation in Two-Dimensional Vortex Matter," Bull. Am. Phys. Soc. **47**, 180 (2002).
   (Abstract B7.008, APS March Meeting, Indianapolis, March 18, 2002.)
6. C.B. Hanna, J.C. Díaz-Vélez*, and A.H. MacDonald, "Miniband Quantum Hall States in Superlattices," Bull. Am. Phys. Soc. 46, 346 (2001).
   (Abstract G29.002, APS March Meeting, Seattle, March 13, 2001.)
7. A.R. Hamilton, M.Y. Simmons, C.B. Hanna, J.C. Díaz-Vélez*, M. Pepper and D.A. Ritchie, "Interlayer charge transfer in low-density bilayer systems," Bull. Am. Phys. Soc. **46**, 111

(2001).
(Abstract A29.004, APS March Meeting, Seattle, March 12, 2001.)

8. C.B. Hanna and J. C. Díaz-Vélez*, "Double-Layer Systems at Zero Magnetic Field," Bull. Am. Phys. Soc. **45**, 267 (2000).
(Abstract E17.012, APS March Meeting, Minneapolis, USA 2000.)
9. A.R. Hamilton, M.Y. Simmons, C.B. Hanna, J.C. Díaz-Vélez*, M. Pepper and D. A. Ritchie, "Exchange-driven bilayer-to-monolayer charge transfer in a biased double-quantum-well system," Poster Presentation (2001).
(Advanced Research Workshop on Semiconductor Nanostructures, Christchurch, New Zealand, February 2001.)
10. C.B. Hanna, "Double-Layer Systems at Zero Magnetic Field," to appear in Bull. Am. Phys. Soc. **45**, (2000).
11. C.B. Hanna and Dylan Haas, "Effects of Interlayer Exchange in Double-Layer Electron or Hole Systems," Bull. Am. Phys. Soc. **44**, 1355 (1999).
12. C.B. Hanna, "Capacitance and Interlayer Phase Coherence," Bull. Am. Phys. Soc. **43**, 496 (1998).
13. C.B. Hanna, A.H. MacDonald and S.M. Girvin, "Properties of the soliton-lattice state in double-layer quantum Hall systems," 12th International Conference on the Electronic Properties of Two-Dimensional Electron Systems, Tokyo, Japan, (1997).
14. C.B. Hanna, "Effects of Layer Imbalance on the Double-Layer Quantum Hall Effect," Bull. Am. Phys. Soc. **42**, 553 (1997).
15. C.B. Hanna and A.H. MacDonald, "Spontaneous interlayer coherence in triple-layer quantum Hall systems," Bull. Am. Phys. Soc. **41**, 483 (1996).
16. S.M. Girvin, C.B. Hanna and A. H. MacDonald, "Gap collapse in double-layer quantum Hall systems and the K-T temperature for soliton-lattice melting," Bull. Am. Phys. Soc. **41**, 483 (1996).
17. C.B. Hanna and A.H. MacDonald, "Collective modes of coherent superlattices in the quantum Hall regime," Bull. Am. Phys. Soc. **40**, 645 (1995).
18. C.B. Hanna, D.P. Arovas and S.M. Girvin, "Density of states and Thouless number for a model of random spin-orbit scattering in the lowest Landau level," Bull. Am. Phys. Soc. **40**, 706 (1995).
19. C.B. Hanna, D.P. Arovas, K. Mullen, S.M. Girvin, A.H. MacDonald and H. P. Wei, "Scaling of the Thouless number in the Quantum Hall Regime," Bull. Am. Phys. Soc. **39**, 147 (1994).
20. C.B. Hanna and B.A. Jones, "Contribution of Quantum-Well States to the RKKY Coupling in Magnetic Multilayers," Bull. Am. Phys. Soc. **38**, 561 (1993).
21. C.B. Hanna and A.L. Fetter, "Ground State Energy of the Anyon Gas," Bull. Am. Phys. Soc. **38**, 754 (1993).
22. C.B. Hanna and D.H. Lee, "Electromagnetic Fluctuations and the Quantum Hall Liquid," Bull. Am. Phys. Soc. **37**, 589 (1992).
23. C.B. Hanna and B.A. Jones, "Interface Scattering Contributions to the Exchange Coupling in Magnetic Multilayers," Bull. Am. Phys. Soc. **37**, 77 (1992).
24. Q. Dai, J.L. Levy, A.L. Fetter, R.B. Laughlin and C. B. Hanna, "Quantum mechanics of the fractional-statistics gas: random-phase approximation," Bull. Am. Phys. Soc. **37**, 172 (1992).
25. C.B. Hanna, A.L. Fetter and R.B. Laughlin, "Collective Behavior of Anyons," Bull. Am. Phys. Soc. **35**, 583 (1990).

26. C.B. Hanna, A.L. Fetter and R. B. Laughlin, "Superconductivity of a Doped Mott Insulator," Bull. Am. Phys. Soc. **34**, 886 (1989).
27. C.B. Hanna and A. Kapitulnik, "Low Temperature Magnetotransport Measurements of p-type HgCdTe," Bull. Am. Phys. Soc. **32**, 491 (1987).
28. C.B. Hanna, E.S. Hellman and R. B. Laughlin, "Space-Charge Modulation of Current in Heterojunction Tunneling Experiments," Bull. Am. Phys. Soc. **31**, 394 (1986).
29. C.B. Hanna and R.B. Laughlin, "The Role of Impurities in Sequential Phonon Emission in Heterostructure Tunnel Junctions," Bull. Am. Phys. Soc. **30**, 631 (1985).

Presentations by Students (oral presentations, unless otherwise indicated)

*indicates student collaborators

- J. R. Rodriguez*, poster: "Nanoscale Physics of Quantum-Well Capacitors", Idaho State Legislature, Boise, Idaho, January 19, 2005
- J. R. Rodriguez*, 2nd place poster: "Nanoscale physics of quantum-well capacitors", Boise State University Research and Professional Practice Conference", Boise State University, April 19, 2004.
- J. R. Rodriguez*, poster: "Nanoscale Capacitance", Idaho State Legislature, Boise, Idaho, January 14, 2004
- J.R. Rodriguez*, J.C. Díaz-Vélez* and C.B. Hanna, "Modeling the effects of quantum exchange in nanoscale-spaced double-quantum-well systems," 15th Biennial IEEE University/Government/Industry Microelectronic Symposium (UGIM '03), Boise, Idaho, July 1, 2003
- J.R. Rodriguez*, J.C. Díaz-Vélez* and C.B. Hanna, "Generalized capacitances of double-quantum-well systems," to appear in Bull. Am. Phys. Soc. 47, (2003).
  (Abstract B23.015, APS March Meeting, Austin, March 3, 2003.)
- J.C. Díaz-Vélez*, C.B. Hanna and J.C. Lusth, "Optimizing QCA Performance," oral presentation, Bull. Am. Phys. Soc. 46, 534 (2001).
  (Abstract A29.004, APS March Meeting, Seattle, March 13, 2001.)
- J.C. Díaz-Vélez* and C.B. Hanna, "Spontaneous Layer Imbalance in Double-Layer Electron Systems," oral presentation.
  (Abstract B3.003, APS Northwest Sectional Meeting, Eugene, May 19, 2000.)
- Dylan Haas*, "A Simple and Accurate Model for Double-Layer Semiconductor Devices," oral presentation at the 1998 annual meeting of the Idaho Academy of Science. Winner for Best Undergraduate Presentation in Physics.

Courses Taught

- PHYS 105L, Laboratory for Introduction to Descriptive Astronomy
- PHYS 111L, Laboratory for General Physics I (formerly PHYS 101L)
- PHYS 112L, Laboratory for General Physics II (formerly PHYS 102L)
- PHYS 125, Introductory Physics Colloquium
- PHYS 211, Mechanics, Waves, and Heat
- PHYS 212, Electricity, Magnetism, and Optics
- PHYS 295/395, Research in Physics
- PHYS 309, Introductory Modern Physics

- PHYS 381, Electromagnetism
- PHYS 382, Electrodynamics
- PHYS 397, Special Topics (Directed Research in Physics)
- PHYS 412, Introductory Quantum Mechanics
- PHYS 422, Special Topics: Introduction to General Relativity
- PHYS 482, Senior Project
- PHYS 497, Special Topics (Directed Research in Physics)
- PHYS 522, Advanced Topics: Solid-State Physics (graduate level)
- PHYS 593, Thesis Research
- PHYS 596, Graduate Research (graduate level)

Academic Service

1. **Department of Physics**:
   - Department Chair, 2009 – present
   - Associate Chair for Program Development, 2004 – present
   - Chair, Long-Term Planning Committee, 1999 – present
   - Chair, Faculty Search Committee, 1999 – present
   - Library Liaison, 1997 – present
   - Organize Physics Halloween Party for majors and faculty, 1996 – present
2. **College of Arts and Sciences**:
   - Faculty Awards and Honors Committee, 1996
   - Tenure and Promotion Committee, 1998, 1999, 2002, 2009, 2010
3. **University**:
   - Biomolecular Sciences PhD Planning Committee, 2008 - present
   - Materials Science and Engineering Graduate Affiliate Faculty Committee, 2005
   - Human Resources Committee, 2004
   - Materials Science and Engineering Faculty Search Committee, 2003
   - Materials Science and Engineering Organizing Committee (College of Arts and Sciences and College of Engineering), 2002 to present
   - Chair, Thesis Committee and Thesis Advisor (Boise State University's first M.S. in Materials Science and Engineering), 2004 - 2005
   - Master's Thesis Committee member (College of Engineering and Interdisciplinary Master's Program), 2000 to present
   - Faculty Search Committee (College of Engineering), 1999
   - Graduate Program Committee (College of Engineering), 1998
   - Chaired *ad hoc* Unix Security Committee, 1997

Professional Service and Affiliations

- Reviewer for the National Science Foundation and the Canadian Research Council
- Referee for Physical Review Letters, Physical Review B, Physical Review A, Physical Review E
- Member of the American Physical Society

MINOTI HIREMATH

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CURRENT POSITION

Research Assistant Professor January 2011-Present
Boise State University, Department of Biology,
Research: Investigating epithelial mesenchymal interactions regulated by PTHrP and Wnt signaling in embryonic mammary development and breast cancer. Understanding the interactions between Estrogen receptor and PTHrP signaling in the pathogenesis and treatment of breast cancer.

EDUCATION

Post-Doctoral Associate, November 2007-December 2010
Yale University, New Haven, CT.
Advisor: John Wysolmerski, M.D.

Ph.D Cell Biology, August 2002- July 2007
New York University School of Medicine, New York, NY.
Advisor: Pamela Cowin, Ph.D.

Ph. D. candidate, Department of Genetics, August 2001-May 2002
University of Georgia, Athens, GA.

M. B. B. S. (Bachelor of Medicine and Surgery), August 1995- January 2001
Byramjee Jeejeebhoy Medical College, University of Pune, India

HONORS AND AWARDS:

ASBMR Young Investigator Travel Award, Amount: $500 2011
Travel monies for first authors of abstracts that are highest ranked in their categories.

MSTMRI Small Project Award, Amount $7,500 2011-2012
Crosstalk between PTHrP and Estrogen Receptor in Mammary Development and Breast Cancer.

Department of Defense Postdoctoral Fellowship, Amount: $243,000 2009-2012
Role of Mesenchymal Wnt Signaling in Mediating the Effects of PTHrP in the Mammary Gland.

Department of Defense Predoctoral Fellowship, Amount: $90,000 2003-2006
Beta-catenin and Progesterone in Hormone Receptor Negative Breast Cancer.

RESEARCH EXPERIENCE

Boise State Univeristy, Boise, ID 2010-present
Research Assistant Professor.
- Epithelial-mesenchymal interactions in embryonic mammary development.
- Role of stromal Wnt signaling in breast cancer formation.
- Interactions between PTHrP and Estrogen Receptor signaling in breast cancer.

Yale University, New Haven, CT 2007-2010
Postdoctoral Associate, Advisor: Dr. John Wysolmerski
Intersections between PTHrP, Wnt and Bmp signaling during mammary mesenchyme specification and breast cancer.
• Demonstrated regulation of Wnt signaling by PTHrP during embryonic mammary development using transgenic Wnt signaling reporter mice.
• Analyzed requirement for Wnt signaling during mammary mesenchyme specification by deletion of beta-catenin and Lef1.
• Used conditional deletion models to demonstrate the role of BMP signaling during early mammary development

New York University, New York, NY 2002-2007
Graduate Student, Advisor: Dr. Pamela Cowin
Beta-catenin and progesterone signaling in mammary development and breast cancer.
• Demonstrated two populations of beta-catenin responsive cells in the mammary gland that differed in their location and requirement for progesterone signaling.
• Used transgenic and knockout mouse models to demonstrate that progesterone signaling restrains the progression of beta-catenin induced mammary hyperplasias to tumors.

University of Georgia, Athens, GA 2000-2001
Graduate Research Assistant
• Cultured human embryonic stem cells and measured rate of division by BrdU incorporation in the laboratory of Dr. Steven Stice.
• Cloned and analyzed splice variants of Kit ligand mutations in ENU-mutagenized mice in the laboratory of Dr. Mary Bedell.
• Cloned *K.Lactis* telomeres in the laboratory of Dr. Michael McEachern.

TEACHING EXPERIENCE

Instructor Fall 2011
Boise State University, Department of Biology
Functional and Comparative Anatomy, ZOOL 301
The evolutionary development of vertebrate anatomy, fishes through mammals. Dissection of the shark, salamander, and cat plus demonstrations of other vertebrate types. Contributed to course design, teaching, evaluation, laboratory experimental design and demonstration of dissection.

Co-Instructor with Dr. Julia Oxford. Spring 2011
Boise State University, Department of Biology
Developmental Biology, BIOL 451/551
A developmental biology course that includes lecture and laboratory components. Contributed to course design, teaching, evaluation and laboratory experimental design.

Lecturer in Yale College Seminar Series Fall 2010
"Towards a New Understanding of Breast Cancer", (CSBK231)
A seminar course that aims to explore the connections between molecular and cellular process in relation to breast cancer. Students will develop a better understanding of the biology of breast cancer and its treatment.

Guest Lecturer Spring 2005
Cell Biology, New York University
Moderated group discussion sessions on Wnt signaling for a small group of graduate students.

Graduate Teaching Assistant August 2000 – December 2000
Department of Genetics, University of Georgia, Athens, GA
Genetics laboratory course for undergraduate biology majors.
• Taught basic concepts of cellular structure and function and Mendelian genetics.
• Designed and graded exams.

Graduate Teaching Assistant January 2001 – May 2001
Concepts in Biology (BIOL1103L) laboratory course for undergraduate non-biology majors.
• Taught molecular biology and using model organisms genomics and to illustrate basic biological principles

Medical Intern February 1999- March 2000
Byramjee Jeejeebhoy Medical College, Pune, India
• Conducted lectures in rural AIDS education for high school students.
• Taught Anatomy and Physiology to nursing students at Ruby Hall Clinic, Pune, India.

PUBLICATIONS

Hiremath M, Dann P, Fischer J, Shi W and Wysolmerski JJ. Signaling pathways in embryonic mammary development: The PTHrP-Wnt connection. *Manuscript in preparation.*

Hiremath M, Lydon JP and Cowin P. Progesterone Receptor Predisposes Breast To β-catenin-Induced Hyperplasia But Delays Tumor Progression. *Manuscript in preparation.*

Mukherjee A, Soyal SM, Li J, Ying Y, Szwarc MM, He B, Kommagani R, Hodgson MC, **Hiremath M**, Cowin P, Lydon JP. A mouse transgenic approach to induce β-catenin signaling in a temporally controlled manner. *Transgenic Res. 2010 Dec 2***.**

Hens JR, Dann P, **Hiremath M**, Pan T, Chodosh L and Wysolmerski JJ. Analysis of Gene Expression in PTHrP-/- Mammary Buds Supports a Role for BMP Signaling and MMP2 in the Initiation of Ductal Morphogenesis. *.Dev Dyn 2009 Nov;238(11):2713-24.*

Teissedre B, Pinderhughes A, Incassati A, Hatsell SJ, **Hiremath M**, Cowin P. MMTV-Wnt1 and -D89b-catenin induce canonical signaling in distinct progenitors and differentially activate Hedgehog signaling within mammary tumors. PLoS ONE. 2009; 4(2):e4537. Epub 2009 Feb 19.

Hiremath M, Lydon JP and Cowin P. The Pattern Of β-Catenin-Responsiveness within the Mammary Gland is Regulated by Progesterone Receptor. *Development. 2007 Oct;134(20):3703-*12.

Hiremath M and Cowin P. Cadherins in metastasis in "New Developments in Metastasis Suppressor Research". Nova Publishers, Ed. Jackson P, 2007.

Hatsell. SJ, **Hiremath. M**, Shamamian. P and Cowin.P. Molecular and cellular biology of breast cancer in "Breast Cancer". Second Edition, In "Breast Cancer" Ed. Roses D, 2005.

Hatsell S, Rowlands T, **Hiremath M**, Cowin P. Beta-catenin and Tcfs in mammary development and cancer. *J Mammary Gland Biol Neoplasia. 2003 Apr;8(2):145-58.*

INVITED TALKS

March 2011	53rd Annual Symposium of the Idaho Academy of Sciences, Caldwell, ID.
June 2010	Boise State University, Department of Biology. Boise, ID.
October 2009	Young Investigators Meeting, Translational Health Sciences Institute, Cambridge, MA

POSTER PRESENTATIONS

Hiremath M, Dann P, Shi W, Wysolmerski JJ (2011). Pthrp-Induced BMP Signaling Plays A Role In Specification Of The Mammary Mesenchyme. Poster to be presented at the American Society for Bone and Mineral Research. San Diego, CA., September 2011. **Selected as a plenary poster and for Young Investigator Travel Award.**

Hiremath M, Dann P, Fischer J, Wysolmerski JJ (2011). Pthrp-Induced Wnt Signaling Plays A Role In Specification Of The Mammary Mesenchyme. Poster at the Gordon Research Conference on Mammary Gland Biology. Newport, RI., June, 2011.

Hiremath M, Dann P and Wysolmerski JJ (2010). Pthrp-Induced Wnt Signaling Plays A Role In Specification Of The Mammary Mesenchyme. Poster presented at the John B. Warshaw Developmental Biology Symposium, New Haven, CT, October 2010.

Hiremath M, Dann P and Wysolmerski JJ (2010). Pthrp-Induced Wnt Signaling Plays A Role In

Specification Of The Mammary Mesenchyme. Poster presented at the ENDO Society Meeting, San Diego, CA, June 2010. **Selected for presidential poster competition**.

Hiremath M and Wysolmerski JJ (2009). Pthrp-Induced Wnt Signaling Plays A Role In Specification Of The Mammary Mesenchyme. Poster presented at the Gordon Research Conference on Mammary Gland Biology. Newport, RI., June, 2009.

Hiremath M and Wysolmerski JJ (2009). Pthrp-Induced Wnt Signaling Plays A Role In Specification Of The Mammary Mesenchyme. Poster presented at the American Society for Bone and Mineral Research. Montreal, CA., September 2009. **Selected as a plenary poster.**

Hiremath M and Cowin P (2007). Progesterone receptor and beta-catenin signaling in alveolar development and breast cancer. Poster presented at the Gordon Research Conference on Mammary Gland Biology. Newport, RI., June 2007.

Hiremath M and Cowin P (2005). Beta-catenin and progesterone in alveolar development and breast cancer. Poster presented at the Gordon Research Conference on Mammary Gland Biology. Newport, RI., June 2005.

Hiremath M and Cowin P (2005). Beta-catenin and progesterone in hormone receptor negative breast cancer. Poster presented at the Era of Hope Conference, Philadelphia, PA., June 2005.

Formenti S.C, **Hiremath M**, Yang A, Demaria S and Cowin P. Beta-catenin induces a population of radio-resistant alveolar stem/progenitors that progress to form hormoneindependent breast tumors in mice. Presented as a poster at the 47th Annual meeting of the American Society of Therapeutic Radiology and Oncology, Denver, CO., June 2005.

Hiremath M and Cowin P (2005). Beta-catenin and progesterone in alveolar development and breast cancer. Poster presented at the Keystone Symposium on Cancer and Development, Banff, CA., February 2005.

MENTORING:

Charla Taylor, Summer student, NYU	2004
Rebecca Smith, Intel Science Scholar, Summer Student, NYU	2004, 2005
Rengin Azeglou, Rotating Graduate Student, NYU	Spring 2005
Jennifer Fischer, Summer Student, Yale University	2009, 2010
Kelsey Bruch, Undergraduate, Boise State University	Summer and Fall 2011
Hannah Dyah, Undergraduate, Boise State University	Fall 2011

SERVICE

Panelist, Women in Science seminar at Yale University School of Medicine. October 2010

PROFESSIONAL ASSOCIATIONS

Idaho INBRE (IDeA Network of Biomedical Research Excellence).
Idaho Academy of Science.
New York Academy of Sciences.
American Association for the Advancement of Science.
American Society for Bone and Mineral Research.

Curriculum Vitae—Research

Cheryl L. Jorcyk, Ph.D.
Department of Biological Sciences
Boise State University

Business Address:

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Lab: (208) 426-4805
Fax: (208) 426-4267

Education:

1984-1991	Doctor of Philosophy (Biology), The Johns Hopkins University, Baltimore, MD
1979-1983	Bachelor of Science (Biology), Pennsylvania State University, State College, PA

Awards and Societies:

2011	Business Women of the Year Honoree—Idaho Business Review
2008	Health Hero Educator Honoree—Idaho Business Review
1998-present	American Association for Cancer Research, Active Member
1998-present	American Association for the Advancement of Science, Member
1998-2009	Sigma Xi Scientific Research Society, Boise State University Chapter, Full Member
1998-present	Idaho Academy of Science, Member
1995-1997	American Association for Cancer Research, Associate Member
1992-1997	Intramural Research Training Award, Postdoctoral Fellowship, NIH
1982-1983	The Hammond Biological Scholarship and Award

Grant Review Panels:

2011	California Tobacco-Related Disease Research Program (TRDRP), Cancer Study Section.
2010-present	Department of Defense (DOD), Congressionally Directed Medical Research Program (CDMRP) Breast Cancer Immunology/Endocrinology Panel.
2009	NIH, CSR, Challenge Grant Program, Bioengineering Sciences and Technologies Panel.
2008	Department of Defense (DOD), Congressionally Directed Medical Research Program (CDMRP) Prostate Cancer Immunology Panel.
2008	Department of Defense (DOD), Congressionally Directed Medical Research Program (CDMRP) Prostate Cancer Pathology Panel. Ad-hoc Reviewer.
2007-2010	California Breast Cancer Research Program (CBCRP), Pathology Study Section.
2006-2007	Cancer Research UK. Ad-hoc Reviewer.
2006	Veterans Administration (VA) Merit Grant Program. Ad-hoc Reviewer.

Patents and Patent Disclosures:

2009 Boise State University Invention Disclosure "Simple Agarose Gel for Analyzing RNA Quality". BSTU.006P 10/14/2009.

Professional Experience:

2010-present Affiliate Associate Professor, Department of Microbiology, Molecular Biology, and Biochemistry (currently being reorganized), College of Agriculture and Life Sciences, University of Idaho, Moscow, ID.

2007-2010 Director of Undergraduate Studies, Department of Biological Sciences, Boise State University, Boise, ID.

2003-present Associate Professor, Department of Biological Sciences, Boise State University, Boise, ID. Determination of the role on the cytokine oncostatin M in tumor progression and metastasis.

2001-2009 Affiliate Member, Chronic Illness Research Center (formally called the Cancer Prevention and Research Center, Washington State University, Pullman, WA.

1998-present Affiliate Member**,** Cancer Research Section, Mountain States Tumor and Medical Research Institute (MSTMRI), Boise, ID.

1999-2003 Project Director, J.A. & Kathryn Albertson Foundation grant. Student Research Fellowships and Hands-On Science Education Reform for Vallivue and Kuna School Districts.

1997-2003 Assistant Professor, Department of Biology, Boise State University, Boise, ID. Elucidation of molecular mechanisms involved in tumor progression utilizing mouse prostate and mammary cell lines.

1995 Instructor, Frederick Community College, Frederick, MD.
Lecturer for a Nutrition class; involved the complete organization and teaching of this course.

1994 Instructor, Frederick Community College, Frederick, MD
Lecturer and Laboratory Instructor for Introductory Biology; consisted of two 75-minute lectures and one three-hour lab section per week.

1992-1997 Postdoctoral Fellow with Dr. Jeffrey E. Green, Laboratory of Molecular Oncology, NCI, NIH, Frederick, MD. Studying prostate cancer and tumor progression by the establishment of cell lines from transgenic mice expressing SV40 large T-antigen. Utilizing the transgenic mice as a model for immunotherapy treatment of prostate and mammary cancers. Studying the function of the cellular oncogene, Ets-1, by utilizing 1) homologous recombination in ES cells to produce mice lacking a functional Ets-1 protein; 2) mice producing transgenic Ets proteins.

1985-1991 Doctoral Student with Dr. Takis Papas, The Johns Hopkins University, Baltimore, MD. Doctoral Dissertation: "The Human *Ets1* Gene: Genomic Structure, Promoter Characterization and Alternative Splicing."

Recent Publications: *Peer-reviewed Publications: (from a list of 37 published or in press)*

Holzer, R.G., MacDougall, C., Atwood, C., Green, J.E., and **Jorcyk, C.L**.: Development and characterization of a progressive series of hormone-responsive mammary adenocarcinoma cell lines derived from the C3(1)/SV40 Large T-antigen transgenic mouse model. ***Breast Cancer Research and Treatment*** 77: 65-76, 2003.

Holzer, R.G., Tommack, M., Schlekeway, E., Ryan, R.E, and **Jorcyk, C.L**: Oncostatin M induces the detachment of a reservoir of invasive mammary carcinoma cells: the role of cyclooxygenase-2. ***Clinical and Experimental Metastasis*** 21:167-176, 2004.

MacDougall, C.A., Ide, A., Soares, C., Vargas, M., Holzer, R.G., and **Jorcyk, C.L**.: Involvement of the hepatocyte growth factor-met receptor signaling loop with the classical "3M" pathways in tumor progression of mouse prostate adenocarcinoma cells. ***The Prostate*** 64: 139-149, 2005.

Queen, M.M., Ryan, R.E., Holzer, R.G., Keller-Peck, C.R., and **Jorcyk, C.L.**: Breast cancer cells stimulate neutrophils to produce Oncostatin M: potential implications for tumor progression. ***Cancer Research*** 65: 8896-8904, 2005.

Jorcyk, C.L., Holzer, R.G., and Ryan, R.E.: Oncostatin M induces detachment and enhanced metastatic capacity in T-47D human breast carcinoma cells. ***Cytokine*** 33:323-336, 2006.

Halsted, KC, Bowen, KB, Bond, L, Jorcyk, CL, Fyffe, WE, Kronz, JD, Oxford, JT. Collagen alpha1(XI) in normal and malignant breast tissue. ***Modern Pathology*** 21:1246-54, 2008.

Jackiewicz, Z., **Jorcyk, C.L**., Kolev, M., and Zubik-Kowal, B. Correlation between animal and mathematical models for prostate cancer progression. ***Computation and Mathematical Methods in Medicine*** iFirst article, 1-12, 2009.

Graugnard, E., Cox, A., Lee, J., **Jorcyk, C.L.,** Yurke, B., and Hughes, W.L. Kinetics of DNA and RNA hybridization in serum and serum-SDS. ***IEEE Transactions on Nanotechnology*** 9, 603, 2010.

Graugnard, E., Cox, A., Lee, J., **Jorcyk, C.L.,** Yurke, B., and Hughes, W.L. Operation of a DNA-based autocatalytic network in serum. ***Lecture Notes in Computer Science,*** 6518, 83, 2011.

Tawara, K. and **Jorcyk, C.L**. The clinical significance of interleukin-6 in cancer metastasis to bone. ***Cancer Management and Research*** 3, 177, 2011.

Jorcyk, C.L., Kolev, M., and Zubik-Kowal, B. Mammary adenocarcinoma cell progression and numerical simulations. Submitted to ***Integral Methods in Science and Engineering***, Springer, for publication as a book chapter.

Jorcyk, C.L., Kolev, M., Tawara, K., and Zubik-Kowal, B. Experimental versus numerical data for breast cancer progression. Submitted to ***Nonlinear Analysis: Real World Applications.***

Aranda, P.S. and **Jorcyk, C.L**. Simple agarose gel for analyzing RNA quality. Submitted to ***Electrophoresis***.

Yu, GX., Ngam, P., Woodward, J., Tawara, K., and **Jorcyk, C.L**. RSeq$^{Dis\text{-}Quan}$, a tool for RNASeq analysis: the study of myeloid-derived suppressor cells (MDSCs) in metastatic breast cancer. In preparation for ***Nucleic Acids Research***.

Sutherland, C., Tawara, K., Bolin, C., and **Jorcyk, C.L.** Novel mouse mammary cell lines for bioluminescence imaging (BLI) of bone metastasis. In preparation for ***Biological Procedures***.

Kadaba, S., Halsted, K., Bowen, K.B., Bond, L., Fyffe, W.E., Kronz, J.D., and **Jorcyk, C.L.** Differential expression of oncostatin M in *in situ*, invasive and metastatic ductal carcinoma of the breast. In preparation.

Nandakumar, M., Fox, R., LaJoie, D., Ryan, R., and **Jorcyk, C.L**. Differential expression of VEGF in breast cancer cells induced by IL-6 cytokines. In preparation.

Current Research Support:

Susan G. Komen for the Cure KG100513 (Jorcyk, PI) 6/21/2010 – 6/20/2013
Susan G. Komen Breast Cancer Research Program $600,000
Analysis of oncostatin M in breast cancer metastasis to bone for the purpose of inhibiting disease progression.

ACS RSG-09-276-01-CSM (Jorcyk, PI) 7/1/2009 – 6/30/2013
American Cancer Society Research Scholar Grant $720,000
Breast cancer metastasis to the bone: the role of oncostatin M.

NIH NCI R15CA137510 (Jorcyk, PI) 4/1/2009 – 3/30/2012
Oncostatin M-induced VEGF in human breast cancer is HIF1α-mediated. $211,500

NASA NNX10AN29A (Jorcyk, Co-PI) 10/01/2010 –9/30/2013
Molecular mechanisms of cellular mechanoreception in bone. $749,916

NIH NCRR P20RR016454 (Bohach, PI; Jorcyk, Team Member) 4/1/2009 – 3/31/2014
Idaho IDeA Network for Biomedical Research Excellence. Total = ~$15,000,000
Col11a1 function during development, structure and signaling is to address osteoblast-osteoclast cell signaling.

MISE (Cornell, PI; Jorcyk, Collaborator) 4/1/2008–3/31/2011
Merck Institute for Science Education $60,000
Merck AAAS Undergraduate Science Research Program

HERC Idaho State Board of Education (Jorcyk, Co-PI) 7/01/2007 – 6/30/2011
Musculoskeletal Research. (Last year is no cost extension) ~$1,000,000

Pending Grants:

W.M. Keck Foundation (Jorcyk, Co-PI) 7/01/2007 – 6/30/2011
Medical Research/Science and Engineering Research Programs $1,000,000
Synthetic DNA reactions for low-cost diagnosis and treatment of disease. (In Phase II)

Research Completed (since 2003):

J.A. & Kathryn Albertson Foundation (Jorcyk, PI) 01/02/99--06/30/03
General operating expenses. $500,000 total; Jorcyk Lab, $176,660
Graduate and undergraduate fellowships for cancer research.

M.J. Murdock Charitable Trust (Jorcyk, PI) 05/01/02 – 01/31/04
Partners in Science Program. $14,000
Characterization of genes involved in the prostate cancer to metastasis conversion.

NIH P20 RR16454 (Jorcyk, PI) 09/01/02 --08/31/03
NIH/NCRR ~$35,000
Oncostatin M enhances metastatic potential.

Boise State University (Jorcyk, PI) 05/01/03–04/30/04
Faculty Research Initiated Grants $5,000
Oncostatin M-treated breast cancer cells stimulate new blood vessel formation.

Mountain States Tumor and Medical Research Institute (Jorcyk, PI) 05/12/03 –05/11/04
Seed Grant Program $5,000
Effects of neutrophil-derived oncostatin M in a breast tumor environment.

NIH R01 CA104470 (Jorcyk, Collaborator; Magnuson, PI) 09/01/03 – 08/31/08
Contribution of Pim-1 kinase to cell survival. N/A

M.J. Murdock Charitable Trust (Jorcyk, PI) 05/01/04 – 01/31/06
Partners in Science Program. $14,000
Determination of the receptor utilized by oncostatin M to promote metastatic characteristics in MDA-MB-231 breast cancer cells.

Sigma Xi (Jorcyk, PI) 05/01/04 – 04/30/05
Grants in Aid Program. $2,000
Induction of epithelial cell-secreted proteases by neutrophil-derived oncostatin M.

Mountain States Tumor and Medical Research Institute (Jorcyk, PI) 05/12/04 –05/11/05
Seed Grant Program $5,000
Determination of the receptor utilized by OSM to promote metastatic characteristics in T47D human breast cancer cells.

NIH P20 RR16454 (Jorcyk, Investigator; Laskowski, PI) 07/01/04 – 06/03/09
NIH/NCRR (Jorcyk) $395,000
Oncostatin M induces VEGF in human breast carcinoma cells.

NIH R15 CA106274 (Jorcyk, PI) 03/01/05 – 02/28/08
NIH/NCI $186,893
Oncostatin M induces VEGF-mediated angiogenesis.

Boise State University (Jorcyk, PI) 07/01/05 –06/30/06
Faculty Research Initiated Grants $15,000
Determination of a role for oncostatin M in breast cancer metastasis to bone.

Mountain States Tumor and Medical Research Institute (Jorcyk, PI)05/01/07 –04/30/08
St. Luke's/Seed Grant Program $5,000
Development of OSMR-beta mouse mammary carcinoma cell lines.

NIH, ITHS (Jorcyk, PI) 05/01/09 – 04/30/10
Small Pilot Project Translational Grant $14,000
The role of tumor cell-derived oncostatin M in breast cancer metastasis to bone.

Mountain States Tumor and Medical Research Institute (Jorcyk, PI)05/01/09 –04/30/10
Seed Grant Program $7,500
Knockdown of OSM-induced HIF1alpha by RNAi.

MSTMRI (Jorcyk, Collaborator; Yu, PI) 05/01/09 –04/30/10
Seed Grant Program $7,500
Myeloid-derived suppressor cell (MDSC) gene expression in normal tissue versus metastatic breast cancer.

Invited Speaker Presentations (since 2003):

Breast cancer: a role for Oncostatin M? Albertson's College, Caldwell, ID. November 17th, 2003. ***State.***

Breast cancer: a role for Oncostatin M? College of Engineering, Boise State University, Boise, ID. November 21st, 2003. ***Local.***

Oncostatin M: promoting the phenotype of metastatic breast cancer, University of Texas at San Antonio, San Antonio, TX, April 16th, 2004. ***National.***

Oncostatin M induces VEGF in human breast carcinoma cells: stimulation of angiogenesis *in vitro* and *in vivo,* 3rd Annual BRIN Conference, Idaho State University, Pocatello, ID, August 9th-11th, 2004. ***State.***

Neutrophil-derived oncostatin M: potential implications for breast cancer progression, 2nd Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 8th, 2005. ***State.***

Neutrophil-derived oncostatin M: potential implications for breast cancer progression, Idaho State University, Department of Biological Sciences, Pocatello, ID, November 17th, 2005. ***Regional.***

Neutrophil-derived oncostatin M: potential implications for breast cancer progression, AACR (American Association for Cancer Research) Special Conference on Cancer, Proteases, and Tumor Microenvironment, Bonita Springs, FL, December 1st, 2005. ***International.***

Breast cancer: the design of targeted therapies. Idaho Society of Radiological Technology Conference, Boise, ID. April 29th, 2006. ***State***.

Researching breast cancer. eGirls Conference, Boise State University, Boise, ID. June 16th, 2006. ***Local***.

Breast cancer research at Boise State University, Boise State Foundation Board, Boise State University, Boise, ID. July 20th, 2006. ***Local***.

Oncostatin M induces vascular endothelial growth factor in human breast cancer cells and promotes angiogenesis. 3rd Annual INBRE Conference, Northern Idaho College, Coeur d'Alene, ID, August 8th, 2006. ***State.***

Neutrophil-derived oncostatin M: potential implications for breast cancer progression. 11th World Congress on Advances in Oncology, Crete, Greece. October 13th, 2006. ***International***.

Neutrophil-derived Oncostatin M: potential implications for breast cancer progression. University of Nevada at Reno. Reno, NV, May 1st, 2007. ***Regional.***

Oncostatin M is a potential target for inhibiting breast tumor progression. American Association for the Advancement of Science (AAAS) Pacific Division Annual Conference. Boise, ID, June 20th, 2007. ***Regional.***

Oncostatin M-induced HIF1α in human breast cancer. Annual INBRE Conference in Moscow, ID, August 6th-9th, 2007. ***State.***

The role of oncostatin M in breast cancer. CAMBR (Center for Advanced Microelectronics and Biomolecular Research) Symposium. Post Falls, WA, October 12th, 2007. ***Regional.***

Breast cancer metastasis to bone. IAS (Idaho Academy of Sciences) 50th Annual Conference, College of Western Idaho, Nampa, ID, March 28th, 2008. ***State.***

Oncostatin M as a potential target for inhibiting breast tumor progression. College of Idaho, Caldwell, ID, May 16th, 2008. ***State.***

Oncostatin M is a potential target for inhibiting breast tumor metastasis. AAAS (American Association for the Advancement of Sciences) Pacific Division Annual Conference, Waimea, HI, June 18th, 2008. ***Regional.***

The role of oncostatin M in breast tumor progression and metastasis. The Peter MacCallum Cancer Centre Anderson Lab, Melbourne, Australia, November 18th, 2008. ***International***.

A role for oncostatin M in osteoclastogenesis and breast cancer metastasis to bone? 5th Annual INBRE Conference, Boise State University, Boise, ID, August 4th – 6th, 2008. ***State.***

The role of oncostatin M in breast tumor progression and metastasis. 1st Annual Idaho INBRE Symposium, Boise, ID, April 4th, 2009. ***State.***

The role of oncostatin M in breast tumor progression and metastasis. 3rd Annual Workshop for Small Animal Imaging, St. Louis, MS, June 21st, 2009. ***National.***

A role for oncostatin M in breast cancer metastasis to bone. University of Idaho, Department of Microbiology, Molecular Biology, and Biochemistry, Moscow, ID, April 29th, 2010. ***State.***

Oncostatin M as a potential target for inhibiting breast cancer metastasis to bone. American Association for the Advancement of Science (AAAS) Pacific Division Annual Conference, Ashland, OR, June 14th, 2010. ***Regional.***

Extracellular matrix modulates cell signaling. 7th Annual INBRE Conference, University of Idaho, Moscow, ID, August 2nd-4th, 2010. ***State.***

Understanding breast cancer progression. Boise State University, Department of Materials Science and Engineering, Boise, ID. September 24th, 2010. ***Local.***

Thesis Advisor for Masters Students:

- Lynda Zhang — M.S. in Biology, July 30, 2000
- Kurt Lindsay — Received M.D. from Oregon Health Sciences Institute, 2005
- Colin Soares — M.S. in Biology, March 22, 2002
- Ryan Holzer — M.S. in Biology, March 12, 2003
- Marisa Queen — M.S. in Biology, March 11, 2005
- Alex Ide — M.S. in Biology, March 16, 2005
- Amanda Bruesch — M.S. in Biology, September 14, 2007
- David Chang — Commodities Trader
- Patrick Aranda — M.S. in Biology, October 7, 2009
- Ken Tawara — Current M.S. student; thesis defense March 23, 2011
- Madhuri Nandakumar — Current M.S. student
- Hunter Covert — Current M.S. student
- Jordan Koncinsky — Current M.S. student
- Jake Goyden — Will start M.S. program Fall 2011

Department of Biological Sciences Graduate Student Thesis Committees:

- Michael Davis (Dr. Troy Rohn)
- Sorcha Cusack (Dr. Julie Oxford)
- Ryan Medeck (Dr. Julie Oxford)
- Jodie Newman (Dr. Troy Rohn)
- Tim O'Donnell (Dr. Bob Rychert)
- Amy Couch (Dr. Henry Charlier)
- Alma Hodzic (Dr. Denise Wingett)
- Nathan Hoskins (Dr. Julie Oxford)
- Kendra Coonse (Dr. Julie Oxford)
- Ming Fang (Dr. Julie Oxford)
- Ashley McCartney (Dr. Kristen Mitchell)
- Stephanie Wyler (Dr. Kristin Mitchell)
- Emily Schmid (Dr. Kristen Mitchell)

Graduate Student Thesis Committees from other Universities:

- Kyle Rosenke Ph.D. from University of Idaho (Dr. Lee Fortunato), August 9, 2006

Postdoctoral Fellows:

- Dr. Sujatha Kadaba, 2007
- Dr. Celeste Bolin, started January 11th, 2010
- Dr. Jim Moselhy, started November 10th, 2010

Research Associates:

- Dollie LaJoie, B.S., started August 23rd, 2010
- Dr. Randall Ryan, started October 25th, 2010

Mentor for High School Students:

- Chris Anderson — Treasure Valley Math and Science Center
- Charles Bin — Boise High School

Mentor for Undergraduate Students:

- Barbara Smith
- Erick Schlekeway — Attended Medical School
- Matt Tommack
- Brooke McCuskey
- Anna Hemphill
- Kencee Amyx — Attended Medical School
- Brian Byrne — Attended Medical School
- Andrew Oler — Attended Ph.D. Program
- Lee Rooney — Accepted into Medical School
- Tshering Sherpa — Attended Ph.D. Program
- Jenny Stear — Attended Medical School
- Tyrell Simpkins — Attended D.O./Ph.D. Program
- Deidre Barrera
- Amanda Bruesch — Attended M.S. Program at Boise State University
- Christine MacDougal — Attended Ph.D. Program, Attended Law School
- Loni Connell — (from University of Georgia)
- Dan Henbest — Attended Medical School
- Kelly Katula — Attended Medical School (D.O. Program)
- Jonathan Lee — (from BYU-Idaho)
- Jeff Redshaw — Attended Medical School
- Mary Lewis — (from BYU-Idaho)
- Bengt Phung — Attended Ph.D. Program (from College of Idaho)
- Ryan Fox
- Stephen-David Spelter
- Logan Miller — (from BYU-Idaho)
- Kara Jackson
- Caleb Sutherland — Attended Ph.D. Program
- Dollie Thompson
- Farhad Mangal
- Krista DeCoursey — (from BYU-Idaho)
- Maygen Cardova
- Rachael Anderson — (from BYU-Idaho)
- Maryam Sabetian

Mentor for Medical Students:

- Jeff Walker — University of Washington
- Joe Deaver — University of Washington
- Camille Asher — University of Washington

Presentations: (Poster and Oral Presentations since 2003)

Microarray analysis comparing the PIN cell line, Pr-111, and the prostate adenocarcinoma cell line, Pr-14_2. Amy Ambrosier, Colin R. Soares, Peter S. Nelson, and Cheryl L. Jorcyk. Murdock Charitable Trust's Partners in Science Meeting, San Diego, CA, January 16-18, 2003. *Regional.*

Oncostatin M induces cyclooxygenase (Cox)-2, and stimulates Cox-2-mediated detachment of a reservoir of invasive cells in mammary carcinoma. Ryan Holzer, Eric Schlekeway, Randy Ryan and Cheryl Jorcyk. 94th Annual Meeting for the American Association for Cancer Research (AACR), Washington, DC, July 11-14, 2003. *National.*

The Effects of OSM-induced VEGF on HUVECs: An *in-vitro* Angiogenesis Assay. Kencee K. Amyx, Alexander E. Ide, Ryan G. Holzer and Cheryl L. Jorcyk, 2nd Annual BRIN Conference, Boise, ID, August 11-13, 2003. *State.*

Oncostatin M Promotes *in vitro* Angiogenesis Through Induction of Vascular Endothelial Growth Factor in Mammary Carcinoma. (Oral Presentation), Alex Ide and Cheryl L. Jorcyk, 2nd Annual BRIN Conference, Boise, ID, August 11-13, 2003. *State.*

Oncostatin M (OSM) stimulates the detachment of a reservoir of invasive mammary carcinoma cells: the role of cyclooxygenase-2. (Oral Presentation), Ryan G. Holzer and Cheryl L. Jorcyk, 2nd Annual BRIN Conference, Boise, ID, August 11-13, 2003. *State.*

Effects of Neutrophil-derived Oncostatin M (OSM) on Breast Cancer Cells. (Oral Presentation), Marisa Queen and Cheryl L. Jorcyk, 2nd Annual BRIN Conference, Boise, ID, August 11-13, 2003. *State.*

Oncostatin M Induces Cell Detachment and Enhances the Metastatic Capacity of T-47D Human Breast Carcinoma Cells. Cheryl L. Jorcyk, Ryan G. Holzer, and Randall E. Ryan. AACR Special Conference on Breast Cancer, Huntington Beach, CA, Oct. 9-12, 2003. *National.*

Development of a Tool To Study Breast Cancer Metastasis: MDA-MB-231 Cells Designed to Overexpress Oncostatin M. Brooke McCuskey, Marisa Queen, and Cheryl L. Jorcyk. Idaho Academy of Sciences Conference, March 25th -27th, 2004. (Awarded 2nd place for Graduate Student Poster Presentations.) *State.*

The Effects of OSM-induced VEGF on Endothelial Cell Tube Formation. Kencee K. Amyx, Alexander E. Ide, Ryan G. Holzer and Cheryl L. Jorcyk. Idaho Academy of Sciences Conference, March 25th -27th, 2004. *State.*

Oncostatin M Induces Detachment and Enhances the Metastatic Capacity of T-47D Human Breast Carcinoma Cells. Cheryl L. Jorcyk, Ryan G. Holzer, and Randall E. Ryan. 95th Annual Meeting for the American Association for Cancer Research (AACR), Orlando, FL, March 27th-31st, 2004. *National.*

Breast Cancer Cells Co-cultured with Neutrophils Express Endogenous Oncostatin M (OSM). Marisa Queen, Alexander Ide, Kencee Amyx, Barbara Smith[1], Randy Ryan, and Cheryl Jorcyk. 95th Annual Meeting for the American Association for Cancer Research (AACR), Orlando, FL, March 27th-31st, 2004. *National.*

Protein Characterization Illuminates the Effects of Oncostatin M in Breast Cancer: 2 Dimensional Polyacrylamide Gel Electrophoresis of MB-MDA231 Cells. Pernilla Stridh-Igo; Kencee Amyx; Cheryl Jorcyk; Julie Oxford; and Sheryl Hawkes. 1st Annual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 19th, 2004. *Local.*

The Role of Oncostatin M in Human Microvascular Endothelial Cell Proliferation. Lee Rooney, Adrian Pauw, Alex Ide and Cheryl L. Jorcyk. 1st Annual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 19th, 2004. *Local.*

Neutrophils Co-Cultured with Breast Cancer Cells Express Endogenous Oncostatin M (OSM). (Oral Presentation) Marisa Queen, Alexander Ide, Kencee Amyx, Barbara Smith,

Randy Ryan, and Cheryl Jorcyk. 3rd Annual BRIN Conference, Idaho State University, Pocatello, ID, August 9th-11th, 2004. *State.*

OSM and Breast Cancer Metastasis to the Bone. Andrew Oler and Cheryl L. Jorcyk. 3rd Annual BRIN Conference, Idaho State University, Pocatello, ID, August 9th-11th, 2004. *State.*

Does Oncostatin M have a Role in Breast Cancer Metastasis to the Bone? Andrew Oler and Cheryl Jorcyk. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

Oncostatin M Induction of Vascular Endothelial Growth Factor in Human Breast Cancer Cells Promotes Angiogenesis. Alexander Ide, Ryan Holzer, Kencee Amyx and Cheryl Jorcyk. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

Development of Tools to Study Breast Cancer Metastasis: MDA-MB-231 Cells Designed to Overexpress Oncostatin M. Amanda J. Bruesch, Tshering Sherpa, Brooke McCuskey, and Cheryl Jorcyk. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

Evaluation of OSM-Receptor In Normal Human Breast Tissue, Breast Carcinoma, and Metastatic Carcinoma. Byrne B, Queen M, Jorcyk C. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

The Role of Oncostatin M in Human Microvascular Endothelial Cell Proliferation. Lee O. Rooney, Alexander E. Ide, and Cheryl L. Jorcyk. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

Neutrophils Co-cultured with Human Breast Cancer Cells Express Endogenous Oncostatin M (OSM). Marisa Queen, Alexander Ide, Lee Rooney, Randy Ryan, and Cheryl Jorcyk. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

Determination of the Receptor Utilized by Oncostatin M (OSM) to Promote Metastatic Characteristics in MDA-MB-231 Human Breast Cancer Cells. Heidi Pluska and Cheryl L. Jorcyk. MJ Murdock Charitable Trust's Partners in Science Meeting, San Diego, CA, January 13th-15th, 2005. *Regional.*

Breast cancer cells stimulate neutrophils to produce oncostatin M: potential implications for tumor progression. Marisa M. Queen, Alexander E. Ide, Ryan G. Holzer, Randall E. Ryan, and Cheryl L. Jorcyk. Keystone Symposium on Microenvironment of the Tumor, Banff, British Columbia, Canada, February 5th-10th, 2005. *International.*

Oncostatin M Induction of Vascular Endothelial Growth Factor in Human Breast Cancer Cells Promotes Angiogenesis. Alexander Ide, Ryan Holzer, Kencee Amyx, and Cheryl Jorcyk. 96th Annual Meeting for the American Association for Cancer Research (AACR), Anaheim, CA, April 16th-20th, 2005. *National.*

Neutrophils Co-cultured with Human Breast Cancer Cells Express Endogenous Oncostatin M (OSM). Marisa Queen, Alexander Ide, Lee Rooney, Randy Ryan, and Cheryl Jorcyk. 96th Annual Meeting for the American Association for Cancer Research (AACR), Anaheim, CA, April 16th-20th, 2005. *National.*

Evaluation of OSM-Receptor In Normal Human Breast Tissue, Breast Carcinoma, and Metastatic Carcinoma. Stear J, Byrne B, Queen M, Jorcyk C. 2nd Annual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 11th 2005. *Local.*

Initiating Oncostatin M in vivo Studies. (Oral Presentation) Amanda J. Bruesch and Cheryl L. Jorcyk. 2nd Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 7th-10th, 2005. *Regional.*

The Role of Oncostatin M in Prostate Cancer. David H. Chang and Cheryl L. Jorcyk. 2n Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 7th-10th, 2005. *Regional.*

GM-CSF from Breast Cancer Cells Triggers Expression of Oncostatin M (OSM) by Neutrophils During Co-culture. Soma Ganguly, Marisa M. Queen, and Cheryl L. Jorcyk. 2nd Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 7th-10th, 2005. *Regional.*

Signaling of OSM-induced VEGF in human breast and prostate cancer cell lines. Andrew J. Oler, Alexander E. Ide, David Chang, Cheryl L. Jorcyk. 2nd Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 7th-10th, 2005. *Regional.*

Oncostatin M-Receptor evaluation in normal, carcinoma, and metastatic human tissue. Stear Jenny, Byrne Brian, Queen Marisa, Jorcyk Cheryl. 2nd Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 7th-10th, 2005. *Regional.*

Breast cancer cells stimulate neutrophils to produce oncostatin M: potential implications for tumor progression. Marisa M. Queen, Alexander E. Ide, Ryan G. Holzer, Randall E. Ryan, and Cheryl L. Jorcyk. AACR Special Conference on Cancer, Proteases, and Tumor Microenvironment, Bonita Springs, FL, November 30th-December 4th, 2005. *National.*

Determination of the Receptor Utilized by Oncostatin M (OSM) to Promote Metastatic Characteristics in MDA-MB-231 Human Breast Cancer Cells. Heidi Pluska and Cheryl L. Jorcyk. MJ Murdock Charitable Trust's Partners in Science Meeting, San Diego, CA, January 12th-14th, 2006. *Regional.*

The role of oncostatin M in prostate cancer. David Chang, Andrew Oler, and Cheryl Jorcyk. 97th Annual Meeting for the American Association for Cancer Research (AACR), Washington, DC, March 29th-April 5th, 2006. *National.*

Oncostatin M Induction of Vascular Endothelial Growth Factor in Human Breast Cancer Cells Promotes Angiogenesis. Alexander Ide, Ryan Holzer, Marisa Queen, Andrew Oler, Amanda Bruesch, Kencee Amyx, Randy Ryan, and Cheryl Jorcyk. 97th Annual Meeting for the American Association for Cancer Research (AACR), Washington, DC, March 29th-April 5th, 2006. *National.*

Colon cancer: a role for oncostatin M in tumor cell progression? Tyrell Simkins and Cheryl Jorcyk. 3rdAnnual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 17th 2006. *Local.*

In vivo oncostatin M studies—in progress. (Oral Presentation). Amanda Bruesch, Dan Henbest, and Cheryl Jorcyk. 3rd Annual INBRE Conference, Northern Idaho College, Coeur d'Alene, ID, August 6^{8h}-8th, 2006. *Regional.*

Knocking down oncostatin M receptor beta expression in tumor cells utilizing RNA interference. (Oral Presentation). Patrick Aranda and Cheryl Jorcyk. 3rd Annual INBRE Conference, Northern Idaho College, Coeur d'Alene, ID, August 6th-8th, 2006. *Regional.*

The role of oncostatin M in prostate cancer. Jonathan Lee, David Change, Andrew Oler, and Cheryl Jorcyk. 3rd Annual INBRE Conference, Northern Idaho College, Coeur d'Alene, ID, August 6th-8th, 2006. *Regional.*

Does Oncostatin M play a role in colorectal cancer? Tyrell Simkins and Cheryl L. Jorcyk. 4th Annual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 16, 2007. *Local.*

The clinical significance of Oncostatin M and its receptors in breast cancer. AAAS (American Association for the Advancement of Science) Pacific Division Annual Conference. (Oral Presentation) Sujatha Kadaba, Karen Halsted, Kara Bowen, Laura Bond, William Fyffe, Joseph Kronz, and Cheryl L. Jorcyk. Boise, ID. June 20, 2007. *Regional*.

Oncostatin M induces VEGF through HIF1alpha. (Oral Presentation) AAAS (American Association for the Advancement of Science) Pacific Division Annual Conference. David Chang and Cheryl L. Jorcyk. June 20, 2007. Boise, ID. *Regional*.

Breast cancer stimulation of osteoclast differentiation: the role of Oncostatin M. (Oral Presentation) AAAS (American Association for the Advancement of Science) Pacific Division Annual Conference. Ken Tawara, Patrick Aranda, Sujatha Kadaba, Andrew Oler, and Cheryl L. Jorcyk. June 20, 2007. Boise, ID. *Regional*.

Breast cancer: confirming oncostatin's role in tumor progression *in vivo*. AAAS (American Association for the Advancement of Science) Pacific Division Annual Conference. Amanda Bruesch and Cheryl L. Jorcyk. June 20, 2007. Boise, ID. *Regional*.

Knocking down Oncostatin M Receptor beta expression in tumor cells: utilizing RNAi for selective mRNA cleavage. AAAS (American Association for the Advancement of Science) Pacific Division Annual Conference. Patrick Aranda and Cheryl L. Jorcyk. June 20, 2007. Boise, ID. *Regional*.

Oncostatin M's role in breast tumor progression *in vivo*. 4th Annual INBRE Conference. Amanda Bruesch and Cheryl L. Jorcyk. August 6, 2007, University of Idaho, Moscow, ID. *State.*

Knocking down Oncostatin M receptor beta expression in tumor cells. 4th Annual INBRE Conference. Patrick Aranda and Cheryl L. Jorcyk. August 6, 2007, University of Idaho, Moscow, ID. *State.*

Breast cancer stimulation of osteoclast differentiation: the role of Oncostatin M. 4th Annual INBRE Conference. Ken Tawara, Andrew Oler, Sujatha Kadaba, and Cheryl L. Jorcyk. August 6, 2007, University of Idaho, Moscow, ID. *State.*

The effect of Oncostatin M on hypoxia-inducible factor 1 alpha and cyclooxygenase-2 gene expression in human breast cancer cells. 4th Annual INBRE Conference. Bengt Phung, Arthur Ayers, and Cheryl L. Jorcyk. August 6, 2007, University of Idaho, Moscow, ID. *State.*

The effect of Oncostatin M on integrin expression in human breast cancer cells. 4th Annual INBRE Conference. Mary Lewis and Cheryl L. Jorcyk. August 6, 2007, University of Idaho, Moscow, ID. *State.*

Oncostatin M induces VEGF through HIF1a in human breast cancer cells. AACR (American Association for Cancer Research) Special Conference on Breast Cancer. Cheryl L. Jorcyk. October 18, 2007. San Diego, CA. *National.*

OSM elevates RUNX2 mRNA expression in human breast cancer cells. Bengt Phung, Cheryl L. Jorcyk, and Sara Heggland. 16th Annual Murdock College Science Research Program Conference. November, 2, 2007, Portland, OR. *National.*

OSM elevates RUNX2 mRNA expression in human breast cancer cells. Bengt Phung, Cheryl L. Jorcyk, Sara J. Heggland. 99th Annual Meeting for the American Association for Cancer (AACR), San Diego, April 12-16th, 2008. *National.*

Breast cancer cell stimulation of osteoclast differentiation and activity: the role of oncostatin M. Ken Tawara, Sujatha Kadaba, Andrew Oler, Cheryl L. Jorcyk 99th Annual Meeting for the American Association for Cancer (AACR), San Diego, April 12-16th, 2008. *National.*

Oncostatin M receptor knockdown in mammary carcinoma cells: the role of OSM signaling in tumor progression and metastasis. Patrick S. Aranda, Ken Tawara, Cheryl L. Jorcyk. 99th Annual Meeting for the American Association for Cancer (AACR), San Diego, April 12-16th, 2008. *National.*

OSM induces VEGF through regulation of HIF1a. David H. Chang, Sujatha Kadaba, Bengt Phung, Alexander Ide, and Cheryl L. Jorcyk. 99th Annual Meeting for the American Association for Cancer (AACR), San Diego, April 12-16th, 2008. *National.*

Using siRNA to modify the expression of OSM in mammary cancer cells in vitro. Jeff Redshaw, Patrick Aranda, Kelly Katula, and Cheryl L. Jorcyk. 5thAnnual Boise State University Undergraduate Research Conference, Boise State University, Boise, ID, April 14th, 2008. *Local.*

Human breast cancer cell metastatic potential is reduced by the combination of OSM and a HIF1a inhibitor. Ryan K. Fox, Amanda Bruesch, Cheryl L. Jorcyk. 5th Annual Boise State University Undergraduate Research Conference, Boise State University, Boise, ID, April 14th, 2008. *Local.*

Using siRNA to modify the expression of OSM in mammary cancer cells in vitro. Jeff Redshaw, Patrick Aranda, Kelly Katula, and Cheryl L. Jorcyk. Idaho Academy of Sciences Annual Conference, Boise, ID, March 27-29, 2008. *State.*

Human breast cancer cell metastatic potential is reduced by the combination of OSM and a HIF1a inhibitor. Ryan K. Fox, Amanda Bruesch, Cheryl L. Jorcyk. Idaho Academy of Sciences Annual Conference, Boise, ID, March 27-29, 2008. *State.*

A Tetracycline-inducible plasmid construct for controlling oncostatin M expression in breast cancer cell lines. Jeffrey C. Walker and Cheryl L. Jorcyk. The American Federation for Medical Research Western Regional Meeting, Carmel, CA, January 31-February 2, 2008. *Regional.*

Using shRNA to reduce the expression of mouse OSM in mouse mammary cancer cells in vitro. Jeff Redshaw, Patrick Aranda, Kelly Katula, and Cheryl Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. *State.*

Cancer Switches: developing an inducible plasmid to control oncostatin M expression in human and murine breast cancer cell lines. Jeffrey C. Walker and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. *State.*

Tomato fluorescent expression in breast cancer metastasis. Kara Jackson and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. *State.*

Oncostatin M: the role of mammary cancer progression in an orthotopic In vivo mouse model. Ken Tawara, Sujatha Kadaba, and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. *State.*

The effects of knockdown expression of HIF1a and VEGF: angiogenesis in breast cancer. Logan J. Miller, Patrick Aranda, Jeff Walker, and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. *State.*

Oncostatin M receptor knockdown in mammary carcinoma cells: the role of OSM signaling in tumor progression and metastasis. Patrick S. Aranda, Ken Tawara, and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. *State.*

Investigations on the effects of HIF1a inhibitors on the metastatic potential of human breast cancer cells. Ryan K. Fox, Amanda J. Bruesch, and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. *State.*

The relationship of OSM Receptor expression and colitis-associated colorectal cancer in mice. Stephan-David Spelter, Tyrell Simkins, Ken Tawara, and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. *State.*

Investigating the role of carbonyl reductase in anthracycline drug resistance. Ryan Morton, Christopher Ewing, Cheryl L. Jorcyk, and Henry Charlier. 237th American Chemical Society National Meeting, Salt Lake City, UT, March 22nd – 26th, 2009. *National.*

Breast cancer cell stimulation of osteoclast differentiation and activity: the role of oncostatin M. Ken Tawara, Sujatha Kadaba, Andrew Oler, and Cheryl L. Jorcyk. 100th Annual Meeting for the American Cancer Society, Denver, CO, April 18th – 22nd, 2009. *National.*

Development of bioluminescent mammary cancer cells with knocked down expression of OSM for detection of bone metastasis *in vivo.* Caleb Sutherland, Jeff Redshaw, Ken Tawara, and Cheryl L. Jorcyk. 6thAnnual Boise State University Undergraduate Research Conference, Boise State University, Boise, ID, April 20th, 2009. *Local.*

The role of OSM in breast cancer cell-promoted osteoclastogenesis. Farhad Mangal, Ken Tawara, and Cheryl L. Jorcyk. 6thAnnual Boise State University Undergraduate Research Conference, Boise State University, Boise, ID, April 20th, 2009. *Local.*

The role of oncostatin M in breast cancer metastasis to bone. Ken Tawara and Cheryl L. Jorcyk. International Bone and Mineral Society (IBMS) Workshop on Musculoskeletal Biology in Sun Valley, ID August 8th-12th, 2009. *International.*

OSM-induced RunX2 in human breast cancer cells (not exact title). The Endocrine Society's 91st Annual Meeting, Washington, D.C., June 10th – 13th, 2009. *National.*

Point-of-contact, DNA-based amplifier for detecting cancer-related micro-RNAs in blood serum. (Oral presentation) Elton Graugnard, Amber Cox, William L. Hughes, Jeunghoon Lee, Cheryl L. Jorcyk, William B. Knowlton, and Bernard Yurke. 2009 Nanoelectronic Devices for Defense Security (Nano-DDS), Fort Lauderdale, FL, September 28th – October 2nd, 2009. *National.*

Point-of-contact, DNA-based Amplifier for Detecting Cancer-Related Micro-RNAs in Blood Serum. Graugnard, E., Cox, A., Lee, J., Jorcyk, C.L., Yurke, B., and Hughes, W.L. Oral & Paper Presentation, Nanoelectronic Devices for Defense & Security Conference, Fort Lauderdale, FL, Sept. 28-Oct. 2, 2009. *National.*

A role for oncostatin M in breast cancer metastasis. Ken Tawara, Caleb Sutherland, Rachael Anderson, and Cheryl L. Jorcyk. Keystone Symposium on Cancer and Inflammation in Keystone, CO February 7th-12th, 2010. *National.*

Breast cancer cell regulation of osteoclast differentiation and activity: the role of oncostatin M. Ken Tawara, Andrew Oler, and Cheryl L. Jorcyk. Miami 2010 Winter Symposium on Targeting Cancer Invasion and Metastasis in Miami Beach, FL, February 21st-24th, 2010. *National.*

Point-of-Contact, DNA-Based Amplifier for Detecting Cancer-Related Micro-RNA in Blood Serum. Graugnard, E., Cox, A., Lee, J., Jorcyk, C.L., Yurke, B., and Hughes, W.L. Abstract & Poster Presentation, 7th Annual Conference on Foundations of Nanoscience, Snowbird, UT, April 27-30, 2010. *National.*

Reaction Kinetics of a DNA-Based Amplifier for use in Detection of Cancer-Related miRNA. Cox, A., Graugnard, E., Hughes, W.L., Lee, J., Jorcyk, C.L., and Yurke, B. Abstract & Poster Presentation, 7th Annual Conference on Foundations of Nanoscience, Snowbird, UT, April 27-30, 2010. *National.*

Operation of a DNA-based autocatalytic amplifier in human serum. Graugnard, E., Cox, A., Lee, J., Jorcyk, C.L., Yurke, B., and Hughes, W.L. 16th International Conference on DNA Computing and Molecular Programming, Hong Kong, China. To be presented June 14-17, 2010. *International.*

Effects of oncostatin M on breast cancer metastatic potential. Caleb Sutherland, Ken Tawara, and Cheryl L Jorcyk. 7thth Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. *State.*

Developing 4T1.2 and 4T1-luc2 cells that overexpress full-length and truncated oncostatin M inducibly and constitutively. Dollie LaJoie, Hunter Covert, Jeff Walker, Cheryl L. Jorcyk. 7thth Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. *State.*

Establishing human breast cancer cells that inducibly express oncostatin M. Hunter Covert, Dollie LaJoie, Joe Deaver, and Cheryl L. Jorcyk. 7thth Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. *State.*

Will exogenous oncostatin M induce production of oncostatin M? Jordan Koncinsky and Cheryl L. Jorcyk. 7th[th] Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. *State.*

Development of 66c14 murine mammary carcinoma cells having constitutive expression of truncation oncostatin M. Rachael Anderson, Dollie LaJoie, Ken Tawara, and Cheryl L. Jorcyk. 7th[th] Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. *State.*

The role of oncostatin M (OSM) in osteoclast differentiation and activity in an in vitro model of breast cancer metastasis to bone. (Oral Presentation) Celeste Bolin and Cheryl L. Jorcyk. 7th[th] Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. *State.*

Hypoxia inducible factor 1 alpha plays a role in mammary cancer cell-mediated bone destruction. (Oral Presentation) Ken Tawara and Cheryl L. Jorcyk. 7th[th] Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. *State.*

Professional Service:

Manuscript Reviewer, numerous journals including *Cancer Research, Molecular Cancer Research,* the *International Journal of Cancer*, *BMC Cancer*, the *International Journal of Biochemistry and Cell Biology*, the *American Journal of Pathology*, *Cytokine*, *Experimental Cell Research,* and *the Archives of Biochemistry and Biophysics.*

Member, VA Research and Development Biosafety Committee. Department of Veterans Affairs Medical Center, Boise, ID, 1999-2006.

Member, Southern Idaho Science Collaborative (SISC). Nampa, ID, 1999-2005.

Community Scientist, Vallivue School District Hands-On Science Reform Program. Spring 2003.

Participant, St. Luke's Regional Medical Center's Mountain States Tumor Institute (MSTI) oncology seminar/dinner presentations, 2003-present.

Member, Washington State University Cancer Prevention and Research Center (CPRC) Conference Committee. Washington State University, Pullman, WA. Spring 2004.

Member, Discovery Center of Idaho (DCI) Education Committee. Boise, ID, 2004-2007.

Affiliate Member, BioIdaho. Boise, ID 2004-2007.

Member, BioIdaho Planning Committee, Hosted first BioBreak event at the Idaho State Laboratories, Boise, ID, 2004 the BioIdaho Legislature Dinner, Boise, ID, 2005, and the BioIdaho Legislative Luncheon, Boise, ID, 2007.

Northwest Regional Officer, Sigma Xi Honorary Science Society, 2005-2006.

Member, Idaho Comprehensive Cancer Collaborative (ICCC) Cancer Prevention Subcommittee. Boise, ID, 2005-present.

CDC Grant participant, Idaho Comprehensive Cancer Collaborative (ICCC). Boise, ID. 2005.

Vice-President, Sigma Xi Honorary Science Society. Boise State University Chapter, 2005-2006.

Lobbyist, National Cancer Institute, NIH. Lobbied for cancer funding to Idaho Senators and Congressmen on Capital Hill, Washington DC, 2006.

Member, MentorNet. Designed to provide mentors to young researcher around the country, 2006.

President, Sigma Xi Honorary Research Society Chapter. Boise State University, Boise, ID, 2007-2008.

Lobbyist, American Cancer Society. Lobbied for cancer funding to Idaho state legislators, Boise, ID, 2009.

University Research-related Service:

Member, Graduate Studies Oversight Committee (GSOC). The Department of Biology, Boise State University, 2000-2006.

Host for Seminar Speakers, Department of Biological Sciences Seminar Series, Boise State University, 2003-present.

Member, IACUC (Institutional Animal Care and Use Committee). Boise State University, 2005-2006.

Member, Biomolecular Sciences Ph.D. Planning Committee. (Chair, Molecular & Cellular Biology Section). Boise State University, 2005-2006.

Vice-President, Sigma Xi Honorary Science Society. Boise State University Chapter, 2005-2006.

Member, Premedical Student Summer Fellowship Grant Review Committee. The Department of Biology, Boise State University, 2006.

President, Sigma Xi Honorary Research Society Chapter. Boise State University, Boise, ID, 2007-2008.

Member, IACUC (Institutional Animal Care and Use Committee). Boise State University, 2007-2008.

Member, IRB (Internal Review Board). Biomedical Human Subjects, Boise State University, 2008-2010.

Co-Chair, Internal Review Board (IRB) Committee. Boise State University, 2010-present.

Byung I. Kim, Ph. D

Associate Professor of Physics, Boise State University, Boise, ID 83725
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(i) Professional Preparation

Korea Advanced Institute of Science and Technology	Physics	BS, 1991
Seoul National University	Physics	MS, 1993
Seoul National University	Physics	Ph. D, 1998
University of Houston	Chemical Physics	1998-2001
Sandia National Laboratories	Biophysics	2001-2004

(ii) Appointments

2009 Aug.– Present : Associate Professor
2004 July– 2009 July : Assistant Professor, Boise State University
2001 Nov.– 2004. July: Postdoctoral Appointee, Sandia National Laboratories
1998 Nov.– 2001 Oct: Research Associate I, University of Houston

(iii) Research Areas of Interest

Confinement induced water phase transitions, Chiral recognitions, Long Term structural change of plasmid DNA, Molecular self-assembly, Biomolecular stabilization constant measurement, Development of bioactive surfaces, Cantilever based optical interfacial force microscopy (COIFM), Magnetic force microscopy (MFM) using electrostatic force modulation, Electrochemical scanning tunneling microscopy (EC-STM), Nanotribology using friction force microcopy (FFM), AFM-FET hybrid biosensor, SPM based nanolithography.

(iv) Research Experiences

Dr. Kim's research is focused on molecular scale investigation of bio-molecular systems such as proteins, DNAs, cells, and bacteria using various scanning probe techniques including COIFM, STM, AFM, and MFM. The COIFM, which stands for "cantilever based optical interfacial force microscope," is a special scanning probe microscope recently developed by Dr. Kim for biophysics research at Boise State University. Kim's group currently uses the COIFM for investigating phase transition of interfacial water, which is important in understanding biomolecular systems such as antifreeze proteins. The instrument is also used to probe the metastable states of molecular interactions between two biomolecules. This research is funded from National Science Foundation. Another current research project that Dr. Kim is conducting is the investigation of organic molecular recognitions in electrochemical environments by scanning tunneling microscopy (STM). The competitive roles of intermolecular and adsorbate-substrate interactions in molecular ordering is a subject currently being studied using STM. Another project is the study of an enzyme system, 5-methyl thioadenosine/s-adenosylhomocysteine nucleosidase (MTAN) extracted from Escherichia coli, by measuring a biomolecular stabilization constant using a novel atomic force microscope (AFM) technique. Kim's group is also studying the relationship between topography and magnetic structures by a recently developed magnetic force microscope that employs a novel electrostatic force modulation.

(v) Publications (Peer Reviewed)

1. B. I. Kim, J. Rice, H. Joo, and J. Holmes, **"**Measuring a Stabilization Constant between Two Bio-Molecules using Atomic Force Microscopy," submitted to *Biophysical J.* for publication on 4/22/2011 (under review).
2. B. I. Kim, "Direct Observation of Polymer-like Water Structure by Cantilever-Based Optical Interfacial Force Microscopy," submitted to Phys. Rev. Lett. for publication on 3/4/2011 (under revision).
3. B. I. Kim, J. A. Rasmussen and E. J. Kim, "Large Oscillatory Forces Generated by Interfacial Water under Shear Modulation between Two Hydrophilic Surfaces," submitted Appl. Phys. Lett. for publication on 2/17/2011 (under revision).
4. B. I. Kim, Reilly Clark, and Tyler Clark, "Long-Term Structural Changes of Plasmid DNA Studied by Atomic Force Microscopy," Scanning **33**, 1–8 (2011).
5. B. I. Kim, J. R. Bonander, and J. A. Rasmussen, "Simultaneous measurement of normal and friction forces using a cantilever-based optical interfacial force microscope," Rev. Sci. Instrumn. **82**, 053711 (2011).
6. B. I. Kim, "Nanotribology and nanoindentation using advanced scanning probe techniques," Scanning, **32**: v–vi. (2010)
7. B. I. Kim, "Separation of Topographic Features from Magnetic Force Images using Capacitive Coupling Effect," Rev. Sci. Instrum. **80**, 023702 (2009).
8. J. R. Bonander and B. I. Kim, "Cantilever Based Optical Interfacial Force Microscope", *Appl. Phys. Lett.* **92**, 103124 (2008)
9. J. Philip, A. Punnoose, B. I. Kim, K. M. Reddy, S. Layne1, J. O. Holmes, B. Satpati, P. R. Leclair, T. S. Santos and J. S. Moodera, "Carrier-controlled ferromagnetism in transparent oxide semiconductors," Nature Materials **5**, 298-304 (2006)
10. B. I. Kim, "Chiral Recognition of PVBA on Pd(111) and Ag(111) Surfaces", Langmuir **22**, 9272-9280 (2006)
11. B. I. Kim, "Direct Comparison Between Phase Locked Oscillator And Direct Resonance Oscillator In The Noncontact Atomic Force Microscopy Under Ultrahigh Vacuum", Rev. Sci. Instrum. **75**, 5035(2004)
12. B. C. Bunker, B. I. Kim, J. E. Houston, S. T. Picraux, R. Rosario, A. A. Garcia, M. Hayes, and D. Gust, "Observations of Photo-Switching in Tethered Spiropyrans Using the Interfacial Force Microscope" Nano Letters **3**, 1723 (2003).
13. B. C. Bunker, D. L. Huber, R. P. Manginell, B. -I. Kim, A. K. Boal, G. D. Bachand, S. B. Rivera, J. M. Bauer, C. M. Matzke, "Incorporation of Bioactive Materials into Integrated Systems"**,** Proc. SPIE **5220** 28 (2003).
14. D. L. Huber, R. P. Maginell, M. A. Samara, B. -I. Kim, and B. C. Bunker, "Programmed Adsorption and Release of Proteins in a Microfluidic Device", Science **301**, 352 (2003).
15. B.-I. Kim, C. Cai, X. Deng, S. S. Perry, "Adsorption-induced chirality influences surface orientation in organic self-assembled structures: an STM study of PVBA on Pd(111)", Surf. Sci. **538**, 45 (2003).
16. L. C. Fernandez-Torres, B.-I. Kim, S. S. Perry, The frictional response of VC(100) surfaces: Influence of 1-octanol and 2,2,2-trifluoroethanol adsorption, Tribology Letters **15**, 43 (2003).

17. X. Chen, S. Wang, Y. L. Yang, L. Smith, N. J. Wu, B.-I. Kim, S. S. Perry; A. J. Jacobson, A. Ignatiev, Electrical conductivity relaxation studies of an epitaxial $La_{0.5}Sr_{0.5}CoO_{3-delta}$ thin film, Solid State Ionics **146**, 405 (2002).

18. R. L. Guenard, L. C. Fernandez-Torres, B.-I. Kim, S.S. Perry, P. Frantz, S. V. Didziulis, Selective surface reactions of single crystal metal carbides: alkene production from short chain alcohols on titanium carbide and vanadium carbide, Surf. Sci. **515**, 103 (2002)

19. B. I. Kim, S. Lee, R. L. Guenard, L. C. Fernandez-Torres, S. S. Perry P. Frantz and S. V. Didziulis, "Chemical Modification of the Interfacial Frictional Properties of Vanadium Carbide Through Ethanol Adsorption", Surf. Sci.(2001) **481**, 185 (2001)

20. C. A. Mims, N. I. Joos, P. A.W. van der Heide, A. J. Jacobson, C. Chen, C. W. Chu, B.-I. Kim, S. S. Perry, Oxygen transport in oxide thin film structures oriented $La_{0.5}Sr_{0.5}CoO_{3-x}$ on single-crystal yttria-stabilized zirconia, Electrochemical and Solid State Letters **3**, 59 (2000).

21. H. Lee, S. M. Lee, E. T. Ada, B.-I. Kim, M. Weiss, S. S. Perry, J. W. Rabalais, Shallow implantation of Ti+ ions in sapphire [a -Al_2 O_3(0001)], Nucl. Instrum. Meth. B **157**, 226 (1999).

22. B. I. Kim, U. H. Pi, S. Yoon and Z. G. Khim, " Lithography by tapping mode atomic force microscope with electrostatic force modulation", Appl. Phys. A **66**, s95 (1998).

23. B. I. Kim, J. W. Hong, J. I. Kye, Z. G. Khim and S. Yoon, "Construction of Magnetic Force Microscope and its Application to Magnetic Multilayer Films" J. Kor. Phys. Soc. **31**, S79 (1997).

24. J. W. Hong, B. I. Kim**,** J. I. Kye and Z.G. Khim, "Effect of electrostatic force and tapping mode operation of atomic force microscope" J. Kor. Phys. Soc. **31**, S83 (1997).

25. J. I. Kye, W. K. Park, B. I. Kim, Z. G. Khim, G. T. Jeong, D. H. Lee, T. E. Shim, and J. G. Lee, Single Electron Tunneling Effect in YBCO Film, J. Kor. Phys. Soc. **29**, 354 (1996).

26. G.T. Jeong, J.I. Kye, W.K. Park, J.W. Hong, B. I. Kim, and Z.G. Khim, "Observation of Coulomb Staircase in YBCO Film", High Temperature Superconductivity **5**, 261 (1995).

27. B. I. Kim, J. W. Hong, G. T. Jeong, S. H. Moon, D. H. Lee, T. U. Shim and Z. G. Khim, "Effect of $Mg(OH)_2$ On $YBa_2Cu_3O_7$ thin film on MgO by AFM", J. Vac. Sci. Technol. **B12(3)**, 1631 (1994).

28. W. Jo, H-J. Cho, T. W. Noh, B.-I. Kim, D_Y. Kim, Z. G. Khim, and S-I. Kwun, Structural and electro-optic properties of pulsed laser deposited $Bi_4Ti_3O_{12}$ thin films on MgO, Appl. Phys. Lett. **63**, 2199 (1993).

(vi) **Patent Pending and Invention Disclosure**

- Inventor: Byung Kim, Invention Title:“ Invention of a simultaneous measurement technique of normal and friction forces using a cantilever-based optical interfacial force microscope,” Boise State University Invention Disclosure Form (submitted on May 13, 2011).
- Inventor: Byung Kim, Invention Title:“Cantilever Based Optical Interfacial Force Microscope (COIFM),” submitted to US Patent and Trademark Office on April 9, 2010.
- Inventor: Byung Kim, Invention Title:“ High-Speed Atomic Force Microscope (HS AFM) Using an Angular Laser-Beam Detection (ALBD) Scheme for Simultaneous Optical Imaging with Improved Resolution,” Boise State University Invention Disclosure Form (submitted on August 10, 2009).

(vii) **Memberships and Professional Services**

Member of Biophysical Society

Member of American Vacuum Society

Guest Editor of Journal *Scanning* (2009-present)

NSF MRI, NSF IDBR Review panelist (2009, 2010)

Textbook Review Service (four book manuscripts in Biophyiscs and Analog Electronics)

Proposal Reviewer of NSF, Research Corporation, and others

Refereeing Review Service of 27 Papers from *Nanotechnology, Langmuir, Ultramicroscopy, Journal of Micromechanics and Microengineering, Scanning, IEEE Sensors, Applied Physics Letters, Journal of Applied Physics, and Journal of Adhesion Science and Technology*

Member of the Institutional Biosafety Committee (IBC) of Boise State University (2004 – 2007)

Reviewer of the Faculty Research Grants (2005-2006)

Tenure/Promotion Committee of Physics Department (2010- Present)

Member of the Honor & Awards Committee of College of Arts and Sciences (2005-2006, 2009-2010)

Member of the Mini Development Committee of College of Arts and Sciences (2005-2006)

Member of the Bio/Nanophysics Faculty Search Committee of Physics Department (2005-2006)

(viii) **Research Supports (~$450,000)**

1. **NATIONAL SCIENCE FOUNDATION: "**IDBR: RUI: Development of a Cantilever Based Optical Interfacial Force Microscope," Amount: $240,181 Time Period: 06/01/09 - 05/31/12; **PI**: Byung Kim
2. **THE PETROLEUM RESEARCH FUND**: "Chiral Recognition of PVBA on fcc(111) Surfaces in Electrochemical Solutions"; Agency: PRF AMERICAN CHEMICAL SOCIETY, Amount: **$40,000**; Time Periods:6/1/2007-8/31/2009; **PI**: Byung Kim.
3. **COTTRELL COLLEGE SCIENCE AWARDS**; "Scanning Probe Microscopy of Interfacial Water Confined between Silica Surfaces"; Agency: Research Corporation; Amount: **$45,683**; Time Periods: 05/11/07 - 05/12/09; **PI**: Byung Kim.
4. **INBRE Summer 2006 INBRE UG Fellowship Prospective Mentor**; "Summer Undergraduate Fellowship Mentor"; Agency: Idaho BRIN/INBRE Program; Amount : **$6,000** ($5,000 for UG Salary); Time Periods: 10 weeks (summer 2005); **PI**: B. Kim
5. **NSF EPSCoR Startup Augmentation funding**; "Development of Interfacial Force Microscope for Water Study"; Agency: University of Idaho; Time Periods : 1 year (June 1, 2005 to May 31, 2006); Amount: **$10,000**; PIs: Byung Kim (**PI**)
6. **NIH-SBIR I - Subcontract**; "Bypassing Fluidics in Proteomic Screening", Agency : Potentia Pharmaceuticals, Inc., Amount : **$100,814** ; Time Periods : 1 year (June 1, 2005 to Nov 30, 2006); PIs: Byung Kim (**PI**) and Russell, Dale
7. **Collaborative Grant Improvement Initiative (CGII)**; Achieving excellence in research and scholarship "Biophysical and Biochemical Characterization of Protein Structure and Molecular Interactions in Cell Signaling", Agency : Boise State University; Amount: **$150,000** for 2 year. Time periods :2 years (June 2005 to May 2007); PIs: J. Oxford (**PI**), H. Charlier, N. Hazeki-Taylor, B. Kim, B. Knowlton, J. Peloquin, A. Punnoose, and S. Smith (co -PIs)
8. **Faculty Research Initiation Grants (FRIG)**;"High-Speed AFM For Biomolecular Studies,"; Agency : Boise State University –ORA; Time Periods: 1 year (July 2005-June 2006), Amount:**$15,000**; PIs: Byung Kim **(PI)**

9. **Faculty Research Grants (FRG)**; "Single molecular studies of chiral recognition on fcc(111) surfaces,"; Agency : Boise State University –ORA; Time Periods: 1 year (July 2005 - June 2006), Amount:**$5,000**; PIs: Byung Kim **(PI)**

(ix) **Presentations** (since joining BSU; * marks undergraduate research assistants)

1. Byung Kim, "Single Molecule Structural Transitions of Water Polymer Chains in a Nanoscale Confined Space Studied by COIFM" AVS 57th International Symposium & Exhibition, November 17 - November 22, 2010, Albuquerque, NM, USA.
2. Edward Kim*, Luke Smith*, Rob Schreiber*, and Byung Kim, "Elastomer Insulated Tip for Cantilever Based Optical Interfacial Force Microscope in Liquid" 7th Annual Undergraduate Research & Scholarship Conference 2010, April 12, 2010, Student Union Building, Boise State University.
3. Jared Rasmussen* and Byung I. Kim, "Entropy of Water Chains and Freely Jointed Chain Model: Humidity Dependence Study." 7th Annual Undergraduate Research & Scholarship Conference 2010, April 12, 2010, Student Union Building, Boise State University.
4. Joey Hanson* and Byung Kim, "Chiral Recognition of 4, 4' Biphenyl-dicarboxylic acid on Pd(111) and Au(111) Studied by Electrochemical-Scanning Tunneling Microscopy," 7th Annual Undergraduate Research & Scholarship Conference 2010, April 12, 2010, Student Union Building, Boise State University.
5. Reilly Clark*, Tyler Clark*, and Byung I. Kim, "The Uncoiling of Plasmid DNA over Time." 7th Annual Undergraduate Research & Scholarship Conference 2010, April 12, 2010, Student Union Building, Boise State University.
6. Ryan Boehm* and Byung Kim, "Dual-Feedback Atomic Force Microscope Using an Angular Laser Beam Detection Scheme for Simultaneous Optical Imaging with Improved Resolution." 7th Annual Undergraduate Research & Scholarship Conference 2010, April 12, 2010, Student Union Building, Boise State University.
7. Edward Kim*, Thanh Tran, Luke Smith, and Byung Kim, "Scanning Probe Microscopy of Interfacial Water Confined between Silica Surfaces," 6th Annual Undergraduate Research & Scholarship Conference 2009, April 20, 2009, Student Union Building, Boise State University.
8. Joey Hanson*, Travis Reynolds*, and Byung Kim, "Intercalation Process of Acidic Ions into Graphite Atomic Steps Studied by Electrochemical-Scanning Tunneling Microscopy," 6th Annual Undergraduate Research & Scholarship Conference 2009, April 20, 2009, Student Union Building, Boise State University.
9. Byung Kim, Jeremy Bonander*, Edward Kim*, and Thanh Tran*, "Scanning Probe Microscopy of Interfacial Water Confined Between Silica Surfaces," AVS 56th International Symposium & Exhibition, November 8 - November 13, 2009, San Jose, CA, USA.
10. B. I. Kim, "Separation of Topographic Features from Magnetic Force Images using Capacitive Coupling Effect," AVS 55th International Symposium, October 19-24, 2008, Hynes Convention Center, Boston, MA
11. J. O. Holmes*, B. I. Kim, P. Deschatelets, N. Minskoff and D. L. Russell, "An AFM-PMOS FET Biosensor for Proteomic Screening," 5th Undergraduate Research and Scholarship Conference, April 14th, 2008, Jordan Ballroom of the Student Union Building, Boise Sate University. Joe Holmes was awarded an outstanding research achievement award at Boise State University in 2008
12. E. J. Kim*, B. I. Kim, and J. R. Bonander*, "High-Speed Atomic Force Microscopy Combined with

Optical Microscopy for Biological Studies" 5th Undergraduate Research and Scholarship Conference, April 14th, 2008, Jordan Ballroom of the Student Union Building, Boise Sate University.

13. Thanh Tran* and Byung Kim, "Probing Interfacial Water in Confined Spaces with a Novel Cantilever Based Optical Interfacial Force Microscope," Idaho Utah Section of AAPT 27th Annual Spring Meet ing March 28 - 29, 2008, Boise State University, West Campus, Nampa, Idaho 83687.
14. Travis Reynolds* and Byung Kim, "Graphite Intercalation Process in Perchloric Acid Solutions Studied by Electrochemical-Scanning Tunneling Microscopy and Cyclic Voltammetry," Idaho Utah Section of AAPT 27th Annual Spring Meeting March 28 - 29, 2008, Boise State University, West Campus, Nampa, Idaho 83687.
15. B. I. Kim and J. Bonander*, "Humidity Dependent Ordering of Water and its Effect on Adhesion and Friction between Silica Surfaces," AVS 54th International Symposium & Exhibition, Oct 14-19,2007, Washington State Convention Center, Seattle, WA.
16. B. I. Kim, J. Rice*, J. Holmes*, and K. Cornell, "Probing an Enzymatic Transition State Using Atomic Force Microscopy." Symposium Biomedical/Biorelated Materials' at the AAASPD conference, Boise, June 17-21, 2007 (invited speaker).
17. J. O. Holmes*, B. I. Kim, P. Deschatelets, N. Minskoff and D. L. Russell, "An AFM-PMOS FET Biosensor for Proteomic Screening," Undergraduate Research and Scholarship Conference, April 16th, 2007, Jordan Ballroom of the Student Union Building, Boise Sate University. Joe Holmes was awarded an outstanding research achievement award at Boise State University in 2007 (Attached a letter from Associate Dean Helen Lojek to Joe Holmes)
18. J. Bonander* and B. I. Kim, "Development of a High-speed Atomic Force Microscope," Undergraduate Research and Scholarship Conference, April 16th, 2007, Jordan Ballroom of the Student Union Building, Boise Sate University.
19. J. O. Holmes*, B. I. Kim, P. Deschatelets, N. Minskoff and D. L. Russell, "An AFM-PMOS FET Biosensor for Proteomic Screening," Annual Boise State Day at the Legislature Date, 01/17/2007, Idaho State Capitol Building, Boise Idaho.
20. J. Bonander* and B. I. Kim, "Development of a High-speed Atomic Force Microscope," Annual Boise State Day at the Legislature Date, 01/17/2007, Idaho State Capitol Building, Boise Idaho.
21. B. I. Kim, J.L.Rice*, K.A. Cornell, P. Deschatelets,"Single Molecule Force Spectroscopy on 5-Methyl thioadenosine/S-Adenosylhomocysteine Nucleosidase (MTAN) from Escherichia coli by Atomic Force Microscopy", AVS 53th International Symposium & Exhibition, Nov 12-17,2006, Moscone West, San Francisco, CA.
22. J. L. Rice* and B. I. Kim, "Probing the single molecular unbinding force between MTAN and HIA using atomic force microscopy", 5th Annual INBRE Research Conference, August 6- 8, 2006, Coeur d'Alene, ID.
23. B.I. Kim, "Humidity Dependent Ordering of Water and its Effect on Adhesion and Friction between Silica Surfaces" Gordon Research Conference on TRIBOLOGY, 06/18/2006 - 06/23/2006, Colby College, Waterville, ME. The PI's participation at this conference was due to the invitation of Vice-Chair Dr. Wahl. They supported the PI's travel expense partially with GRC chair funds in the amount of $660.
24. J.J. Durrant*, R. Nuxoll, and B. I. Kim, "*Development of Novel Atomic Force Microscopy for Biological Studies,"* Undergraduate Research and Scholarship Conference, April 17th, 2006, Jordan Ballroom of the Student Union Building, Boise Sate University.

25. J. Holmes*, K. Cornell, B. I. Kim and P. Deschatelets, "*Single Molecular Antibody-Antigen Interactions Studied by Atomic Force Microscopy"* Undergraduate Research and Scholarship Conference, April 17th, 2006, Jordan Ballroom of the Student Union Building, Boise Sate University.
26. J.J. Durrant*, R. Nuxoll, and B. I. Kim, "*Development of Novel Atomic Force Microscopy for Biological Studies"* Annual Boise State Day at the Legislature Date, January 18, 2006 4th floor Rotunda, Idaho State Capitol Building, Boise Idaho
27. J. Holmes*, K. Cornell, and B. I. Kim, "*Single Molecular Antibody-Antigen Interactions Studied by Atomic Force Microscopy"* Annual Boise State Day at the Legislature Date, January 18, 2006 4th floor Rotunda, Idaho State Capitol Building, Boise Idaho.
28. B.I. Kim, J.O. Holmes*, M.R. Kongara, and A. Punnoose *"A Comparative Study of the Magnetic Domain Structure of Mn Doped ITO Thin Films by Magnetic Force Microscopy,"* AVS 52nd Annual International Symposium, October 30-November 4, 2005, Hynes Convention Center Boston, MA
29. Byung Kim, "*Atomic Force Microscopy in Bio-Physics Research,"* 4th Annual INBRE Research Conference, August 7- 9, 2005, Nampa, ID
30. B.-I. Kim, "Tuning of Orientation and Chiral Recognition of a Single Chiral Molecule in Self-Assembly through Modulation of Anchoring Sites," AVS 51th Annual International Symposium, November 14- November 19, 2004, Anaheim Convention Center Anaheim, CA

(x) List of Supervised Students and Their Professional Experience

Undergraduate Students

1. Soomin Kim (Pharmacy at U. of Michigan, May 2011 –present), PVBA Trimer Study
2. Reilly Clark (Biology, September 2010 –present), Observation of Plasmid DNA structures by AFM.
3. Ryan Boehm (Pre-Med, May 2009 –present), Development of Bio-highspeed AFM.
4. Edward Kim (Physics, July 2007 – February 2011), Biological COIFM
5. Jared Rassmussen (Health Science Studies, May 2009 – January 2011), Water structure strudies.
6. Peter Olsoy (Biology, May 2010- December 2010) Analysis of poly-NIPAM data.
7. Matthew Turner (Chemistry, May 2010- December 2010) Analysis of EC-STM data.
8. Kyle Needs (MS&E, May 2010- July 2010) Analysis of Bio-AFM data.
9. Nikki Lundy (MS&E, May 2010- December 2010) Analysis of COIFM data on water.
10. Rob Schreiber (Physics, May 2009 – August 2009), Instrumnetation of EC-STM, COIFM and Highspeed AFM using lab-view program
11. Luke Smith (Biology Graduate, December 2007 – August 2009), Bio-AFM.
12. Joey Hanson (Pre-Med, Junior, January 2009 – August 2009), Chiral recognition of BPBA on fcc(111)
13. Lynn Ann Hoppert (Biology, May 2009 –August 2009), Development of bioactive surfaces.
14. Veronica Fletcher (Health Science Studies, July 2009- August 2009) Development of poly-NIPAM surface for control of protein adsorption and desorption..
15. Joseph O. Holmes (physics major, February 2005 – July 2008) MFM, FET sensor and BioAFM.

16. Travis Reynolds (physics major 2 degree, May 2007 – July 2008): EC-STM
17. Thanh Tran (EE, May 2007 – July 2008) Interfacial Water
18. Daniel Barrett (Biology, September 2007-December 2007): AFM
19. Jennifer Rice (biology major, May 15,2006 – July 2006) MTN-HIA by AFM.
20. Jeremy Bonander (chemistry major & physics minor, May 15,2006 – September 2007) COIFM Development.
21. Mark Smith (Physics 2 degree, February 2007-May 2007) EC-STM
22. J.J. Durrant (physics, May 2005 – July 2006) AFM Construction.
23. Eric Hoskins (biology, February 2006 – May 2006) BioAFM.
24. Alina Schmipf (chemistry major & physics minor, 10/12/05 – 01/19/06) BioAFM.

<u>High School Intern Students (during summer 2009)</u>

1. Kevin Brown (Capital High School (Boise, ID) and Treasure Valley Science and Math Center) (March 2011 – present), Analysis of Water Data
2. Lauren Reeder (Boise High School and Treasure Valley Science and Math Center, Junior), (November 2010 –Present), EC-STM of organic molecules on metal surfaces.
3. Hyonjee Joo (Boise High School and Treasure Valley Science and Math Center, Junior), (July 2010 –Present), Bio-AFM.
4. Reilly Clark (Rocky Mountain High School (Merdian, ID), Senior) (May 2009 –August 2010), Observation of Plasmid DNA structures by AFM.
5. Tyler Clark (Rocky Mountain High School (Merdian, ID), Junior) (May 2009 –August 2009), Observation of Plasmid DNA structures by AFM.
6. Alex Harmon (Capital High School (Boise, ID) and Treasure Valley Science and Math Center, Junior), (May 2009 –November 2009), SPM circuit analysis, and force-distance curve analysis using freely jointed chain model.
7. Christina Lee (Boise High School, Senior), (May 2009 –August 2009), EC-STM of organic molecules on metal surfaces.

Jeunghoon Lee, Ph. D.

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(208) 968-0775 (home)
(630) 373-4059 (cell)

EDUCATIONAL AND PROFESSIONAL BACKGROUND

Boise State University, Boise, ID

- Assistant Professor, Aug. 2008 – present

Northwestern University, Evanston, IL

- Postdoctoral research with Prof. Teri W. Odom, Oct. 2005 – Aug. 2008
  - Fabrication and functionalization of multi-metal nanopyramids for biological imaging and targeted therapeutics
  - Orientation and refractive index dependent optical properties of metal nanopyramids

University of Connecticut, Storrs, CT

- Graduate research with Prof. Fotios Papadimitrakopouls, Jan. 1999 – Aug. 2005
- Ph. D. in Polymer Science, Sep. 2005

  Thesis title: "Ligand Assisted Assemblies of CdSe Quantum Dots for Microelectronics and Biological Applications"
  - CdSe quantum dot labeling of plasmid DNA for gene tracking
  - Layer-by-layer assembly of CdSe quantum dots for light-emitting diode applications
  - Structure – fluorescence relationship of water-soluble polymer/CdSe QD clusters

Seoul National University, Seoul, Korea

- Graduate research with Prof. Jyongsik Jang, Jan. 1994 – Feb 1996
- M. S. Chemical Technology, Feb. 1996

  Thesis title: "Synthesis and Adhesion Performance of High-Temperature Polyimide Adhesives"
  - Synthesis and adhesion testing of polyimides with flexible linkers
  - FT-IR analysis of polyimides/aluminum interface

Seoul National University, Seoul, Korea

- B. S. Chemical Technology, Feb. 1994 (*cum laude*, GPA 3.74/4.3)

TEACHING EXPERIENCE

Boise State University

- Spring 2011 CHEM 301 "Survey of Organic Chemistry"
  CHEM 310 "Organic Chemistry Laboratory II"
- Fall 2010 CHEM 509/CHEM 422 "Introduction to Polymer Chemistry"
  CHEM 308 "Organic Chemistry Laboratory I"
- Spring 2010 CHEM 309 "Organic Chemistry II"
  CHEM 310 "Organic Chemistry Laboratory II"
- Fall 2009 CHEM 307 "Organic Chemistry I"
  CHEM 308 "Organic Chemistry Laboratory I"
- Spring 2009 CHEM 309 "Organic Chemistry II"
  CHEM 310 "Organic Chemistry Laboratory II"
- Fall 2008 CHEM 307 "Organic Chemistry I"

University of Connecticut

- Spring 2005 Teaching Assistant, CHEM 195 "Science of Chemistry", introductory chemistry course for non-science major undergraduates
- Spring 2004 Guest Lecturer, CHEM 195 "Science of Chemistry", introductory chemistry course for non-science major undergraduates
- Spring 2004 Undergraduate Research Supervision
- Spring 2003 Teaching Assistant, CHEM 394 "Conductive Polymers and Devices" graduate course
- Spring 2001 Teaching Assistant and Guest Lecturer, CHEM 384 "Polymer Characterization" graduate course

Seoul National University

- Spring 1995 Teaching Assistant, "Organic Chemistry I" undergraduate course, conducted review sessions

RESEARCH GRANTS

- "MRI: Acquisition of Vis-NIR Tunable Femtosecond Mode-Locked Laser Source and Measurement System," National Science Foundation, co-PI, $627,185, 9/15/2009 – 9/14/2011
- "DNA Polymerization-Assisted Colorimetric Detection of Nucleic Acids using Gold

Nanoparticles," Mountain States Tumor and Medical Research Institute, PI, $7,500, 7/1/2010 – 6/30/2011

- "IDR: Self-Assembling Nanophotonic and Nanoelectronic Devices on DNA Nanobreadboards," National Science Foundation, co-PI, $774,999, 8/15/2010 – 8/14/2013

OTHER EXPERIENCES

- Society of Plastics Engineers (SPE) UConn student chapter (Sep. 2000 – Sep. 2001), Secretary
- Military Service (Apr. 1996 – Oct. 1997), Public Service Agent, Seongnam, Korea
- Cheil Industries (Jul. 1992 – Aug. 1992), Summer internship

AWARDS AND AFFILIATIONS

- University of Connecticut doctoral dissertation fellowship, 2005
- Polymer program poster competition, University of Connecticut, 1st place, May 2002
- University of Connecticut graduate travel grant, 2002
- Polymer program summer research fellowship, University of Connecticut, 2001
- Korean Institute of Chemical Engineers scholarship, 1992-1993
- American Chemical Society Member
- Materials Research Society Member

PUBLICATIONS (Journal Articles)

1. H. Bui, C. Onodera, C. Kidwell, Y.P. Tan, E. Graugnard, W. Kuang, **J. Lee,** W. B. Knowlton, B. Yurke, and W. L. Hughes, "*Programmable Periodicity of Quantum Dot Arrays with DNA Origami Nanotubes*", Nano Lett., (2010), 10(9), 3367-3372.

2. E. Graugnard, A. Cox, **J. Lee**, C. Jorcyk, B. Yurke, and W. L. Hughes, "*Kinetics of DNA and RNA Hybridization in Serum and Serum-SDS*", IEEE Trans. Nanotechnol., (2010), 9(5), 603-609.

3. **J. Lee**, W. Hasan, and T. W. Odom, *"Tuning the Thickness and Orientation of Single Au Pyramids for Improved Refractive Index Sensitivities"*, J. Phys. Chem. C, (2009), 113(6), 2205-2207.

4. W. Hasan, C. L. Stender, M.-H. Lee, C. L. Nehl, **J. Lee**, and T. W. Odom, "*Tailoring the Structure of Nanopyramids for Optimal Heat Generation*", Nano Lett., (2009), 9(4), 1555-

1558.

5. J. Henzie, **J. Lee**, M.-H. Lee, W. Hasan, and T. W. Odom, *"Nanofabrication of Plasmonic Structures"*, Ann. Rev. Phys. Chem. (2009), 60, 147-165.

6. **J. Lee**, W. Hasan, C. Stender, and T. W. Odom, *"Pyramids: A Platform for Designing Multifunctional Plasmonic Particles"*, Acc. Chem. Res. (2008), 41(12), 1762-1771.

7. K. Shuford, **J. Lee**, T. W. Odom, and G. C. Schatz, *"The Optical Properties of Pyramidal Shell Nanoparticles",* J. Phys. Chem. C (2008), 112(17), 6662-6666.

8. **J. Lee**, W. Hasan, M.-H. Lee, T. W. Odom, *"Optical Properties and Magnetic Manipulation of Bi-Material Nanopyramids*", Advanced Materials (2007), 19(24), 4387-4391.

9. W. Hasan[†], **J. Lee**[†], J. Henzie, T. W. Odom, *"Selective Functionalization and Spectra Identification of Gold Nanopyramids*", Journal of Physical Chemistry C (2007), 111(46), 17176-17179. ([†] co-first author).

10. **J. Lee**, B. Yang, R. Li, T. Seery, F. Papadimitrakopoulos, *"Poly(Allyl amine) Encapsulated CdSe Nanocrystals"*, Journal of Physical Chemistry B (2007), 111(1), 81-87.

11. C. Srinivasan, **J. Lee**, F. Papadimitrakopoulos, L. Silbart, D. Burgess, *"Intracellular Trafficking of Plasmid DNA using Semiconductor Quantum Dot Probe"*, Molecular Therapy (2006), 14(2), 192-201.

12. S. Kim, B. Yang, S. Hou, **J. Lee**, F. Papadimitrakopoulos, "DNA-assisted monolayer immobilization of 2D opaline arrays", Advanced Functional Materials (2006), 16(12), 1590-1598.

13. R. Li, **J. Lee**, D. Kang, Z. Luo, M. Aindow and F. Papadimitrakopoulos, *"Band-Edge Photoluminescence Recovery from Room-Temperature Synthesized Zinc Blende CdSe Nanocrystals"*, Advanced Functional Materials (2006), 16(3), 345-350.

14. R. Li, **J. Lee**, F. Papadimitrakopoulos, M. Aindow, D. Horspool, *"Thermally-Assisted Bottleneck Etching of CdSe Nanocrystal by Amines"*, Journal of the American Chemical Society (2005), 127(8), 2524-2532.

15. D. Kang, **J. Lee**, F. Papadimitrakopoulos, M. Aindow, *"$Cd_2P_2Se_6$ Nanolens formed at a Water-Air Interface"*, Journal of Materials Science Letters (2005), 40(15), 4097-4100.

16. D. Kang, **J. Lee**, F. Papadimitrakopoulos, M. Aindow, *"Assembly of CdSe Nanocrystals into Well-Ordered Monolayers with Strong Crystallographic Texture"*, Philosophical Magazine

Letters (2003), 83(9), 569-574.

17. R. G. Ispasoiu, Y. Jin, **J. Lee**, F. Papadimitrakopoulos, T. Goodson, III. *"Two-photon Absorption and Photon-number Squeezing with CdSe Nanocrystals"*, Nano Letters (2002), 2(2), 127-130.

18. **J. Lee**, M. Mathai, F. Jain, F. Papadimitrakopoulos, *"Layer-by-layer growth of CdSe-based nanocrystal light-emitting diodes"*, Journal of Nanoscience and Nanotechnology (2001), 1(1), 59-64 (invited for inaugural issue).

19. R. G. Ispasoiu, **J. Lee**, F. Papadimitrakopoulos, T. Goodson III, *"Surface effects in the fluorescence ultra-fast dynamics from CdSe nano-crystals"*, Chemical Physics Letters (2001), 340(1,2), 7-12

20. J. Jang and **J. Lee**, *"Effect of Imidization Temperature on the Adhesion of Polyimide to Aluminum"*, Journal of Applied Polymer Science (1996), 62(2), 199-205

PUBLICATIONS (book chapters and proceedings)

1. **J. Lee**, J. Henzie, T. W. Odom, *"Manipulating the Optical Properties of Individual and Arrays of Gold Nanopyramids"* in Nanostructures in Electronics and Photonics, Ed. F. Rahman, World Scientific Publising Co., Singapore

2. A. Vasiliev, M. Aindow, **J. Lee**, F. Papadimitrakopoulos, F. Jain, *"Crystallographic description for nanoparticle assemblies - application to cadmium selenide clusters"*, Materials Research Society Symposium Proceedings (2001), 635 (Anisotropic Nanoparticles), C4.37/1-C4.37/4.

SELECTED PRESENTATIONS

1. *"Quantitative Colorimetric Detection of DNA using Oligonucleotide-Functionalized Gold Nanoparticles"*; ACS Spring Meeting, Anaheim, CA, March 2011 (poster).

2. *"Anisotropy in Plasmonic Particles and Nanoparticle Assembly"*; University of Idaho Chemistry Seminar, Moscow, ID, November 2010 (talk).

3. *"Sensitive Colorimetric Detection via Gold Nanoparticles and Hybridization Chain Reaction"*; INBRE conference, Moscow, ID, August 2010 (poster).

4. *"Plasmonic Particles for Imaging, Sensing, and Therapeutics"*; Boise State University Materials Science and Engineering Seminar, Boise, ID, October 2008 (talk).

5. *"Dual mode imaging and selective functionalization of multi-material nanopyradmids"*; ACS Fall Meeting, Boston, MA, August 2007 (talk).

6. *"Nanoscale pyramids: Fabrication, Manipulation, and Functionalization"*, Midwest MRSEC 2007 Symposium, Evanston, IL, April 2007 (talk)

7. *"Selective Biological Functionalization and Anisotropic Scattering Behavior of Magnetic Nanopyramids"*; ACS Spring Meeting, Chicago, IL, March 2007 (poster).

8. *"Environmentally-induced Photoluminescence Red-shift in Poly(allylamine)/CdSe nanocrystal Clusters"*, MRS Fall Meeting, Boston, MA, December 2004 (poster).

9. *"Water-Soluble Poly(allyl amine) Encapsulated CdSe Nanocrystals"*, ACS Fall Meeting, New York, NY, September 2003 (poster).

10. *"Preparation and Characterization of Water-Soluble CdSe Nanocrystal-Polymer Aggregates"*, MRS Fall Meeting, Boston, MA, December 2002 (talk).

11. *"Non-aqueous Layer-By-Layer Growth of Diamine/CdSe Nanocrystal Based Light-Emitting Diodes"*, Connecticut Symposium on Microelectronics & Optoelectronics, Storrs, CT, April, 2001 (talk).

12. *"Amine based Layer by Layer Growth of Semiconductor Nanocrystal Films for EL Applications"*, MRS National Meeting, Boston, MA, November 2000 (poster).

Curriculum Vitae
Owen Michael McDougal, Ph.D.

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EDUCATION

1998 Ph.D. Organic Chemistry, University of Utah, Salt Lake City, UT. Ph.D. Dissertation: *Conus Peptides Investigated by Nuclear Magnetic Resonance Spectroscopic Methods*. Advisor: C. Dale Poulter; GPA: 3.85/4.00.

1992 B.S. Chemistry/Spanish minor, State University of New York College (SUNY) at Oswego, NY. GPA: 3.59/4.00.

1990 A.S. Chemistry, SUNY Morrisville, NY. GPA 3.67/4.00.

PROFESSIONAL POSITIONS

Leadership Experience

2009-2011 Faculty Senate President, Boise State University, Boise, ID

Position Roles and Responsibilities: As Senate President, attended and presented at Idaho State Board of Education meetings, met regularly with the BSU President, Provost and VP for Academic Affairs, VP for Finance and Administration, VP for General Counsel, presented at dean's council, networked regularly with Senate Chairs from University of Idaho, Idaho State University, and Lewis and Clark State College, met with Presidents of Professional and Classified Staff, orchestrated two Senate meetings monthly for two years, assembled agendas and meeting materials, finalized minutes, worked with committee chairs, served as the point of contact and liaison between faculty and the administration and State Board of Education, conducted an all-day Senate retreat to make progress on a faculty constitution, new core curriculum, prioritized projects for the year, and disseminated Senate actions to the faculty at the end of each semester.

Achievements as Senate President: **1) Curriculum changes:** lowered the minimum credits required for graduation from 128 to 120, approved a new core curriculum with an emphasis on learning objectives and assessment of outcomes, exploration of a new academic calendar to improve financial model for instruction, evaluation of new approaches to implement technology in teaching and learning; **2) Governance:** rewrote the faculty constitution to include academic freedom and responsibility, presidential succession, new position definitions, clarification of voting rights, and inclusion of a voting representative on the Senate by lecturers, research, and clinical faculty, held an open faculty forum, faculty wide vote, worked with the Office of the President to clarify wording in the faculty approved constitution, and coordinated the effort to

develop an institutional financial challenge policy and lobbied to modify Idaho State Board of Education policy wording to allow universities to manage their own finances; **3) Faculty Compensation:** served as an advocate to enhance faculty compensation, established the Faculty Incentive Pay Program with the VP for Research, facilitated the Tuition Dependent Assistance Program and access to the Children's Center for faculty and staff with the VP for Finance and Administration & the AVP for Human Resources, worked with the AVP for Human Resources to explore the viability of forming a health care consortium for higher education employees, worked with the Provost and VP of Academic Affairs to explore faculty salary increases, which led to a recommendation by the Financial Affairs committee for a model to internally fund increases independent of the state; and **4) Service and Training:** nominated to participate in the inaugural Presidential Leadership Academy, selected to serve on administrative search committees for the AVP Human Resources, AVP Instructional Technology, and the Provost and VP Academic Affairs, and participated in administrative meetings including the executive budget, dean's council, strategic planning, naming of buildings, and selection of honorary doctorate candidates.

Academic Positions

2009-Present	Associate Professor of Chemistry, Boise State University, Boise, ID.
2006-2009	Assistant Professor of Chemistry, Boise State University, Boise, ID.
2003-2006	Associate Professor of Chemistry, Southern Oregon University, Ashland, OR.
1998-2003	Assistant Professor of Chemistry, Southern Oregon University, Ashland, OR.

Graduate and Undergraduate Assistantships

09/92-5/93	Teaching Assistant, instructor of Survey of Chemistry and Organic laboratory, University of Utah, Salt Lake City, UT.
08/91-5/92	Research Fellow in Organic Chemistry, State University of New York at Oswego, Oswego, NY.
06/91-8/91	Research Experiences for Undergraduates, University of Utah, Salt Lake City, UT.

Professional Positions

05/05–8/05	Visiting Professor, instructor of Organic and Bioorganic Chemistry, University of Utah, Salt Lake City, UT.
09/04-5/05	Visiting Associate Professor of Chemistry, sabbatical appointment, University of Utah, Salt Lake City, UT.
08-9/02; 8-9/03; 6-9/04; 8–9/05	Visiting Professor, instructor of Organic Chemistry (4 years) and Green Organic Chemistry Laboratories (summer 2004 only), University of Oregon, Eugene, OR.

06/01-8/01 Visiting Professor, instructor of Bioorganic Chemistry, University of Utah, Salt Lake City, UT.

06/90-8/90 Laboratory Technician, Galson Laboratories, East Syracuse, NY.

GRANTS ($2,625,676 in Funding; $773,874 as PI)

11/10 QinetiQ North America Year I, "^{31}P ssNMR Analysis of Treated Fabrics" ($50,000) Contract.

2/10 Boise Technology Inc. Year IV, "NMR Characterization of Chemical Composition in a Mixed Phase System" ($45,904) Collaborative Contract.

2/10 BSU, Designing for Learning Success, "Expanding Organic Chemistry at BSU" ($20,000) PI.

1/10 USAMRAA Defense Threat Reduction Agency contract number W81XWH-07-1-0004, "The DNA Safeguard Project" (Grant: $1,069,525; McDougal portion: $103,200) Co-PI.

9/09 NSF MRI Grant No. 0923535: "Acquisition of a LC-MS at Boise State University" ($676,964) Co-PI.

7/09 Idaho State Board of Education Technology Incentive Grant Program, "Modernizing Freshman Laboratories Using State-of-the-Art Instrumentation" ($55,700) PI.

7/09 MSTMRI grant number 6PR3382000170, "Design, Synthesis, and Biological Testing of Novel and Selective Antagonists of nAChRs." ($7,500) PI.

4/09 NIH Grant #P20 RR016454 from the INBRE Program of the National Center for Research Resources (Grant: $16,000,000; McDougal portion: $100,000 est.) Co-PI.

3/09 Boise Technology Inc. Year III, "NMR Characterization of Chemical Composition in a Mixed Phase System" ($35,000) Collaborative Contract.

7/08 USAMRAA Defense Threat Reduction Agency contract number W81XWH-07-1-0004, "The DNA Safeguard Project" (Grant: $1,069,525; McDougal portion: $116,728) Co-PI.

5/08 Pacific Northwest National Laboratory-Environmental Molecular Sciences Laboratory (PNNL-EMSL), "Metabolomics and Proteomics of Bacterial Signaling" (est. $15,000) PI.

2/08 Boise Technology Inc. Year II, "NMR Characterization of Chemical Composition in a Mixed Phase System" ($26,500) Collaborative Contract.

1/08 MSTMRI, "In Search of a Cure for Parkinson's: A Structure Activity Relationship Study" ($5,000) PI.

1/08 Idaho State Board of Education Technology Incentive Grant Program, "Going Green: Environmental, Economic, Efficient Organic Chemistry Lab Curriculum" ($99,700) PI.

11/07 Merck/AAAS Undergraduate Research Program ($60,000) Co-PI.

11/07 Research Corporation grant number 6PR3381000172, "The Design, Synthesis, and Biological Testing of Novel and Selective Antagonists of Neuronal Nicotinic Acetylcholine Receptors" ($56,000) PI.

11/07 College of Arts and Science Travel Award, "NMR at the Interface," poster presentation, Experimental Nuclear Magnetic Resonance Conference, Asilomar, CA ($400) PI.

10/07 College of Arts and Sciences Civic Engagement Grant Program, "Establishing Community Engagement in the Chemistry Curriculum" ($15,000) PI.

7/07 Boise Technology Inc., Year I, "NMR Characterization of Chemical Composition in a Mixed Phase System" ($24,000) Collaborative Contract.

2/07 MSTMRI, "Electrostatic Topography Mapping of Novel and Selective Antagonists of Neuronal Nicotinic Acetylcholine Receptors" ($5,000) PI.

6/06 NSF CRIF-MU/RUI Grant Number 0639251: "Acquisition of a 500-MHz Nuclear Magnetic Resonance Spectrometer at Boise State University" ($500,000) Co-PI.

6/06 Office of Research Administration (BSU): "Travel Award, Scientific or Scholarly Activities" ($500).

5/05 Professional Development Grant (SOU): "Keeping Current with Modern Technology in Organic Spectroscopy" ($6,017) PI.

5/03 NSF Workshop: "NMR Fundamentals and Applications," Washington State University ($2,500) PI.

5/03 Professional Development Grant (SOU): "Incorporating a New 400 MHz NMR Spectrometer into the Chemistry Curriculum" ($3,880) PI.

5/03 SOU Technology Resource Grant: "A New Printer for Chemistry" ($1,300) PI.

3/03 Murdock Charitable Trust: "Organic Spectroscopy Laboratory and Biotechnology Evolution at Southern Oregon University." ($213,000) Co-PI.

5/02 Professional Development Grant (SOU): "Development of a spectroscopic database to be used by undergraduate students to improve their understanding of NMR, IR, and MS." ($1,713) PI.

4/02 Carpenter II Travel Grant: Applied toward travel to the 43rd ENC, Asilomar, CA ($350) PI.

8/01 NSF MRI Grant Number 0116245: "Acquisition of a 400 MHz NMR Spectrometer to Broaden Research Experiences for Undergraduates at Southern Oregon University" ($293,310) PI.

2/01 Agilent Technologies University Relations Grant: "A New GC-MS for Chemistry." ($76,910) Co-PI.

5/99 Carpenter II Travel Grant: JEOL ECLIPSE NMR System Management course, Peabody, MA ($350) PI.

4/99 Professional Development Grant (SOU): "Development of an advanced NMR instrumentation course for undergraduates" ($2,350) PI.

3/99 General Education Course Development Grant (SOU): Development of general scientific coursework and laboratory experiments for non-science majors ($4,000) PI.

11/98 Scientific Research Grant (SOU): Black tail deer tarsal gland research lab preparation. ($1,200) PI.

3/98 Student Travel Award to the 39th Annual ENC, Asilomar, CA ($700) PI.

PUBLICATIONS

Peer Reviewed (*corresponding author, † research student co-author)

Reed B. Jacob,† Casey W. Bullock,† Tim Anderson, **Owen M. McDougal**,* *J. Comp. Chem.,* "DockoMatic – Automated Peptide Analog Creation for High Throughput Virtual Screening," (*in press*).

Owen M. McDougal,* Seth Eidemiller,† Nick Weires† and Michael M. McCormick, *Biomass Power & Thermal,* "Biomass Briquettes: Turning Waste into Energy," ***4***(*12*), 46-49 (2010).

Casey W. Bullock,† Reed B. Jacob,† **Owen M. McDougal**, Greg Hampikian, Tim Anderson,* *BMC Research Notes*, "DockoMatic – Automated Ligand Creation and Docking," **3**, 289-297 (2010).

Reed B. Jacob† and **Owen M. McDougal,*** *Cellular and Molecular Life Sciences*, "The M-superfamily of conotoxins: a review," ***67***, 17-27 (2010).

Matt Turner,† Seth Eidemiller,† Bryan Martin,† Andrew Narver,† Joshua Marshall,† Logan Zemp,† Kenneth A. Cornell, J. Michael McIntosh, **Owen M. McDougal**,* *Bioorganic Medicinal Chemistry*, "Structural Basis for α-Conotoxin Potency and Selectivity," ***17***(*16*), 5894-5899 (2009).

Owen M. McDougal,* Matthew W. Turner,† Andrew J. Ormond,† C. Dale Poulter, *Biochemistry*, "Three-Dimensional Structure of Conotoxin tx3a: An m-1 Branch Peptide of the M-Superfamily," ***47***, 2826-2832 (2008).

Coyner Graf,† and **Owen McDougal**,* *The Chemical Educator,* "A Practical Method for the Display of High Resolution One- and Two-Dimensional NMR Spectra on the World Wide Web," ***13***, 92-95 (2008).

Gloria P. Corpuz, Richard B. Jacobsen, Elsie C. Jimenez, Maren Watkins, Craig Walker, Clark Colledge, James E. Garrett, **Owen McDougal**, Wenquin Li, William R. Gray, David R. Hillyard, Jean Rivier, J. Michael McIntosh, Lourdes J. Cruz, and Baldomero M. Olivera,* *Biochemistry*, "Definition of the M-Conotoxin Superfamily: Characterization of Novel Peptides from Molluscivorous *Conus* Venoms," ***44***, 8176-8186 (2005).

Aaron Hart† and **Owen McDougal**,* *The Chemical Educator*, "Spectroscopic Data Management for the Time-Strapped Educator," ***9***(*6*), 374-377 (2004).

Jonas Buser† and **Owen McDougal**,* *The Chemical Educator*, "A Pedagogical Approach to the Instruction of Organic Spectroscopy," ***9***(*4*), 216-219 (2004).

Owen McDougal and C. Dale Poulter,* *Biochemistry,* "Three-Dimensional Structure of Mini-M Conotoxin mr3a," ***43***, 425-429 (2004).

Seth Holstein,† Richard Stanley, **Owen McDougal**,* *Journal of Chemical Innovation,* "Fuel Briquettes Out of Junk Mail and Yard Wastes," **31(**2), 22-28 (2001).

Books

Owen M. McDougal and Richard P. Steiner, "Introduction to Organic and Biological Chemistry," 2nd ed.; Cengage Learning: Mason, OH (2010) ISBN: 1111633673.

Owen M. McDougal and Richard P. Steiner, "Introduction to Organic and Biological Chemistry," 1st ed.; Cengage Learning: Mason, OH (2009) ISBN: 1111032300.

Owen McDougal, "Essentials of General, Organic, and Biological Chemistry: Student Study and Solutions Guide," Harcourt College Publishers, Orlando, FL (2000) ISBN 10: 0030056527.

Book Chapter

Owen McDougal. Chapter 17, "Biochemistry" A web chapter to accompany, Basic Concepts of Chemistry, Seventh Edition by L. Jack Malone, John Wiley & Sons, Inc., Hoboken, NJ (2003).

Manuscripts under Review

Nicholas A. M. Weires,† Aubrey Johnston,† Don L. Warner, Michael M. McCormick, Karen Hammond, **Owen M. McDougal**,* *J. Chem. Ed.,* "Recycling of Waste Acetone by Fractional Distillation," (*submitted September 2010).*

Reed B. Jacob,† Tim Andersen, and **Owen M. McDougal**,* *Med. Chem. Comm.*, "Taking the Code Out of Computational Chemistry," (*submitted January 2011*).

PRESENTATIONS (past 3 years)

National Conference Presentations

8/10 **Owen McDougal** and Reed Jacob, poster, *Automatic DockOmatic: Ligand and receptor screening made easy.* The 240th National ACS Meeting, Boston, MA.

5/09 Bryan Martin, Michael Hill, **Owen McDougal**, poster, *What does NMR have to do with the Mixing of Oil and Water?* Council on Undergraduate Research Posters on the Hill, Washington DC, VA.

4/09 **Owen M. McDougal**, invited oral, *What does NMR have to do with Undergraduate Research?* Experimental Nuclear Magnetic Resonance Conference 50th Annual Meeting, Asilomar, CA.

3/09 **Owen M. McDougal**, poster, *Structural Basis for α-Conotoxin Potency and Selectivity*, Experimental Nuclear Magnetic Resonance Conference 50th Annual Meeting, Asilomar, CA.

3/09 Seth Eidemiller, **Owen McDougal**, poster, *Model Behavior: Synthetic Conotoxin Analogs for Parkinson's*, ACS 237th Annual Meeting, Salt Lake City, UT.

3/09 Benjamin A. Parker, Julia Coppola, Henry Charlier, **Owen McDougal**, Michael Hill, poster, *Hydrolysis of Parathion in a Liquid-Liquid Biphasic System*, ACS 237th Annual Meeting, SLC, UT.

3/09 Mark Swartz, Angela Gomez, **Owen M. McDougal**, poster, *Alternative Energy at Home*, ACS 237th Annual Meeting, Salt Lake City, UT.

3/09 Aubrey Johnston, Michael M. McCormick, **Owen M. McDougal**, poster, *Going Green in Idaho*, ACS 237th Annual Meeting, Salt Lake City, UT.

3/09 Bryan Martin, Michael Hill, **Owen McDougal**, poster, *Distribution of p-Nitrophenol in a Model Biphasic System by SPS^{3}RE NMR Spectroscopy*, ACS 237th Annual Meeting, Salt Lake City, UT.

8/08 **Owen M. McDougal**, invited oral, Chemical Education symposium: Innovation in Nuclear Magnetic Resonance Spectroscopy in the Undergraduate Curriculum. Session chair: Dr. Donald Mencer. Talk entitled, *OSpecWeb: An On-line Educational Resource to Supplement the Instruction of Organic Spectroscopy*. ACS 236th Annual Meeting, Philadelphia, PA.

4/08 Taylor Dixon, Michael Hill, and **Owen McDougal**, poster, *Applications of Diffusion-Ordered NMR Spectroscopy and Slice-Selection Imaging in the Study of the Interfacial Region of a Mixed Phase Solution.* The 2008 CUR, Posters on the Hill, Washington, DC.

Regional Conference Presentations

8/10 Julia Oxford, Cheryl Jorcyk and **Owen McDougal**, invited oral, *Extracellular Matrix Modulates Cell Signaling*. The 8th Annual INBRE Conference, Moscow, ID.

8/10 Chris Mallory, **Owen McDougal** and Julia Oxford, poster, *Computational Studies of Collagen XI α1 Domain*. The 8th Annual INBRE Conference, Moscow, ID.

8/10 Mark M. Swartz, Seth Eidemiller, Ken Cornell and **Owen McDougal**, poster, *Metabolic Analysis of MTN Deficiency in E. coli*. The 8th Annual INBRE Conference, Moscow, ID.

8/10 Nick Weires, Andrew Narver and **Owen McDougal**, poster, *NMR Investigation of Conotoxin pK_a*. The 8th Annual INBRE Conference, Moscow, ID.

6/10 **Owen M. McDougal** and Reed B. Jacob, invited oral, *DockoMatic: Automating Autodock for Ligand to Receptor Binding Prediction.* The 91st Annual AAASPD Conference, Ashland, OR.

6/10 Emily Drussel, Bryan Martin, David Luker, Michael Hill, Gerry Chingas, **Owen McDougal**, poster, *Using NMR Techniques in a Model Biphasic System to Find Partition Coefficients*. The 91st Annual AAASPD Conference, Ashland, OR.

6/10 Aubrey Johnston, Michael M. McCormick, Karen Hammond, Don Warner, **Owen M. McDougal**, oral, *Going Green in the Organic Lab*. The 91st Annual AAASPD Conference, Ashland, OR.

8/09 Reed B. Jacob, Ken Cornell, **Owen McDougal**, invited oral, *Finding MRSA's Kryptonite: Computational Directed Combatant Pentapeptides*. The 90th Annual AAASPD Conference, San Francisco, CA.

8/09 Chris Mallory, Emily Drussel, **Owen M. McDougal**, poster, *α-Conotoxin E11A Binding Activity Towards Nicotinic Acetylcholine Receptor*. The 8th Annual INBRE Research Conference, Pocatello, ID.

8/09 Luke Woodbury, **Owen M. McDougal**, and Julia Oxford, poster, *Chondroitin Sulfate Glycosaminoglycan Binding Sites within Collagen Type XI*. The 8th Annual INBRE Research Conference, Pocatello, ID.

8/09 Andrew Narver and **Owen M. McDougal**, poster, *pK_a Determination in Alpha-Conotoxin MII and Analogs*. The 8th Annual INBRE Research Conference, Pocatello, ID.

8/09 David Luker and **Owen M. McDougal**, poster, *Taking a Slice out of NMR – A New Method*. The 8th Annual INBRE Research Conference, Pocatello, ID.

8/09 Aubrey Johnston and **Owen M. McDougal**, poster, *Peptide Synthesis, Cleavage and Purification*. The 8th Annual INBRE Research Conference, Pocatello, ID.

8/09 Seth Eidemiller, Ken Cornell, **Owen McDougal**, poster, *Manipulation of E. coli: A Metabolomics Study*. The 8th Annual INBRE Research Conference, Pocatello, ID.

4/09 **Owen M. McDougal**, invited oral, *Where does all the Time Go?* Idaho INBRE Research Symposium, Boise State University, Boise, ID.

2/09 **Owen M. McDougal**, invited oral, *Idaho INBRE Research Opportunity for Undergraduates: Peptides for Parkinson's*, Brigham Young University-Idaho, Rexburg, ID.

6/08 **Owen McDougal**, invited oral, *From Snail Venom to Therapeutics: How Conotoxins Provide Insight into Drug Design*, AAASPD 89th Annual Meeting Waimea, HI.

6/08 Matthew Turner, Logan Zemp, **Owen McDougal**, poster, *Three Dimensional Solution Structure for α-Conotoxin MII [E11A]: Structure-Function Studies in the Development of Therapeutic Approaches for Parkinson's Disease*, AAASPD 89th Annual Meeting, Waimea, HI.

3/08 **Owen McDougal**, invited oral, *Energy and Poverty in Idaho*, Idaho Academy of Sciences 50th Annual Meeting, College of Western Idaho, Nampa, ID.

3/08 **Owen McDougal**, invited oral, *Deadly Snails, NMR, and the Treasure Valley*, Idaho Academy of Sciences 50th Annual Meeting, CWI, Nampa, ID.

3/08 Seth Eidemiller and **Owen McDougal**, invited oral, *Biomass Fuel Briquettes: Composition, Compaction and Combustion*, Idaho Academy of Sciences 50th Annual Meeting, CWI, Nampa, ID.

3/08 Matthew Turner and **Owen McDougal**, poster, *Three-Dimensional Solution Structure of Conotoxin tx3a: A m-1 Branch Peptide of the M-Superfamily.* Idaho Academy of Sciences 50th Annual Meeting, CWI, Nampa, ID.

8/07 Andrew Ormond and **Owen McDougal**, poster, *Developing Therapeutic Approaches for Parkinson's Treatment: Analysis of α-CTx MII Analogs*. The 6th INBRE Conference, Moscow, ID.

6/07 Matthew Turner, Ryan Morton, and **Owen McDougal**, poster, *OSpec Web: An Online Educational Resource to Facilitate the Instruction of Organic Spectroscopy.* The 88th Annual AAASPD, Boise, ID.

6/07 Blake Stanhouse, Dana Moracco, Paige Fetzer, Ben Parker, and **Owen McDougal**, poster presentation, *The Three C's of Renewable Biomass Briquettes.* The 88th Annual AAASPD Conference, Boise, ID.

Local Conference Presentations

4/10 Luke Woodbury, Kendra Coonse, **Owen McDougal**, Julia Oxord, poster, *Determination of Sulfated Glycosaminoglycan Binding Sites within Collagen Type XI Using Surface Plasmon Resonance and Nuclear Magnetic Resonance Spectroscopy.* Undergraduate Research Conference (URC), Boise State University, Boise, ID.

4/10 Emily Drussel, Bryan Martin, Michael Hill, Gerry Chingas, **Owen McDougal**, poster, *Using NMR Techniques to Find Partition Coefficients Across Biphasic Systems.* URC, BSU, Boise, ID.

4/10 Scotia Gonzales and **Owen McDougal**, poster, *Pentapeptide Synthesis, Cleavage, and Purification*. URC, Boise State University, Boise, ID.

4/10 Chris Mallory and Owen McDougal, poster, *Bioinformatics, Homology Modeling, and Parkinson's Disease*. URC, Boise State University, Boise, ID.

4/10 Andrew Narver and Owen McDougal, poster, *pK_a Determination of Alpha Conotoxin MII and Analogs*. URC, Boise State University, Boise, ID.

4/09 Aubrey Johnston and **Owen McDougal**, poster, *Going Green at Boise State University*, URC, Boise State University, Boise, ID.

4/09 Reed Jacob, Matt Walters, Ken Cornell, and **Owen McDougal**, poster, *Resistance is Not Futile: Computational Directed Design of Combatant Pentapeptides*, URC, Boise State University, Boise, ID.

4/09 Mark Swartz and **Owen McDougal**, poster, *Affordable Alternative Energy at the Community Level*, URC, Boise State University, Boise, ID.

4/08 **Owen McDougal**, invited oral, *Chemistry, Chemistry Everywhere: In You, On You, Around You*, Capital Scholars Showcase of Learning, BSU SUB, Boise, ID.

4/07 Dana Moracco, Blake Stanhouse, and **Owen McDougal**, poster presentation, *Making Use of Organic Waste: Fuel Briquette Technology for Cooking and Heating.* The 4th Annual URC, Boise, ID.

SERVICE

Awards and Honors

08/10–12/10	Presidential Leadership Academy, Boise State University, Boise, ID.
08/09	Certificate of completion, AMIX Metabolomics NMR Software training course, Bruker Biospin Inc., Peabody, MA.
05/09	Undergraduate Student Research Achievement Award, Council on Undergraduate Research, Posters on the Hill, Washington, DC.
05/08	Recipient Scientific User Access, Pacific Northwest National Laboratory-Environmental Molecular Sciences Laboratory, Richland, WA.
04/08	Undergraduate Student Research Achievement Award, Council on Undergraduate Research, Posters on the Hill, Washington, DC.
11/07	College of Arts and Sciences Travel Award, 48th Experimental Nuclear Magnetic Resonance Conference, Asilomar, CA.
03/07	Certificate of completion, Center for Teaching and Learning, Service Learning Course Development six-week training workshop.
06/06	Recipient Travel Award, Office of Sponsored Projects, Boise State University, Boise, ID.
04/06	Certificate of appreciation for ten years of service, National Ski Patrol.
05/03	National Science Foundation Workshop Award, "NMR Fundamentals and Applications," Washington State University, Pullman, WA.
04/02	Recipient of Carpenter II Travel Award, 43rd Experimental Nuclear Magnetic Resonance Conference, Asilomar, CA.
02/01	Feature/Cover Article, "A Unique Approach to Conservation," *Journal of Chemical Innovation*.
05/99	Recipient of Carpenter II Travel Award, JEOL ECLIPSE NMR System Management Course, Peabody, MA.
03/99	Recipient of General Education Course Development Grant, Southern Oregon University, Ashland, OR.
03/98	Recipient of Student Travel Award, 39th Experimental Nuclear Magnetic Resonance Conference, Asilomar, CA.

Professional Service

National

01/09-12/09	Local Section Activities Committee, American Chemical Society
05/07-09/09	Councilor, Representative for Snake River Local Section of the American Chemical Society.
03/09-12/09	Chemistry Exam Writer, United States Academic Decathlon (USAD), 450 MC questions for high achieving high school students; http://www.usad.org/.
05/07	NSF Merit Review: Bio & Hydrogen Panel: Sustainable Energy, Washington DC.
10/96–4/06	National Ski Patrol: Park City, UT (1996-1998) & Mt. Ashland, OR (1998-2006).

Regional

06/12	Meeting Chair, collocated American Chemical Society Northwest Regional Meeting and American Association for the Advancement of Science Pacific Division annual meeting, Boise, ID.
12/09-Present	President Elect, Snake River Local Section American Chemical Society.
06/07	Program Organizer for the 88th Annual American Association for the Advancement of Science Pacific Division (AAASPD) Meeting, Boise Center on the Grove, Boise, ID.
03/06-06/06	Chair Elect, Sigma Xi, Southern Oregon Chapter, SOU, Ashland, OR.
09/01–Present	AAASPD Executive Committee (2005-Present); Chemistry Section Chair and Councilor (2001-Present), Site Selection Committee (2006-Present).

Professional Association Memberships

American Association for the Advancement of Science, Lifetime Member

Idaho Academy of Sciences, Lifetime Member

American Chemical Society

Sigma Xi, Scientific Research Society

Institutional Service

University Level Committees:

11/10-Present	Provost and Vice President of Academic Affairs, University Search Committee, faculty representative.
10/10-Present	Technology in Teaching and Learning Committee, faculty representative.
09/10-Present	Alternative Academic Calendar Committee, faculty representative.

07/10-11/10	Associate Vice President for Human Resources, University Search Committee, faculty representative.
03/10-Present	Academic Grievance Board, faculty representative.
09/09-Present	University Naming Committee; Faculty Senate/All Faculty Representative.
01/07–5/11	Faculty Senate, College of Arts and Sciences Representative; ***Senate President from 9/09 to the 5/11***.
08/09–09/10	Graduate Council, Math and Science Representative.
11/09-06/10	Associate Vice President for Information Technology, University Search Committee, faculty representative.
08/09–09/10	Faculty Grievance Committee, Faculty Senate Liaison.
02/08–Present	Honorary Doctorate Degree Selection Committee, Science Representative.
10/00–06/03	Professional Development Committee, Southern Oregon University. ***Committee Chair 9/02 – 6/03.***

Department Level Committees:

02/09-Present	Graduate Studies Committee
11/08–Present	Student Awards/Scholarships Committee
10/08–05/09	Chair NMR Facility Manager Search Committee
11/09-04/10	Biochemist Search Committee
11/08-05/09	Biochemist Search Committee
11/07–08/08	Chair Biochemist Search Committee
09/06-05/07	Public Relations/Outreach Committee
09/99–05/04	Environmental Studies Committee, Chemistry Department Representative, SOU.

THESIS COMITTEES

Emma Baker	Chemistry MS	^{31}P SSNMR of Treated Fabrics
Reed B. Jacob	Interdisciplinary MS	Bioinformatics
Amy Ulappa	Biology MS	Sage brush metabolomics
Brian Dies	Biology MS	Biofuel production
Jemima Monroe	Materials Science, Engineering	Materials characterization

COLLABORATORS

Julia Oxford, Boise State University, Boise, ID
Gerry Chingas, Boise State University, Boise, ID
Michael Hill, Boise Technology, Inc. Nampa, ID
Ben Parker, BHS Marketing, Inc. Nampa, ID
Phil Johnson, BHS Marketing, Inc. Nampa, ID
James Groome, Idaho State University, Pocatello, ID
J. Michael McIntosh, University of Utah, Salt Lake City, UT
Richard P. Steiner, University of Utah, Salt Lake City, UT

RESEARCH STUDENTS (2006-Present)

Student	Degree Path	Project
Emma Baker	Chemistry MS	^{31}P SSNMR of Treated Materials
Reed B. Jacob	Interdisciplinary MS	Bioinformatics
Emily Drussel	Chemistry, BS	Biphasic slice imaging NMR
Bryan Martin	Chemistry/Biology BS	Biphasic slice imaging NMR
	Technician	Collagen XIa1 structure/function
David Luker	Biology BS	Biphasic slice imaging NMR
Aubrey Johnston	Chemistry BS	Green Organic Chemistry Curriculum Development
Luke Woodbury	Chemistry/Biology BS	Collagen XIa1 structure and function
Scotia Gonzales	Chemistry BS	Peptide synthesis, purification, biological activity
Chris Mallory	Chemistry BS	Bioinformatics
Andrew Narver	Biology BS	Conotoxin structure/function
Matthew Mirkin	Chemistry BS	OSpec Web
Seth Eidemiller	Pre-Med	Fuel briquettes, conotoxins, MTN metabolomics
Mark Swartz	Chemistry BS	Biphasic slice imaging NMR, MTN metabolomics
Teslin Brasseure	Chemistry BS	Biphasic slice imaging NMR
Matthew Turner	Biology BS	Conotoxin structure/function
Logan Zemp	Chemistry BS	Conotoxin modeling
Andrew Ormond	Biology BS	Conotoxin modeling
Taylor Dixon	Chemistry BS	Biphasic slice imaging NMR
Dana Morocco	Biology BS	Fuel Briquettes
Blake Stanhouse	Biology BS	Fuel Briquettes
Paige Fetzer	Biology BS	Fuel Briquettes
Nick Weires	Chemistry BS (UofI)	Fuel Briquettes, Green Chemistry, Conotoxins
Ryan Morton	Biology BS	OSpec Web
Ben Parker	Chemistry BS	Biphasic slice imaging NMR
Josh Marshall	Biology BS	Collagen XIa1 modeling
Julie Napier	Chemistry BS (BYU-I)	Conotoxins

REFERENCES: *Available upon request.*

Kristen A. Mitchell, Ph.D.

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EDUCATION

2003 **Ph.D. Pharmacology/Toxicology**, Dept. of Pharmaceutical Sciences, Washington State University, Pullman, WA (Mentor: B. Paige Lawrence, Ph.D.)

1995 **B.S. Microbiology**, Idaho State University, Pocatello, ID

PROFESSIONAL EXPERIENCE

2010-pres. Director, Undergraduate Studies, Dept. of Biological Sciences, Boise State University
2008-pres. Affiliate Member, Mountain States Tumor and Medical Research Institute, Boise, ID
2008-pres. Assistant Professor (tenure-track), Dept. of Biological Sciences, Boise State University
2005-2007 Adjunct Professor, Biology Dept, San Jacinto College, Houston, TX
2006-2007 Postdoctoral Fellow, Laboratory of Dr. Cornelis Elferink, Dept. of Pharmacology and Toxicology, University of Texas Medical Branch, Galveston, TX
2004-2006 Postdoctoral Trainee, NIH National Research Service Award (NRSA), Laboratory of Dr. Cornelis Elferink, Dept. of Pharmacology and Toxicology, University of Texas Medical Branch, Galveston, TX
2003-2004 Postdoctoral Trainee, National Institutes of Environmental Health Sciences (NIEHS), Laboratory of Dr. Cornelis Elferink, Dept. of Pharmacology and Toxicology, University of Texas Medical Branch, Galveston, TX
1996-2003 Graduate Research/Teaching Assistant, Dept. of Pharmaceutical Sciences, College of Pharmacy, Washington State University, Pullman, WA
1995-1996 Associate Research Scientist, Plasma Manufacturing Technology Division, Bayer Corporation, Clayton, NC

HONORS AND AWARDS

2011 Outstanding New Investigator Award, Idaho Academy of Science
2009 Top Ten Scholars Honored Professor, Boise State University
2008 Junior Faculty Travel Fellowship, The Toxicology Forum
2007 Best Postdoctoral Publication Award, Society of Toxicology
2004 NRSA Individual Postdoctoral Fellowship (NIH/NIEHS)
2003 Award for Outstanding Woman in Graduate Studies, Honorable Mention, WSU
2000 Teaching Assistant Excellence Award, Washington State University
2000 “Senator of the Year," Graduate and Professional Student Association, WSU
2000 Predoctoral Fellowship, PhRMA Foundation
1998 Predoctoral Fellowship, American Foundation for Pharmaceutical Education
1994 NSF Summer Research Fellowship, University of Wisconsin-Madison

PROFESSIONAL ACTIVITIES

National Committees and Service

2010-pres. Chair, Cell and Molecular Biology Section, American Association for the Advancement of Science Pacific Division
2008-pres Manuscript Reviewer (ad hoc), *Toxicology; Chem Biol Interact*
2009-2011 Councilor, Pacific Northwest Chapter of the Society of Toxicology (PANWAT)
2008-2010 Member, Membership Committee, Immunotoxicology Specialty Section, Society of Toxicology
2008-2010 Member, Awards Committee, Immunotoxicology Specialty Section, Society of Toxicology
2009 Symposium Organizer & Chair, *Recent Advances in Pharmacology and Toxicology,* 90th Annual Meeting of the American Association for the Advancement of Science Pacific Division, San Francisco, CA.
2008 External Grant Reviewer (ad hoc), University of Washington Institute of Translational Health Sciences Small Grant Program
2008 Symposium Organizer & Chair, *Putting your best foot forward: Job Interviewing Workshop for Early Career Scientists,* 47th Annual Meeting of the Society of Toxicology, Seattle, WA
2007-2008 Chair, Postdoctoral Assembly Board, Society of Toxicology
2007 Invited Panelist, *National Leadership Workshop on Mentoring Women in Biomedical Sciences*, NIH Working Group on Women in Biomedical Careers, Bethesda, MD
2006-2007 Councilor, Postdoctoral Assembly Board, Society of Toxicology
2005 Host, Undergraduate Education Program, Society of Toxicology
2004 Member, International Postdoc Committee, National Postdoctoral Association
2004 Facilitator, Annual Meeting of the National Postdoctoral Association
2003 Member, Program Committee, Gulf Coast Chapter of the Society of Toxicology
2001-2003 Student Representative, Pacific Northwest Association of Toxicologists (PANWAT), Society of Toxicology

University Committees and Service

Boise State University, Boise, ID

2010-2011 Chair, Science Competition Day Planning Committee
2010-pres. Director, Undergraduate Studies, Dept. of Biological Sciences
2008-pres. Member, Undergraduate Research Conference Planning Committee
2008-pres. Member, Institutional Animal Care and Use Committee (IACUC)
2008-pres. Member, Science Competition Day Planning Committee

Committee Chair (Thesis Advisor) for these Graduate Students in the Dept. of Biological Sciences:

2010-pres. Stephanie Wyler, M.S. candidate (degree expected 05/2012)
2010-pres. Wendy Harvey, M.S. candidate (degree expected 08/2012)
2009-pres. Ashley McCartney, M.S. candidate (degree expected 05/2012)
2009-pres. Cheri Lamb, M.S. candidate (degree expected 08/2012)
2008-pres. Christopher Horras, M.S. candidate (degree expected 08/2011)
2009-2010 Emily Schmid, M.A. (degree awarded 12/2010)

Committee Member for these Graduate Students

2010-pres. John Reeck, M.S. candidate, Dept. Biological Sciences
2010-pres. Kellie Pease, M.S. candidate, Dept. Biological Sciences
2009-pres. Reed Jacob, M.A. candidate, Dept. Chemistry and Biochemistry
2009-pres. Lavanya Vempati, M.S. candidate, Dept. Biological Sciences
2008-pres. Ming Fang, M.S. Dept. Biological Sciences (degree awarded 05/2010)

Other Committees and Service

2009-pres. Member, Institutional Animal Care and Use Committee (IACUC), Brown Mackie College, Boise, ID
2008-pres. Member, Institutional Animal Care and Use Committee (IACUC), Boise VA Medical Center, Boise, ID

PUBLICATIONS

Peer-reviewed research articles:

Wyler SA, Hennings DL, D'Ingillo SR, Lamb CL, Horras CJ, Mitchell KA. Monocyte chemoattractant protein (MCP)-1 is not required for Kupffer cell activation after partial hepatectomy. (*in preparation*)

Horras CJ, Lamb CL, King A, Hanley J, Mitchell KA. Suppression of liver regeneration by TCDD does not require natural killer cells. (*submitted to Journal of Immunotoxicology)*

Horras CJ, Lamb CL, Mitchell KA (2011) Regulation of hepatocyte fate by interferon-gamma. *Cytokine Growth Factor Rev* 22(1):35-43

Mitchell KA, Wilson SR, Elferink CJ (2010) The activated aryl hydrocarbon receptor synergizes mitogen-induced murine liver hyperplasia. *Toxicology* 276(2):103-9.

Mitchell KA, Elferink CJ (2009) Timing is everything: Consequences of transient and sustained Ah receptor activation. *Biochem. Pharmacol.* 77(6):947-56.

Mitchell KA, Lockhart CA, Huang G, Elferink CJ (2006) Sustained Ah receptor activity attenuates liver regeneration. *Mol. Pharmacol.* 70(1): 163-70.

Park KT, Mitchell KA, Huang G, Elferink CJ (2005) The Ah receptor predisposes hepatocytes to Fas-mediated apoptosis. *Mol. Pharmacol.* 67(3): 612-22

Mitchell KA, Lawrence BP (2003) T cell receptor transgenic mice provide novel insights into understanding cellular targets of TCDD: Suppression of antibody production, but not the response of $CD8^+$ T cells, during infection with influenza virus. *Toxicol. Appl. Pharmacol*. 192(3): 275-86.

Mitchell KA, Lawrence BP (2003) Exposure to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) renders influenza virus-specific $CD8^+$ T cells hyporesponsive to antigen. *Toxicol. Sci.* 74(1): 74-84.

Jerrells TR, Mitchell K, Pavlik J, Jerrells J, Hoerman D (2002) Influence of ethanol consumption on experimental viral hepatitis. *Alcohol. Clin. Exp. Res.* 26(11): 1734-46.

Warren TK, Mitchell KA, Lawrence BP (2000) Exposure to 2,3,7,8-tetrachloro-dibenzo-*p*-dioxin (TCDD) suppresses the humoral and cell-mediated immune responses to influenza A virus without affecting cytolytic activity in the lung. *Toxicol. Sci.* 56(1): 114-123.

Jerrells TR, Sibley DA, Slukvin II, Mitchell KA (1998) Effects of ethanol consumption on mucosal and systemic T-cell-dependent immune responses to pathogenic microorganisms. *Alcohol. Clin. Exp. Res.* 22 (5 Sup): 212S-215S.

RESEARCH GRANTS RECEIVED

Current:

Role of monocyte chemoattractant protein (MCP)-1 in liver regeneration
NIH R15DK088749
Role: PI
2010-2013

Immunoregulation of liver regeneration by the aryl hydrocarbon receptor
NIH Idea Network of Biomedical Research Excellence (INBRE), P20RR016454
Role: Magnet PI
2009-2012

Investigating mechanisms of alcohol-induced liver fibrosis
M.J. Murdock Charitable Trust, Partners in Science Program
Role: PI
2010-2012

Mechanisms of cellular mechanoreception in bone
NASA
Role: Co-PI
2010-2013

Completed:

Role of monocyte chemoattractant protein (MCP)-1 during priming phase of liver regeneration
Institute of Translational Health Sciences (ITHS), UL1RR025014
Role: PI
2010-2011

Role of innate immunity in Ah receptor-mediated suppression of liver regeneration
Mountain States Tumor and Medical Research Institute (MSTMRI), Small Project Grant
Role: PI
2008-2009

Role of Cytochrome P4501A1 in Cell Cycle Progression
NIH, National Research Service Award, F32ES013588
Role: PI
2004-2006

Immunotoxic Effects of TCDD on Antigen-Specific T Cell Responses
Predoctoral Fellowship, Pharmaceutical Researchers and Manufacturers of America (PhRMA)
2000-2002

Mechanism of TCDD suppression of T cell-dependent immune responses during infection with human influenza A virus
Predoctoral Fellowship, American Foundation for Pharmaceutical Education (AFPE)
1998-2001

INVITED PRESENTATIONS

2011 *From Dioxin Toxicity to Cell Cycle Regulation: Searching for a Physiological Role for the Ah Receptor.* 53rd Annual Meeting and Symposium of the Idaho Academy of Science, Caldwell, ID. 4/1/2011

2009 *AhR-Mediated Cell Cycle Control: Multiple Mechanisms, New Directions*. Department of Pharmaceutical Sciences, Washington State University, Pullman, WA. 12/4/2009

2009 *In Vivo Regulation of Hepatocyte Proliferation By the Aryl Hydrocarbon Receptor.* 90th Annual Meeting of the American Association for the Advancement of Science Pacific Division, San Francisco, CA.

2008 *In Vivo Regulation of Hepatocyte Proliferation By the Aryl Hydrocarbon Receptor.* 89th Annual Meeting of the American Association for the Advancement of Science Pacific Division, Waimea, Hawaii.

2008 *In Vivo Regulation of Hepatocyte Proliferation By the Aryl Hydrocarbon Receptor*. 50th Anniversary Meeting of the Idaho Academy of Science, Nampa, ID.

2006 *Role of Aryl Hydrocarbon Receptor Activity During Liver Regeneration*. NIEHS Center in Environmental Toxicology, Environmental Health Sciences Seminar Series, University of Texas Medical Branch, Galveston, TX.

2006 *Sustained AhR Activity Attenuates Liver Regeneration*. NIEHS Center in Environmental Toxicology, Biotransformation Research Core, University of Texas Medical Branch, Galveston, TX.

TEACHING EXPERIENCE

Boise State University (2008-present)

BIOL 497/597	Toxicology *(3 credits)*
BIOL 205	Introductory Microbiology *(4 credits)*
ZOOL 401/501	Human Physiology *(4 credits)*
BIOL 497/595	Readings and Conference: TCDD Immunotoxicity *(1 cr)*
BIOL 497/595	Readings and Conference: Molecular Pharmacology of the Ah Receptor *(1 cr)*
BIOL 598	Perspectives in Toxicology *(1 cr)*

San Jacinto College (2005-2007)

BIOL 2401	Human Anatomy and Physiology I *(4 credits)*
BIOL 2402	Human Anatomy and Physiology II *(4 credits)*

University of Texas Medical Branch (2003-2007)

BBSC 6104	Critical Reading of the Scientific Literature; course director *(1 credit)*
PHTO 6118	Introduction to Research; guest lecturer

Texas A&M University at Galveston (2004)

MARB 414	Toxicology; course co-director and lecturer *(3 credits)*

TRAINEES

Graduate Students

03/10-pres. Stephanie Wyler, M.S. candidate, Dept. Biological Sciences, Boise State University
01/10-pres. Wendy Harvey, M.S. candidate, Dept. Biological Sciences, Boise State University
08/09-pres. Cheri Lamb, M.S. candidate, Dept. Biological Sciences, Boise State University
02/09-pres. Ashley McCartney, M.S. candidate, Dept. Biological Sciences, Boise State University
08/08-pres. Christopher Horras, M.S. candidate, Dept. Biological Sciences, Boise State University
08/09-08/10 Emily Schmid, M.A. completed, Dept. Biological Sciences, Boise State University

Undergraduate Students (enrolled in BIOL 496 credit for independent study in my laboratory)

01/11-pres. Jalisa Robinson, Dept. Biological Sciences, Boise State University
01/11-pres. Brian Ellsworth, Dept. Biological Sciences, Boise State University
01/11-pres. Perry Hamilton, Dept. Biological Sciences, Boise State University
01/11-pres. Krista Baker, Dept. Biological Sciences, Boise State University
08/10-12/10 Ashley Machado, Dept. Biological Sciences, Boise State University
08/10-pres. Megan Sandmann, Dept. Biological Sciences, Boise State University
08/10-pres. Carolyn Klocke, Dept. Biological Sciences, Boise State University
08/10-pres. Ricky Aguayo, College of Health Sciences, Boise State University
08/10-05/11 Coley Doolittle, Dept. Biological Sciences, Boise State University
08/10-05/11 Alexandra King, Dept. Biological Sciences, Boise State University
08/10-05/11 Amie Moore, Dept. Biological Sciences, Boise State University
05/10-08/10 Byron Ward, Dept. Biological Sciences, Boise State University
01/10-05/10 LynnAnn Hoppert, Dept. Biological Sciences, Boise State University
01/10-12/10 Kristofer Lark, Dept. Biological Sciences, Boise State University
01/10-05/11 Evan Schlager, Dept. Biological Sciences, Boise State University
08/09-12/09 Erik Ponce, Dept. Biological Sciences, Boise State University
08/09-05/11 Lauren Troy, Dept. Biological Sciences, Boise State University
08/09-pres. Eva Amouzougan, Dept. Biological Sciences, Boise State University
01/09-05/10 Billy Galligar, College of Health Sciences, Boise State University
01/09-05/09 Nicholas Bock, Dept. Biological Sciences, Boise State University
08/08-05/10 Shawna D'Ingillo, Dept. Biological Sciences, Boise State University
08/08-08/09 Cheri Lamb, College of Health Sciences, Boise State University
08/08-12/08 Matthew Dudley, Northwest Nazarene University, Nampa, ID

Other Trainees

Summer 2011

- Dr. Kristine Ablin-Stone, Biology Teacher at Borah High School, *MJ Murdock Partners in Science Program*
- Jamie Minick, Undergraduate Student, Boise State University, *INBRE Summer Research Fellow*
- Caleb Huang, High School Student, Meridian Medical Arts Charter High School, *INBRE Excellence in Biomedical Research Intern*

Summer 2010

- Steven Clements, Medical Student at University of Washington, *Medical Student Research Training Program (MSRTP)*

- Dr. Kristine Ablin-Stone, Biology Teacher at Borah High School, *MJ Murdock Partners in Science Program*
- Eva Amouzougan, Undergraduate Student, Boise State University, *INBRE Summer Research Fellow*
- Kyler Lewis, High School Student, Meridian Medical Arts Charter High School, *INBRE Excellence in Biomedical Research Intern*

Summer 2009
- Dietric Hennings, Medical Student at University of Washington, *Medical Student Research Training Program (MSRTP)*
- Cheri Lamb, Undergraduate Student, Boise State University, *INBRE Summer Research Fellow*
- Jason Hanley, post-baccalaureate student at Boise State University, *MSTMRI Research Fellowship (year-long)*

SCIENTIFIC AND PROFESSIONAL SOCIETIES

American Association for the Advancement of Science (2005-present)
American Physiology Society (2010-present)
ASPET (2005-present)
Sigma Xi (2008-present)
Society of Toxicology (1999-present); Full member (2009-present)

Curriculum Vitae: June 2011

Julia Thom Oxford

Distinguished Professor Biological Sciences
Co-Director,Musculoskeletal Research Institute
Director, Biomolecular Research Center
Boise State University
Boise, Idaho 83725
(208) 426-2395
joxford@boisestate.edu

Degrees:

Doctor of Philosophy, Biochemistry and Biophysics	1986
Washington State University, Pullman, WA	
Dissertation: "Export of Protein in Escherichia coli"	
Advisor: Prof. Linda L. Randall	
Department of Biochemistry and Biophysics	
Washington State University	
Master of Sciences, Biochemistry and Biophysics	1985
Washington State University, Pullman, WA	
Bachelor of Arts, Chemistry and Biology (cum Laude)	1981
Linfield College, McMinnville, OR	

Positions Held:

Professor, Department of Biological Sciences, Boise State University, 2008-present
Affiliate Faculty, University of Washington, School of Medicine, Department of Biochemistry, 2003-present
Affiliate Faculty, University of Idaho, Dept of Microbiology, Molecular Biology and Biochemistry, 2002-present
Associate Professor, Department of Biology, Boise State University, 2003-2008
Assistant Professor of Biology, Boise State University, 2000-2003.
Affiliate Faculty, Oregon Health Sciences University, School of Dentistry, 2000-2002.
Research Assistant Professor, Integrative Biosciences Department (formerly Oral Molecular Biology), School of Dentistry, Biochemistry and Molecular Biology, School of Medicine, Oregon Health Sciences University, 1995-2000.
Visiting Assistant Professor of Clinical Sciences, Equine Orthopaedics, Colorado State University, 1996-1998.
Senior Research Associate, Shriners Hospital for Crippled Children, Portland, 1992-1996.
Postdoctoral fellow, Shriners Hospital for Crippled Children and Department of Biochemistry and Molecular Biology, Oregon Health Sciences University, 1988-1992.
Postdoctoral fellow, Biochemistry/Biophysics Program, Washington State University, 1988.
Postdoctoral fellow, Dept of Cellular Biology, Swiss Institute for Experimental Cancer Research, 1987-1988.
Graduate Research Assistant, Dept of Biochemistry/Biophysics, Washington State University, 1982-1986.
Graduate Teaching Assistant, Department of Chemistry, Washington State University, 1982-1982.

Honors and Awards:

C. Glenn King Fellowship, Chemistry Dept. Washington State University, 1981-1982.
Graduate Student Travel Award, Washington State University, 1984.
Phi Lambda Upsilon, Washington State University, 1986.
ISREC Postdoctoral Fellowship, 1987 and 1988.
Arthritis Investigator Award, Arthritis Foundation, 1996.
Gerlinger Research Foundation Award, 1999.
Oregon Medical Research Foundation Award, 2000.
Boise State University Foundation Scholar Award, Research and Creative Activity, 2006.
Lori and Duane Steuckle Dean's Distinguished Faculty Award, 2005-2009
MMACHS Distinguished Lecture Series February 10, 2011
Boise State University Distinguished Professor 2011

Teaching

Undergraduate Courses:

Boise State University

Biology/Materials Science/ Mechanical&Biomedical Engineering 477 Biomaterials Science
Biology 497 Biochemistry of Cell Signaling
Biology 497 Introduction to Bioinformatics
Biology 191 General Biology
Biology 493 Internship in Laboratory Research
Biology 451 Developmental Biology, lecture and laboratory
Biology 443 Advances Developmental Biology
Biology 301 Cell Biology
Biology 202 General Zoology lecture and laboratory
Chem 405 Research in Chemistry

Portland State University (adjunct professor)

Chemistry 450 Biochemistry, 1991-1994.
Chemistry 250 Nutrition, 1991.

Lewis and Clark College, Portland, Oregon (adjunct professor)

Chemistry 335 and 336, Biochemistry lecture and laboratory, 1992.

Graduate Courses:

Boise State University

Biology/Materials Science/Mechanical&Biomedical Engineering 577 Biomaterials Science
Biology 598 Biomaterials Graduate Seminar
Biology 597 Biochemistry of Cell Signaling
Biology 597 Introduction to Bioinformatics
Biology 465/565 Advanced Topics in Molecular Biology Techniques
Biology 466/566 Advanced Topics in Cancer and Developmental Biology
Biology 567 Extracellular Matrix
Biology 596 Directed Research, Boise State University
Biology 551 Developmental Biology, lecture and laboratory
Biology 543 Advances Developmental Biology
Biology 650 Scientific Writing for publication

Oregon Health Sciences University

Oral Biology 513, Bone Physiology; endochondral and intramembranous ossification, 1998-2000.

Colorado State University (visiting professor)

PS 796, Grant writing course, Department of Physiology, 1996.
VS630, Molecular biology applications in Orthopaedic research, Veterinary Teaching Hospital, 1996.

Other: Item Writer for Medical College Admission Test, American College Testing Program, 1989-present.

Directed research, independent study and internships

Undergraduate Student Research Projects:

Kelci Burgess, 2010-present
Oncostatin M in Osteoarthritis

Neda Shefa, 2009 –present
Chondrocyte model systems for regenerative medicine
Abdominal aortic aneurysms
Posters on the Hill Presentation, 2011

Stephanie Frahs, 2009-present
Mechanotransduction in bone cells; biomaterials
Recipient of the NASA Microgravity University Award, 2011
Sigma Xi Grant in Aid of Research Award, 2011

Dawn Mikelonis, 2009-present
Zebrafish as model system for eye development
Recipient of the NASA Microgravity University Award

Jonathan Reeck, 2009-1010
Molecular biology analysis of Col11a1DVR transgenic mouse
Recipient of Sigma Xi Grant in Aid of Research, 2011

Benjamin Davis, 2006-2011, LC-Mass spectrometry, Proteomics
Recipient of INBRE Summer Undergraduate Research Fellowship, 2009
Recipient of the NASA Microgravity University Award, 2011

Luke Woodbury, 2006-2011, Histological characterization of the Col11a1deltaVR mouse model for osteoarthritis; Protein: carbohydrate interactions, protein purification, monomer-dimer equilibrium analysis by AUC, SEC-MALS
Undergraduate Research Symposium Presentation, 2006, 2007, 2008, 2009
AAAS Pacific Division poster presentation, 2007
INBRE Biomedical Research Fellow, 2009

Jonathan Hendersen, 2006-2009, Atomic Force Microscopy
Undergraduate Research Symposium Presentation 2007,2008, 2009
INBRE Summer Undergraduate Research Fellowship 2008, 2009

Tamara Kelly, 2007-2008
INBRE Summer Research Fellow, 2006
Undergraduate Research Symposium Presentation , 2007
Award recipient of the MSMRI research fellowship, 2007-2008
Began Medical School 2008

Amber Pedracini, 2007, Micro-CT analysis of bone density in mouse model of chondrodysplasia
Award recipient of Pre-med student research summer fellowship
Contributing author on peer-reviewed manuscript

Chelsea Sonius, 2007
INBRE Summer Research Fellow

Erik Linn, 2006-2007, Targeted deletion of Col11a1 variable region (VR); a model for osteoarthritis, Boise State University
Award recipient of the MSMRI research fellowship, 2006-2007

Undergraduate Research Symposium Presentation, 2007
Began Meical school, University of Utah, 2007

Kaci Bloxam, 2006-2007, Atomic Force Microscopy characterization of early intermediates in collagen fibrillogenesis, Contributing author on peer reviewed published manuscript

Jeremiah Maschmann, 2006-2007, Genomic analysis of the collagen gene family in zebrafish
Undergraduate Research symposium Presentation, 2006
Graduated from Washington State University, 2011

Rohn McCune, 2004-2005, Protein purification and refolding, Boise State University
BRIN Summer Research Fellow, 2004
Recipient of First Place in BRIN Undergraduate Student Poster Competition
Award recipient of NASA Idaho Space Consortium Undergraduate Team Research Grant, 2005
Undergraduate Research Symposium Presentation, 2005
Began Medical School, University of Utah, 2006

Desiree Hansen, 2005, Analysis of the microenvironment of chondrosarcoma cells, Boise State University
Award recipient of NASA Idaho Space Consortium Undergraduate Team Research Grant, 2005
Undergraduate Research Symposium Presentation, 2005

Arzhang Fallahi, 2003-2004 Homology modeling of the amino propeptide domain of collagen XI alpha 1 chain, Boise state University and Albertson College of Idaho
Began Medical School University of Washington, 2004

Becky Kroll, 2002-2004, Surface plasmon resonance measurements of molecular interactions, Boise State University
Began Medical School, University of Utah, 2004

Joeli Adriany, 2003-2004, Post-translational modifications of collagen type XI in the vitreous of the eye, Boise State University
Top Ten Scholar, 2004, Boise State University

Katey Irwin, 2002-2005, Molecular modeling of the amino propeptide of collagen XI alpha 1 chain, Proteomics, Boise State University
BRIN Summer Research Fellow, 2002 and 2003
Poster presentation at NCUR Meeting, 2003, Salt Lake City
McNair Scholar, 2004-2005
Award recipient of NASA Idaho Space Consortium Undergraduate Team Research Grant, 2005
Began Graduate School, 2005

Pernilla Stridh-Igo, 2001, 2004 Fetal Alcohol Syndrome, Proteomics, Boise State University.
Top Ten Scholar, 2004
Began Graduate School, Karolinska Institure, Sweden, 2004

Holli Shultz, 2002-2003, Endochondral ossification; Recombinant expression of collagen XI isoforms, Boise State University
Poster presentation at NCUR Meeting, 2003, Salt Lake City
Pre-med Research Fellow, 2002, Boise State University

Theresa Jenkins, 2001-2002, Fetal Alcohol Syndrome, Boise State University

Kristy Trent, 2001-2002, The Biochemistry of vitreous humor liquefaction with aging, Boise State University.

Jenifer Barry, 2001, Chondrocyte cell culture and protein expression, Boise State University.
Pre-Med Research Fellow, 2001

Top Ten Scholar, 2001, Boise State University
Began Medical School, University of Washington, 2002.

Stephen Edwards, 2001, Fetal Alcohol Syndrome, Boise State University.
Began Dental School, 2002

Brian Spangler, 1999, Cartilage regeneration in culture and recapitulation of chondrocyte phenotype. Summer student, Oregon State University.
Began Dental School, 2001.

Kristen Jones, 1999, Optimization of culture conditions for bacterial expression of recombinant α1(XI) collagen amino terminal domain isoforms. Summer student, Concordia University.

Stephanie Kristovich, 1999 and 2000, Affinity, chelation and ion exchange chromatography for purification of vitreous-specific isoforms of α1(XI) collagen; potential involvement in high myopia and retinal detachment. Summer student, Linfield College.
Began Dental School, Oregon Health Sciences University, School of Dentistry, 2000.

Lauri (Wood) Hausafus, 1991-92. Cloning and expression of isoforms of collagen type XI. Summer student, University of Oregon.
Began Dental School, Oregon Health Sciences University, School of Dentistry, 2001

Graduate Student Research Projects:

Jonathon Reeck, 2010-present Zebrafish model system for osteogenesis
Recipient of Sigma Xi Grant-in-aid of research, 2011

Ming Fang, 2007-2010 Zebrafish Craniofacial Development
Recipient of ISU Molecular Core Facility Grant for DNA Sequencing
First author on Gene Expression Pattern 2010
Began doctoral program at Cincinnati Children's Hospital, 2010.

Kendra Coonse, 2006-2010, Master of Science, Collagen-Biglycan interactions
Began Medical School 2010

Katey Anderson, 2005- present, Proteomic analysis of cartilage extracellular matrix

Kelly Willius, 2005-Bone regeneration in the zebrafish
Recipient of NASA-ISGC Graduate Student Fellowship, 2006-2007
Began Nursing school, 2007.

Nathan Hoskins 2007-2009, Master of Science, Col11a1 regulates bone microarchitecture

Jason Adams, 2005-2008 Master of Science, Axial skeletal development in the zebrafish
Recipient of NASA-ISGC Graduate Student Fellowship, 2006-2007
Began doctoral program at Brigham Young University, 2008.

Prarthana Kashikar, 2004-2007, Master of Arts, Quantitative Real Time Polymerase Chain Reaction for the analysis of alternative splicing, Boise State University
Research Technician, Boise State University.

Lisa Warner, 2004-2006 Biomechanical characterization of laboratory generated cartilage, vitreous and cornea. Materials Science Program, Boise State University
Recipient of Sigma Xi Grant-In –Aid of Research, 2004
Podium presentation at Materials Research Society Meeting, 2005
Contributing author on six papers.
Entered PhD program, University of Colorado, Boulder, CO

Ryan Medeck, 2000-2003, Master of Science, Morphogenetic messages in the extracellular matrix: The role of bone morphogenetic proteins (BMPs) and collagens.
Recipient of Sigma Xi Grant-In –Aid of Research, 2001, 2002.
Contributing author on three papers.

Employed by the Center for Disease Control.

Sorcha (Cusack) Yingst, 2000-2004, Master of Science, MeCP2 and gene silencing in neuronal differentiation; possible cause of Rett Syndrome. Boise State University.
Recipient of Sigma Xi Grant-In –Aid of Research, 2001, 2002.
Recipient of MSMRI Grant-In-Aid of Research, 2003-04
Conributing author on six papers.
Physician's Assistant program, Idaho State University.
Physician's Assistant, Twin Falls, Idaho.

David Frisbie,1997-1999. The treatment of osteoarthritis in exercised horses using interleukin-1 receptor antagonist delivered using gene therapy. Doctor of Philosophy, Colorado State University, Thesis committee.

Troy Trumble, 1998-1999. Matrix metalloproteinase and cytokine tissue expression and synovial fluid protein levels in naturally occurring joint disease in horses Master of Science, Colorado State University, Thesis committee.

Joanne Ingle Fehr, 1996-1997. Comparison of Northern blot hybridization and a reverse transcriptase polymerase chain reaction technique for measurement of mRNA expression of metalloproteinases and matrix components in articular cartilage and synovial membrane from horses with osteoarthritis. Master of Sciences, Colorado State University.

Mary L. Taylor, 1994. *Trichinella spiralis* collagens of the cuticle. Master of Sciences, Portland State University, Thesis committee.

Grants for Educational Purpose:

Microarray analysis of gene expression for developmental studies, Course Development grant, 2002, Boise State University, $980.

Enhancement of Developmental Biology Laboratory Course, 2004, Boise State University, $650.

Merck/AAAS grant for undergraduate research at the interface of Chemistry and Biology, November 2, 2007, $60,000 funded for three years, Co-P.I.s; Cornell, Jorcyk, McDougal, Charlier, Tinker, Oxford.

Research

Refereed Publications:

1. Akihiro Iida, James Groarke, Soonheuy Park, Julia Thom, Jaime Zabicky, Gerald Hazelbauer and Linda Randall. "A signal sequence mutant defective in export of ribose-binding protein and a corresponding pseudorevertant isolated without imposed selection." (1985) **The EMBO Journal**, *4, 1875-80*.
2. Simon J. S. Hardy, Julia R. Thom and Linda L. Randall. "Export of Protein." (1987) **Annual Reviews of Microbiology**, *41, 507-541*
3. Julia R. Thom and Linda L. Randall. "The Role of the Leader Peptide of Maltose-Binding Protein in Two Steps of the Export Process." (1988) **Journal of Bacteriology**, *170, 5645-5661*.
4. Julia R. Thom, Kurt Doege, Walter Horton and Nicholas P. Morris. "A stably transformed line of rat chondrocytes synthesize type XI but not type II collagen." (1990) **Journal of Cell Biology**, *111, 23a*.

5. Julia R. Thom and Nicholas P. Morris. "Biosynthesis and proteolytic processing of Type XI collagen in embryonic chick sterna." (1991) **Journal of Biological Chemistry**, *266, 7262-7269*.
6. Julia Thom Oxford, Kurt J. Doege, Walter E. Horton, Jr. and Nicholas P. Morris. "Characterization of type II and type XI collagen synthesis by an immortalized rat chondrocyte cell line (IRC) having a low level of type II collagen mRNA expression." (1994) **Experimental Cell Research**, *213, 28-36*.
7. Morris, N.P., Keene, D.R. and Oxford, J.R.T.,"Ultrastructural localization of type XI collagen in human growth plate cartilage." (1994) **Transactions Orthopaedic Research**, *19, 423.*
8. Y. Li, D.A. Laccerda, M.L. Warman, D.R. Beier, H. Yoshioka, Y. Ninomiya, J.T. Oxford, N.P. Morris, K. Andrikopoulos, F. Ramirez, B.B. Wardell, G. D. Lifferth, C. Teuscher, S.R. Woodward, B.A. Taylor, R.E. Seegmiller, and B.R. Olsen. "A Fibrillar collagen gene, Col11a1, is essential for skeletal morphogenesis." (1995) **Cell**, *80, 423-430.*
9. Julia Thom Oxford, Kurt J. Doege and Nicholas P. Morris. "Alternative exon splicing within the amino terminal-nonhelical domain of the rat proα1(XI) collagen chain generates multiple forms of the mRNA transcript which exhibit tissue dependent variation." (1995) **Journal of Biological Chemistry,** *270:9478-9485.*
10. Douglas R. Keene, Julia Thom Oxford and Nicholas P. Morris. "Ultrastructural localization of collagen types II, IX and XI in the growth plate of human rib and fetal bovine epiphyseal cartilage: type XI collagen is restricted to thin fibrils." (1995) **Journal of Histochemistry and Cytochemistry**, *43:967-979*.
11. GBM Davis, JRT Oxford, and NP Morris. "Expression of α1(XI) variants in developing cartilage." (1996) **Transactions Orthopaedic Research**, *vol. 21*.
12. GBM Davis, JRT Oxford, LC Hausafus, BF Smoody and NP Morris. "Temporal and spatial expression of spliceforms of the α1(XI) collagen gene in fetal rat cartilage" (1998) **Developmental Dynamics**, 213:13-26.
13. Oxford, J., Frisbie, D., Trotter, G., Rodkey, W., Steadman, J., McIlwraith, C. "Enhancement of Articular cartilage repair of the femoral condyle using subchondral plate microfracture: early expression of cartilage-specific markers indicating chondrogenesis" (1999) **Transactions Orthopaedic Research**, *vol 24, p. 678*.
14. Gregory, K., Chen, Y., Mechling, D., Smoody, F.,Oxford, J., Morris, N. "Structure of the amino terminal domain of the alpha-1(XI) collagen chain" (1999) **Transactions Orthopaedic Research**, *vol 24, p. 812*.
15. Gregory, K.E., Oxford, J.T., Chen, Y., Gambee, J. and Morris, N.P. "Structural organization of distinct domains within the non-collagenous N-terminal region of collagen type XI" (2000) **Journal of Biological Chemistry**, *275: 11498-506*.
16. Chen, Y., Sumiyoshi, H., Gregory, K., Smoody, B., Oxford, J., Morris, N., "Regulation of alternative splicing of the amino terminal domain of alpha-1(XI) collagen". (2000), **Transactions Orthopaedic Research,** *vol 25, p. 9768*.
17. Oxford, J., Taylor, M., DeScala, J. "Osteoprotegerin is expressed in degenerative joint disease". (2000) **Transactions Orthopaedic Research**, *vol 25, p. 1019*.
18. Morris, N.P , Oxford, J.T., Davies, G.B.M., Smoody, B.F., Keene, D.R . "Developmentally regulated alternative splicing of the alpha 1 (XI) collagen chain: spatial and temporal segregation of isoforms in the cartilage of fetal rat long bones" (2000) **J Histochemistry and Cytochemistry,** *48: 725-41.*
19. Fehr, J., Trotter, G.W., Oxford, J.T. "Comparison of Northern blot hybridization and a reverse transcriptase-polymerase chain reaction technique for measurement of mRNA expression of metalloproteinases and matrix components in articular cartilage and synovial membrane from horses with osteoarthritis." (2000) **American Journal of Veterinary Research,** *61:900-5.*

20. Lampi, K.J., Oxford, J.T., Shearer, T.R., David, L.L., Bachinger, H.P. and Kapfer, D., "Deamidation of human bB1 alters the elongated structure of the dimmer" (2001) **Experimental Eye Research**, 72(3):279-88.
21. Trumble, T.N., Trotter, G.W., Oxford, J.T., McIlwraith, C.W., Billinghurst, R.C., Frisbie, D.D. "Synovial fluid gelatinase concentrations and matrix metalloproteinase and cytokine expression in naturally occurring joint disease in horses".(2001) **American Journal of Veterinary Research**, 62(9):1467-77.
22. Chen Y, Sumiyoshi H, Oxford JT, Yoshioka H, Ramirez F, P Morris N." Cis-acting elements regulate alternative splicing of exons 6A, 6B and 8 of the alpha1(XI) collagen gene and contribute to the regional diversification of collagen XI matrices". (2001) **Matrix Biology** *20(8):589-99*.
23. Frisbie, DD, Oxford, JRT, Southwood, L., Trotter, GW, Rodkey, WG, Steadman, JR, Goodnight, J.L., McIlwraith, CW. "Early events in cartilage repair after subchondral bone microfracture" (2003) **Clinical Orthopaedics and Related Research**, 407:215-227.
24. Irwin, K., Doan, Phuong, Schimpf, Martin, Oxford, Julia Thom "Studies of type XI collagen interaction" (2003) **Proceedings of the National Conference on Undergraduate Research (NCUR),** pp 1-8.
25. Medeck, RJ, Sosa, S.,Morris, NP,Oxford, JT. " BMP-1-mediated proteolytic processing of alternatively spliced isoforms of collagen type XI."(2003) **Biochemical Journal,** 376: 361-8.
26. Oxford JT, DeScala J, Morris N, Gregory K, Medeck R, Irwin K, Oxford R, Brown R, Mercer L, Cusack S., " Interaction between amino propeptides of type XI procollagen alpha1 chains (2004) **J Biol Chem**. 279:10939-10945.
27. Rohn TT, Cusack SM, Kessinger SR, Oxford JT "Caspase activation independent of cell death is required for proper cell dispersal and correct morphology in PC12 cells". (2004) **Experimental Cell Research**, 295: 215-225.
28. Cusack SM, Rohn TT, Medeck RJ, Irwin KM, Brown RJ, Mercer LM, Oxford JT " Suppression of MeCP2beta expression inhibits neurite extension in PC12 cells" (2004) **Experimental Cell Research** 299: 442-53.
29. Fallahi, A., Kroll, B., Warner, L., Oxford, R., Irwin, K., Mercer, L., Shadle, S., Oxford, JRT. "Structural model of the amino propeptide of collagen XI alpha 1 chain with similarity to the LNS domains" (2005) **Protein Science,** 14(6) 1526-1537.
30. Warner, L.R., Fallahi, A., Irwin, K., Yingst, S., Shadle, S., Oxford, J.T., "Modeling and characterization of the amino propeptide of collagen α1(XI), a regulatory domain in collagen fibrillar architecture" (2005) **Procedings of the Materials Science Research Society,** L.4.9.1-L.4.9.6.
31. Gerritsen, M., Hampikian, J., Knowlton, W., Oxford, J., Warner, L., Araujo, D., and Clark, Z. "Collagen fibrillogenesis on Ti-6Al-4V-ELI" in **Coatings, Materials Science and Technology**, (2005) pp. 97-100.
32. Warner, L., Brown, R., Yingst, S and Oxford, J "Isoform-specific heparan sulfate binding within the amino terminal noncollagenous domain of collagen α1(XI)" , (2006) **Journal of Biological Chemistry**, 281:39507-16.
33. Warner, L., Blasick, C., Brown, R., Oxford, J. "Expression, purification and refolding of recombinant collagen a1(XI) amino terminal domain splice variants", (2007) **Protein Expression and Purification**, 52:403-409.
34. Dufty, BM, Warner, LR, Hou, ST, Jiang, SX, Gomez-Isla, T, Leenhouts, KM, Oxford, JT, Feany, MB, Masliah, E, Rohn TT, "Calpain-cleavage of a-synuclein; connecting proteolytic processing to disease-linked aggregation" (2007) **Neurobiology** 170:1725-38.

35. Takata, T, Oxford JT, Brandon, TR, Lampi KJ, "Deamidation alters the structure and decreases the stability of human lens betaAlpha3-crystallin" (2007) **Biochemistry**, 46:8861-71.
36. Gerritsen**,** M, Oxford, J.T., Frary, M., Henderson, J., Hampikian, J.M. "Immuno-SEM characterization of developing bovine cartilage", (2008) **Materials Science and Engineering*:* C,** 28:341-346.
37. Kahler, R., Yingst, S., Krawczak, D., Oxford, J., and Westendorf, J. "Collagen 11a1 is indirectly activated by Lymphocyte Enhancer-binding factor 1 (Lef1) and negatively regulates osteoblast maturation" (2008) **Matrix Biology**, 27(4):330-8. PMCID: PMC2431459 [Available on 05/01/09].
38. Bowen, KB, Reimers, AP, Luman, S, Kronz, JD, Fyffe, WE, Oxford, JT "Immunohistochemical localization of collagen type XI alpha 1 and alpha 2 chains in human colon tissue" (2008) **Journal of Histochemistry and Cytochemistry,** 56:275-283. PMCID: PMC2324180 [Available on 03/01/09]
39. Halsted, KC, Bowen, KB, Bond, L, Jorcyk, CJ, Fyffe, WE, Kronz, JD, Oxford, JT "Collagen XI α1 in normal and malignant breast tissue", (2008) **Modern Pathology**. 21:1246-54. NIHMS# 77903.
40. Takumi Takata, Julie T Oxford, Borries Demeler, and Kirsten J Lampi, "Deamidation destabilizes and triggers aggregation of a lens protein, A3-crystallin", (2008) **Protein Science**. 17:1565-75. PMCID: PMC2525517 [Available on 09/01/09]
41. Yingst, S, Cole, J., Warner, L., Bloxham, K., Brown, R., Kenoyer, L., Knowlton, B., Oxford, JRT., "Characterization of Collagenous Matrix Assembly in a Chondrocyte Model System" (2009) **Journal of Biomedical Materials Science,** 90:247-55.
42. Toumpoulis IK, Oxford JT, Cowan DB, Anagnostopoulos CE, Rokkas CK, Chamogeorgakis TP, Angouras DC, Shemin RJ, Navab M, Ericsson M, Federman M, Levitsky S, McCully JD. "Differential expression of collagen type V and XI alpha-1 in human ascending thoracic aortic aneurysms", (2009), **Ann Thorac Surg**. 88:506-13.
43. Fang M, Adams JS, McMahan BL, Brown RJ, Oxford JT. The expression patterns of minor fibrillar collagens during development in zebrafish **Gene Expr Patterns** 2010 Oct-Dec;10(7-8):315-22. Epub 2010 Jul 18, PMC2956583 [Available on 2011/10/1]
44. Jeff P. Gorski, Nichole T. Huffman, Sridar Chittur, Ronald J. Midura, Claudine Black, Julie Oxford, and Nabil G. Seidah Inhibition of SKI-1 proprotein convertase and caspase-3 blocks transcription of key extracellular matrix genes regulating osteoblastic mineralization, J **Biol Chem**. 2010 Nov 13. [Epub ahead of print]
45. Tawara, Kenneth, Oxford, Julia Thom, Jorcyk, CL. "Clinical significance of interleukin (IL)-6 in cancer metastasis to bone: potential of anti-IL-6 therapie**s."** (2011) **Cancer Management Research,** 2011;3:177-89. Epub 2011 May 18

Research Funding:

Current funding:

1. TITLE: Musculoskeletal Research Center
   DURATION: 07/01/07 to 06/30/11
   AGENCY (FUNDING SOURCE): Idaho State Board of Education, HERC
   ROLE ON PROJECT: Principal Investigator
   TOTAL AWARD: $1,000,000
   Objective: To provide a focal point for collaborative musculoskeletal research.
2. TITLE: Regulation of cell signaling by Col11a1 during craniofacial development in the zebrafish

DURATION: 09/01/09 to 08/31/12
AGENCY (FUNDING SOURCE): NIH (NICHD)
ROLE ON PROJECT: Principal Investigator
TOTAL AWARD: $211,500
Objective: to investigate the role of minor fibrillar collagens in craniofacial development using a zebrafish model system. To provide research opportunities for undergraduate students.

3. TITLE: Molecular Mechanisms of Cellular Mechanoreception in Bone
DURATION: 9/1/2010 – 8/30/13
AGENCY: NASA
ROLE ON PROJECT: Principal Investigator
TOTAL AWARD: $716,733
Objective: To investigate the mechanism of cellular response to changes in gravitational force. Information will inform the health concerns of individuals with osteoporosis as well.
4. TITLE: Idaho INBRE Program (PI: Carolyn Hovde Bohach)
DURATION: 7/15/04 to 6/31/14
FUNDING SOURCE: Funding Source: NIH (NCRR)
ROLE ON PROJECT: Co-PI
TOTAL AWARD: $16.2M ($2.6 M to Boise State University for INBRE 1, $4.1 M to Boise State University for INBRE 2, $443,751 for ARRA supplement)
Objective: To build a lasting change in biomedical research in Idaho in the form of new research opportunities and an increase in research infrastructure at Idaho Universities. To create and sustain jobs and accelerate the pace of research discovery.
5. TITLE: Acquisition of a Liquid Chromatography - Tandem Mass Spectrometer (LC/MS)(P.I.: Ken Cornell)
DURATION: Sept 2009 – August 2012
AGENCY: NSF
ROLE ON PROJECT: Co-PI
AMOUNT REQUESTED: $597,877
Objective: Instrument acquisition
6. TITLE: NSF Engineering Education Research to Practice (E2R2P) (Don Pumlee, Linda Huglin, Steve Villachica, P.I.)
DURATION: 10/01/2010 – 9/30/2013
AGENCY: NSF
ROLE ON PROJECT: Sounding board member,
AWARD AMOUNT: $150,000
Objective: To discover how to improve the process by which engineering education research is brought into practice.

Previous funding:

1. Topoisomerase II and the regulation of gene expression by higher-ordered chromatin structure; January 1987-December 1988, Postdoctoral fellowship, Funded by ISREC, Swiss Institute for Experimental Cancer Research, SF 45,000.
2. Cartilage Matrix Proteins; 1989-1995, Postdoctoral Fellowship, Funded by Shriners Hospital.
3. The role of type XI collagen in the functional integrity of normal and osteoarthritic cartilage; July 1996-June 1999, Principal Investigator, Funded by Arthritis Foundation, Biomedical Science Grant, $225,000.

4. Biological resurfacing of large articular cartilage defects; July 1996-September 1998 Co-Investigator, (P.I. C.W. McIlwraith) Funded by Steadman-Hawkins Sports Medicine Foundation and National Football League Charities (NFL) $60,000.
5. Application of a small sample extraction technique and quantitative polymerase chain reaction in the analysis of mRNA, DNA and protein from normal and osteoarthritic equine articular cartilage; July 1996-June 1997 Co-Investigator, (P.I. Gayle Trotter) Funded by CSU College Research Council, $9,400.
6. Synovial fluid and tissue expression of degradative enzymes, inflammatory mediators and cytokines in naturally occurring joint disease in horses; July 1997-June 1998 Co-Investigator, (P.I. Gayle Trotter) Funded by CSU College Research Council, $34,000.
7. Synovial fluid and tissue expression of degradative enzymes, inflammatory mediators and cytokines in naturally occurring joint disease in horses--equipment; September 1997, Co-Investigator, (P.I. Gayle Trotter) Funded by Southern California Equine Foundation, $11,095.
8. The treatment of osteoarthritis in exercised horses using interleukin-1 receptor antagonist delivered using gene therapy; January 1998 Principal Investigator, Funded by Southern California Equine Foundation, $49,306.
9. Collagen Type XI in skeletal development and disease; February 1999, Principal Investigator, Funded by Gerlinger Foundation, $24,988.
10. X-ray diffraction studies of protein structures, 1998, Collaborator (P.I. Oren Anderson) Funded by Research Corporation, $25,000.
11. Type XI collagen in extracellular matrix assembly; March 1, 2000 to February 28, 2001 Principal Investigator, MRF, OHSU, $25,000.
12. Biomedical Optics for Medical Research and Clinical Care; June 1, 2000 to May 31, 2005, NIH, Investigator (P.I. Steven Jacques) $3,115,625 total, of which $210,000 is designated for "Biomechanical and Optomechanical characterization of laboratory-generated cartilage" subproject-JTO).
13. NSF-EPSCOR "Acquisition of a peptide synthesizer" duration: 1 year, 2002, amount requested: $15,000.
14. NSF MRI/RUI "Acquisition of an EPR Spectrometer for Collaborative Research and Materials Science Education", $338,795 09/01/03 to 08/31/06.
15. Biomedical Research Infrastructure Network for Idaho, October 1, 2001 to June 30, 2004, NIH Co-Investigator (Michael Laskowski, PI), $6,000,000 total of which $1,383,947 was designated for BSU.
16. Supplement to Biomedical research infrastructure Network for Idaho, $2,000,000 total, of which $496,583 was designated for BSU.
17. MSMRI "Role of MeCP2 in neuronal cell differentiation and Rett syndrome", $5,000, June, 2003-May, 2004.
18. Molecular regulation of bone density and trabecular structure. 10/2005 to 6/2005, NASA Idaho EPSCoR, $4000.
19. NSF MRI/RUI "Acquisition of a Transmission Electron Microscope for Multidisciplinary Research and Education" 09/01/05 to 08/31/07, Co-PI, $691,910.
20. Collaborative Grant Improvement Initiative, 07/01/05 to 06/30/07, Boise State University, Principal Investigator, $150,000.
21. Investigating the role of collagen type XI in the structural integrity of cartilage tissue, 03/15/05 to 03/14/07, NASA Idaho Space Grant consortium, Principal Investigator, $30,000.
22. Type XI collagen isoforms in skeletal biology, February 1, 2001 to January 31, 2008, NIH RO1, Principal Investigator, $1,349,811.
23. Type XI collagen isoforms in skeletal biology-Independent Scientist Award, Career Development Grant, September 1, 2002 to August 31, 2007, NIH, Principal Investigator, $385,516.
24. NSF MRI/RUI:Acquisition of a Confocal Microscope for Multidisciplinary Research &Education, 09/01/06 to 08/31/10, NSF, Principal Investigator, $348,000.
25. MJMurdock Charitable Trust, Investigating mechanisms of alcohol-induced liver fibrosis using a zebrafish model system (P.I.: Kristen Mitchell), 5/17/10 to 12/31/11, Collaborator, $15,000

Invited Lectures and Presentations:

"Export of Protein in Escherichia coli." Linfield College, McMinnville, OR, 1983.
"Export of Protein." Biocenter, Basel, Switzerland, 1985.

"Export of Protein." European Molecular Biology Laboratory, Heidelberg, Germany, 1985.
"Export of Maltose-binding Protein in Escherichia coli." University of Utrecht, Biochemistry Department, Utrecht, the Netherlands, 1985.
"Export of Protein in Escherichia coli." University of Munich, Department of Physiology and Biochemistry, Munich, Germany, 1986.
"The Role of the Leader Peptide in Two Steps of the Export Process." Department of Cell Biology, Battelle Pacific Northwest Laboratories, Richland, WA, 1988.
"Intermediates in the Biosynthesis of Type XI Collagen." Western Connective Tissue Society, Santa Cruz, CA, 1990.
"A Stably Transformed Line of Chondrocytes Synthesizes Type XI but not Type II Collagen." Western Connective Tissue Society, Portland, OR, 1991.
"The Export of Protein in E. coli and into the Extracellular Matrix of Eukaryotic cells", Department of Microbiology, Colorado State University, Fort Collins, CO, 1995.
"The role of Type XI Collagen in the functional integrity of Normal and Osteoarthritic Cartilage", Equine Orthopaedic Research Program, Colorado State University, Fort Collins, CO, 1996.
"Type XI Collagen in the functional integrity of Normal and Osteoarthritic Cartilage", Department of Orthopaedic Research, University of New Mexico School of Medicine, Albuquerque, NM 1997.
"Maintenance of Structural Integrity in Cartilage", Department of Oral Molecular Biology, Oregon Health Sciences University, Portland, OR 1998.
"The molecular mechanism of type XI collagen function. " Arthritis Research Conference, Atlanta, GA August, 1999.
"The role of extracellular matrix molecules in skeletal development" University of Idaho, Department of Microbiology, Molecular Biology and Biochemistry, Moscow, ID November, 2001.
"Extracellular matrix molecules in development and disease" Boise State University, Chemistry Department, January 2002.
"Role of extracellular matrix molecules in development and disease" Mountain States Medical Research Institute, Board of Directors, February 5, 2002.
"Computational Methods in the structural analysis of the Npp domain of Collagen XI, a TSPN domain", Bioinformatics, BRIN, August, 2002, Moscow, Bioinformatics in Idaho.
"Extracellular matrix molecules in skeletal development" Idaho State University, Department of Pharmacology, Pocatello, ID 2002
"BMP-1 Mediated proteolytic processing of collagen type XI"; Medeck, Sosa and Oxford; Northwest Regional Developmental Biology Conference, March 2003
"Role of MeCP2 in neuronal differentiation and Rett Syndrome"; Cusack and Oxford; Northwest Regional Developmental Biology Conference, March 2003
"Rett Syndrome, MeCP2 in neuronal differentiation" Rett Syndrome Symposium, April, 2004.
"Type XI collagen in skeletal development" Brigham Young University, Provo, Utah, 2004.
"Collagen XI isoforms in skeletal biology" Boise State University, Department of Materials Science and Engineering, September 24, 2004.
"Collagen XI isoforms in skeletal biology" Washington State University,Vancouver,WA September 28, 2004.
"Collagen type XI and the structural integrity of cartilage" Materials Research Society, San Francisco, March, 2005
"Neuronal differentiation is blocked in the absence of MeCP2; rescued by caspase inhibitor" International Rett Syndrome Consortium, Victoria, British Columbia, August, 2005
"Collagen XI in bone trabeculae formation" NASA ISGC Moscow, Idaho, October 24, 2005
"Development of a model system for Rett syndrome", University of Idaho, Neuroscience Program, October 27, 2005
"Collagen XI isoforms in skeletal biology" University of Idaho, Department of Biological Sciences October 28, 2005

"Characterization of Recombinant Isoforms of the Amino Propeptide Globular Domain of Type XI Collagen by SRCD and cCD", Lisa Warner, Raquel Brown, Christina Blasick, Sorcha Yingst, Rohn McCune, Julia Thom Oxford, Daresbury, UK, September 2005

"Collagen XI isoforms in skeletal biology" November 3, 2005, Julia Thom Oxford, College of Idaho

"Collagen Fibrillogenesis on Ti-6Al-4V-ELI", MS&T conference in Pittsburg, Michelle Gerritsen, Bill Knowlton, Janet Hampikian, Julie Oxford, 9/27/2005

"Modeling and characterization of the amino propeptide of collagen a1(XI), a regulatory domain in collagen fibrillar architecture", in Structure and Mechanical Behavior of Biological Materials, edited by Rizhi Wang Lisa Rose Warner, Arzhang Fallahi, Becky Kroll, Sorcha Yingst, Susan Shadle, Julia Thom Oxford: (Mater. Res. Soc. Symp. Proc. 874E, Warrendale, PA, 2005), L4.9.

"Molecular interactions of the extracellular matrix", INBRE Annual Research Conference, Julia Thom Oxford, Moscow ID, 2007.

"The role of extracellular matrix in cell signaling", *INBRE Research Network*, Oxford JRT, Jorcyk CL, McDougal O. Boise, Idaho, June 22, 2010.

"Biomineralization Foci". AADR *Annual Meeting*, Pernoud D, Gorski J, Oxford JRT. Washington, DC USA March 3-6, 2010."Extracellular Matrix modulates cell signaling". INBRE Annual Research Conference, Julia Oxford, Cheryl Jorcyk, Owen McDougal, Moscow ID, 2010."Molecular Mechanisms of mechanoreception in bone". NASA ISGC, Julia Thom Oxford, Troy Rohn, Cheryl Jorcyk, Kristen Mitchell, August 18-19, 2010.

"Rotating Wall Bioreactor for investigations into the molecular mechanisms of mechanoreception in bone". Benjamin Davis, Stephanie Frahs, Jake Goyden, Lindsey Catlin, Julia Thom Oxford,Troy Rohn, Cheryl Jorcyk, Kristen Mitchell, Idaho National Laboratories, CAES, NASA ISGC, May 26-27, 2011

Contributed papers and posters at professional meetings:

Julia R. Thom and N. P. Morris, "Biosynthesis and proteolytic processing of type XI collagen." Third International Conference of Molecular Biology and Pathology of Matrix. June, 1990.

Julia R. Thom, K. J. Doege, W. Horton and N.P. Morris, "A stably transformed line of rat chondrocytes synthesizes type XI but not type II collagen." J. Cell. Biol. 111:23a, 1990.

Julia Thom Oxford, K.J. Doege, W. E. Horton, Jr. and N.P. Morris, "Characterization of type II and type XI collagen synthesis by an immortalized rat chondrocyte cell line deficient in □1(II) mRNA." Keystone Symposium, 1993.

Julia Thom Oxford, K.J. Doege, and N.P. Morris, "Analysis of the structure of the amino propeptide of □1 (XI) collagen " Molec. Biol. Cell, 4:65a, 1993.

Y.Li, D. Lacerda, M. Warman, D. Beier, J.T. Oxford, N.P. Morris, K. Andrikopoulos, F. Ramirez, B. Taylor, R. Seegmiller, and B.R. Olsen. " An abnormality in □1(XI) collagen causes autosomal recessive chondrodysplasia (cho) in mice. Mol. Biol. Cell, 4:7a, 1993.

D. R. Keene, J.T. Oxford and N. P. Morris, "Immunolocalization of collagen types II, IX and XI in the growth plate of human rib cartilage by electron microscopy." Mol. Biol. Cell, 4:289a, 1993.

Julia Thom Oxford and N.P. Morris, " Characterization of collagen synthesized by IRC cells." J. Cell Biochem., 17E:156, 1993.

N.P. Morris, D.R. Keene and J.T. Oxford, "Ultrastructural localization of type XI collagen in human growth plate cartilage." Transactions, Orth. Res. Soc., 19: 423, 1994.

N.P. Morris, K.J. Doege and J.T. Oxford, "Alternative structure of the pro□1(XI) amino terminal domain." Western Connective Tissue Soc., 1994.

N.P. Morris, J.T. Oxford and K.J. Doege, "Alternative splicing in the amino-terminal domain of pro □1(XI) generates polymorphic structures which show tissue specific expression."Fifth International Conference on the Molecular Biology and Pathology of Matrix, 1994.

N. Morris, J. Thom Oxford and K. Doege Alternative splicing in the N-terminal domain of Proα1(XI) generates polymorphic structures which show tissue-specific expression**, *Matrix Biology, Volume 14, Issue 5, September 1994, Pages 361-362***

J. Oxford, D. Frisbie, L. Southwood, L. Hausafus, J. Goodnight, S. Cammarata, G. Trotter, W. Rodkey, W. McIlwraith, " Early events in articular cartilage repair--an equine model for enhancement of repair". Keystone Symposium on Wound repair, 1998.

J. Oxford, D. Frisbie, G.Trotter, W. Rodkey, J. Steadman, W. McIlwraith, "Enhancement of articular cartilage repair of the femoral condyle using subchondral plate microfracture: Early expression of cartilage specific markers indication chondrogenesis". Orthopaedic Research Society Meeting, February, 1999.

Gregory, K.E., Chen, Y., Mechling, D.E., Smoody, B.F., Oxford, J.T., Morris, N.P., "Structure of the amino terminal domain of the alpha-1(XI) collagen chain." Orthopaedic Research Society Meeting, February, 1999.

Oxford, J., "The molecular mechanism of type XI collagen function. " Arthritis Research Conference, August, 1999.

Oxford,J.T., Descala, J.A., Morris, N.P., Gregory, K.E., Topping, T.B., and Randall, L.L. "Interaction between type XI pro-collagen molecules via the amino propeptides of □1(XI) chains is coupled to proteolytic processing." Molecular Biology of the Cell, 11:265a.

Kristovich, SR and Oxford, JRT. "Effects of □1(XI) collagen isoforms on the structural and functional properties of the vitreous humor." , 221st National Meeting of the American Chemical Society.

Oxford, JRT and Lampi, KJ, "Deamidation of human □B1 crystallin alters the dimer structure" International Light Scattering Colloquium 2001, October 22 and 23, 2001

Medeck, R., Sosa, S.and Oxford, J., "BMP-1 processing of collagen type XI isoforms" American Society for Matrix Biology, November, 2002.

Cusack, S., Rohn, T., Oxford, J., "A PC12 cell model for Rett syndrome caused by MeCP2 mutations" American Society for Cell Biology, December, 2002.

Medeck, R., Sosa, S., and Oxford, J., "BMP-1 mediated proteolytic processing of collagen type XI", American Society for Cell Biology, December, 2002.

Medeck, R., Sosa, S., and Oxford, J., "BMP-1 mediated proteolytic processing of collagen type XI", Society for Developmental Biology, Northwest Region, March, 2003.

Cusack, S., Rohn, T., Oxford, J., "A PC12 cell model for Rett syndrome caused by MeCP2 mutations" Society for Developmental Biology, Northwest Region, March, 2003.

Lisa Warner, Arzhang Fallahi, Becky Kroll, Linda Mercer, Katey Irwin, Julia Thom Oxford, "Structural model of the amino propeptide of collagen XI alpha1chain, LNS Collagens- Structure and Mechanistic Insights" American Society for Matrix Biology, San Diego, CA, November, 10, 2004.

Lisa Rose Warner, Arzhang Fallahi, Becky Kroll, Sorcha Yingst, Susan Shadle, Julia Thom Oxford: Modeling and characterization of the amino propeptide of collagen □1(XI), a regulatory domain in collagen fibrillar architecture, in Structure and Mechanical Behavior of Biological Materials, edited by Rizhi Wang (Mater. Res. Soc. Symp. Proc. 874E, Warrendale, PA, 2005), L4.9.

Cui, C., Henderson, E., Keightley, A., Oxford, J., Rowe, P., Midura, S., and Gorski, J. "Characterization of proteins enriched in mineralized biomineralization foci supports their role in mineral crystal nucleation", American Society for Bone and Mineral Research, Philadelphia, PA, September, 2006.

Oxford, Julia, Lisa Warner , Noriko Hazeki-Taylor , Raquel Brown , Christina Blasick, "Heparan sulfate binding sites within the amino terminal noncollagenous domain of Collagen type XI", International Growth Plate Workshop, Stevenson, WA, 2006.

Oxford,JT, L.R. Warner, R.J. Brown and C. Blasick "Heparan sulfate binding sites within collagen a1(XI) NTD" *Matrix Biology*, *Volume 25, Supplement 1*, *November 2006*, *Page S69* American Society for Matrix Biology, Nashville, TN, 2006.

Hazeki_Taylor, K.M. Irwin, R.J. Brown and J.T. Oxford, "Collagen interacting proteins in fetal bovine cartilage", *Matrix Biology*, *Volume 25, Supplement 1*, *November 2006*, *Pages S73-S74*, American Society for Matrix Biology, Nashville, TN, 2006.

Gerritsen, Michelle, Julia T. Oxford, Megan Frary, Jonathan Henderson, Janet M. Hampikian, "Immuno-SEM Characterization of Developing Bovine Cartilage", Materials Science and Engineering, 2006.

Knowlton, William B, David Araujo, Patrick Price, Jason Brotherton, Kendra Coonse, Richard G. Southwick III, Amy J. Moll, Julia Thom Oxford "Development of Biomolecular Nanostructure Sensor Arrays", AAAS Pacific Division, Boise, ID, 2007.

Oxford,JT, Raquel Brown, Noriko Hazeki-Taylor "Molecular Interactions within the Extracellular Matrix of Cartilage", AAAS Pacific Division, Boise, ID, 2007.

Brown, Raquel, Julia Thom Oxford, "Identification of Proteins that Interact with the Surface of Collagen Fibrils"American Society for Bone and Mineralization Research, Honolulu, HI, 2007.

Adams, Jason , Raquel Brown, Jeremiah Maschmann, Katey Irwin, Luke Woodbury, Linda Mercer, Julia Thom Oxford "Developmental Expression of Collagen Type XI in Zebrafish (*Danio rerio*)", AAAS Pacific Division, Boise, ID, 2007.

Woodbury, Luke, Dawn Muhlestein, Julia Thom Oxford "Characterization of the Collagen type XI Isoforms using Analytical Ultracentrifugation and Circular Dichroism Spectropolarimetry", AAAS Pacific Division, Boise, ID, 2007.

Maschmann, Jeremiah M., Julia Thom Oxford, Jason S. Adams "Identification of Collagen Gene Loci in *Danio rerio",* AAAS Pacific Division, Boise, ID, 2007.

Muhlestein, Dawn,T.S. Broyles, James Cole, Julia Thom Oxford, Susan E. Shadle "The Effects of Trifluoperazine on Calsequestrin Structure and Protein Aggregation", AAAS Pacific Division, Boise, ID, 2007.

Brown, Raquel, Julia Thom Oxford, "Identification of Proteins that Interact with the Surface of Collagen Fibrils", AAAS Pacific Division, Boise, ID, 2007.

Knowlton, William B., Kaci Bloxham, Jen Cole, Zach Heuman, Lisa Warner, Sorcha Yingst, Linda Kenoyer, Julia Thom Oxford, "A nanometer scale perspective on cartilage genesis", AAAS Pacific Division, Boise, ID, 2007.

Hoskins, Nathan, Amber Pedracini, Linda Mercer, Julia Thom Oxford, "Bone microarchitecture is dependent upon Collagen α1(XI) expression during development", American Society for Bone and Mineral Research, Montreal, 2008

Huffman, NT, C. Chaoying, SV Chittur, JT Oxford, JA Keightley, RJ Midura, JP Gorski, "Enrichment of type XI collagen and 6b N-terminal domain at sites of mineral nucleation within osteoblastic cultures" American Society for Bone and Mineral Research, Montreal, 2008

S.R. Simonson, G. Hynes, J. Galanter, S. Price, J. Oxford, and K.G. Shea The effect of treadmill walking exercise with a partial reduction of body weight on knee osteoarthritis disease progression. *Arthritis Symposium, St. Alphonsus Regional Medical Center*, May 1, 2009Luke Woodbury and Julia Oxford, Interactions between Collagen and Chondroitin Sulfate. *Arthritis Symposium, St. Alphonsus Regional Medical Center*, May 1, 2009

Anthony R. Hafez, Nathan J. Hoskins, Linda M. Mercer, Robert E. Seegmiller, Julia T. Oxford, Analysis of Craniofacial Skeletal Mineralization in a Mouse model of Stickler syndrome. *Arthritis Symposium, St. Alphonsus Regional Medical Center*, May 1, 2009

Ming Fang, Jason Adams, Lane McMahon, Julia Oxford, Craniofacial Skeletal Development: Zebrafish model system for human development, *Arthritis Symposium, St. Alphonsus Regional Medical Center*, May 1, 2009

Julie Oxford, Department of Biological Sciences, Biomarkers of Joint development: Potential Biomarkers for Osteoarthritis? Boise State University, *Arthritis Symposium, St. Alphonsus Regional Medical Center*, May 1, 2009

Kristen Mitchell, Cheryl Jorcyk, Troy Rohn, Julie Oxford, Molecular Mechanisms of Cellular Mechanoreception in Bone Department of Biological Sciences, Boise State, *Arthritis Symposium, St. Alphonsus Regional Medical Center*, May 1, 2009

McMahon, Lane, Jason Adams, Raquel Brown, Jeremiah Maschmann, Linda Mercer, Julia T. Oxford. Seminar. Developmental Expression and Function of Collagen Type XI in Zebrafish (Danio rerio). Western Student Medical Research Forum, Carmel California. Awarded - WAFMR/WSCI/WSPR Outstanding Student Research Award. (2009)

Jeffrey Gorski, Nichole Huffman, Sridar Chittur, Sharon Midura, Ronald Midura, Julie Oxford, Nabil Seidah. Mineralization of Osteoblastic Cultures Requires SKI-1 (site-1) Protease. American Society for Bone and Mineral Research, September 11-15, 2009, Denver, CO.

Jeff P. Gorski[1], Nichole T. Huffman[1], Oxford, J.T.[2], Seidah, N.G.[3], and Midura, R.J. PROCESSING OF BONE SIALOPROTEIN DURING BONE BIOMINERALIZATION. FASEB Summer Research Conference; Osteopontin Biology, Steamboat Springs, Colorado, August 2010

Jeffrey P. Gorski, Nichole Huffman Sridar Chittur, Ronald J. Midura, Dina Black, Julia RT Oxford, Nabil G. Seidah, Transcription of Collagens I and XI, Phex, Dmp1, and Fibronectin by Osteoblastic/Osteocytic Cells is Co-ordinately Regulated. American Society for Bone and Mineral Research, Toronto, Canada, October 15-19, 2010

Mikelonis D, Fang M, Brown RJ, Oxford JRT. Analyzing Collagen Alpha 1(XI) Using a Zebrafish Model System, presented at the *2010 Undergraduate Research Conference*, Boise State University, April, 2010.

Oxford JRT, Biomarkers of Joint development: Potential Biomarkers for Osteoarthritis? *Arthritis Symposium, St. Alphonsus Regional Medical Center*, June 18, 2010.Frahs S, Mitchell K, Jorcyk CL, Rohn TT, Oxford JRT, Molecular Mechanisms of Cellular Mechanoreception in Bone, *Arthritis Symposium, St. Alphonsus Regional Medical Center*, June 18, 2010.

Oxford JRT, Jorcyk CL, McDougal O. The role of extracellular matrix in cell signaling, *INBRE Research Networking meeting*, Boise, Idaho, June 22, 2010.

Simonson SR, Hynes G, Galanter J, Price S, Oxford JRT, Shea KG. The effect of treadmill walking exercise with a partial reduction of body weight on knee osteoarthritis disease progression. *Arthritis Symposium, St. Alphonsus Regional Medical Center*, June 18, 2010.Woodbury L, Oxford JRT, Interactions between Collagen and Chondroitin Sulfate. *Arthritis Symposium, St. Alphonsus Regional Medical Center*, June 18, 2010.Hafez AR, Hoskins NJ, Mercer LM, Seegmiller RE, Oxford JRT. Analysis of Craniofacial Skeletal Mineralization in a Mouse model of Stickler syndrome. *Arthritis Symposium, St. Alphonsus Regional Medical Center*, June 18 2010.Julie Oxford, Troy Rohn, Cheryl Jorcyk, Kristen Mitchell Molecular Mechanisms of mechanoreception in bone. NASA Idaho Space Grant Consortium meeting, College of Idaho, Caldwell, ID Julia Oxford, Cheryl Jorcyk, Owen McDougal Extracellular Matrix modulates cell signaling. Idaho INBRE Conference, Moscow, ID, 08-03-2010Pernoud D, Gorski J, Oxford JRT. Biomineralization Foci AADR Annual Meeting, Washington, DC USA 03-03-2010Julia Thom Oxford, Proteomic analysis of Col11a1-associated protein complexes, Gordon Research Conference, Cartilage Biology & Pathology 03-06-2011Jonathon Reeck, Julia Thom Oxford, Collagen type XI is essential for craniofacial skeletal formation in the zebrafish Idaho Academy of Sciences 04-02-2011Benjamin Davis, Stephanie Frahs, Kristen Mitchell, Troy Rohn, Cheryl Jorcyk, Julia Thom Oxford, Molecular Mechanisms of Cellular Mechanoreception in Bone, Idaho Academy of Sciences. 04-02-2011

Anthony Hafez, Ryan Squires, Robert Seegmiller, Julia Thom Oxford, 3-D reconstruction and analysis of embryonic skeleton, Idaho Academy of Sciences 04-02-2011Stephanie Frahs, Dawn Mikelonis, Benjamin Davis, Julia Thom Oxford, Gravitational Modulation of Calcium Signaling in Bone Idaho Academy of Sciences 04-02-2011Anthony Hafez, Ryan Squires, Robert Seegmiller, Julia Thom Oxford, 3-D reconstruction and analysis of embryonic skeleton, Boise State University Undergraduate Research Conference. 04-11-2011Stephanie Frahs, Dawn Mikelonis, Benjamin Davis, Julia Thom Oxford, Gravitational Modulation of Calcium Signaling in Bone Boise State University Undergraduate Research Conference, 04-11-2011

Neda Shefa, Julia Thom Oxford, Role of minor fibrillar collagens in the progression of arthritis Posters on the Hill, Council on Undergraduate Research poster Undergraduate Research Meeting 05-13-2011

Service

Professional service:

Membership in professional societies: American Society for Bone and Mineral Research,
Mountain States Tumor and Medical Research Institute, Affiliate Member
Sigma Xi
American Society for Matrix Biology

Grant Application Review: arc (Arthritis Research Council, UK)
Burroughs Wellcome Trust
NSF Merit Review of grant applications for Graduate Student fellowships and for Major Research Instrumentation
Study Section (ad hoc) National Institute of Arthritis, Musculoskeletal and Skin Diseases, NIH, Skeletal Biology, Structure and Regeneration, 2001, 2004, 2005.

Manuscript Peer Review for the following journals:

International Journal of Cell Biology
Brain Research
Journal of Histochemistry
Journal of Neurochemistry
BMC Developmental Biology
Journal of Dentistry
Journal of Biomedical Materials Research
Gene Expression Patterns
Acta Biochimica Biophysica
Journal of Cell Biology
Journal of Histochemistry and Cytochemistry

Institutional service:

Faculty Advisor for Mu Delta student organization (March of Dimes) 2010-2011
Boise State Research Scholars group 2008-2009 STEM Education
Director, Biomolecular Research Center, 2004-present
Co-director, Musculoskeletal Research Institute, 2007- present
Department of Biological Sciences Graduate Student Oversight Committee member, 2007-present
Department of Biological Sciences Tenure and Promotion Committee member, 2008-present
INBRE Senior Research Advisory Committee member, 2004-present
University Foundations Scholars Awards Committee Member, 2007-2008
College of Arts and Sciences Honors and Awards Committee Member, Fall 2007
Biology Department Research Committee member 2005-2007
Advising Freshmen in Express Program, June 2005
"NIH Funding" presented by Julie Oxford, Thursday, September 22, 2005
Biotechnology Legislative Task Force presentation, Idaho State Capitol Building, September 7, 2005
President of Boise State chapter of Sigma Xi, 2003-2005
Pre-Dental School review Committee member, 2002
Science Day, Boise State University, 2001

Community service:

Adaptive skiing program, Shriners Hospital, 1990-1995

Career Mentor Program, Linfield College, 1993-2006
Advocates for Women in Science, Engineering and Mathematics, 1995-2000
Expanding Your Horizons (Youth science career program), Yakima, WA, 1995
Advisory Board, BSU Children's Center, 2001-2002
Alumni Mentor Program, Washington State University, 1989-2006
Medical Advisory Board, BioLogic Aqua, Rogue Valley Natural Springs 1998-present
Discovery Center, 2004, 2005
Biology Outreach Workshop: DNA Fingerprinting; Mountain Cove High School, Boise, Idaho, 2005
Treasure Valley Arthritis Awareness Campaign member, 2006; Idaho Arthritis in Motion, 2006-2008
Computer Lab, Riverside Elementary School, 2004-2007
DNA isolation activity, Riverside Elementary, Oct 19, 2007
Treasure Valley Arthritis In Motion (I-AIM) Arthritis Symposium with St Alphonsus Regional Medical Center, April, 2009
Volunteer for local chapter of the National Arthritis Foundation, Wahooz Family Fun Center JA Family Day for families of children with juvenile rheumatoid arthritis, September, 2009
Volunteer for local chapter of the National Arthritis Foundation, Discovery Center JA Family Day for families of children with juvenile rheumatoid arthritis, October 2010
Treasure Valley Arthritis In Motion (I-AIM) Arthritis Symposium with St Alphonsus Regional Medical Center, June, 2010

ALEX PUNNOOSE
Distinguished Professor of Physics and
Associate Faculty of the proposed Interdisciplinary graduate programs in Materials Science and Engineering, and Biomolecular Sciences.
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E-mail: apunnoos@boisestate.edu

EDUCATION

1994 Ph. D. (Physics), Aligarh University, India
1990 M. S. (Solid State Physics), Aligarh University, India.
1988 B. S. (Physics), Mahatma Gandhi University, India.

EMPLOYMENT

04/2011 – Present: Distinguished Professor of Physics, Boise State University.
07/2008 – 03/2011: Professor of Physics, Boise State University.
07/2006 – 07/2008: Associate Professor of Physics, Boise State University.
06/2007 – 08/2007: Visiting Professor of Physics, Indian Institute of Science, Bangalore.
07/2002 – 07/2006: Assistant Professor of Physics, Boise State University.
10/1999 – 07/2002: Postdoctoral associate, West Virginia University (Nanoscale magnetism)
12/1997 – 10/1999: Research associate, Kuwait University (Zn-Cd-Te alloys & solar cells)
11/1994 – 12/1997: Lecturer in Physics, Mahatma Gandhi University, India.
06/1994 – 11/1994: Lecturer in Applied Physics**,** Aligarh University, India.

GRANTS, AWARDS AND HONORS

- 2010-11 award of Boise State University Distinguished Professorship; selected as one of the six Boise State University Distinguished Professors.
- 2007 award for outstanding research in the College of Arts and Science, Boise State University (a college-level award given every two years to the most outstanding researcher among 176 faculty members from 11 departments in the College of Arts and Sciences)
- 2007 award for outstanding teaching in the College of Arts and Science, Boise State University (a college-level award given every two years for the most outstanding performance in teaching, selected from 176 faculty members from 11 departments in the College of Arts and Sciences)
- 2006-2007 Boise State University Foundation award for outstanding research (a university-wide award given annually to the most outstanding researcher among 535 faculty members from 44 departments, and selected by a university-wide committee)
- Finalist, 2006-2007 Boise State University Foundation award for outstanding teaching (a university-wide award given annually for the most outstanding performance in teaching among 535 faculty members from 44 departments, and selected by a university-wide committee)

- Recepient of the 2005 National Science Foundation-CAREER award (The National Science Foundation's most prestigious award in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research (http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503214))
- Finalist of the 2010 Idaho Innovation Award in the Early-Stage innovation category organized by the Idaho Technology council in 2010 for the research work titled "Novel Nanoparticles That Kill Cancer Cells"
- Honored as Coach for a Game by the Boise State University Athletic Department, 2007.
- Selected as one of the two EPSCoR (Experimental Program to Stimulate Collaborative Research) researchers from Idaho to acknowledge at Capitol Hill, Washington, DC for research excellence during the National EPSCoR/IDeA States Membership Meeting, February 28 - March 1, 2006
- Finalist of the 2003 young scientist award of the International ESR (Electron Spin Resonance) Society for the development of a new magnetic resonance technique- "Hysteretic Ferromagnetic Resonance", published in *Journal of Applied Physics* (vol. 93, pp.771, 2003).
- PI or co-PI of 24 grants awarded during 2002-2010, totaling $8M (please see seperate section pm Research Grants for details):
  - 2009 Army Research Office – Applied Nanotechnology grant
  - 2008 National Science Foundation – Collaborative research grant.
  - 2008 National Science Foundation-Major Research Instrumentation (FACS) award.
  - 2007 National Science Foundation - Major Research Instrumentation (XPS) award.
  - 2007 Department of Energy-EPSCoR Implementation Grant.
  - 2006 National Science Foundation-REU award.
  - 2005 National Science Foundation-CAREER award.
  - 2005 National Science Foundation-Europe Materials World Network award.
  - 2005 National Science Foundation - Major Research Instrumentation (TEM) award.
  - 2005 COAS Mini grant, Boise State University.
  - 2005 Boise State University - Faculty Research Associates Program award.
  - 2005 Boise State University - Collaborative Grant Improvement Initiative grant.

- 2005 National Science Foundation -Idaho-EPSCoR RII award.
- 2004 Petroleum Research Fund AC grant.
- 2004 Department of Energy-EPSCoR Implementation Grant.
- 2004 Micron Technology grant: Donation of Research Equipment.
- 2003 Cottrell College Science Award from Research Corporation.
- 2003 National Science Foundation - Major Research Instrumentation (EPR) Award.
- 2003 National Science Foundation -Idaho-EPSCoR Instrumentation (VSM) Award.
- 2003 Idaho EPSCoR-Collaborative Nano-research award 1.
- 2003 Idaho EPSCoR-Collaborative Nano-research award 2.
- 2002 National Science Foundation -EPSCoR Infrastructure Improvement Grant.

- Postgraduate merit scholarship from the Faculty of Science, Aligarh University (India) during 1988 – 1990.
- Top rank in M. S. in the solid state physics division at Aligarh University (India), 1990.

PROFESSIONAL ACTIVITIES

Scientific Sessions Chaired at International Conferences (After joining Boise State):

1. Invited to chair a Session on magnetic semiconductors at the 55th Annual Conference on Magnetism and Magnetic Materials, Atlanta, November 2010.
2. Invited to chair a Session on magnetic semiconductors at the 53rd Annual Conference on Magnetism and Magnetic Materials, Washington DC, 2008.
3. Session chair (magnetic oxides), 52nd Annual Conference on Magnetism and Magnetic Materials, Tampa, FL, November 2007. Coordinated the review process of 15 research papers submitted for publication in the special issue of Journal of Applied Physics.
4. Session chair (magnetic sensors), 51st Annual Conference on Magnetism and Magnetic Materials, Baltimore, MD, January 2007. Coordinated the review process of 18 research papers submitted for publication in the special issue of Journal of Applied Physics
5. Session HS - Spin Dependent Tunneling and Transport, 50th Annual Conference on Magnetism and Magnetic Materials, San Jose, CA, October 30 – November 3, 2005. Coordinated the review process of 28 research papers submitted for publication in the special issue of Journal of Applied Physics.

6. Session GS: Magnetic Semiconductor Oxides, 2004 Joint MMM-Intermag conference, January 5-9, 2004, Anaheim, CA. Coordinated the review process of 11 research papers which appeared in the Journal of Applied Physics.
7. Session on Magnetic Materials at the 10th International Conference on Composites/Nano Engineering, July 20-26, 2003, New Orleans.
8. Session FP: Magnetic Tunnel Junctions and Half Metallics, 47th Annual Conference on Magnetism and Magnetic Materials, November 11-15, 2002 Tampa, FL. Coordinated the review process of 19 research papers which appeared in the Journal of Applied Physics.
9. Session on Nanocomposite Materials, 9th International Conference on Composites Engineering, July, 2002, San Diego.

Selected Invited Talks (After joining Boise State):

1. *Recent Advances in the Development of Dilute Magnetic Semiconductor Oxides*, International Materials Research Congress (IMRC), October 28-November 1, 2007, Cancun, Mexico.
2. *Nanotoxicity and Nanoparticle-based Biomedical Applications,* Idaho State level workshop on Nanotechnology in biomedical advances, October 12, 2007, Post falls, Idaho.
3. *Oxide Semiconductor Nanostructures*
   Department of Physics, Indian Institute of Science, Bangalore, India on June 5, 2003
4. *Dilute Magnetic Semiconductor Nanoparticles*
   Chemistry Department, University of Idaho, April 26, 2007.
5. *Carrier controlled ferromagnetism in chromium doped indium oxide thin films – a ferromagnetic semiconductor,* 17th International Conference on Magnetism (ICM) August 24-27, 2006, in Kyoto, Japan.
6. *Semiconductor Nanoparticles,* International Materials Research Congress (IMRC), Cancun, Mexico, August 21-23, 2006
7. *Physics of Nanoscale oxides*; Department of Physics, Idaho State University, 2006.
8. *Nanoscale Semiconductor Oxides for Multifunctional Device Applications*, International Materials Research Congress (IMRC), August 22-26, 2004, Cancun, Mexico.
9. *EPR Studies of Magnetic Nanoparticles*,
   4th Asia-Pacific EPR Symposium, November 22-25, 2004, Bangalore, India.
10. *Development of Novel Spintronics Materials*,
    Center for Materials for Advanced Technology (c-MAT), Trissur, India, December 3, 2004.
11. *Band Theory and Semiconductor Nanoparticles*,

National Seminar on Solid State Physics, Uzhavoor, India, November 25-28, 2004.

12. *Room temperature Ferromagnetism in Transition-metal-doped Semiconductors,* 10th International Conference on Composites/Nano Engineering, July, 2003, New Orleans.

13. *Finite Size Effects in CuO Nanoparticles,* 9th International Conference on Composites Engineering, July, 2002, San Diego.
14. *Nanoscale Magnetism* Indian Institute of Science, Bangalore, India on June 5, 2003
15. *Dilute Magnetic Semiconductors* Pacific Northwest National Laboratory, August 29, 2003.
16. *Electron Magnetic Resonance in Magnetic Nanoparticles* 31st AMPERE Congress on Magnetic Resonance and Related Phenomena, at Adam Mickiewicz University, Poznan, Poland, July 14-19, 2002.

RESEARCH COLLABORATORS (Co-authors of Published Papers or Co-PIs of proposals)

University Level Collaborations

1. Dr. W. B. Knowlton (Electrical Engineering and Materials Science and Engineering): Collaborates on the synthesis of thinfilm materials and their electrical properties and coauthor of a journal article published in Solar Energy Materials, co-presenter of several conference presentations, and co-PI of two NSF grants.
2. Dr. P. Mullner (Materials Science and Engineering): Collaborates on the studies of magnetic shape memory alloys and coauthor of a journal article published in Journal of Applied Physics, co-presenter of numerous conference presentations, and co-PI of two NSF grants.
3. Dr. B. Kim (Physics): Undertook magnetic force microscopy studies and coauthor of a journal article published in Nature Materials, co- presenter of numerous conference presentations, and co-PI of two NSF grants.
4. Dr. K. Feris (Biology): Conducted antibacterial studies on nanoparticles and coauthor of two journal articles published in Applied Physics Letters and Langmuir, co-presenter of several conference presentations, and co-PI of three major proposals to NIH, HERC and NSF.
5. Dr. D. Wingett (Biology): Carried out nanotoxicity/cancer studies and coauthored half a dozen journal articles published in Applied Physics Letters, Nanotechnology, Advanced Functional Materials, Journal of Materials Science: Materials in medicine, and Langmuir, co-presenter of numerous conference presentations, and co-PI of nine major proposals.

6. Dr. J. Tinker (Biology): Conducted antibacterial studies and coauthor of a journal article published in Langmuir and co-PI of a major proposals to HERC.
7. Dr. D. Tenne (Physics): Carried out optical studies and coauthor of five journal articles published in Physical Review B, Advanced Functional Materials, and Journal of Applied Physics, co-presenter of several conference presentations, and co-PI of ongoing ARO and NSF grants, and two major proposals to NSF.
8. Dr. J. Peloquin (Chemistry): Conducted Raman studies and coauthor of a journal articles published in Physical Review B, and co-PI of two major proposals to NSF.
9. Dr. S. Shadle (Chemistry): Collaborated on ESR studies and co-PI of an NSF-MRI grant, and a major proposals to NSF.
10. Dr. W. Kuang (Electrical Engineering): Working jointly on the synthesis and characterization of photonic materials, and co-PI of two major proposals to NSF.
11. Dr. C. Hanna (Physics): Conducts computations studies and coauthor of seven journal articles published in Physical Review B, Advanced Functional Materials, Nanoscale Research Letters, Langmuir and Journal of Applied Physics, co-presenter of several conference presentations, and co-PI of an ongoing ARO grant, and a major proposals to HERC.

State and National level Collaborations

12. Dr. R. Tanguay, Oregon State University: Collaborates for nanotoxicology studies using zebrafish and coauthor of a manuscript for submission to ACS Nano, and co-PI of an RO1 proposals to NIH and a multi-institutional CEIN proposal to NSF.
13. Dr. M. H. Engelhard, Pacific Northwest National Lab: Carried out x-ray photoelectron spectroscopy studies and coauthor of 14 refereed journal articles and co-presenter of several conference presentations.
14. Mr. R. Baldner, Micron Technology, Boise: Conducted Raman studies and coauthor of a journal article published in Physical Review B.
15. Dr. J. S. Moodera, Massachusetts Institute of Technology: Synthesized magnetic nanostructures and coauthor of four journal articles published in Nature Materials, Physical Review B, and Journal of Applied Physics.
16. Dr. L. C. Brunel, National High Magnetic Field Laboratory (NHMFL), Tallahassee: Collaborated on the studies of magnetic nanoparticles using high magnetic field ESR and coauthored a journal article published in Magnetism and Magnetic Materials.
17. Dr. S. Chambers, Pacific Northwest National Lab: Collaborated on the studies of Co doped titanium oxide films and coauthored a journal article published in Nuclear Instrument and Methods B.
18. Dr. J. Freed, Cornell University: Conducted high field electron magnetic resonance studies and coauthored a journal article published in Applied Magnetic Resonance.
19. Dr. J. Philip, Catholic University, Washington DC: Collaborated on electrical property measurements and coauthor of a journal article published in Nature Materials and another under review in Physical Review B.

20. Dr. V. Gopal, Lawrence Berkeley National Lab: Helped with TEM studies and coauthor of a journal article published in Applied Physics Letters.
21. Dr. M. S. Seehra, West Virginia University: Postdoctoral advisor and coauthor of more than a dozen journal articles.
22. Dr. N. C. Giles, West Virginia University, Morgantown, WV: Conducted EPR studies and coauthor of a journal article published in Journal of Physics: Condensed Matter.
23. Dr. D. Lederman, West Virginia University: Fabricated exchange biased bilayers and coauthor of a journal article published in Journal of Applied Physics.
24. Dr. S. Thevuthasan, Pacific Northwest National Lab: Collaborated on dilute magnetic semiconductors and coauthored more than half a dozen journal articles.
25. Dr. Edward M. Eyring, Department of Chemistry, University of Utah: Collaborated on catalysis research, and coauthored a journal article in Energy and Fuel.
26. Dr. C. Wang, Pacific Northwest National Lab: Collaborated on TEM studies and coauthored more than half a dozen journal articles.
27. Dr. V. Shuttanandan, Pacific Northwest National Lab: Collaborated on Particle Induced x-ray Emission (PIXE) studies and coauthored more than half a dozen journal articles.
28. Dr. R. Kokadapu. Pacific Northwest National Lab: Collaborated on Mossbauer spectroscopy studies and coauthored a journal article in Physical Review B and another manuscript is currently under review.
29. Dr. G. P. Huffman, University of Kentucky: Collaborated on the studies of nanocatalysts, and coauthored three journal articles in Physical Review B, Fuel Processing Technology, and ACS preprints.
30. Dr. D. McIlroy (Physics), University of Idaho: Collaborated on nanowire studies as part of two major NSF-EPSCoR grants.
31. Dr. J. D. Harris, Department of Chemistry, Northwest Nazarene University: Synthesizes oxide nanostructures, co-PI of two joint grants from NSF, and a coauthored manuscript is currently under review for publication in Journal of Applied Physics.
32. Dr. P. Shapiro (Chemistry), University of Idaho: Collaborated on semiconductor nanoparticles and were co-PIs of two DoE-EPSCoR grants and an NSF proposal.
33. Dr. D. Gamelin (Chemistry), Dr. K. Krishnan (Materials Science) and Dr. M. Omsted (Physics), University of Washington, Seattle, WA: Collaborated on dilute magnetic semiconductor materials and devices and jointly submitted a major NSF proposal.
34. Dr. R. G. Rodriguez and Dr. J. Pak, Chemistry, Idaho State University: Collaborated on thin film photovoltaics, published two journal articles in Chemistry of Materials and Journal of Nanomaterials, and were co-PIs of two DoE-EPSCoR grants and a NASA EPSCoR proposal.

International Collaborations

35. Dr. X. Mathew, Centro de Investigacion en Energia-UNAM, **Mexico**: Collaborated on optical studies and solar cells, jointly published two journal articles in Journal of Applied Physics.

36. Dr. G. Kostorz and Dr. B. Schönfeld, ETH Zurich, **Switzerland**: Collaborated on the studies of magnetic shape memory alloy sand co-PIs of an NSF funded Materials World Network grant.
37. Dr. S. K. Misra, Physics, Concordia University, Montreal, **Canada**: Conducted electrom magnetic resonance studies on dilute magnetic semiconductors and jointly published 5 journal articles in journal of Applied Physics and Applied Magnetic Resonance.
38. Dr. B. Satpati, Institute of Physics, Bhuvaneswar, **India**: Collaborated on TEM studies of thinfilms and published a journal paper jointly in Nature Materials.
39. Dr. J. Zhang, National Laboratory of Solid State Microstructures, Nanjing University, **China**: Worked on the synthesis of novel nanostructures and published four journal articles in Advanced Functional Materials, Langmuir, Journal of Applied Physics and Nanoscale Research Letters.
40. Dr. P. K. Biswas, Central Glass and Ceramic research Institute, Kolkata, **India**: Worked on the synthesis of novel nanostructures and jointly published a journal article in Journal of Materials Science: Materials in Electronics.
41. Dr. S. V. Bhat, Department of Physics, Indian Institute of Science, Bangalore, **India**: Worked on the magnetic studies of dilute magnetic semiconductors and published a journal article in Journal of Applied Physics.
42. Dr. S. I. Andronenko, Department of Physics, Kazan Federal University, **Russian Federation**: Worked on the detailed simulation studies of EPR data and published five journal articles and two more manuscripts are currently under review.
43. Dr. M. R. P. Kurup, Chair, Department of Chemistry, Cochin University of Science and Technology, **India**: Worked on the synthesis and studies of novel anti-cancer drug analogues and published three journal articles in Inorganic Chemistry Communications, Spectrochemica Acta and Polyhedron.
44. Dr. D. Pink, Department of Physics, St. Francis Xavier University, Antigonish, **Canada**: Conducts computations studies and coauthor of a journal article published Langmuir.
45. Dr. V. Chernenko, Institute of Magnetism, NASU and MESU, Kiev, **Ukraine**: Collaborated on the studies of magnetic shape memory alloy thinfilms and jointly published a refereed journal paper in the Journal of Applied Physics.

STUDENT ADVISING

Undergraduate students

1. Mr. Michael S. Byrns (Physics): Nov. 2002 - June 2003; Prepared ZnO nanoparticles and completed PHYS 482: Senior Project.
2. Mr. Andrew Wood (Electrical Engineering): January -July, 2003; Prepared nanoparticles of TiO_2 and ZnO; Received *internship at Hewlett-Packard*, Boise.

3. Mr. Thongphanh Panthavady (Biology): June 2003 - January 2004. Investigated ferrihydrite nanoparticles and *published a paper in Physical Review B*. Hired by Sapidyne Inc, Boise and got admitted in Utah medical school.
4. Mr. Jason Hays (Physics); June 2003 – December 2004: Investigated transition-metals-doped ZnO and SnO_2; Completed PHYS 482: Senior Project; *Published 4 research papers* and admitted to graduate school. Won *second prize for best student presentation* at a national level competition held as part of the 26th Annual Symposium on Applied Surface Analysis, Richland, WA, June, 2004 and the *2004 Undergraduate Research and Creative Activity Award* from Boise State University.
5. Mr. Aaron Thurber (Physics); June, 2004 – July 2006: Worked on Fe doped SnO_2, *published 3 research papers in journals*. Selected for a paper presentation at the National EPSCoR Research Conference, September 2005 to be held at Puerto Rico. Got admitted to MS program.
6. Ms. Prabha Malamakkal (Biology); June – August 2006; Worked on the interactions of nanoparticles with bacteria; Got admitted to MS program.
7. Ms. Jill West (Physics); December 2005 – present; Working on Fe and Sb doped SnO_2 nanoparticles; presented papers in three meetings.
8. Mr. Chadd Vankomen (Physics); May 2005 – present; Working on transition metal doped ZnS and SnO_2. Published several papers.
9. Mr. Sean Stephens (Physics): September – December 2006; Worked on nanoparticle synthesis.
10. Mr. Isaac Coombs (Physics): September 2006 – 2009; Working on nanoparticle synthesis. Published a research paper in Nanoscale Research Letters.
11. Mr. Jason Bell (Biology): December 2006 – 2009; Investigating the toxicity of nanoparticles to biological systems. Published a research paper in Applied Physics Letters.
12. Mr. Robert Ormond (Biology): March 2007 – July 2007; Nanosynthesis.
13. Mr. Andrew Coombs (Physics): May 2007 – 2009; Nanosynthesis. Published a journal paper.
14. Mr. Geoffrey L. Beausoleil II (Physics) – January 2010 – present: Synthesis of Ni and Co doped CeO_2. Published a journal paper.
15. Mr. Gordon A. Alanko (Physics) - January 2010 – present: Size-controlled SnO_2 nanoparticle synthesis. Published a journal paper.
16. Mr. Joshua J. Anghel (Physics) – June 2008 – present: Working on semiconductor thin films and CuO nanoparticles. Published three journal papers.
17. Mr. Kelsey Dodge (Physics) - November 2008 - February 2009: Photocatalytic studies of oxide nanoparticles.

18. Mr. Jordan Chess (Physics) - November 2008 - present: Magnetic studies of dilute magnetic oxide nanoparticles.
19. Mr. Nathan Nixon (Physics) - November 2008 - present: Synthesis of oxide nanoparticles.
20. Ms. Maryam Sabetian (Biology) - May 2007 - present: Zeta potential studies of nanoparticles.

Graduate Students:

1. Mr. Jason Hays (Materials Science and Engineering); August, 2005 – May 2007; Topic: Transition-metals-doped semiconductor oxide powders and thin films. *Published 11 research papers* including 4 during his undergraduate period. Thesis committee chair: A. Punnoose.
2. Mr. Aaron Thurber (Materials Science and Engineering); August, 2006 – present; Topic: Magnetic semiconductors; Thesis committee chair: A. Punnoose. Published several research papers
3. Mr. Russell Benson (electrical engineering); August, 2004 – December 2006; Topic: Preparation and characterization of Cr doped ZnO thin films using a sputter deposition system (in collaboration with Dr. W. B. Knowlton). Published a research papers. Thesis committee chair: Dr. W. B. Knowlton.
4. Mr. Robert Hanson (electrical engineering); August, 2004 – December 2006; Topic: Fabrication of ZnO thin films (in collaboration with Dr. W. B. Knowlton). Published a research papers. Thesis committee chair: Dr. W. B. Knowlton.
5. Mr. Markus Chmielus (Materials Science and Engineering); August, 2006 – present; Topic: Magnetic Shape Memory Alloys (in collaboration with Dr. P. Mullner and Dr. W. B. Knowlton). Published several research papers. Thesis committee chair: Dr. P. Mullner.
6. Mr. Dave Carpenter (Materials Science and Engineering); August, 2006 – present; Topic: Magnetic Shape Memory Alloys (in collaboration with Dr. P. Mullner). Thesis committee chair: Dr. P. Mullner.
7. Ms. Cory Hanley (Biology); August, 2006 – present; Topic: Nanoparticle toxicity (in collaboration with Dr. Denise Wingett and Dr. Kevin Feris). Published several research papers. Thesis committee chair: Dr. D. Wingett.
8. Ms. Lydia Johnson (Materials Science and Engineering): 2008-present; Topic: Synthesis and applications of ZnO nanoparticles; Published several research papers. Thesis committee chair: Drs. A. Punnoose/D. Tenne.
9. Ms. Janet Layne (Biology): May 2007 – present; Topic: Nanoparticles for cancer treatment. Two research papers published. Thesis committee chair: Dr. D. Wingett.
10. Panagiota Louka (Biology): November 2010 – present; Topic: Nanoparticles for cancer treatment. Thesis committee chair: Dr. D. Wingett.

Postdoctoral Fellows:

1. Dr. K. M. Reddy, Ph. D (Indian Institute of Chemical Technology, Hyderabad, India); Jan. 2004 – October 2008. Now working as a research scientist at Ohio State University.
2. Dr. Hua Wang, Ph. D (State Key Laboratory for Chemo/Biosensing and Chemometrics, Hunan University, China) October; 2006 - October, 2007.Now working as a research scientist at Pacific Northwest National Laboratory.
3. Dr. Jianhui Zhang, Ph. D., (Associate Professor, National Laboratory of Solid State Microstructures, Department of Physics, Nanjing University, China), August 2008-August 2010. Now working as an Associate Professor of Physics at Nanjing University, China.
4. Dr. Srinivasa Rao Singamany Ph. D (Indian Institute of Science, Bangalore, India); June 2011 - present.

ACADEMIC SERVICE

Department of Physics:

- Member, Departmental Tenure Committee (review of tenure progress of Assistant Professors), 2006-present
- Member, Biophysics Faculty Search Committee, 2007.
- Chair, Biophysics Faculty Search Committee, 2006.
- Chair, Nanophysics Faculty Search Committee, 2006.
- Member, Biophysics Faculty Search Committee, 2004.
- Member, Biophysics Faculty Search Committee, 2011
- Long-Term Planning Committee, 2002-present.
- Physics Internship Coordinator, College of Arts and Sciences, 2003-present.
- Library coordinator, 2005 – 2006.
- Departmental Mini Research Grants Coordinator, 2005 – 2006
- Member of Physics Curriculum Revision Committee.
- Member of Physics Program Review Committee (review and planning of Physics program)

College of Arts and Science:

- Member, Dean Search Committee, 2006.
- Awards and Honors Committee, 2002-2003.
- Awards and Honors Committee, 2004-2005.
- S/N Fourth Floor Lab Renovation Committee, 2002 - 2004.
- MP 302 Lab Renovation Committee, 2003 - 2004.

- S/N 165 Lab Renovation Committee, 2003 - 2004.
- Reviewed and provide suggestions on the applications of candidates for the Materials Chemistry position in the Department of Chemistry, 2006
- MP 309 Lab Renovation Committee, 2004 - 2005.
- Served/serving as the graduate committee member for Ms. Cory Hanley (Biology), Ms. Janet Layne (Biology) and Panagiota Louka (Biology).

University:

- Intellectual Property and Patent Committee, August 2002 - 2008
- Member, Interdisciplinary Materials Science and Engineering Ph. D program working group (5 members) to develop curriculum and notice of intent.
- Environmental Health and Safety Committee, 2005 – present.
- Faculty Research Advisory Committee, 2005 – 2006.
- Member, TEM (Materials Science) faculty search committee, 2006. Also, visited different TEM vendor sites to identify the most suitable TEM for Boise State.
- Member of the Interdisciplinary Faculty Oversight Committee which launched the interdisciplinary Materials Science and Engineering (MS&E) graduate program at Boise State University. Involved in the curriculum development, 2002 - present
- Member of the university wide committees (Biophysics and Biomaterials research emphases) for the proposed PhD program in Biomolecular Science, 2005.
- Electrical and Computer Engineering PhD Program support faculty group.
- Member of the graduate thesis committee of Russell Benson (electrical engineering), Robert Hanson (electrical engineering), Markus Chmielus (Materials Science and Engineering); Dave Carpenter (Materials Science and Engineering).
- Chair of the graduate thesis committee of Jason Hays (Materials Science and Engineering) 2004-2007
- Chair of the graduate thesis committee of Aaron Thurber (Materials Science and Engineering) 2006-2008.
- Chair of the graduate thesis committee of Ms. Lydia Johnson (Materials Science and Engineering); 2008 -present
- Boise State University Speaker's Bureau.

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SERVICE TO THE SCIENTIFIC COMMUNITY

- Member of the International Organizing Committee of the International Symposium on Solar Cells & Solar Energy Materials, Cancun, Mexico, 2003-2006.
- Member of the International Scientific Committee of the International Conference on Composites/Nano Engineering (ICCE) 2003-2006.
- Technical Advisory Board member of Computational Mechanisms Inc., an Information Technology based company located in Santa Clara, CA.
- Expert Faculty of the International School on EPR Spectroscopy and Free Radical Research, November 17-20, 2004, Mumbai, India.
- Ph. D thesis examiner for students from Indian Institute of Science, Andhra University and Pondichery Univeristy in India.
- Reviewer – Applied Physics Letters, Nature Materials, Nanotechnology, Solid State Communications, Journal of Physics and Chemistry of Solids, Journal of Nanomaterials, Journal of Materials Science, Journal of Physics: Condensed Matter, Physica B, Solid State Chemistry, Physical Review B, Langmuir, Chemistry of Materials, Materials Science and Engineering B, and Journal of Applied Physics.
- Proposal reviewer – National Science Foundation, Research Corporation and Petroleum Research Fund, Pacific Northwest National Laboratory User proposals, Canadian Research Council and Department of Energy Office of Basic Sciences,
- Member, American Physical Society (APS)
- Member, International ESR/EPR Society (IES)
- Member, Asia-Pacific ESR/EPR Society (APES)

TEACHING EXPERIENCE

- PHYS 111 General Physics Lab
- PHYS 112 General Physics Lab
- PHYS 309 Introductory Modern Physics with Applications
- PHYS 310 Introductory Modern Physics Lab
- PHYS 482 Senior Project
- PHYS 515 Solid State Physics (graduate level)
- PHYS 522 Advanced Topics: Solid State Physics (graduate level)
- PHYS 523 Physical Methods of Materials Characterization (graduate level)

- PHYS 696 Directed Research (graduate level)
- PHYS 593 Thesis

REFEREED PUBLICATIONS

*(** indicates undergraduate students, * indicates graduate students)*

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2. Effects of reactive oxygen species scavengers on the antibacterial effects of zinc oxide nanoparticles. Tinker, J., Bryant, S., Thurber, A., Feris, K., Pink, D., Punnoose, A. and C. Hanna, Langmuir (submitted, 2011).

3. Occurrence, origin and control of electron-mediated ferromagnetism in transition metal doped tin dioxide nanoparticles, A. Punnoose, A. Thurber, M. H. Engelhard, C. Van Komen**, M. S. Seehra, V. Shuthanandan, R. Kukkudapu, C. Wang, S. Thevuthasan, K. V. Raman, J. Philip and J. S. Moodera, *Physical Review B* (submitted 2010).

4. Improving the selective cancer killing ability of ZnO nanoparticles using Fe doping, Aaron Thurber, Denise G. Wingett, John W. Rasmussen, Janet Layne*, Lydia Johnson*, Dmitri A. Tenne, Jianhui Zhang, Charles B. Hanna, and Alex Punnoose, *Nanotoxicology* (Submitted after revision 2010)

5. An EPR study of CeO_2 nanoparticles: Effect of doping with 5% Co or Ni ions and varying annealing temperature, S. K. Misra, S. I. Andronenko, J. D. Harris, A. Thurber, G. L. Beausoleil II** and A. Punnoose, *Journal of Applied Physics* (Submitted after revision 2010).

6. An Fe^{3+} EPR Study of Nanoparticles of Magnetic Semiconductor $Zn_{1-x}Fe_xO$, Sushil K. Misra, S. I. Andronenko, L. Johnson*, A. Thurber, and A. Punnoose, *Journal of Applied Physics* (submitted, **2010**).

7. Effect of preparation temperature on the physical properties and magnetism of Co doped ZnO nanoparticles, J. Hays*, A. Thurber and A. Punnoose, Magnetism and Magnetic Materials (submitted, 2010)

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8. Enhanced Dye Fluorescence in novel Dye-ZnO nano-composites. Jianhui Zhang, Aaron Thurber, Dmitri Tenne, Denise Wingett, Charles Hanna, and Alex Punnoose, *Advanced Functional Materials* 20, 4358 (2010)

9. Magnetism of ZnO Nanoparticles: Dependence on crystallite size and surfactant coating ,Aaron P. Thurber, Geoffrey L. Beausoleil II**, Gordon A. Alanko**, Joshua J. Anghel**, Michael S. Jones**, Lydia M. Johnson*, Jianhui Zhang, C. B. Hanna, D. A. Tenne, and Alex Punnoose, *Journal of Applied Physics*, 109, 07C305 (2011).

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20. Dopant Spin States and Magnetic Interactions in Transition Metal Doped Semiconductor Nanoparticles. A. Punnoose, K. M. Reddy, J. Hays, A. Thurber, S. Andronenko and S. K. Misra, *Applied Magnetic Resonance,* Vol. 36, pages 331-345 (**2009**).

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Patents

96. "Method for Producing Above Room Temperature Ferromagnetic Semiconductor Nanoparticles for Spintronic and Nanoscale Device Applications" A. Punnoose, Provisional patent application submitted by Boise State University, December, 2003; Conventional patent application filed on August 1, **2005**. Approved.

97. A Novel Magnetic Gas Sensor Using Antiferromagnetic Hematite Nanoparticles Detecting Gases Magnetically, A. Punnoose, K. M. Reddy, Jason Hays*, Aaron Thurber**, Invention disclosure submitted to Boise State University, May 2006; Provisional patent application filed December **2006**. Approved.

98. "Development of ferromagnetism in SnO_2 by Fe doping" A. Punnoose, Provisional patent application submitted by Boise State University, September 2004; Conventional patent application filed on August 1, **2005**. Pending.

99. "ZnO nanoparticles with preferential killing ability for cancer cells" Denise Wingett, Alex Punnoose, K. M. Reddy, Patent Pending. US Patent Application No. 60/974,460, and PCT Patent Application No. PCT/US08/077252, **2008**. Pending.

100. Dye encapsulated fluorescent ZnO particles with cell-specific toxicity for cancer treatment and bio-medical applications. Wang H, Punnoose A, Wingett D, Reddy KM, Feris K. Patent Pending, US Patent Application No.60/974,461, and PCT Patent Application No. PCT/US08/77284, **2008**. Pending.

101. 12/235,575 (projected patent number 7,939,560) issued on April 20, 2011, Fluorescent Particulates Comprising Nanoscale ZnO Layer and Exhibiting Cell-Specific Toxicity.

102. 12/235,415, response to office action filed (awaiting response from Examiner) May 28, 2009; Preferential Killing of Cancer Cells and Activated Human T Cells Using ZnO Nanoparticles.

103. 13/079,469, filed as a continuation-in-part of 12/235,575, April 4, 2011, Fluorescent Particulates Comprising Nanoscale ZnO Layer and Exhibiting Cell-Specific Toxicity.

104. 13/079,594 filed April 4, 2011, Nanoparticles that Preferentially Associate with and Kill Diseased Cells for Diagnostic and Therapeutic Applications.

CONFERENCE PRESENTATIONS

*(** indicates undergraduate students, * indicates graduate students)*

Invited Talks

1. *Recent Advances in the Development of Dilute Magnetic Semiconductor Oxides*, International Materials Research Congress (IMRC), October 28-November 1, 2007, Cancun, Mexico.
2. *Nanotoxicity and Nanoparticle-based Biomedical Applications,* Idaho State level workshop on Nanotechnology in biomedical advances, October 12, 2007, Post falls, Idaho.
3. *Oxide Semiconductor Nanostructures*
   Department of Physics, Indian Institute of Science, Bangalore, India on June 5, 2003
4. *Dilute Magnetic Semiconductor Nanoparticles*
   Chemistry Department, University of Idaho, April 26, 2007.
5. *Carrier controlled ferromagnetism in chromium doped indium oxide thin films – a ferromagnetic semiconductor,* 17th International Conference on Magnetism (ICM) August 24-27, 2006, in Kyoto, Japan.
6. *Semiconductor Nanoparticles,* International Materials Research Congress (IMRC), Cancun, Mexico, August 21-23, 2006

7. *Physics of Nanoscale oxides*; Department of Physics, Idaho State University, 2006.
8. *Nanoscale Semiconductor Oxides for Multifunctional Device Applications*, International Materials Research Congress (IMRC), August 22-26, 2004, Cancun, Mexico.
9. *EPR Studies of Magnetic Nanoparticles*, 4th Asia-Pacific EPR Symposium, November 22-25, 2004, Bangalore, India.
10. *Development of Novel Spintronics Materials*, Center for Materials for Advanced Technology (c-MAT), Trissur, India, December 3, 2004.
11. *Band Theory and Semiconductor Nanoparticles*, National Seminar on Solid State Physics, Uzhavoor, India, November 25-28, 2004.
12. *Room temperature Ferromagnetism in Transition-metal-doped Semiconductors,* 10th International Conference on Composites/Nano Engineering, July, 2003, New Orleans.
13. *Finite Size Effects in CuO Nanoparticles,* 9th International Conference on Composites Engineering, July, 2002, San Diego.
14. *Nanoscale Magnetism* Indian Institute of Science, Bangalore, India on June 5, 2003
15. *Dilute Magnetic Semiconductors* Pacific Northwest National Laboratory, August 29, 2003.
16. *Electron Magnetic Resonance in Magnetic Nanoparticles* 31st AMPERE Congress on Magnetic Resonance and Related Phenomena, at Adam Mickiewicz University, Poznan, Poland, July 14-19, 2002.

Contributed Presentations

1. Synthesis and Characterization of Transition Metal-doped ZnO; Lytia A. Smith**, Theron R. Fereday**, Jerry D. Harris, Jason Brotherton**, Aaron Thurber, William B. Knowlton, Alex Punnoose and Brian J. Frost, poster presentation at the Spring 2010 National Meeting of the American Chemical Society (San Francisco, California, March 21 - 25, **2010**).
2. Magnetism of ZnO Nanoparticles: Dependence on crystallite size and surfactant coating ,Aaron P. Thurber, Geoffrey L. Beausoleil II**, Gordon A. Alanko**, Joshua J. Anghel**, Michael S. Jones**, Lydia M. Johnson*, Jianhui Zhang, C. B. Hanna, D. A. Tenne, and Alex Punnoose, 55th Magnetism and Magnetic Materials conference (AIP) in Atlanta, November **2010**.
3. An EPR study of CeO_2 nanoparticles: Effect of doping with 5% Co or Ni ions and varying annealing temperature, S. K. Misra, S. I. Andronenko, J. D.Harris, A. Thurber, G. L. Beausoleil II** and A. Punnoose, 55th Magnetism and Magnetic Materials conference (AIP) in Atlanta, November **2010.**

4. Synthesis and Characterization of ZnO Sol-gel Powders; Amanda R. Snyder**, Lytia A. Smith**, Theron R. Fereday**, Jerry D. Harris, Aaron Thurber, Jason Brotherton, Pamela Walker, William B. Knowlton, and Alex Punnoose, poster presentation at the Spring 2010 National Meeting of the American Chemical Society (San Francisco, California, March 21 - 25, **2010**).

5. Growth and Characterization of ZnO Thin Films; Theron Fereday**, Lytia Smith**, Amanda Snyder**, Jerry D. Harris, Aaron Thurber, Jason Brotherton**, William B. Knowlton, Alex Punnoose, Seth M. Hubbard, and Brian J. Frost, poster presentation at the Spring 2010 National Meeting of the American Chemical Society (San Francisco, California, March 21 - 25, **2010**).

6. An Fe^{3+} EPR Study of Nanoparticles of Magnetic Semiconductor $Zn_{1-x}Fe_xO$, Sushil K. Misra, S. I. Andronenko, L. Johnson, A. Thurber, and A. Punnoose, 11th joint Intermag-MMM conference, January 11-18, Washington DC, **2009**.

7. Correlation between saturation magnetization, bandgap and lattice volume of transition metal (M = Cr, Mn, Fe, Co or Ni) doped $Zn_{1-x}M_xO$ nanoparticles for x = 0.02 and 0.05; J. Anghel, A. Thurber, D. Tenne, C. B. Hanna, A. Punnoose, 11th joint Intermag-MMM conference, January 11-18, Washington DC, **2009**.

8. Transition metal dopants essential for producing ferromagnetism in nanoparticles, L. Johnson, A. Thurber, J. Anghel, M. Sabetian, D. Tenne, C. B. Hanna, A. Punnoose, 11th joint Intermag-MMM conference, January 11-18, Washington DC, **2009.**

9. Size-controlled preparation of CuInS2 nanoparticles in supercritical CO_2. Pak, Joshua J.; Rodriguez, Rene G.; Fox, Robert V.; Punnoose, Alex; Thurber, Aaron; Bajracharya, Cyril; Lau, Lisa D. Abstracts of Papers, 236th ACS National Meeting, Philadelphia, PA, United States, August 17-21, **2008** (2008), INOR-240

10. Spontaneous Formation of Ternary I-III-VI Chalcogenide Nanoparticles Using Supercritical CO2. Rodriguez, Rene G.; Pak, Joshua J.; Lau, Lisa D.; Fox, Robert V.; Punnoose, Alex; Thurber, Aaron. Abstracts, Joint 63rd Northwest and 21st Rocky Mountain Regional Meeting of the American Chemical Society, Park City, UT, United States, June 15-18 (**2008**), NWRM-276.

11. High sensitivity magnetic gas sensing using magnetic semiconductor nanoparticles. A. Thurber, A. Punnoose and K.M. Reddy, 53rd Magnetism and Magnetic Materials conference (AIP) in Austin, TX November **2008**:

12. Transition from n-type to p-type destroys ferromagnetism in semiconducting Sn1-xCoxO2 and Sn1-xCrxO2 nanoparticles. C.B. Van Komen, M.S. Seehra and A. Punnoose, Physics, Boise State University, Boise, ID; 53rd Magnetism and Magnetic Materials conference (AIP) in Austin, TX November **2008**:

13. Electron Paramagnetic Resonance (EPR) study of Cr^{3+} in Nanoparticles of SnO_2. S.K. Misra, S.I. Andronenko, S. Rao, S.V. Bhat, C. Van Kormen and A. Punnose , 53rd Magnetism and Magnetic Materials conference (AIP) in Austin, TX November **2008**:

14. Resonance properties and anisotropy of Ni-Mn-Ga thin films of different thickness deposited on Si substrate. V. Golub, K.M. Reddy, V. Chernenko, P. Müllner, A. Punnoose and M. Ohtsuka, 53rd Magnetism and Magnetic Materials conference (AIP) in Austin, TX November **2008:**

15. K. Feris, K. M. Reddy, and Alex Punnoose, "Selective toxicity of zinc oxide nanoparticles to gram-positive and gram-negative bacterial systems", The American Society for Microbiology, 107th General Meeting in the Metro Toronto Convention Centre in Toronto, Canada , May 21 - 25, **2007**.

16. Denise G. Wingett, Kevin Feris, Cory Hanley*, K. M. Reddy, H. Wang and Alex Punnoose, "Evaluation of potential toxicity issues and nanomedicine based applications of ZnO nanoparticles", Keystone Symposium "Nanotechnology in Biomedicine", Feb, 11-16, **2007**, Tahoe City, CA.

17. K. M. Reddy and A. Punnoose, "Mapping ferromagnetism in $Ti_{1-x}Co_xO_2$ – Role of preparation temperature (200 – 900^oC) and doping concentration ($0.00015 < x < 0.1$)"; Accepted for presentation in *51st Annual Conference on Magnetism and Magnetic Materials*., Baltimore, January **2007**;

18. Aaron Thurber**, Alex Punnoose; "High-temperature field-induced activation of ferromagnetism in $Ce_{1-x}Ni_xO_2$"; Accepted for presentation in *51st Annual Conference on Magnetism and Magnetic Materials*., Baltimore, January **2007**.

19. Sushil K Misra, S. I. Andronenko, K. M. Reddy, J. Hays*, A. Thurber**, A. Punnoose, "An Fe^{3+} Electron Paramagnetic Resonance Study of $Sn_{1-x}Fe_xO_2$"; Accepted for presentation in *51st Annual Conference on Magnetism and Magnetic Materials*., Baltimore, January **2007**.

20. A. Punnoose, K. M. Reddy, A. Thurber** and J. Hays*; "Hematite based novel nanoscale magnetic gas sensor: Gas selectivity and temperature dependence" Accepted for presentation in *51st Annual Conference on Magnetism and Magnetic Materials*., Baltimore, January **2007**.

21. K. M. Reddy, J. Hays*, A. Thurber** and A. Punnoose; "Magnetic gas sensing using $Sn_{0.95}Fe_{0.05}O_2$: A novel application of magnetic semiconductor nanoparticles", Accepted for presentation in *51st Annual Conference on Magnetism and Magnetic Materials*., Baltimore, January **2007**.

22. K. M. Reddy, R. Benson*, J. Hays*, A. Thurber**, M. H. Engelhard, V. Shutthanandan, R. Hanson*, W. B. Knowlton, and A. Punnoose, "$Zn_{1-x}Cr_xO$ Thin Films Deposited by Reactive Co-sputtering", DoE EPSCoR Annual Statewide Meeting, Pocatello, September 18-20, **2006**.

23. Aaron Thurber**, J. Hays*, K. M. Reddy, and A. Punnoose, "Effects of Transition-Metal Doping on Ferromagnetic Metal Oxide Nanoparticles", Boise State Day Undergraduate Student Research Presentations, January 15, **2006**, Boise, Idaho.

24. A. Punnoose, "Nanoscale Semiconductor Oxides (Invited)", International Materials Research Congress (IMRC), Cancun, Mexico, August 21-24, **2006**.

25. K. M. Reddy, R. Benson*, R. Hansen*, J. Hays*, A. Thurber**, M. H. Engelhard, V. Shutthanandan, S. Thevuthasan, W. B. Knowlton and A. Punnoose, "On the Room Temperature Ferromagnetism of $Zn_{1-x}Cr_xO$ Thin films Deposited by Reactive Co-sputtering", International Materials Research Congress (IMRC), Cancun, Mexico, August 21-24, **2006**.

26. A. Thurber**, J. Hays*, K. M. Reddy, and A. Punnoose, "Effect of Fluorine Doping on the Ferromagnetic Properties of $Sn_{0.95}Fe_{0.05}O_2$", International Materials Research Congress (IMRC), Cancun, Mexico, August 21-24, **2006**.

27. K. M. Reddy, J. Hays*, S. Kundu, L. K. Dua, P. K. Biswas, C. Wang, V. Shutthanandan, M. H. Engelhard and A. Punnoose, "Magnetic properties of Chemically Synthesized Transparent Mn Doped ITO films", International Materials Research Congress (IMRC), Cancun, Mexico, August 21-24, **2006**;

28. Jill West**, J. Hays*, K. M. Reddy, and A. Punnoose, "Condensed Matter Physics and Nanomaterials Research at Boise State University" Boise State Day Undergraduate Student Research Presentations January 15, **2006**, Boise, Idaho

29. J. Hays*, K. M. Reddy, and A. Punnoose, "Effect of preparation conditions on the Fe incorporation and ferromagnetism of $Sn_{1-x}Fe_xO_2$: A Raman spectroscopic investigation", Boise State Day Undergraduate Student Research Presentations January 15, **2006**, Boise, Idaho

30. A. Thurber**, J. Hays*, K. M. Reddy, and A. Punnoose, "Microstructural Characterization of Transition-Metal Doped Metal Oxide Nanoparticles", NSF-EPSCoR Conference Rio Grande, Puerto Rico, September 26-28, **2005**.

31. K. M. Reddy, J. Hays*, A. Thurber**, R. Hansen*, R. Benson*, M. H. Engelhard, V. Shutthanandan, C. Wang, S. Thevuthasan, W. B. Knowlton and A. Punnoose, "Optical and Magnetic properties of Transition metal doped ZnO and TiO_2", DOE/NSF EPSCoR Conference 2005, Morgantown, WV, June 14-16, **2005**.

32. M. Hagler**, P. Mullner, W. B. Knowlton, A. Punnoose, M. Aguirre, "Magneto-Mechanical Properties of Ni-Mn-Ga with different microstructures", International Conference on Magnetic Shape Memory Alloys", Ascona, Switzerland , September **2005**.

33. V. Shutthanandan, S. Thevuthasan, T. Droubay, T. C. Kaspar, and S.A. Chambers, A. Punnoose and J. Hays**, "Quantification of Dopant Concentrations in Diluted Magnetic Semiconductors using Proton Induced X-ray Emission" *17th International Conference on Ion Beam Analysis* (IBA2005), June 26 - July 1, **2005**, Sevilla, Spain.

34. B. Kim, J. Holmes**, K. M. Reddy, and A. Punnoose, "A Comparative Study of the Magnetic Domain Structure of Mn Doped ITO Thin Films by Magnetic Force Microscopy", AVS 52nd International Symposium, October 30-November 4, **2005**, Boston, MA

35. J. Hays**, A. Thurber**, M. H. Engelhard, K. M. Reddy and A. Punnoose, "Development and Processing Temperature Dependence of Ferromagnetism in

$Zn_{0.98}Co_{0.02}O$", *50th Annual Conf. on Magn. Magn. Mater*., San Jose, October 30-November 3, **2005**.

36. Xavier Mathew, C. Mejía-García*, G. Contreras-Puente, J. Hays**, and A. Punnoose, "A Raman spectroscopic investigation on the effect of preparation conditions on the Fe incorporation and ferromagnetism of $Sn_{1-x}Fe_xO_2$", *50th Annual Conf. on Magn. Magn. Mater*., San Jose, October 30-November 3, **2005**.

37. S. K. Misra, Serguei I. Andronenko, K. M. Reddy, J. Hays**, and A. Punnoose, "Electron Paramagnetic Resonance of Co^{2+} Ions in Nanoparticles of SnO_2 Processed at Different Temperatures (350 ^oC, 600 ^oC)", *50th Annual Conf. on Magn. Magn. Mater*., San Jose, October 30-November 3, **2005**.

38. J. Philip, P. R. LeClair and J. S. Moodera, K. M. Reddy and A. Punnoose, "Origin of ferromagnetic behavior in Cr doped Indium oxide thin films", *50th Annual Conf. on Magn. Magn. Mater*., San Jose, October 30-November 3, **2005**.

39. H. Shim*, A. Manivannan and M. S. Seehra, K. M. Reddy and A. Punnoose, "Effect of Interparticle Interaction on the Magnetic Relaxation of NiO Nanorods" *50th Annual Conf. on Magn. Magn. Mater*., San Jose, October 30-November 3, **2005**.

40. K. M. Reddy, R. Benson*, Z. Clark**, R. Hansen*, J. Hays**, A. Thurber**, M. H. Engelhard, V. Shutthanandan, S. Thevuthasan, W. B. Knowlton and A. Punnoose, "On the Room Temperature Ferromagnetism of $Zn_{1-x}Cr_xO$ Thin films Deposited by Reactive Co-sputtering", *DoE-EPSCoR Annual Review Meeting,* Moscow, ID, September, **2005**.

41. A. Thurber** and A. Punnoose, "Sol-gel Synthesis of Novel semiconductor Oxide Materials" Boise State Day Undergraduate Student Research Presentations January 19, **2005**, Boise, Idaho

42. A. Punnoose and M. S. Seehra "Electron Magnetic Resonance Studies of Magnetic Nanoparticles (Invited)" 4th Asia Pacific EPR symposium, Bangalore, India, November 22 – 26, **2004**.

43. A. Punnoose, "Development of Novel Spintronics Materials (Invited)" Center for Materials for Advanced Technology (c-MAT), Trissur, India, December 3, **2004**.

44. A. Punnoose, "Band Theory Applied to Novel Semiconductor Materials (Invited)", National Seminar on Solid State Physics, Uzhavoor, India, November 25-28, **2004**.

45. A. Punnoose, "Nanoscale Semiconductor Oxides for Multifunctional Device Applications (Invited)", A. Punnoose, International Materials Research Congress (IMRC), Cancun, Mexico, August 22-26, **2004**;

46. J. Hays**, V. Gopal, R. Baldner, V. Shutthanandan, J. Peloquin and A. Punnoose, "Microstructural Characterization of Nanoscale Magnetic Semiconductor $Sn_{1-x}Co_xO_2$" *26th Annual Symposium on Applied Surface Analysis*, Richland, WA, June 15-18, **2004**;

47. A. Punnoose and J. Hays**, "Possible Metamagnetic Origin of Ferromagnetism in Transition-Metal-Doped SnO_2" *49th Annual Conf. on Magn. Magn. Mater*., Jacksonville, FL, Nov. 7 – 11, **2004**.
48. J. Hays** and A. Punnoose, "Tailoring the Physical Properties of Semiconductors Through Fe Doping", *Undergraduate Research and Professional Practice Conference*, Boise StateUniversity, April 19, **2004**, Boise, Idaho.
49. J. Hays** and A. Punnoose, "New Magnetic Semiconductors for Spintronic Applications", Boise State Day Undergraduate Student Research Presentations January 21, **2004**, Boise, Idaho.
50. A. Punnoose, J. van Tol, L. C. Brunel, M. S. Seehra, "High-frequency/High-field Electron Magnetic Resonance Studies of Ferrihydrite Nanoparticles". American Physical Society March Meeting, Austin TX (March, **2003**).
51. A. Punnoose, "Room Temperature Ferromagnetism in Transition Metal Doped Semiconductors (Invited)" *Procedings of the Tenth International Conference on Composites/Nano Engineering,* July 20-24, **2003**, New Orleans, LA.
52. A. Punnoose, E. H. Morales, D. Lederman and M. S. Seehra, "X and Q-band ferromagnetic resonance studies of exchange biased Co/MnPt bilayers" American Physical Society March Meeting, Austin TX (March, **2003**).
53. A. Punnoose, M. S. Seehra, W. K. Park and J. S. Moodera, "Is $Co_xTi_{1-x}O_2$ a Spin-glass system?"American Physical Society March Meeting, Austin TX (March, **2003**).
54. A. Punnoose, M. S. Seehra, W. K. Park and J. S. Moodera "On the origin of room temperature ferromagnetism in Co-doped TiO_2 films", Contributed presentation in the 47th Annual Conference on Magnetism and Magnetic Materials, Tampa, FL, November 11-15, **2002**.
55. A. Punnoose and M. S. Seehra "Electron Magnetic Resonance in magnetic nanoparticles.", Invited presentation in the 31st Ampere Congress on Magnetic Resonance and Related Phenomena, Poznan, Poland, July 14-19, **2002**
56. A. Punnoose and M. S. Seehra, "Finite size effects in CuO nanoparticles." Invited presentation in the 9th International Conference on Composites Engineering, July 1-6, **2002**, San Diego, CA.
57. D. Lederman, A. Punnoose, T. Charlton and M. S. Seehra, "Low magnitude of Co magnetization in $[Co(17Å)/Re(6Å)]_{20}$ superlattice.", Podium presentation in the American Physical Society March meeting, **2001**.
58. A. Punnoose, M. S. Seehra and S. Mahamuni, "Magnetic properties of TOAB capped CuO nanoparticles." Podium presentation in the American Physical Society March meeting, **2002**.
59. A. Punnoose and M. S. Seehra, "Particle size dependence of exchange bias, coercivity and Néel temperature of CuO nanoparticles", Podium presentation in the American Physical Society March meeting**, 2002**.

60. A. Punnoose and M. S. Seehra, "Hysteresis anomalies and exchange bias in 66A CuO nanoparticles." Podium presentation at the 46th Annual Conference on Magnetism and Magnetic Materials, Seattle, U. S. A, November 12-16, **2001**.

61. A. Punnoose and M. S. Seehra, "Temperature dependence of paramagnetic resonance in pure and doped ferrihydrite nanoparticles." Poster presentation at the Third Asia-Pacific EPR/ESR Symposium, Kobe University, Japan, October 28-November 2, **2001**.

62. A. Punnoose and M. S. Seehra, "Investigations of copper chloride and tungstated zirconia catalysts using x-ray diffraction and electron spin resonance spectroscopy", Podium presentation at the Annual Technical Meeting of the Consortium for Fossil Fuel Liquefaction Science, Lexington, Kentucky, U. S.A., August 5-8, **2001**.

63. M. S. Seehra, A. Manivannan, A. Raman, A. Punnoose and P. Roy, "Structural properties of ferrihydrite nanoparticles determined by x-ray diffraction and FTIR spectroscopy", Poster presentation at the Eleventh Conference on Computational Research on Materials, Morgantown, West Virginia, U. S. A., May 9-11, **2001**.

64. A. Punnoose, M. S. Seehra, N. Shah and G. P. Huffman, "Temperature variations of magnetic resonance and low-field magnetization in antiferromagnetic nanoparticles of doped ferrihydrites.", Poster presentation at the Eleventh Conference on Computational Research on Materials, Morgantown, West Virginia, U. S. A., May 9-11, **2001**.

65. A. Punnoose and M. S. Seehra, "Magnetic hysteresis anomalies in CuO nanoparticles.". Poster presentation at the Eleventh Conference on Computational Research on Materials, Morgantown, West Virginia, U. S. A., May 9-11, **2001**.

66. A . Punnoose, H. Magnone and M. S. Seehra, "Synthesis and antiferromagnetism of Mn_5O_8.", Podium presentation at the 8th joint MMM-Intermag conference, San Antonio, Texas, U. S. A., January 7-11, **2001**.

67. M. S. Seehra, A. Punnoose, P. Roy, and A. Manivannan, "Effect of Si doping on the ESR properties of ferrihydrite nanoparticles.", Podium presentation at the 8th joint MMM-Intermag conference, San Antonio, Texas, January 7-11, **2001**.

68. A. Punnoose and M. S. Seehra, "Investigations of catalysts and catalytic processes using x-ray diffraction, magnetometry and electron spin resonance spectroscopy.", Podium presentation at the Annual Technical Meeting of the Consortium for Fossil Fuel Liquefaction Science, Washington, U. S.A., July 30-August 2, **2001**.

69. A. Punnoose and M. S. Seehra, "Synthesis and magnetic properties of CuO nanoparticles.", Poster presentation at the Eleventh Conference on Computational Research on Materials, Morgantown, West Virginia, U. S. A., May 17-19, **2001**.

70. M. S. Seehra, A. Punnoose, L. Ma and K. M. Chang, "Effects of the beta phase on the properties of Alloy 783", Poster presentation at the Eleventh Conference on Computational Research on Materials, Morgantown, West Virginia, U. S. A., May 17-19, **2001**.

71. B. P. Maurya, A. Punnoose, Mohd Ikram and R.J.Singh, "EPR study of Mn^{2+} ion doped in potassium oxalate monoperhydrate single crystal.", Podium presentation at the DAE (Department of Atomic Energy) Solid State Physics Symposium, Jaipur, India, December 27-31, **1994**.
72. M. Ikram, A. Punnoose, B.P.Maurya and R.J.Singh, "An EPR and XRD study of CaO-CuO and SrO-CuO systems", Poster presentation at the DAE Solid State Physics Symposium, Jaipur, India, December27-31, **1994**.
73. A. Punnoose, Mohd Ikram, B.P.Maurya and R.J.Singh, "EPR study of exchange coupled copper clusters in $Y_2Cu_2O_5$", Podum presentation at the DAE Solid State Physics Symposium, Jaipur, India, December 27-31, **1994**.
74. A. Punnoose, "Electron paramagnetic resonance studies of the constituents of high-Tc superconductors(Thesis Abstract)", Podium presentation at the DAE Solid State Symposium, BARC, Bombay, India, December 27-31(**1993**).
75. A. Punnoose, Mohd Ikram, B.P.Maurya and R.J.Singh, "Spin glass behaviour in oxygen deficient CuO powder.", Podium presentation at the DAE Solid State Physics Symposium, BARC, Bombay, India, December 27-31 (**1993**).
76. A. Punnoose, B.P.Maurya and R.J.Singh, "A magnetic transition in CuO thin films", Podium presentation at the 80th Indian Science Congress, Goa, India, January 3-8, **1993** (proceedings PP. 9.).

RESEARCH GRANTS

PI or co-PI of 24 grants awarded during 2002-2010, totaling ~ **$7.81M**

Number of proposals submitted: **78**

Number proposals funded: **24**

Funded Projects

1. "NSF-MRI: Acquisition of an XPS system for interdisciplinary Research and Education"; Agency: National Science Foundation; PI: A. Punnoose; Co-PIs: D. Butt (MSE), T. Fujiwara (Chemistry), K. Feris (Biology), J. Harris (Chemistry, NNU), Duration: 2007-2010; Amount: **$744,000**.
2. "Novel nanostructured materials for solar cell and nanoelectronics applications" DoE EPSCoR program; PI: R. Holman (ISU), Co-PIs: A. Punnoose (BSU), D.

Tenne (BSU), J. Pak (ISU), A. Hunt (ISU), R. Rodriguez (ISU), P. Shapiro (UI), Y. Qiang (UI), L. Bergmann (UI) and C. Berven; Duration: 2007-2010; Amount: **$1.35M.**

3. MRI: Acquisition of a FACS (Fluorescent Activated Cell Sorter) to Support Collaborative Research and Education in Bimolecular Sciences and Nanomaterials Applications; **$683,775**; 2008-2011; PI: Denise Wingett; Co-PI: Alex Punnoose; National Science Foundation; Award Number: DBI-0821233.
4. Utility of Zinc Oxide Nanoparticles for Selective Cancer Cell Killing; **$5,000**; 2008-2009; PI: Denise Wingett; Co-PI: Alex Punnoose; St. Luke's Mountain States Tumor & Medical Research Institute; Award Number: NECWINGETT6382.
5. Semiconductor-Based Nanotechnology Applications; **$750,000**; 2009-2011; PI: Charles Hanna; Co-PI: Alex Punnoose; Department of the Army/DOD; Award Number: W911NF-09-1-0051.
6. Collaborative Research: RUI: A Study of the Solution-Based Synthesis of Ndoped ZnO, Mn- and Co-doped ZnO, and (N,Co)-codoped ZnO; **$63,530**; 2008-2011; PI: William Knowlton; Co-PI: Alex Punnoose; National Science Foundation; Award Number: DMR-0840227.
7. "NSF-Europe Materials Collaboration: Micromechanics of Magnetic Shape-Memory Alloys" Agency: National Science Foundation-REU supplement proposal; Duration: 2006; Amount: **$13,000**; Peter Mullner (PI), Alex Punnoose (Physics) and Bill Knowlton (MSE, ECE).
8. "CAREER-Development and investigations of Transition Metal Doped Ferromagnetic SnO_2 Thin Films and Structures" Agency: National Science Foundation; Duration: 2005-2010; Amount: **$400,000**; PI: A. Punnoose.
9. "Acquisition of a Transmission Electron Microscope for Multidisciplinary Research and Education", NSF-MRI proposal (2005-2008); Amount: **$ 997,000** [$692,000 (NSF), $125,000 (Micron) and $ 180,000 (BSU)]: PIs: J. Hampikian (PI), A. Punnoose, P. Mullner, and J. Oxford (co-PIs).
10. "NSF-Europe Materials Collaboration: Micromechanics of Magnetic Shape-Memory Alloys". Duration: 2005-2008; Agency: National Science Foundation; Amount: **$220, 000**; PIs: P. Mullner (PI), A. Punnoose and W. B. Knowlton (co-PIs)
11. "Biophysical and Biochemical Characterization of Protein Structure and Molecular Interactions in Cell Signalling", Agency: Boise State University-ORA Collaborative Grant Improvement Initiative. Duration: 2005-2007; Amount: **$150,000**; PIs: J. Oxford (PI), A. Punnoose, B. Kim, N. H. Taylor, H. Charlier, B. Knowlton, J. Peloquin and S. Smith (co-PIs).
12. "MRI/RUI: Acquisition of an EPR Spectrometer for Collaborative Research and Materials Science Education"; Agency: National Science Foundation; Duration: 2003-2006; Amount: **$338,795**; PIs: A. Punnoose (PI), S. Shadle, W. B. Knowlton and J. Oxford (co-PIs).

13. "Synthesis and Characterization of Wide-Band-Gap Semiconductors for Optoelectronic Applications"; Agency: Department of Energy; Duration: 2004-2007; Amount: **$1,10xx0,000**; PIs: P. Griffiths (UI), A. Punnoose (BSU), P. Shapiro (UI), Y. Quiang (UI), J. Pak (ISU), R. Rodriguez (ISU), L. Bergmann (UI) and C. Wai (UI).
14. "Origin of Room Temperature Ferromagnetism in Co Doped TiO_2 Thin Films"; Agency: Research Corporation; Duration: 2003-2006; Amount: **$52,583**; PI: A. Punnoose
15. "Novel Physical and Gas-sensing Properties of $Sn_{1-x}M_xO_2$ Magnetic Semiconductors"; Agency: Petroleum Research Fund AC grant; Duration: 2004-2006. Amount: **$80,000**; PI: A. Punnoose
16. "Upgrading the Magnetization Measurement Capabilities of an Existing Magnetometer"; Agency: NSF-Idaho-EPSCoR Instrumentation program;; Duration: 2004-2005; Amount: **$98,000**; PIs: A. Punnoose(PI), C. Hanna, W. B. Knowlton, A. Moll and D. Warner (co-PIs).
17. "Magnetic Nanostructures"; Agency: NSF-Idaho-EPSCoR Research grant; ; Period: 2002-2005 (statewide program)
    Amount: **$398,000** (Punnoose's share out of 9 million).
18. "Synthesis and Studies of Ferromagnetic GaMnN"; Agency: Idaho EPSCoR-Collaborative Nano-research; Duration: 2003-2004; Amount: **$5,000**; PI: A. Punnoose
19. "Cluster-Assembled Magnetic Nanostructures"; Agency: Idaho EPSCoR-Collaborative Nano-research; Duration: 2003-2004; Amount: **$5,000**; PI: A. Punnoose
20. "Application of Nanowire Materials in Aqueous Nanosensors and cell Biology Research", Agency: National Science Foundation; Duration: 2005 – 2008; Amount: **$152,723** (Punnoose's share out of 9 million total).
21. 2005 Faculty Research Associates Program award, Agency: Boise State University; Amount: **$4,800**; PI: A. Punnoose
22. College of Arts and Sciences Travel Grant - 2003; Agency: Boise State University; Amount: **$300**; PI: A. Punnoose.
23. "Magneto Optical Kerr effect System: Micron Equipment Donation";Agency: Micron Technology, Boise; Duration: 2004 – 2005; Amount: **$150,000** (Punnoose's share out of $1,000,000 approximately) PIs: A. Punnoose and A. Moll.
24. "Development of Materials Characterization CD-ROM of Virtual Labs"; Alex Punnoose; 2006 Mini grant-COAS, Boise State University; Amount: **$1,000**.

Declined Proposals

25. "ITR/RUI: Synthesis and Investigation of Ferromagnetic Transition-metal-doped GaN"; Agency: National Science Foundation; Amount: $1,258,059;

Submission date: 02/12/03; PIs: A. Punnoose, D. N. McIlroy (UI), L. Bergman, UI.

26. "An REU Site in Chemistry at Boise State University"; Agency: National Science Foundation; Amount: $208,543; Submission date: 03/01/05; PI: Susan Shadle.
27. "DEPSCoR: New Transparent Magnetic Semiconductors for Spintronic Applications"; Agency: AFOSR; Amount: $500,000; Submission date: 10/01/02; PI: A. Punnoose (Top ranked proposal in the statewide competition)
28. "Investigation of the Magnetic Properties of Ferrihydrite Nanoparticles"; Agency: Faculty Research Grant Program, BSU; Amount: $5,000; Submission date: 02/03/03; PIs: A. Punnoose;
29. "Acquisition of a Magnetron Sputtering System for the Fabrication of Magnetic Thin Films, Multilayers and Spintronic Devices"; Agency: EPSCoR-Instument Acquisition Program 2003 ; Amount: $100,000; PI: A. Punnoose.
30. "CAREER-Experimental Investigations of ZnO-MO Systen for Spintronic Applications"; Agency: National Science Foundation; Amount: $400,000; Submission date: 07/24/03; PI: A. Punnoose.
31. "Soil/Clutter Electromagnetic Parameter Characterization", Agency: DoD-SBIR; Amount: $10,000; PI: J. Deak of Non-Volatile Electronics Corporation (with A. Punnoose as sub-contractor).
32. "Acquisition of an Inert Atmosphere Glovebox: A Multi-User Instrument for the College of Arts and Sciences". NSF-Idaho-EPSCoR Instrumentation program; Amount: $70,000; Submission date:01/21/04; PI's: Jeff Peloquin, Dale Russell, Don Warner; Bill Knowlton; Alex Punnoose.
33. "Nanoscale Magnetic Materials for Perpendicular Recording Media with Ultra-High Density". Wei Jiang Yeh, Phys. UI, Yang-Ki Hong, Materials Science, UI, You Qiang, Phys. UI, Alex Punnoose, Phys. BSU; EPSCoR II renewal pre-proposal for the nanomaterials part.
34. "Control of Spin Interactions and Dynamics of Magnetic Configuration"; DoD-EPSCoR 2004; Amount: $710,000; PIs: Y. Qing, Y-K Hong and A. Punnoose;
35. "Linked-particle nanowires for nanocircuitry"**;** Christopher Berven (Physics, UI), Charles Hanna (Physics, BSU), Alex Punnoose (Physics, BSU), Pam Shapiro (Chemistry, UI), EPSCoR II renewal pre-proposal for the nanomaterials part.
36. "Development of Novel Multifunctional Microelectronic Materials for Device Applications"; Punnoose (PI) and Hanna, (*Physics)*; Mullner, (*Mat. Sci.)*; Jessing and Knowlton, (*Elec. Eng).* NSF-EPSCoR II renewal pre-proposal for non-nano part.
37. "Development of Novel Multifunctional Devices Using Tailored Transparent Ferromagnetic Semiconductors"; A. Punnoose (PI), C. Hanna, B. Kim and J.

Peloquin, DoD-DEPSCoR Grant; Amount: $595,981. (Top ranked proposal in statewide competition)

38. "Radiation Effects on Individual Nnaowires for Next Generation of Sensors and Electronic Devices"; Christopher Berven PI (UI), Charles Hanna, Alan Hunt (ISU), David McIlroy (UI), Alex Punnoose (BSU); NSF-EPSCoR II renewal pre-proposal for the nanomaterials part.
39. "Biomolecular Research Center", Idaho State Board of Education, submitted 2003, Amount requested: :$1,000,000. PI: J. T. Oxford.
40. **"**Magnetic Shape-memory Based Magnetic Pico-sensor (MSMMPS)" P. Mullner (PI) and W. B. Knowlton (co-PI); J. Jessing (co-PI) and R. J. Baker (co-PI), *Elec. Eng.*; A. Punnoose (co-PI) and C. Hanna (co-PI), DoD MURI grant. Amount: $3,160,700
41. "RUI:Acquisition of a Vibrating Sample Magnetometer Option (for PPMS) with Variable Temperature Capability for Materials Research", Agency*:* National Science Foundation; Amount: $85,600; Submission date: 01/07/04; PI: A. Punnoose, co-PIs: W. B. Knowlton and A. Moll.
42. "Physical Property Characterization and Design of Biomaterials"; J. Oxford (PI) (Biology), A. Punnoose (Physics), D. Mitchel (Physics), W. B. Knowlton (Electrical engineering) and T. Fujiwara (Chemistry). NSF-EPSCoR II renewal pre-proposal.
43. "Characterization and Reliability of Advanced Microelectronic Materials", W. B. Knowlton (Electrical Engineering), A. Punnoose (Physics), A. Moll (Mechanical Engineering) V. Gopal (Materials Science) and P. Mullner (Materials science); NSF-EPSCoR II renewal pre-proposal.
44. "Acquisition of a NSOM/AFM Instrument for Materials Characterization", J. Peloquin, A. Punnoose, B. Kim, W. B. Knowlton and J. Oxford; NSF-IMR program, 2005. Amount: $197,647.
45. "An REU Site in Chemistry at Boise State University"; Agency: National Science Foundation; Amount: $208,543; PI: Susan Shadle; 2005
46. "Fabrication, Processing and Characterization of Magnetic shape-memory Alloys Containing Rare-earth Elements"; Agency: National Science Foundation -MPM (Manufacturing and processing of materials) proposal; 2005;. Amount: $691,000; Peter Müllner (PI), Alex Punnoose, Darryl Butt and W. B. Knowlton.
47. "Carbon Nanotube-Supported Catalytic Nanoparticles for Low Temperature Fuel Cell Applications" C.M. Wai (UI), A. Punnoose and Frank Cheng (UI), 2005 DoD-DEPSCoR Grant; Amount: $371,451.
48. "A High Sensitivity Thermal Analysis System for Materials Research", A. Punnoose, Dr. Tomoko Fujiwara (Chemistry), Peter Mullner (Materials Science and Engineering), Jeff Jessing (Electrical Engineering, Byung Kim (Physics), William B. Knowlton (EE), Ken Cornell (Chemistry); 2005 EPSCoR Instrumentation program; Amount: $74,000.

49. "UHV STM/AFM for Atomic Scale Interdisciplinary Research", Byung Kim and Alex Punnoose; 2005 EPSCoR Instrumentation program; Amount: $91,000.
50. "Instrumentation for Multidisciplinary Collaborative Nano-Biotechnology Research", NSF-EPSCoR Instrumentations program 2006; Submitted Septemeber 2006; K. Feris (Biology), A. Punnoose, D. Tenne (Physics) and W. Kuang (EE); Amount: $50,000.
51. "Investigation of antimicrobial nanoparticle thinfilms for development of novel antibiowarfare agent materials"; DEPSCoR 2006; Submitted September 2006; K. Feris (PI) and A. Punnoose; Duration: 2007-2010; Amount: $482,130.
52. "Nanostructural Chalcopyrite Materials from Molecular Precursors for New Solar Cell Architectures", Agency: Department of Energy; Submitted Sepetember 2006; P. Shapiro (Chemistry, UI), S. L. Castro, and A. Punnoose (Physics, BSU); Duration: 2007-2010; Amount: $613, 214
53. "MRI: "Acquisition of a FACS to Support Research and Teaching in Biological, Biochemical, Biophysical, and Materials Sciences at Boise State University"; Submitted December 2006; Preproposal for NSF-MRI submission; PI: D. Wingett; Co-PIs: A. Punnoose and 11 others; Amount: $480,000.
54. "Oxide thin-film heterostructures for spintronics: Magnetism, spin-dependent transport and semiconductor integration"; Agency: National Science Foundation; K. Kannan (MSE, UW), D. Gamelin (Chemistry, UW), M. Olmstd (Physics, UW), S. Chambers (PNNL) and A. Punnoose (Physics, BSU); Duration: 2007-2010; Amount: $ 1, 685, 847 (Submission date: October 20, 2006)
55. "A Proposed Method for the Controlled Synthesis of Discrete Nanoscale Ternary Metal Chalcogenide Clusters of Tunable Size and Composition via the Photolytic Decomposition of Single Source Precursors", Agency: National Science Foundation; P. Shapiro (Chemistry, UI), A. Punnoose (Physics, BSU); D. Rabinovich (Chemistry, University of North Carolina); Duration: 2007-2008; Amount: $148,000 (Submission date: November 3, 2006)
56. "NIRT: Wide band gap oxides based nanostructures", Agency: National Science Foundation; PI: A. Punnoose; Co-PIs: K. Feris (Biology) and D. Wingett (Biology), Duration 2007-2010; Amount: $ 1,250,000 (Submission date: November 15, 2006)
57. "Investigation of the interactions of semiconductor oxide nanoparticles with eukaryotic and prokaryotic systems", Agency: National Institute of Health – R21, A. Punnoose (PI) and K. Feris (co-PI); Amount: $528,000 (Submission date: August 15, 2006)
58. DoE EPSCoR: Ecologically Sustainable and Socioeconomically Responsible Production of Biofuels and Bioproducts; $800,000; 2010-2013; PI: Matthew Morra, co-PI: Alex Punnoose, U.S. Department of Energy/DOE EPScoR

59. Science at the Nano-Bio Interface-Innovative Defense Applications Assessing the Nanotoxicity and Health Effects; $2,000,000; 2009-2010. PI: Alex Punnoose; Co-PI: Kevin Feris.
60. "Semiconductor-based Nanotechnology Applications", 2006 Appropriations Application; Agency: Department of Defense, PI: A. Punnoose, Duration 2007-2010; Amount: $ 1.5 Million (Submission date: November 3, 2006)
61. "MULTIDISCIPLINARY APPLIED NUCLEAR SCIENCES FOR THE 21ST CENTURY" Doug Wells (ISU), Herbert Maschner (ISU), Robert Holman (ISU), Linda DeVaux (ISU), Alex Punnoose (Boise State University), 2008 NSF – EPSCoR pre-proposal (in review), Amount: 9,000,000.
62. "Biomedical Applications of Nanotechnology", Agency: W. M. Keck Foundation, PI: A. Punnoose, Duration: 2008 – 2011, Amount: 1,500,000 (Approved based on internal competition for Phase I application)
63. "MRI: Acquisition of a dual beam SEM/FIB for multidisciplinary Research and Education" Full proposal for NSF-MRI program; PI: M. Frary; Co-PIs: P. Mullner (MSE), A. Punnoose (Physics), M. Schmitz (Geosciences), M. Mitkova (EE), Duration: 2007-2010; Amount: $1,454,546.
64. "Consolidated bioprocessing of agricultural wastewater for H_2 production via photo-heterotrophic microbial metabolism", Department of Energy, 2007, PI: Kevin Feris, co-PI: Alex Punnoose, Duration: 2007-2010, Amount: $447,885
65. "Nanotoxicity evaluation and nanotechnology-based biowarfare countermeasures, therapeutics and other defense applications", 2008 Appropriations Application; Agency: Department of Defense, PI: A. Punnoose, Duration 2009, Amount: $4,000,000
66. "Life Sciences - Nanoscience Innovations" NSF-EPSCoR RII white paper; PIs: A. Punnoose (BSU), R. Hill (UI) and C. Daniels (ISU); Duration: 2008-2011; Amount: $9M.
67. Innovative Nanotechnology Applications for U.S. Defense and Human Health; Principal Investigators: Dr. Denise Wingett, Charles Hanna, Alex Punnoose; FY2011 Appropriations Application - White Paper; Duration: 2011-2014; Amount: $2M
68. "NSF IMR: Acquisition of Fourier Transform Infrared Spectroscopic Facility for Materials Research and Student Training" Agency: National Science Foundation; PI: D. Tenne, Co-PIs: Alex Punnoose, Department of Physic, Boise State University, Dr. Jerry D. Harris, Department of Chemistry, Northwest Nazarene University; Duration: 2008 – 2011; Amount: $250,000; Submission date: January 10, 2008.
69. Semiconductor-based nanotechnology applications – ii; PI: Alex Punnoose; Duration: 2011-2014; Amount: $1.5M
70. Center for Bioenergy and Bioproducts, SBOE-HERC, PI: Mathew Morra, co-PI: Alex Punnoose, Duration: 2010-2012, Amount: $990,000.

71. NSF-BME proposal "Improving the therapeutic potential of ZnO nanoparticles for cancer treatment"; PI: A. Punnoose, collaborator: D. Wingett; Duration: 2009-2012, Amount: $300,000
72. "Bicoastal-National Institute for Nanotechnology and the Environment (B-NINE)", Agency: National Science Foundation – Center for Environmental Implications of Nanotechnology program; BSU subcontact PI: A. Punnoose, Co-PIs: D. Wingett (Biology), C. Hanna (Physics) and K. Feris (Biology); Duration: 2008 – 2013; Amount: $1,000,000
73. NIH R15 Differential toxicity of oxide nanoparticles: Role of electrostatic interactions; PI: A. Punnoose, collaborator: D. Wingett; Duration: 2009-2012, Amount: $300,000
74. NSF-MRI Acquisition of Fourier Transform Infrared Spectroscopic Facility for Interdisciplinary Research and Education; Dmitri Tenne, Maria Mitkova, Daryl Butt, Alex Punnoose, 2010 BSU internal competition; Amount: $388,000.
75. NIH R01; Differential cytotoxicity of nanoparticles and safer nanotechnology solutions; PIs: A. Punnoose and D. Wingett; Duration: 2009-2012, Amount: $1.7M.

Proposals in-review

76. NIH R15 Mechanisms of the selective cytotoxicity of metal oxide nanoparticles and approaches for improving the cancer cell killing; PI: A. Punnoose, collaborator: D. Wingett; Duration: 2009-2012, Amount: $423,000.
77. Idaho NASA EPSCoR Program; Thin film photovoltaics through novel nanoparticles; PI: J. Pak (ISU), co-PIs: Rene Rodriguez and Andrew Holland (ISU) and Alex Punnoose (BSU); Duration: 2011-2014, Amount: $750,000. Notice of Intent approved.
78. HERC Incubation Fund; Selective Cancer Killing Using ZnO Nanoparticles; PI: A. Punnoose, co-PI: D. Wingett; Duration: 2011-2012, Amount: $50,000; approved by Boise State for consideration by HERC.

Proposals in preparation

79. Resubmission of revised NSF-BME proposal "Improving the therapeutic potential of ZnO nanoparticles for cancer treatment"; PI: A. Punnoose, co-PI: D. Wingett; Duration: 2011-2014, Amount: $500,000
80. Resubmission of revised NIH R01 proposal; Differential cytotoxicity of nanoparticles and safer nanotechnology solutions; PIs: A. Punnoose and D. Wingett; Duration: 2011-2014, Amount: $1.7M.
81. NSF : Environmental and Health impacts of oxide nanoparticles; PI: A. Punnoose, co-PIs: Wingett, Hanna, Feris, Tinker; Duration: 20011-2014, Amount: $600,000

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CURRICULUM VITAE

Rajesh Nagarajan, Ph. D.

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EDUCATION AND TRAINING

1993-1996	*Madras Christian College, Chennai, India*	B.Sc	(Chemistry)
1996-1998	*Indian Institute of Technology, Chennai*	M.Sc	(Chemistry)
1998-2004	*Wesleyan University, Middletown, CT*	Ph.D	(Chemistry)
2004-2006	*Johns Hopkins University, Baltimore, MD*	Postdoc	

ACADEMIC AND PROFESSIONAL APPOINTMENTS

06/2010 -	Assistant Professor, Department of Chemistry & Biochemistry, *Boise State University,* Boise, ID
08/2006 – 05/2010	Assistant Professor, Department of Chemistry, *Skidmore College,* Saratoga Springs, NY
02/2004 – 07/2006	Postdoctoral Fellow, Department of Pharmacology and Molecular Sciences, *The Johns Hopkins University School of Medicine,* Baltimore, MD
01/2002 – 01/2004	Grad. Research Assistant, *Wesleyan University,* Middletown, CT
08/1998 – 12/2001	Grad. Teaching Assistant, *Wesleyan University,* Middletown, CT
01/1997 – 05/1998	Merit Fellow, *Indian Institute of Technology,* Chennai, India

PROFESSIONAL OBJECTIVES AND INTERESTS

- Teaching general chemistry, organic chemistry and biochemistry courses.
- Drug design.
- Mechanistic studies of enzymes of medicinal interest.
- Organic Synthesis.
- Structure-activity studies of ligands bound to DNA/Proteins.

TEACHING EXPERIENCE

Boise State University

- CHEM431: Biochemistry I
- CHEM433: Biochemistry II
- CHEM432: Biochemistry Laboratory
- CHEM513: Advanced Enzymology

Skidmore College

- CH107H: Intensive General Chemistry Honors
- CH105: Chemical Principles I
- CH105L: Chemical Principles I Laboratory
- CH106: Chemical Principles II
- CH341L: Biochemistry-Macromolecular Structure and Function
- CH342: Biochemistry-Intermediary Metabolism
- SSP100: Drug Discovery-From Laboratory Bench to Pharmacy Stack

The Johns Hopkins University School of Medicine

- Teaching Assistant-Bioorganic Reaction Mechanisms

Wesleyan University

- Teaching Assistant for General Chemistry, Biochemistry and Organic Chemistry courses
- Chemistry Instructor, Health Professionals Partnership Initiative
- Instructor, Graduate Pedagogy Course

RESEARCH INTERESTS

Boise State University & Skidmore College
Principal Investigator: Dr. Rajesh Nagarajan

Bacterial Resistance Enzymes, Quorum Sensing, Biofilm Inhibitors

- Synthesis of acyl-ACP analogs for *P. aeruginosa* LasI AHL synthase.
- Mechanistic studies on acyl-ACP binding in LasI AHL synthase.
- Design and evaluation of biofilm inhibitors.

The Johns Hopkins University School of Medicine
Principal Investigator: Dr. James T. Stivers

Mechanistic Enzymology of Vaccinia Virus Topoisomerase

- Kinetic analysis of an inhibitor for vaccinia virus topoisomerase discovered through high-throughput ribonuclease assay.
- Investigation of phosphoryl interactions at the cleavage site in DNA phosphate backbone in the active site of topoisomerase (IB).
- Specificity studies of purine nucleotides in the major groove of DNA towards topoisomerase (IB).

Wesleyan University
Principal Investigator: Dr. Rex F. Pratt

Bacterial Resistance Enzymes

- Synthesis, thermodynamic and kinetic evaluation of pentacoordinate and tetrahedral transition states of phosphonate inhibitors of a class C β-lactamase.
- Investigation of the specificity towards peptide substrates of bacterial DD-transpeptidases (*Streptomyces R61, Actinomadura R39*, *E.coli PBP2 and PBP5, S.aureus PBP2a*).

- Mechanistic analysis of an inhibitor designed on the basis of bacterial cell wall for *Streptomyces R61* DD peptidase.

Indian Institute of Technology, Madras, India
Principal Investigator: Dr. A. K. Mishra
Fluorescent Spectroscopy Studies on Liposomes

- Partition coefficient studies of Avomine and Chlorpromazine on Dimyristoylphosphatidylcholine liposomes using fluorescence spectroscopy.

RESEARCH EXPERIENCE AND SKILLS

Protein Chemistry and Enzymology

- Enzyme Assays, Kinetics and Data analysis.
- Protein Expression and Purification.
- Thermodynamics of Thermal and Guanidine Denaturation of Enzymes and Enzyme-Inhibitor Complexes.

Nucleic Acid Biochemistry

- DNA Synthesis.
- Native and Denaturing Gel Electrophoresis.
- SDS-PAGE Electrophoresis.
- Agarose Gel Electrophoresis.
- Plasmid Supercoil Relaxation Assay.
- Radiolabeling of 3′ and 5′ ends in DNA.
- Enzyme Assays of Fluorescent Labeled DNA.

Bench Skills

- HPLC, UV, CD, Fluorescence Spectroscopy, NMR, MALDI.
- Equilibrium Dialysis of Enzyme-Inhibitor Complexes.
- Phosphocellulose and Desalting Chromatography.
- Stopped Flow Spectrometer and Rapid Quench Instrument.
- Phosphoroimager and Scintillation Counter.
- Micromax Plate Reader for High-Throughput Assays.
- Synthesis of Peptide Substrates.

Molecular Dynamics

- Experience in running and analyzing MM and MD Simulations on ligand-bound proteins.

Scientific Software

- Proficient in using software such as INSIGHT (molecular modeling), ULTRAFIT, DYNAFIT (Data Fitting), Image Quant and PRISM.

RESEARCH GRANTS

Internal Grants

Skidmore Student-Faculty Summer Collaborative Research Grant 02/2009
"Biochemical assay for *P.aeruginosa* LasI AHL Synthase", $6,216

Role: Sole-PI (Funded)

Skidmore Student-Faculty Summer Collaborative Research Grant 02/2008
"Synthesis of a 4-oxo Substrate Analog for Bacterial Quorum Sensing LasI AHL Synthase", $6,154
Role: Sole-PI (Funded)

Skidmore Student-Faculty Summer Collaborative Research Grant 02/2008
"Synthesis of a 3-hydroxydodecanoyl cysteamine Substrate for *P. aeruginosa* LasI AHL Synthase", $3,145
Role: Sole-PI (Funded)

Skidmore Student-Faculty Summer Collaborative Research Grant 02/2007
"Synthesis of a Bacterial Quorum Sensing Autoinducer Analog", $5,950
Role: Sole-PI (Funded)

External Grants

NSF: Major Research Instrumentation 01/2009
"Acquisition of a Libra 120 transmission electron microscope for research enhancement at Skidmore College", $664, 737
Role: Co-PI (Funded)

Research Corporation 11/2007
"Design, Synthesis and Evaluation of acyl-ACP Substrate Analogs for *P. aeruginosa* LasI AHL Synthase", $44,992
Role: Sole-PI (Not Funded)

The Camille and Henry Dreyfus Foundation 05/2006
"Design, Synthesis and Evaluation of Quorum Sensing Inhibitors", $30,000
Role: Sole-PI (Not Funded)

Mountain States Tumor & Medical Research Institute 03/2011
"Biochemical Assay for LasI AHL Synthase", $7,241
Role: Sole-PI (Funded)

PEER REVIEWED PUBLICATIONS

1. S.A.Adediran, Ish Kumar, Rajesh Nagarajan, Eric Sauvage and R. F. Pratt. Kinetics of Reactions of the *Actinomadura* R39 DD-Peptidase with Specific Substrates. *Biochemistry* (2011), 50, 376-387.

2. Rajesh Nagarajan and James T. Stivers. Unmasking Anticooperative DNA-Binding Interactions of vaccinia DNA Topoisomerase I. *Biochemistry* (2007), 46(1), 192-199.

3. James T. Stivers and Rajesh Nagarajan. Probing Enzyme Phosphoester Interactions by Combining Mutagenesis and Chemical Modification of Phosphate Ester Oxygens, *Chemical Reviews* (2006), 106, 3443-3467.

4. Rajesh Nagarajan and James T. Stivers. Major Groove Interactions of vaccinia Topo I Provide Specificity by Optimally Positioning the Covalent Phosphotyrosine Linkage, *Biochemistry* (2006), 45(18), 5775-5782.

5. Rajesh Nagarajan, Keehwan Kwon, Barabara Nawrot, Wojciech J. Stec and James T. Stivers. Catalytic Phosphoryl Interactions of Topoisomerase IB, *Biochemistry* (2005), 44(34), 11476-11485.

6. Keehwan Kwon, Rajesh Nagarajan and James T. Stivers. Ribonuclease Activity of Vaccinia DNA Topoisomerase IB: Kinetic and High-Throughput Inhibition Studies Using a Robust Continuous Fluorescence Assay, *Biochemistry* (2004), 43(47), 14994-15004.

7. Nicholas R. Silvaggi, Helen R. Josephine, Alexandre P. Kuzin, Rajesh Nagarajan, Rex F. Pratt and Judith A. Kelly. Crystal Structures of Complexes Between the R61 DD-Peptidase and Peptidoglycan-mimetic β-lactams: a Non-Covalent Complex with a "Perfect Penicillin", *J. Mol. Biol* (2005), 345(3), 521-533.

8. Rajesh Nagarajan and Rex F. Pratt. Synthesis and Evaluation of New Substrate Analogues of Streptomyces R61 DD-Peptidase: Dissection of a Specific Ligand, *Journal of Organic Chemistry* (2004), 69(22), 7472-7478.

9. Rajesh Nagarajan and Rex F. Pratt. Thermodynamic Evaluation of a Covalently Bonded Transition State Analogue Inhibitor: Inhibition of β–Lactamases by Phosphonates, *Biochemistry* (2004), 43(30), 9664-9673.

PRESENTATIONS

Presentations at conference/workshop

(Skidmore College: Principal Investigator)

- Rajesh Nagarajan, Thad W. Vickery*, Edward T. Wilson* and Saranya Soundararajan*, "Design, synthesis and evaluation of modified acyl-ACP substrates for P. aeruginosa LasI AHL synthase", American Chemical Society, 238th National Meeting and Exposition, Washington, DC, Aug 2009.

- Thad W. Vickery* and Rajesh Nagarajan, "Acyl carrier protein substrate specificity of LasI AHL synthase" American Chemical Society, 236th National Meeting and Exposition, Philadelphia, PA, Aug 2008.
  * Undergraduate Student co-authors

(Johns Hopkins University: Postdoctoral Fellow)

- Rajesh Nagarajan and James T. Stivers, "Catalytic Phosphoryl Interactions of Topoisomerase IB", American Chemical Society, 230th National Meeting and Exposition, Washington, DC, Aug 2005.

(Wesleyan University: Graduate Student)

- Rajesh Nagarajan and Rex F. Pratt, "Specific Substrates for Bacterial DD- Peptidases", American Chemical Society, 224th National Meeting and Exposition, Boston, MA , Aug 2002.

- Rajesh Nagarajan and Rex F. Pratt, Esther B. and Bingham J. Humphrey Memorial Symposium, "A Comparative Thermodynamic Study of Phosphonates and Boronates as class C β-lactamase Inhibitors", University of Vermont, Sep 2000.

AWARDS AND HONORS

2003	Peterson Fellowship, *Wesleyan University*, Middletown, CT
2001	Max Tishler Award, *Wesleyan University,* Middletown, CT
1996-1998	Merit Scholarship, *Indian Institute of Technology*, Chennai, India
1996	Merit Certificate, Royal Society of Chemistry, London
1996	Edinburgh Studentship, *Madras Christian College,* Chennai, India
1996	T.T. Thomas Prize, *Madras Christian College,* Chennai, India
1995	Edinburgh Scholarship, *Madras Christian College,* Chennai, India
1995	Hoare Prize, *Madras Christian College,* Chennai, India

COMMITTEE EXPERIENCE

- Advisory Committee on International Studies (ACIS), Skidmore College, 2006-2007.
- Porter Scholarship Committee, Skidmore College, 2008-present.
- Analytical Chemistry Search Committee, Skidmore College, 2008.
- Skidmore College Honors Council, 2007-present.
- NMR Committee, Skidmore College, 2007-present.
- International Affairs Committee, Skidmore College, 2007-present.
- Academic Safety Officer search committee, Skidmore College, 2007.
- Search Committee for Chemistry Teaching Associate, Skidmore College, 2007.
- Educational Policy Committee (EPC), Wesleyan University, 2001-2002.
- Graduate Student Judiciary Board, Wesleyan University, 2002 - 2003.

WORKSHOPS ATTENDED

Skidmore College

- IRC worshop on 'Internet 2' - 03/2008
- Information Technology workshop: Dreamweaver - 02/2008
- Teaching with technology: Multimedia – 11/2007
- Pedagogy workshop on video conferencing – 10/2007
- Teaching film in courses - 05/2007
- First year seminar development workshop – 05/2007
- Thinking about media: new literacy and classroom - 02/2007
- Social class and its pedagogical implications in the classroom - 09/2006
- Library 101 in the year 2006 - 11/2006

External Workshops

- CRLT performance on "Conflict in the classroom" at Union College, 03/2008
- Council on Undergraduate Research Meeting, Alexandria, VA, 03/2007

PROFESSIONAL MEMBERSHIP

2002-	American Chemical Society (ACS)
2006-	Council on Undergraduate Research (CUR)
2011-	American Association for the Advancement of Science (AAAS)
2011-	Idaho Academy of Science (IAS)
2011-	Mountain States Tumor & Medical Research Institute (MSTMRI)

SCHOLARLY ACTIVITIES

- Reviewed manuscripts for *'Biochemistry'* journal
- Invited to review grant proposals for NSF-MRI program, 08/2009
- Presented a seminar on 'Career Opportunities in Science', Skidmore College, 02/2007
- Mentored research projects for 8 undergraduate students (Skidmore College)
- Research Mentor for 9 undergraduate students and 2 postdoctoral fellows at BSU

INVITED TALKS

- Johns Hopkins University School of Medicine, Baltimore, MD, May 2003
- University of Illinois, Urbana Champaign, IL, May 2003
- Illinois Institute of Technology, Chicago, IL, Nov 2005
- Skidmore College, Saratoga Springs, NY, Dec 2005
- Wesleyan University, Middletown, CT, Nov 2006
- University of Wisconsin, Whitewater, WI, Dec 2008
- University of San Francisco, San Francisco, CA, Dec 2008
- University of Colorado, Denver, CO, Jan 2009
- Western Washington University, Bellingham, WA, Feb 2009
- The College of New Jersey, Ewing, NJ, Dec 2009
- Eastern Illinois University, Charleston, IL, Jan 2010
- Eastern Michigan University, Ypsilanti, MI, Feb 2010
- Western Carolina University, Cullowhee, NC, Mar 2010
- University of Illinois, Urbana Champaign, IL, Apr 2010
- University of Michigan, Ann Arbor, MI, Apr 2010
- Boise State University, Boise, ID, Apr 2010

Curriculum Vitae

Troy Townsend Rohn

Date and Place of Birth: June 6, 1967; San Jose, CA

Academic Training:

B.S. (Physiology) University of California at Davis, 1990
Ph.D. (Pharmacology) University of Washington, 1994

Professional Experience:

1990-1995: Predoctoral fellow in the Department of Pharmacology, University of Washington.

1995-1997: Postdoctoral fellow; INSERM Unite 99, Paris, France.

1997-1998 Postdoctoral fellow; Department of Veterinary Molecular Biology, Montana State University.

1998-2000 Postdoctoral fellow, Department of Neurology, Institute for Brain Aging and Dementia, UC Irvine

2000-2005 Assistant Professor, Department of Biology, Boise State University, Boise, ID

2005-2010 Associate Professor, Department of Biological Sciences, Boise State University, Boise, ID

2010- Professor, Department of Biological Sciences, Boise State University, Boise, ID

List of Undergraduates Mentored in Lab:

1. William Nesse (listed as co-author on published manuscript)
2. Stephen Kessinger (listed as co-author on published manuscript
3. Carly Merkel
4. Kristen Leenhouts (listed as co-author on published manuscript)
5. Young Eun Kim (listed as co-author on published manuscript)
6. Matthew Kai
7. Sorcha Cusack (listed as co-author on published manuscript)
8. Kwang-Ho Ha (listed as co-author on published manuscript)
9. Elizabeth Figueredo
10. Serena Wong (listed as co-author on published manuscript)
11. Cody Eaton (listed as co-author on published manuscript)
12. Shaniece Craft
13. Stephen Kessinger (listed as co-author on published manuscript)
14. Jordan Harris

15. Guy Warhurst
16. Lindsey Catlin

List of Graduate Students Mentored in Lab:

1. Michael Davis (listed as co-author on published manuscript)
2. Jodie Newman (listed as co-author on published manuscript)
3. Peter Mouser (listed as co-author on published manuscript)
4. Brain Dufty (listed as co-author on published manuscript)
5. Veera Vyas (listed as co-author on published manuscript)
6. Deby Kumasaka (listed as co-author on published manuscript)
7. Polina Kokoulina (listed as co-author on published manuscript)

I have also served on numerous Thesis committees for students in other labs in our biology department

Formal Teaching Activities Past three years.

1) **Instructor for Biol. 442/542 (Molecular Neurobiology)** at Boise State University. This is a molecular neurobiology course for under- and graduate-students. Responsible for teaching all lectures, exam preparations, and grading. This is an intensive upper division course that most students find very challenging. The one aspect of this course that I try to do most is keep current with the most recent advancements in particular topics.

2) **Instructor for Biol. 431/531 (Pharmacology)** at Boise State University. This is a pharmacology course for both graduate and undergraduate students. All areas of pharmacology are covered. This is an interesting course as far as the students go. I typically have a wide-range of students enrolled in this course with various majors including pre-nursing, premedical, pre-pharmacy, pre-dental, biology etc. I try to teach this course at the level first year medical students. It is an extremely challenging course in terms of content and pace.

3) **Instructor for Biol. 100 (Concepts of Biology)** at Boise State University. This is a non-majors course covering all aspects of biology. A two-hour weekly lab to enforce concepts taught in class was also given. I am responsible for all aspects of this class. This is a service course for our department and typically the class size is large (greater than 200 students) and encompasses students who are not science majors.

4) **Instructor for Biol. 100 (Electronic Course)** at Boise State University. This is the online version the same course that I teach face-to-face. I was one of the original faculty members involved with the pilot blackboard program and was the first faculty member to develop and teach an online course for our department.

Major Awards for Teaching and Research:

1) 2005 Faculty Recognition Nomination for best faculty by ASBSU
2) 2006 Faculty Recognition Nomination for best faculty by ASBSU
3) 2007 Nominee for Foundation Scholar Teaching Award
4) 2008 Finalist Foundation Scholar Teaching Award
5) 2008 Nominated for Health-Hero in Teaching Idaho Business Review
6) 2008 College of Arts and Sciences Distinguished Award for Teaching
7) 2008 College of Arts and Sciences Distinguished Award for Research
8) 2009 Winner Foundation Scholar Teaching Award
9) 2010 Nominated for Idaho Professor of the year (did not win)
10) 20111 Nominated for Idaho Professor of the year (under review).

Major Research Interests:
Our laboratory is interested in the role that certain proteases play in promoting the pathology associated with different neurodegenerative diseases. For example, in Alzheimer's disease, our lab has investigated the role that caspases may play in promoting neurofibrillary tangle formation. In this regard, we hypothesize that the caspase-cleavage of the microtubule-associated protein, tau, may be the link between senile plaques and tangles observed in this disease. We have developed a novel transgenic mouse model of AD that overexpresses the anti-apoptotic protein, Bcl-2 and have demonstrated that such overexpression prevents plaque and tangle formation and improves cognition. More recently, we are beginning to assess the ability of caspase inhibitors in preventing Alzheimer's disease pathology in an aggressive transgenic mouse model of Alzheimer's.

Current and Pending Funding:

1) Oxford, Julie (PI), Rohn, Troy (Co-I) Funded
NASA EPSCoR 9/1/2010 to 8/31/2013
Molecular Mechanisms of Cellular Mechanoreception in Bone
2.2 month salary support and O.E., $7,200 per year

2) Rohn, Troy (PI) Funded
KO Alzheimer's Disease Foundation $28,000
To support undergraduate research fellows in my lab

3) Rohn, Troy (PI) Pending
NIH R21 4/1/2011 to 3/31/13 $167,217
A multi-organsimal approach to Azheimer's diseae drug discovery

Research projects funded, but have expired:

1) **Rohn, Troy (PI) Funded Effort 20%**

American Health Assistance Foundation (AHAF) $131, 140 01/04/2007-03/31/20010
Caspase-cleavage of tau in Alzheimer's disease
This was a three-year pilot study to examine the role of caspases as an interconnecting step between plaques and tangles in AD. The major goal of this project is to develop a novel transgenic mouse model of AD that over-expresses the antiapoptotic protein, Bcl-2.

2) **NIH/NCRR INBRE COPI's Laskowski, M. and Oxford, J.**
Funded
Rohn, Troy (Magnate Project Investigator P.I.)
07/01/2004-06/30/09 50%
$375,000
Involvement of astrocyte caspase activation and CD40/CD40L signaling interactions in Alzheimer's Disease
The major goals of this project are to develop specific antibodies that will recognize the caspase-cleavage products of GFAP, an astrocytic-specific protein. In addition, this proposal will examine if caspase activation occurs in reactive astrocytes of the AD brain and whether such activation is associated with specific markers of inflammation such as CD40/CD40L.

3) Development of Site-Directed Caspase-Cleavage Antibodies (R03); submitted to National Institute for Aging, July 2000. $50,000 for a one-year period was requested. **Funded** May 2001 - 2003 for $56,287

4) The Role of Caspase-8 in Alzheimer's Disease (AREA R15); submitted to National Institute for Health, September 15, 2000. $100,000 over a 3 year period was requested. **Funded** July 2001-2004, $122,523

Memberships and other Activities:

2000-2007 Board Member, Idaho Chapter of Alzheimer's Association
2005-2007 Grant Reviewer for Alzheimer's Association
2006-Member of the Snake River Association for Neuroscience
2007- Member of Society for Neuroscience
2008- Member of ISTAART, International Society to Advance Alzheimer Research and Treatment
2009- Executive Editor, *International Journal of Physiology, Pathophysiology and Pharmacology*
2010- Executive Editor, *International Journal of Clinical Experimental Pathology*

Publications (**H-index:** 23, as calculated by Google Scholar)

1. Clinch, K.A., Vincenzi, F.F., Rohn, T.T., Hinds, T.R. (1993) Stobadine protects ion pump ATPases from free radical inhibition. *Proc. West. Pharmacol. Soc.* **36**:209-214.
2. Rohn, T.T., Hinds, T.R., Vincenzi, F.F. (1993) Ion transport ATPases as targets for free radical damage. Protection by an aminosteroid of the Ca^{2+} pump ATPase and Na^{+}/K^{+} pump ATPase of human red blood cell membranes. *Biochem. Pharmacol.* **46**:525-534.

3. Rohn, T.T., Hinds, T.R., Vincenzi, F.F. (1993) Inhibition of the Ca^{2+} pump ATPase in intact red blood cells by tert-butyl hydroperoxide: importance of glutathione peroxidase. *Biochem. Biophys. Acta* **1153**:67-76.

4. Rohn, T.T., Hinds, T.R., Vincenzi, F.F. (1995) Inhibition of the Ca^{2+} pump ATPase in intact red blood cells by activated neutrophils. *Free Radic. Biol. Med.* **4**: 655-667.

5. Rohn, T.T., Hinds, T.R., Vincenzi, F.F. (1996) Inhibition of the Ca^{2+} pump ATPase by iron-generated reactive oxygen species: protection by 6,7, dimethyl-2,4-di-1-pyrrolidinyl-7H-pyrrolo (2,3-d) pyrimidine sulfate, (U-89843D), a potent, novel antioxidant/free radical scavenger. *Biochem. Pharmacol.* **51**: 471-476.

6. Sauvadet, A., Rohn, T.T., Pecker, F. and Pavoine, C. (1996) Synergistic actions of glucagon and mini-glucagon on calcium mobilization in cardiac cells. *Circulation Res.* **78**: 102-109.

7. Sauvadet, A., Pavoine, C., Rohn, T.T., and Pecker, F. (1996) Calcium signal and contraction. *C. R. Soc. Biol.* **190**: 243-253.

8. Sauvadet, A., Rohn, T.T., Pecker, F. and Pavoine, C (1997) Arachidonic acid drives mini-glucagon action in cardiac cells. *J. Biol. Chem.* **272**:12437-12445.

9. Rohn, T.T., Sauvadet, A., Pavoine, C. and Pecker, F. (1997) Xanthine affects $[Ca^{2+}]_i$ and contractile responses of ventricular cardiocytes to electrical stimulation. *Am. J. Physiol.* **273**: C909-C917.

10. Rohn, T.T. and Quinn, M.T. (1998) Inhibition of Peroxynitrite-mediated tyrosine nitration by the novel pyrrolopyrimidine antioxidant, U-101033E. *Eur. J. Pharmacol* **353**: 329-336.

11. Rohn, T.T., Nelson, L.K., Waeg, G. and Quinn, M.T. (1998) U-101033E (2,4-diaminopyrrolopyrimidine), a potent inhibitor of membrane lipid peroxidation as assessed by the production of 4-hydroxynonenal, malondialdehyde, and 4-hydroxynonenal-protein adducts. *Biochem. Pharmacol.* **56**:1371-1379.

12. Rohn, T.T., Nelson, L.K., Snipes, K.M., Swain, S.D., Jutila, K.L. and Quinn, M.T. (1999) Priming of human neutrophils by peroxynitrite: potential role in enhancement of the local inflammatory response. *J. Leukocyte Biol.* **65**: 59-70.

13. Rohn, T.T., Nelson, L.K., Davis, A.R. and Quinn, M.T. (1999) Inhibition of GTP binding to Rac2 by peroxynitrite: Potential role for tyrosine residue modification. *Free Radic. Biol. Med.* **26**: 1321-1331.

14. Ivins, K.J., Thornton, P.L., Rohn, T.T. and Cotman, C.W. (1999) Neuronal apoptosis by β-amloid is mediated by caspase-8. *Neurobiology of Disease* **6(5)**: 440-449.

15. Rohn, T.T., Ivins, K.J., Bahr, B.A., Cotman, C.W. and Cribbs, D.H. (2000) A monoclonal antibody to amyloid precursor protein induces neuronal apoptosis. *J. Neurochem.* **74**: 2331-2342.

16. Rohn, T.T., Head, E., Su, J.H., Anderson, A.J., Bahr, B.A., Cotman, C.W. and Cribbs, D.H. (2001) Evidence for caspase activation in tangle-bearing neurons in Alzheimer's disease.

American Journal of Pathology **158**: 189-198 (See Commentary, page 1-2). A figure from this manuscript was selected for the cover illustration.

17. Mbebi, C., Rohn, T.T., Doyennette, M-A., Chevessier, F., Jandrot-Perrus, M., Hantai, D. and Verdiere-Sahuque, M. (2001). Thrombin receptor induction by injury-related factors in human skeletal muscle cells. *Experimental Cell Research* **263**: 77-87.

18. Rohn, T.T., Wong, S.M., Cotman, C.W. and Cribbs, D.H. (2001). 15-Deoxy-$\Delta^{12,14}$-prostaglandin J_2, a specific ligand for peroxisome proliferator-activated receptor-γ, induces neuronal apoptosis. *NeuroReport* **12**: 839-843.

19. Rohn, T.T., Head, E., Nesse, W.P., Cotman, C.W. and Cribbs, D.H. (2001). Activation of caspase-8 in the Alzheimer's disease brain. *Neurobiology of Disease* **8**:1006-1016.

20. Swain, S.D., Rohn, T.T. and Quinn, M.T. (2002). Neutrophil priming in host defense: Role of oxidants as priming agents. *Antioxidants and Redox Signaling* **4**:69-83.

21. Head, E., Lott, I.T., Cribbs, D.H., Cotman, C.W. and Rohn, T.T. (2002). β-Amyloid deposition and neurofibrillary tangle association with caspase activation in Down syndrome. *Neurosci. Lett* **330(1)**: 99-103

22. Rohn, T.T., Rissman, R.A., Davis, M.C., Kim, Y., Cotman, C.W. and Head, E. (2002). Caspase-9 activation and caspase cleavage of tau in the Alzheimer's disease brain. *Neurobiol Dis* **11**:341-354. A figure from this manuscript was selected for the cover illustration.

23. Rohn, T.T., Rissman, R.A., Head, E. and Cotman, C.W. (2002). Caspase Activation in the Alzheimer's Disease Brain: Tortuous and Torturous. *Drug News & Perspectives* **15(9)**: 549-557.

24. Clements MK, Siemsen DW, Swain SD, Hanson AJ, Nelson-Overton LK, Rohn TT, Quinn MT. (2003) Inhibition of actin polymerization by peroxynitrite modulates neutrophil functional responses. *J Leukoc Biol* **73(3)**: 344-355.

25. Chung, C-W, Hong, Y-M, Song, Woo, H-N, Choi, Y-H, Rohn, T.T. and Jung, Y-K. (2003). Atypical role of proximal caspase-8 in truncated tau-induced neurite regression and neuronal cell death. *Neurobiol Dis* **14(3):** 557-566.

26. Rohn, T.T., Cusack, S.M., Kessinger, S.R., and Oxford, J.T. (2004). Caspase activation independent of cell death is required for proper cell dispersal and correct morphology in PC12 cells. *Exp Cell Res.* **295(1):** 215-225.

27. Rissman, R.A., Poon, W.W., Blurton-Jones, M., Oddo, S., Torp, R., LaFerla, F.M., Rohn, T.T. and Cotman, C.W. (2004). Caspase-dependent cleavage of tau is an early event in Alzheimer's disease tangle pathology. *Journal of Clinical Investigation* **114:** 121-130 (See commentary, page 23).

28. Cusack, S.M., Rohn, T.T., Medeck R.J., Irwin, K.M., Brown, R.J., Mercer, L.M. and Oxford, J.T. (2004) Suppression of MeCP2beta expression inhibits neurite extension in PC12 cells. *Exp Cell Res.* 2004 Oct 1;**299(2):** 442-53.

29. Newman, J., Rissman R.A., Sarsoza, F., Kim, R.C., Dick, M., Rohn T.T. and Head, E. (2005) Caspase-cleaved tau accumulation in neurodegenerative diseases associated with the intracellular accumulation of tau or synuclein. *Acta Neuropathol (Berl).* **110(2):** 135-44.

30. Mouser, P.E., Head, E., Ha, K-H., and Rohn, T.T. (2006). Caspase cleavage of GFAP within degenerating astrocytes of the Alzheimer's disease brain. *American Journal of Pathology* **168(3):** 936-46.

31. Dufty, B.M., Warner, L.R., Hou, S.T., Jiang, S.X., Gomez-Isla, T., Leenhouts, K.M., Oxford, J.T., Masliah, E. and Rohn T.T. (2007). Calpain-cleavage of alpha-synuclein: Connecting proteolytic processing to disease-linked aggregation *American Journal of Pathology* **170(5)**: 1725-38.

32. Acarin, L., Villapol, S., Faiz, M., Rohn, T.T., Castellano, B. and Gonzalez, B. (2007). Caspase-3 activation in astrocytes following postnatal excitotoxic damage correlates with cytoskeletal remodeling but not with cell death or proliferation. *Glia,* **55**(9):954-65.

33. Rohn, T.T., Vyas, V., Hernandez-Estrada, T., Nichol, K.E., Christie, L-A and Head, E. (2008). Lack of pathology in a triple transgenic mouse model of Alzheimer's disease after overexpression of the anti-apoptotic protein, Bcl-2. *J. Neurosci*, **28(12)**: 3051-59

34. Corsetti V., Amadoro G., Gentile A., Capsoni S., Ciotti M.T., Cencioni M.T., Atlante A., Canu N., Rohn T.T., Cattaneo A, Calissano P. (2008). Identification of a caspase-derived N-terminal tau fragment in cellular and animal Alzheimer disease models. *Mol. Cell. Neurosci.* **38(3):**381-92. PMID: 18511295

35. Rohn, T.T. (2008). Caspase-cleaved TAR DNA-binding protein-43 is a major pathological finding in Alzheimer's disease. *Brain Research*, **1228(4):** 189-198.

36. Rohn, T.T. and Head, E. (2008). Caspase Activation in Alzheimer's Disease: Early to Rise and Late to Bed. *Reviews in the Neurosciences* (Invited Review, **19:** 383-393).

37. Rohn, T.T., Hernandez-Estrada, T. and Head, E. (2009) Caspases as therapeutic targets in Alzheimer's disease: Is it time to "cut" to the chase? *Int. J. Clin. Exp. Pathol.* (Invited Review, **2, 108-118**).

38. Rohn, T.T. and Kokoulina, P. (2009). Caspase-cleaved TAR DNA-binding protein-43 in Pick's disease. *Int*, *J. Physio. Pathophysio. Pharmacol.* **1(1)**:25-32.

39. Kumasaka, D.K., Galvan, V., Head, E. and Rohn T.T. (2009). Caspase Cleavage of the Amyloid Precursor Protein is prevented After Overexpression of Bcl-2 in a Triple Transgenic Mouse Model of Alzheimer's Disease. *Int J Physio Pathophysio Pharmacol* **1(1)**:48-56

40. Rohn, T.T. (2009). Cytoplasmic Inclusions of TDP-43 in Neurodegenerative Diseases: A Potential Role for Caspases. *Histology and Histopathology* (Invited Review, **24(8):**1081-1086).

41. Rohn, T.T., Kokoulina, P., Eaton, C.R. and Poon, W.W. (2009). Caspase Activation in Transgenic Mice with Alzheimer-like Pathology: Results From a Pilot Study Utilizing The Caspase Inhibitor, Q-VD-OPh. *Int J Clin Exp Med*. 2009; 2(4): 300–308. Published online 2009 November 5.

42. Rohn, T.T. (2010). The Role of Caspases in Alzheimer's Disease; Potential Novel Therapeutic Opportunities. Invited Review, *Apoptosis Journal*, 2010 Feb 3. [Epub ahead of print].

43. Kokoulina, P. and Rohn, T.T. (2010). Caspase-cleaved TAR DNA-binding protein-43 in Parkinson's disease and dementia with Lewy bodies. *Neurodegenerative Diseases*, **7(4)**: 243-250.

44. Rohn, T.T., Wirawan, E., Brown, R.J., Harris, J.R., Masliah, E. and Vandenabeele, P. (2011) Depletion of Beclin-1 due to proteolytic cleavage by caspases in the Alzheimer's disease brain. *Neurobiology of Disease* **43:** 68-78.

45. Masliah, E., Rockenstein, E., Mante, M., Crews, L., Spencer, B., Adame, A., Patrick, C., Trejo, M., Ubhi, K., Rohn, T.T., Mueller-Steiner, S., Seubert, P., Barbour, R., McConlogue, L., Buttini, M., Games, D. and Schenk, D. (2011). Passive immunization reduces behavioral and neuropathological deficits in an alpha-synuclein transgenic model of Lewy body disease. *PLoS ONE*, 10.1371/journal.pone.0019338.

46. Rohn, T.T. and Catlin, L.W. (2011). Immunolocalization of Influenza A Virus and Markers of Inflammation in the Human Parkinson's Disease Brain. *PLoS ONE*, 31 May 2011 10.1371/journal.pone.0020495.

Abstracts:

1. Rohn, T.T., Hinds, T.R., Vincenzi, F.F. (1993) Ion transport ATPases as targets for free radical damage: Protection by the aminosteriod U74006F. Presented at the meetings of the Western Pharmacology Society, January 31-February 5, Incline village, NV.
2. Vincenzi, F.F., Clinch, K.A., Rohn, T.T., Hinds, T.R. (1993) Stobadine protects ion pump ATPases from free radical inhibition. Presented at the meetings of the Western Pharmacology Society, January 31-February 5, Incline village, NV.
3. Aziz, S., Tada, Y., Raichenbach, D.D., Vincenzi, F.F., Rohn, T.T. (1993) An antioxidant (lazaroid) in combination with a subtherapeutic dose of cyclosporine prolongs cardiac allograft survival. Presented at the International Society for Heart and Lung Transplantation, 13th Annual Meetings, April 1-3, 1993, Boca Raton, FL.
4. Vincenzi, F.F., Rohn, T.T., Clinch, K.A., Hinds, T.R. (1993) Ion pumps: Link between free radical mechanisms and in vivo effectiveness of protectant drugs? Presented at the

International Conference on Critical Aspects of Free Radicals in Chemistry, Biochemistry and Medicine, February 14-17, 1993, Vienna Austria.

5. Rohn, T.T., Hinds, T.R., Vincenzi, F.F. (1994) Neutrophil-mediated inhibition of the calcium pump ATPase in intact red blood cells. Presented at the meetings of the Western Pharmacology Society, February 2, Kona, HI.

6. Hinds, T.R., Nguyen, H., Rohn, T.T., and Vincenzi, F.F. (1994) Effect of strophanthidin on the Ca pump ATPase in human erythrocyte membranes. Presented at the meetings of the Western Pharmacology Society, February 2, Kona, HI.

7. Rohn, T.T., Sauvadet, A., Pavoine, C. and Pecker, F. (1996) P_2-purinoceptor activation by extracellular ATP results in a negative chronotropic effect in stimulated ventricular myoctes. Presented at the meetings of the 21st Symposium European, Hormones and Cell Regulation, September 20-23, Alsace, France.

8. Rohn, T.T., Nelson, L.K., Waeg, G., and Quinn, M.T. (1998) Inhibition of Peroxynitrite-Mediated Tyrosine Nitration By U-101033E, A Novel Pyrrolopyrimidine Antioxidant. *J. Leukocyte Biol.* Presented at the meetings of the American Heart Association, November 15-18, Dallas, Texas.

9. Rohn, T.T., Ivins, K.J., Bahr, B.A., Cotman, C.W. and Cribbs, D.H. (1999). Involvement of the amyloid precursor protein in neuronal apoptosis. Presented at the meetings of Neuroscience in October, Miami, Florida.

10. Cotman, C.W., Rohn, T.T. and Cribbs, D.H. (2000) The activation of apoptosis in Alzheimer's disease. Presented at the sixth international Stockholm/Springfield Symposium on Advances in Alzheimer Therapy, Stockholm, Sweden.

11. Kessinger, S.R., Cusack, S.M., Kim, Y-E, Davis, M.C., Oxford, J.T. and Rohn, T.T. (2002). Caspase cleavage of tau in the Alzheimer's disease brain. Presented at the 1st annual BRIN conference, Moscow, Idaho.

12. Rohn, T.T., Davis, M.C. and Head, E. (2002). Caspase cleavage of tau in the Alzheimer's disease brain. Presented at the eighth annual International Conference on Alzheimer's Disease and Related Disorders. Stockholm, Sweden, July 20-25.

13. Rissman RA, Head E, Poon WW, Cotman CW, Rohn TT. (2002) Caspase Dependent Cleavage of Tau is Correlated with Increasing Alzheimer's Disease Neuropathologic Severity. Soc Neurosci Abstr # 592.17 Nov 2-7 in Orlando, Fl

14. Rohn TT, Rissman RA, Poon WW, Blurton-Jones, M., Cotman, C.W. (2003). Caspase cleavage of tau is an early event in neurofibrillary tangle formation in Alzheimer's disease. Presented at the Sixteenth Annual Grantee Conference for American Federation for Aging Research, June 12-14 Santa Barbara, CA.

.

15. Figueredo, E. and Rohn T.T. (2003). Caspase cleavage of tau in a transgenic mouse model of Alzheimer's disease. Presented at the second annual BRIN conference August 10-14, Boise, ID.

16. Newman, J., Rissman R.A., Sarsoza, F., Kim, R.C., Dick, M., Head, E. and Rohn T.T. (2004). Caspase-cleaved tau accumulation in neurodegenerative diseases associated with the intracellular accumulation of tau or synuclein. Presented at the ninth annual International Conference on Alzheimer's Disease and Related Disorders. Philadelphia, Pennsylvania, July 17-22.

17. Mouser, P., Head, E. and Rohn T.T. (2005). Caspase cleavage of GFAP within degenerating astrocytes of the Alzheimer's disease brain. Presented at Alzheimer's Association International Conference on Prevention of Dementia: Early Diagnosis and Intervention. Washington, D.C., June 18-21.

18. Rohn, T.T., Dufty, B.M., Warner, L.R. and Oxford, J.T. (2006). Calpain-cleavage of a-synuclein in Parkinson's and Dementia with Lewy body disease: Connecting proteolytic processing to disease-linked aggregation. Presented at the tenth annual International Conference on Alzheimer's Disease and Related Disorders. Madrid, Spain, July 16-20.

19. Rohn, T.T., Vyas, V., Hernandez-Estrada, T. and Head, E. (2007). Overexpression of the apoptotic protein, Bcl-2, prevents pathology in a transgenic mouse model of Alzheimer's disease. Presented at Alzheimer's Association International Conference on Prevention of Dementia: Early Diagnosis and Intervention. Washington, D.C., June 10-12.

20. Acarin, L., Villapol, S., Faiz, M., Rohn, T.T., Castellano, B. and Gonzalez, B. (2007). Astroglial caspase-3 activation after postnatal excitotoxicity is associated with cytoskeletal remodeling but not with proliferation or cell death. Presented at the VIII European Meeting on Glial Cells in Health and Disease. London, UK, September.

21. Rohn, T.T., Kumasaka, D.K., Galvan, V. and Head E. (2008). Caspase-cleavage of the amyloid precursor protein is prevented after overexpression of Bcl-2 in a triple transgenic mouse model of Alzheimer's disease. Presented at the eleventh annual International Conference on Alzheimer's Disease. Chicago, Illinois, July 24-30.

22. Carlos, A.J., Poon, W.W., Cotman, C.W. and Rohn T.T. (2010). Overexpression of Bcl-2 in APP transgenic mice reduces amyloid pathology. To be presented at the annual International Conference on Alzheimer's Disease. Honolulu, Hawaii, July 24-30.

Curriculum Vitae **MARCELO D. SERPE**

Department of Biological Sciences, Boise State University
1910 University Drive, Boise, ID 83725-1515
E-mail: MSerpe@boisestate.edu
Phone: (208) 426-3687

Present Position:
Professor

Academic Degrees, Postdoctoral Work, and Previous Positions:
Associate Professor, Boise State University, 2002-2010
Assistant Professor, Boise State University, 1998-2002
Assistant Professor, Cayey University College, University of Puerto Rico, 1995-98
Postdoctoral research associate, Plant Cell Biochemistry, University of California, Riverside, 1991-95.
Ph.D., Plant Physiology, University of California, Davis, 1991.
M.S., Plant Science, California State University, Fresno, 1983.
Ingeniero Agronomo, Facultad de Agronomia, Universidad de Buenos Aires, 1981.

Research Experience:
Assistant/Associate Professor, Department of Biology, Boise State University. Research on the regulation of plant growth by environmental and biochemical factors. August 98 to present
Research associate, Department of Botany and Plant Sciences, U.C. Riverside. Analysis of the function and biochemical structure of certain proteoglycans, arabinogalactan-proteins, present on the surface of plant cells. March 91 - July 95
Research assistant, Plant Biology Graduate Group, U.C. Davis. Performed research in the area of regulation of leaf growth under water deficits and during ontogeny. October 85 - December 90.
Laboratory technician, Zaiger's Nursery, Modesto, CA. Responsible for a tissue-culture lab in a privately sponsored breeding program designed to improve horticultural species. April 84 - May 85.
Research assistant, U.S.D.A. Horticultural Research Laboratory, Fresno, CA. In vitro propagation of early varieties of *Prunus* and seedless *Vitis*, May 82 - April 84.

Teaching Experience:
General Biology (lecture and laboratory) (Boise State University)
Plants and Society (lecture and laboratory) (Boise State University)
Molecular Biology of Plant Development (lecture and laboratory) (Boise State University)
Plant Physiology (lecture and laboratory) (Boise State University)
Plant Anatomy and Microtechnique (lecture and laboratory) (Boise State University)
Transgenic Plants (lecture and laboratory) (Boise State University)
Control of Seed Germination (graduate seminar) (Boise State University)
General Botany (lecture and laboratory) (Boise State University)
General Botany (lecture and laboratory) (Cayey University College)

General Biology (lecture and laboratory) (Cayey University College)

Publications:

Zhou X, ZhangY, Ji X, Downing A, **Serpe MD**. Combined effects of nitrogen deposition and water stress on growth and physiological responses of two annual desert plants in northwestern China. Environmental and Experimental Botany (in press)

Chao WS, **Serpe MD** (2010) Changes in the expression of carbohydrate metabolism genes relating to three phases of bud dormancy in leafy spurge. Plant Molecular Biology 73: 227-239

Scholten M*, Donahue J**, Shaw NL, **Serpe MD** (2009) Environmental regulation of dormancy loss in *Lomatium dissectum* (Apiaceae) seeds. Annals of Botany 103: 1091-1101

Serpe MD, Zimmerman SJ**, Deines L*, Rosentreter R. (2008) Seed water status and root tip characteristics of two annual grasses on lichen-dominated biological soil crusts. Plant Soil 303: 191-205

Deines L*, Rosentreter R, Eldridge DJ, **Serpe MD** (2007) Germination and seedling establishment of two annual grasses on lichen-dominated biological soil crusts. Plant Soil 295: 23-35

Chao WS, **Serpe MD**, Jia Y, Shelver WL, Anderson JV, Umeda M (2007) Potential roles for autophosphorylation, kinase activity, and abundance of a CDK-activating kinase (Ee;CDKF;1) during growth in leafy spurge. Plant Molecular Biology 63: 365-379

Serpe MD, Orm JM*, Barkes TR**, Rosentreter R (2006) Germination and seed water status of four grasses on moss dominated biological soil crusts from arid lands Plant Ecology 185: 163-178

Chao WS, **Serpe MD**, Anderson JV, Gesch RW, Horvath DP (2006) Sugars, hormones, and environment affect the dormancy status in underground adventitious buds of leafy spurge (*Euphorbia esula*). Weed Science 54: 59-68

Serpe MD, Muir AJ**, Andème-Onzighi C, Driouich A (2004) Differential expression of callose and a β-1,4 galactan epitope in the laticiferous plant *Euphorbia heterophylla* L. International Journal of Plant Sciences 165: 571-585

Wicklow-Howard M, **Serpe MD**, Orm J**, Stokes J, Rosentreter R (2003) Effect of biological soil crusts on seed germination and seedling growth of *Bromus tectorum*. Proceedings of the VIIth International Rangelands Congress 1276-1278

Serpe MD, Muir AJ**, Driouich A (2002) Immunolocalization of β-D-glucans, pectins, and arabinogalactan-proteins during intrusive growth and elongation of nonarticulated laticifers in *Asclepias speciosa* Torr. Planta 215: 357-370

Serpe MD, Muir AJ**, Keidel AM** (2001) Localization of cell wall polysaccharides in non-articulated laticifers of *Asclepias speciosa*. Protoplasma 216: 215-226

Serpe MD, Matthews MA (2000) Turgor and cell wall yielding in dicot leaf growth in response to changes in relative humidity. Australian Journal of Plant Physiology 27: 1131-1140

Serpe MD, Nothnagel EA (1999) Arabinogalactan-proteins in the Multiple Domains of the Plant Cell Surface. Advances in Botanical Research 30: 207-289

Serpe MD, Nothnagel EA (1996) Heterogeneity of arabinogalactan-proteins on the plasma membrane of rose cells. Plant Physiology 112: 1261-1271

Serpe MD, Nothnagel EA (1996) Lipid lateral mobility in the plasma membrane of whole plant cells. Pflügers Archives-European Journal of Physiology. 43: 253-254

Serpe MD, Nothnagel EA (1995) Purification and biochemical characterization of arabinogalactan-proteins from the cell wall of rose cells. Plant Physiology 109: 1007-1016

Serpe MD, Nothnagel EA (1994) Effects of Yariv phenylglycosides on *Rosa* cell suspensions: Evidence for the involvement of arabinogalactan-proteins in cell proliferation. Planta 193: 542-550

Serpe MD, Matthews MA (1994) Growth, pressure, and wall stress in epidermal cells of *Begonia* leaves during development. International Journal of Plant Sciences 155: 291-301

Serpe MD, Matthews MA (1994) Changes in cell wall yielding and stored growth in *Begonia argenteo-guttata* L. leaves during the development of water deficits. Plant Cell Physiology 35: 619-626

Serpe MD, Matthews MA (1992) Rapid changes in cell wall yielding of elongating *Begonia argenteo-guttata* L. leaves in response to changes in plant water status. Plant Physiology 100: 1852-1857

Emershad RL, Ramming DW, **Serpe MD** (1989). In ovulo embryo development and plant formation from stenospermic genotypes of *Vitis vinifera*. American Journal of Botany 76: 397-402

*Graduate student in my lab, ** undergraduate student in my lab

Presentations during the past five years

Osgood T, Rosentreter R., Serpe MD (2010) Influence of Bromus tectorum litter on the photosynthetic capacity of a moss dominated biological soil crust. Annual Meeting of Northwest Science

Carter K, Davidson B, White M, Shaw N, Serpe M. (2010) Identification of mycorrhizae associated with *Artermisia tridentata* ssp. *Wyomingensis* in Southwestern Idaho. National Native Seed Conference

Carter K, Serpe M. (2010) Identification and multiplication of native mycorrhizal species that colonize *Artemisia tridentata* ssp. *Wyomingensis* seedlings. Annual Meeting Intermountain Seedling Growers' Association

Chao WS, Serpe MD (2009) Differential expression of carbohydrate metabolism genes during bud dormancy changes in leafy spurge (*Euphorbia esula*). American Society of Plant Biologists

Chao WS, Serpe MD (2009) Differential expression of carbohydrate metabolism genes associated with bud dormancy changes in leafy spurge (*Euphorbia esula*). 4th International Symposium on Plant Dormancy

Donahue J, Perez M, Serpe MD (2009) Primary and Secondary Dormancy in *Lomatium dissectum* (Apiaceae) seeds. Undergraduate Research Symposium, Boise State University

Osgood T, Serpe MD (2009) Influence of a moss-dominated biological soil crust and litter on *Bromus tectorum* establishment under natural conditions. Undergraduate Research Symposium, Boise State University

Serpe MD (2009) Factors affecting *Lomatium dissectum* seed germination and seedling establishment. Annual meeting Great Basin Native Plant Selection and Increase Project

Donahue J, Scholten M, Shaw NL, Smith JF, Serpe MD (2008) Differences in cold stratification requirements among populations of *Lomatium dissectum* seeds. Join meeting of Botanists from North America. Vancouver, British Columbia

Serpe MD (2008) Germination and seed water status of native and exotic grasses on biological soil crusts from the Great Basin of North America. Seminar presented at the Xinjiang Institute of Ecology and Geography, Chinese Academy of Science, Urumqi, China

Zimmerman SJ, Rosentreter R, Serpe MD. (2008) Effect of lichen dominated biological soil crusts on seed water status and root penetration of two annual grasses and its ecological significance. Joint meeting of the International Association for Lichenolgy and American Bryological and Lichenological Society. Monterrey, California

Chao WS, Anderson JV, Horvath DP, Serpe MD (2007) Changes in well-defined phases of bud dormancy involve shifts in carbohydrate metabolism. American Society of Plant Biologists

Scholten M, Serpe MD, Shaw NL (2007) Embryo growth and germination in *Lomatium dissectum* seeds. Society for Range Management.

Scholten M, Zimmerman S, Shaw NL, Serpe MD (2007) Environmental regulation of dormancy loss in *Lomatium dissectum* seeds. Botanical Society of America.

Zimmerman S, Rosentreter R, Serpe MD (2007) Germination and seed water status of native and exotic grasses on biological soil crusts. AAAS Pacific Division

Zimmerman S, Serpe MD (2007) Influence of lichen-dominated biological soil crusts on seed water status of two annual grasses. Undergraduate Research Symposium, Boise State University

Chao WS, Serpe MD, Jia Y, Shelver WL, Anderson JV, Umeda M (2006) Autophosphorylation and kinase activity of a CDK-activating kinase (CAK1Ee) from leafy spurge (*Euphorbia esula*). American Society of Plant Biologists

Deines L, Barkes T, Rosentreter R, Novak S, and Serpe M (2006) Germination and seed water status of two annual grasses on lichen-dominated biological soil crusts. Botanical Society of America.

Deines L, Barkes T, Rosentreter R, and Serpe M (2006) Germination and water status of grass seeds on lichen-dominated biological soil crusts. Northwest Science Society.

Scholten M, Shaw NL, Serpe MD (2006) Embryo growth and germination in *Lomatium dissectum* seeds. Northwest Science Society.

Scholten M, Shaw NL, Serpe MD (2006) Breaking Dormancy in *Lomatium dissectum* Seeds. 14th Wildland Shrub Symposium

Scholten M, Zimmerman S, Shaw NL, Novak S, Serpe M (2006) Requirements for embryo growth and dormancy break in *Lomatium dissectum* seeds. Botanical Society of America.

Grants during the past five years:

USDA Functional biodiversity of native mycorrhizae during early development of Big Sagebrush: a step(pe) towards Restoring Sagebrush Ecosytems ($149,451) (PI: M. Serpe, Co-PI M. White). (Jan 10-Dec 11)

USDA Forest Service ($9,400) Diversity of mycorrhizal species that colonize *Artemisia tridentata* in southwestern Idaho (Jan 10-Dec 12)

USDA-ARS ($28,596) Adaptation of Lesser-Known Wine Grape Cultivars to Climatic Features of the Snake River Valley American Viticultural Area (Oct 10-Jul 12)

Bureau of Land Management ($39,946): Influence of litter and a moss-dominated biological soil crust on *Bromus tectorum* establishment under natural environmental conditions (May 08-Oct 12)

Forest Service, U.S.D.A. ($19,875) Development of procedures to break dormancy in *Lomatium*

dissectum seeds (Feb 07- Sep 10)
Forest Service, United State Department of Agriculture ($15,350) Requirements for dormancy break and germination in *Lomatium dissectum* seeds (Aug 06-Aug 09)
USDA-ARS ($14,000) Quantification of abscisic acid in leaves of grape plants exposed to different irrigation treatments (Oct 2007-Jul 2009)

Equipment grants:
LI-COR Biosciences: Acquisition of a LI-6400XTR portable photosynthesis and fluorescence system for undergraduate teaching and research at Boise State University. ($40,000) PI M. Serpe, Co-PI S. Novak. (2008).
National Science Foundation: Acquisition of a Confocal Microscope ($375,000). PI: Julia Oxford, Co-Pi M. Serpe, M. Streeter, and J. Tinker, (2005)
National Science Foundation Acquisition of a Transmission Electron Microscope for Multidisciplinary Research and Education ($1,000,000) PI Janet Hampikian, C0-PIs P.Mullner and J. Oxford, other participants: T.Fujiwara, B. Knowlton, A.Moll, A.Punnose, and M. Serpe (2005)

Professional Societies:
American Society of Plant Biologists
Botanical Society of America

Major Professor for the following students:
Lynell Deines (graduated in 2006)
Melissa Scholten (graduated 2011)
Keith Carter (current)
Bill Davidson (current)
Jacob Cragin (current)

Member in the thesis committee of the following students:
Joseph Rausch (graduated in 2003)
Cindy R. Dalzell (graduated in 2004)
Stuart Murray (graduated in 2007)
Quentin Tuckett (graduated in 2007)
Rylene LaRee Moore
John Wilford
Danielle Clay
Morgan Peterson
Teresa Tarifa De Yensen

CURRICULUM VITAE

Juliette Kay Tinker

Date of Preparation: 6/1/11

I. Personal Data

Home address:
2662 E. Brierfield Dr.
Eagle, ID 83616
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Professional address:
Department of Biological Sciences
Boise State University
1910 University Dr.
Boise, ID 83725
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II. Education

B.A. in Biology and English, May 1994
Washington University, St. Louis, MO.

Ph.D. in Microbiology, December 2000
The University of Iowa, Iowa City, IA.
Thesis: Regulation of Type I Fimbrial Production In *Salmonella typhimurium*: The Characterization and Genetic Analysis of *fim*Y, *fim*U and *fim*W.
Dr. Steven Clegg, Thesis Advisor

Post-doctoral fellowship, September 2000 –September 2004
Department of Microbiology, The University of Colorado Health Sciences Center, Denver, CO.
Dr. Randall Holmes, Principal Investigator

III. Current Position

Assistant Professor, Department of Biological Sciences, Boise State University, Boise, ID. January 2005- present.

IV. Areas of Research Interest

Vaccine development and pathogenic bacteriology

Current Research

1)The development of non-toxic *Vibrio cholerae* and *Escherichia coli* enterotoxins as adjuvants for mucosal vaccines.
2) Characterization of bacterial enterotoxin intracellular host trafficking.
3) Identification and characterization of novel bacterial enterotoxins from Gram negative pathogens.
4) Characterization of the antibacterial activity of zinc nanoparticles.

V. Professional Affiliations

1997-present American Society for Microbiology
2005-2007 Sigma Xi Scientific Research Society
2006-present Mountain States Tumor and Medical Research Institute
2007-present American Association for the Advancement of Science
2008-present Idaho Academy of Sciences
2009-present Phi Kappa Phi Honor Society

VI. Teaching Activities

Washington University **Teaching Assistant**

1994 Developmental Biology, laboratory.

The University of Iowa **Teaching Assistant/Tutor**

1995 Molecular Biology for High School Students, lecture/laboratory.
1996 Health Sciences Microbiology for Dental and Pharmacy Students, laboratory.
1997 Pathogenic Bacteriology, laboratory.
1998 Principles of Infectious Diseases for Medical Students, laboratory.

The University of Colorado **Post-doctoral Fellow**

2001 Topics in Microbial Pathogenesis, 3 lectures.
2002 Medical Microbiology, 3 laboratories.

Boise State University **Assistant Professor**

2005 Pathogenic Bacteriology lecture/laboratory (4 credits).
Introductory Microbiology lecture/laboratory (4 credits).
2006 Introductory Microbiology lecture/laboratory (4 credits).
Infection and Immunity seminar (2 credits).
2007 Pathogenic Bacteriology lecture/laboratory (4 credits).
Ecology of Infectious Disease seminar (2 credits).
Research in the Biological Sciences (1 credit)
2008 Vaccines and Vaccine Development lecture (3 credits).
Introductory Microbiology lecture/laboratory (4 credits).
Advanced Topics in Molecular Techniques seminar (2 credits).
2009 Pathogenic Bacteriology lecture/laboratory (4 credits)
Vaccines and Vaccine Development lecture (3 credits)
2010 Introductory Microbiology lecture/laboratory (4 credits)
Advanced Immunology Laboratory (2 credits)
Cancer Vaccines seminar (1 credit)
2011 Pathogenic Bacteriology lecture/laboratory (4 credits)
Microbial Toxins seminar (1 credit)
Vaccinology (3 credits; service-learning course)

Other

2002-2005 Instructor for Westernaires, a non-profit horse riding organization for children.

VII. Supervising Students in Research

The University of Iowa

1998 Co-teach summer Molecular Biology course to High School students

1998-2000 Train undergraduates enrolled in summer research projects.

The University of Colorado Health Sciences Center

2000-2004 Train undergraduates and graduate students in laboratory techniques.

2003 Train and mentor medical student with summer research fellowship from The University of Buffalo, NY.

Boise State University

2005 graduate students, major advisor: Chadwick Davis.
undergraduate students: Tabitha Sturgis, Liz Villaneuva, Felicia Martinez, Alonzo Rivas, Blake McDonald, Juliann Lucero, Kimberly Stevenson.

2006 graduate students, major advisor: Chadwick Davis,
graduate students, committee member: Alma Hodric, Holly Schultz, Brian Dufty.
undergraduate students: Tabitha Sturgis, Liz Villaneuva, Alonzo Rivas, Jason Bell, Felica Martinez, Blake McDonald, Sara Murray, Jason Bell.

2007 graduate students, major advisor: Chadwick Davis.
graduate students, committee member: Alma Hodric, Brian Dufty, Ashley Masterson, Veera Vaas, Cory Hanley.
undergraduate students: Liz Villaneuva, Brady Callahan, Rachel Nielsen, Britni Arlian, Sara Wilson, Rachael Shin, Justin Peer.

2008 graduate students, major advisor: Chadwick Davis.
graduate students, committee member: Ashley Masterson, Cory Hanley, Polina Kokoulina.
undergraduate students: Britni Arlian, Sara Wilson, Brady Callahan, Christina Hayes, Caitlin Otto, Rachael Nielsen, Herbie Pollard.

2009 post-doctoral fellow: Jenny Yan
research technician: Britni Arlian
graduate students, major advisor: Lavanya Vempati
graduate students, committee member: Ashley Masterson, Polina Kokoulina, Cory Hanley, Emily Schmidt.
undergraduate students: Britni Arlian, Caitlin Otto, Mary Zettick, Sheenah Bryant, Herbie Pollard, Jayashree Sanjeverman, Brady Callahan, Brad Morris.

2010 post-doctoral fellow: Jenny Yan
research technician: Britni Arlian
graduate students, major advisor: Lavanya Vempati

graduate students, committee member: Polina Kokoulina, Emily Schmidt, Ashley McCartney.
undergraduate students: Herbie Pollard, Brad Morris, Casey Denton, Benjamin Tverdy, Sheenah Bryant, Marita King, Kimberly Empey, Chris Barbey, Nathan Zhart.
high school students: Kelly Rekeire

2011 post-doctoral fellow: Jenny Yan
research technician: Britni Arlian
graduate students, major advisor: Lavanya Vempati
graduate students, committee member: Panagiota Louka, Christopher Porterfield, Ashley McCartney.
undergraduate students: Brad Morris, Sheenah Bryant, Casey Denton, George Hafez, Kelly Rekeire.

VIII. Funding and Awards

1997-1999 NIH Parasitism Training Grant Trainee (#5T32AI07511).
2000 American Society for Microbiology student travel grant award, $500.
2001-2003 Post-doctoral National Research Service Award (#T32AI07537).
2006 Boise State University Faculty Research grant. P.I., $5000.
2006 Boise State University Graduate Student Research grant (Chadwick Davis) $500.
2006 NSF Major Research Instrumentation grant. Confocal microscope. Co-PI, $348,786 (#0619793).
2006 Boise State University COAS Travel grant. P.I., $500.
2007 Merck AAAS Undergraduate Science Research Program grant. Co-P.I. $60,000.
2007 Boise State University Faculty Research Associates Program grant. P.I. $5310.
2007 Mountain States Tumor Medical Research Institute Small Project Grant. Trafficking of fluorescent bacterial enterotoxins. P.I., $5000.
2008 WWAMI small pilot projects grant. The characterization of enterotoxin chimeras as Staphylococcal mucosal vaccines $10,000.
2008 NSF Major Research Instrumentation grant. Fluorescence Activated Cell Sorter. Co-PI, $503,775 (#0821233)
2009 Idaho delegation appropriations grant. Department of Defense. A West Nile Virus Vaccine. Co-P.I., $940,000.
2009 Mountain States Tumor Medical Research Institute Small Project Grant. Novel AB5 type toxins from gram negative pathogens. P.I. $7500.
2009 Idaho State Board of Education Tech Incentive Grant. Development of a molecular immunology course. Co-PI. $122,000.
2009 USDA AFRI competitive seed grant (#2009-01778).Enterotoxin-based mucosal vaccines to prevent bovine mastitis caused by *Staphylococcus aureus*. P.I. $150,000.

2011 Boise State University Graduate Student Research grant (Lavanya Vempati) $500.

2011 Boise State University Center for Teaching and Learning STEM mini-grant. Vaccinology course, fall 2011. P.I. $1000.

2011 Mountain States Tumor Medical Research Institute Small Project Grant. Characterization of ArtAB from *Salmonella enterica* Typhimurium. P.I. $7500.

Pending

2011 Northwest Regional Center of Excellence for Biodefense and Emerging Infectious Disease Developmental Project grant. LcrV-enterotoxin A_2/B chimeras as mucosal *Yersinia pestis* vaccines. P.I. $344,723 *4/30/11*

IX. Publications

Tinker, J. K. and S. Clegg. 2000. Characterization of FimY as a coactivator of type I fimbrial expression in *Salmonella enterica* Serovar Typhimurium. *Infect.Immun.* 68(6):3305-3313.

Tinker, J. K., L.S. Hancox and S. Clegg. 2001. FimW is a negative regulator affecting type I fimbrial expression in *Salmonella enterica* Serovar Typhimurium. *J. Bacteriol.* 183(2):435-442.

Tinker, J.K. and S. Clegg. 2001. Control of FimY translation and type I fimbrial production by the arginine tRNA encoded by *fim*U in *Salmonella enterica* serovar Typhimurium. *Mol. Micro.* 40(3):757-768.

Yeh, K-S., **J.K. Tinker** and S. Clegg. 2002. FimZ binds to the *Salmonella typhimurium fim*A promoter and may regulate its own expression with FimY. *Microbiol. Immunol.* 46 (1): 1-10.

Tinker, J.K., J.L. Erbe, W.G.J. Hol and R.K. Holmes. 2003. Cholera holotoxin assembly requires a hydrophobic domain at the A-B_5 interface: mutational analysis and development of an *in vitro* assembly system. *Infect. Immun.* 71(7):4093-4101

Tinker, J.K., J.L. Erbe and R.K. Holmes. 2005. Characterization of fluorescent chimeras of cholera toxin and *Escherichia coli* heat-labile enterotoxins produced by use of the twin arginine translocation system. *Infect. Immun.* 73(6):3627-3635

Feris, K., Otto, C., **Tinker, J**., Wingett, D., Punnoose, A., Thurber, A., Kongara, M., Sabetian, M., Quinn, B., Hanna, C., and D. Pink. 2009. Electrostatic Interactions Affect Nanoparticle-Mediated Toxicity to Gram-Negative Bacterium *Pseudomonas aeruginosa* PAO1. *Langmuir* 16:26(6):4429-36.

Tinker, J.K.*, Davis, C.T and B.A. Arlian. April 2010. Purification and characterization of *Yersinia enterocolitica* and *Yersinia pestis*-cholera toxin A2/B chimeras. *Protein Expression and Purification.* 74(1):16-23

Submitted

Arlian, B.A. and **J.K. Tinker*.** May 2011. Mucosal Immunization with a *Staphylococcus aureus* IsdA-cholera toxin A_2/B chimera induces antigen specific Th2 type responses in mice. *Clinical and Vaccine Immunology*. Pending revision.

Tinker,J.K.*, Bryant, S., Thurber, A., Reddy, K.M., Feris, K., Otto, C.C., Pink, D., Hanna C., and A. Punnoose. June 2011. Effects of reactive oxygen species scavengers on the antibacterial action of zinc oxide nanoparticles. *Langmiur.*

In preparation

Tinker, J.K.*, Yan, J., Knipple, R., Rasmussen, J., Yu, G., Wingett, D., and K. Cornell. July 2011. Construction and characterization of a domain-III – cholera toxin A2/B chimera as a West Nile vaccine in mice. *Vaccine Development and Therapy.*

(*corresponding author).

X. Selected Abstracts

The role of FimY in the regulation of *Salmonella typhimurium* FimA expression. Tinker, J.K. Hancox, L., and S. Clegg. American Society for Microbiology General Meeting, Atlanta, GA., May 1998.

Construction and characterization of *fim*Y and *fim*W mutants affecting type I fimbrial expression in *Salmonella typhimurium*. Tinker, J.K. and S.Clegg. Gordon Research Conference on Molecular Mechanisms of Microbial Adhesion, Newport, RI., June, 1999.

The characterization of FimW as a negative regulator of type I fimbrial expression in *Salmonella enterica* serovar Typhimurium. Tinker, J.K. and S. Clegg. American Society for Microbiology General Meeting, Los Angeles, CA., May, 2000.

Analysis of mutations within the hydrophobic A-B interface of cholera toxin that effect assembly *in vi*vo and *in vitro*. Tinker, J.K., Erbe, J.L., and R.K. Holmes. American Society for Microbiology General Meeting, Salt Lake City, UT., May, 2002.

Construction of LcrV-enterotoxin fusions for use as potential mucosal *Yersinia* Vaccines. Davis, C.T., Tinker J.K. American Society for Microbiology General Meeting. Toronto, Canada. May, 2007.

Construction of an LcrV-cholera toxin fusion for use as a potential *Yersinia* vaccine. Davis, C.T., Tinker J.K. AAAS Pacific Division Annual Conference, Boise, ID., June 2007.

Construction of enterotoxin fusions for use as potential vaccines against methicillin-resistant *Staphylococcus aureus*. Arlian, B., Tinker,

J.K. 6th Annual Idaho INBRE Research Conference., Moscow, ID, August 2007.

Development of enterotoxin fusions for use as potential mucosal vaccines. Arlian, B., Wilson, S., and Tinker J.K. 7th Annual Idaho INBRE Research Conference, Boise, ID. August 2008.

Construction of a potential mucosal West Nile vaccine. Callahan, B. and Tinker, J.K. 7 th Annual Idaho INBRE Research Conference, Boise, ID. August 2008.

Methods for the Purification of Shiga Toxin Based Vaccines. Pollard, H., Arlian, B. and Tinker J.K. Boise State University Undergraduate Research Conference. Boise, ID. April 2009.

Construction Of Enterotoxin Chimeras For Use As Potential Mucosal Staphylococcal Vaccines. Arlian, B.A., Callahan, B.C. and J.K. Tinker. American Society for Microbiology ICAAC Annual Meeting. San Francisco, CA. September 2009.

Cholera toxin A2/B chimeras as potential West Nile vaccines. Yan, J.A. and J.K.Tinker. American Society for Microbiology Intermountain Branch annual meeting. Provo, UT. April 2010.

Development of Shiga Toxin 1 Derivatives as Potential Mucosal Vaccine Adjuvants. Vempati, L. and J.K. Tinker. Boise State University Graduate Student Research Symposium. Boise, ID March 2011

Purification of a Novel *Salmonella enterica* Typhimurium AB-type Enterotoxin. Morris, B.A and J.K. Tinker. Idaho Academy of Sciences Annual S ymposium. Caldwell, ID March 2011 (3rd place award)

Immunogenicity of a *Staphylococcus aureus* IsdA-Cholera Toxin A2/B Chimera after Intranasal Vaccination of Mice. Arlian, B.A. and J.K. Tinker. American Society for Microbiology Annual Intermountain Branch Meeting. Ogden, UT April 2011 (student award)

XI. Oral presentations and symposia

The development of bacterial enterotoxin chimeras for use as potential vaccines. Tinker. J.K. Idaho INBRE Annual Research Conference. Nampa, ID. August 12, 2005.

Development of cholera toxin and *E.coli* heat-labile toxin chimeras as potential mucosal vaccines. Davis, C., and Tinker, J.K. Western INBRE States Infectious Disease Symposium. Moscow, ID. April 23, 2006.

The development of bacterial enterotoxin chimeras as potential vaccines. Tinker, J.K.. AAAS Pacific Division Annual Conference. Boise, ID, June 20, 2007 (Infectious disease symposium co-organizer).

Bacterial enterotoxins as vaccines. Tinker, J.K. Albertson College, Department of Biology, invited by Dr. Ann Koga. May 9, 2007.

Vaccines: current recommendations and future directions. Tinker, J.K. Boise State University Osher Institute symposium. January 21, 2008.

Vaccines: current recommendations and the autism debate. Tinker, J.K. St. Luke's Hospital Infection Control Week. October 21, 2008.

The use of bacterial enterotoxins as potential mucosal vaccines. Tinker, J.K. Ft. Dodge Animal Health, Ft. Dodge, IA. November 24, 2008.

Vaccine safety: busting some myths. Tinker, J.K. St. Luke's Hospital Infection Control Week. October 21, 2009.

Construction and characterization of an IsdA-cholera toxin chimera as a potential Staphylococcal mucosal vaccine. Arlian, B.A and Tinker, J.K. American Society for Microbiology Intermoutain branch annual meeting. Provo, UT. April 11, 2010.

Cholera toxin A_2/B chimeras as potential Staphylococcal vaccines. Tinker, J.K. AAAS Pacific Branch annual meeting. Ashland, OR. June 12, 2010.

Cholera toxin A_2/B chimeras as mucosal Staphylococcal vaccines. Tinker, J.K. University of Washington ITHS Pilot Awards Symposium. Seattle, WA. Dec 17, 2010.

Cholera toxin A_2/B chimeras as potential mucosal vaccines. Tinker, J.K. American Society for Microbiology Annual Intermountain Branch Meeting. Ogden, UT. April 9, 2011

XII. University, professional and community service

University

2005-present	Member, Biology Department Reserch Committee
2007-present	Judge, College of Arts and Sciences Wallice G. Kay writing competition
2008-2010	Member, University Academic Grievance Committee
2008-2011	Member, University Foundation Scholars, Research and Creative Committee
2008-2010	Member, Institutional Biosafety Committee
2010-present	Chair, Institutional Biosafety Committee

Professional

2006	Journal reviewer, Idaho Academy of Sciences
2007	Chapter reviewer, Microbiology (Cowen, Talaro), McGraw Hill
2008	Symposium co-chair, AAAS Pacific Division, Boise, ID
2009-2010	Academic Advisory Board Member, Annual Editions Microbiology, McGraw Hill
2009-present	Journal reviewer, Protein Expression and Purification
2009-present	Journal reviewer, Journal of Biotech Research
2011	ASM Intermountain Branch board member

Community

2007	Boise State University Oscher Institute lecture; "Vaccine Safety"

2008-present	lecturer on vaccine safety for St. Luke's hospital annual Infection Prevention Week
2009-present	Idaho Immunization Coalition member
2010-present	Central Health District Immunization Advisory Board
2009	Vaccines and Vaccine Development service-learning course with the Idaho Immunization Program
2011	Vaccinology service-learning course with the Central District Immunization Board and the Idaho Immunization Program

DON L. WARNER

Department of Chemistry, Boise State University
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PROFESSIONAL EXPERIENCE

Boise State University, 2008-present: Associate Professor of Chemistry
Boise State University, 2002-2008: Assistant Professor of Chemistry
Lowell Bennion Community Service Center, University of Utah, 1995-1997: Volunteer in Service to America

EDUCATION

University of Michigan, Ann Arbor, MI	Chemistry	Ph.D.	2002
University of Wisconsin, Madison, WI	Chemistry	M.S.	1998
University of Utah, Salt Lake City, UT	Chemistry	B.S.	1995

HONORS AND AWARDS

Roche Award for Excellence in Organic Chemistry, Hoffmann-La Roche (2001)
Bristol-Myers Squibb Graduate Fellowship (2001)
Associated Students of Boise State Outstanding Faculty Member, Arts and Sciences (2003)
Associated Students of Boise State Outstanding Faculty Member, Arts and Sciences (2003)
Boise State Faculty Research Associate (2004)
Boise State Top Ten Scholars Honored Faculty Member—recognized by 3 of the 10 students (2007)
Boise State College of Arts and Sciences Award for Distinguished Teaching—finalist (2007)
Boise State Provost's Excellence in Advising Award, College of Arts and Sciences (2007)
American Chemical Society, Division of Organic Chemistry Travel Award (2008)
Boise State Top Ten Scholars Honored Faculty Member—recognized by 1 of the 10 students (2009)
Boise State Top Ten Scholars Honored Faculty Member—recognized by 1 of the 10 students (2010)
Associated Students of Boise State Outstanding Faculty Member, Arts and Sciences (2010
Boise State Top Ten Scholars Honored Faculty Member—recognized by 1 of the 10 students (2011)

FUNDING

"REU Site: Summer Research in Chemistry at Boise State University for First Year Undergraduates"; *National Science Foundation*; 09/10-08/13; Role: PI.

"MRI: Acquisition of an LC-MS for Multidisciplinary Research and Education"; *National Science Foundation*; 05/09-04/12; role: co-PI.

"Evaluation of DNA Cross-Linking by Aziridinomitosenes"(renewal); *National Institutes of Health*; 03/09-02/12; role: PI.

"Evaluation of DNA Cross-Linking by Aziridinomitosenes" (Competitive Administrative Supplement); *National Institutes of Health*; 07/09-12/10; role: PI.

"Investigations into the formation of DNA-protein cross-links by synthetic aziridinomitosenes"; *Mountain States Tumor and Medical Research Institute*; 06/08-09/09; role: PI.

"Going Green: Environmental, Economic, Efficient Organic Chemistry Lab Curriculum"; *Idaho State Board of Education*; 07/08-06/09; role: Co-PI.

"Acquisition of GC/MS and FT-IR Instrumentation to assist with the Integration of Research-Based Learning throughout Boise State University's Chemistry Curriculum"; *National Science Foundation*; 03/2008-02/2011; role: PI.

"Acquisition of a 500-MHz Nuclear Magnetic Resonance Spectrometer at Boise State University"; *National Science Foundation*; 04/2007-03/2010; role: Co-PI and primary author (grant guidelines required Chemistry Department Chair to serve as PI).

"Evaluation of DNA Cross-Linking by Aziridinomitosenes"; *National Institutes of Health*; 03/05-02/09; role: PI.

"Biological Computational Chemistry: Development of Projects and Tutorials"; *Boise State COAS Mini-Development Grant to Aid Instruction*; 10/2007-05/2008; role: PI.

"Investigation of Alkyl Migration from Silicon to Carbon for the Stereocontrolled Synthesis of Carbon-Carbon Bonds"; *Research Corporation*; 06/01/2004-05/31/2008; role: PI.

"1,5-Dipoles from Nonstabilized Azomethine Ylides: Application to the Synthesis of 2-Pyrrolines"; *Petroleum Research Fund*; 07/01/2004-09/01/2006; role: PI.

"Synthesis of Doxorubicin C14 Benzyl Ethers and Evaluation as CR Substrates and Topoisomerase II Inhibitors"; *Mountain States Tumor and Medical Research Institute*; 06/15/04-06/14/05; role: PI.

"Synthesis and Alkylating Properties of Aziridinomitosene B"; *Mountain States Tumor and Medical Research Institute*; 5/03-4/04; role: PI.

"Stereoselective Generation of Chiral Silanes Using a 1,2 Migration Sequence"; *Boise State University Faculty Research Grant*; 7/03-6/04; role: PI.

"Synthesis and Biological Properties of Aziridinomitosenes"; *NSF EPSCoR Start-up Augmentation Funding*; 08/02-01/03; role: PI.

SYNERGISTIC ACTIVITIES AND SERVICE

Professional Organizations/Conferences/Committees

Proposal Reviewer/Panelist, *National Science Foundation*
Councilor, American Chemical Society Snake River Local Section
Program Director, 2012 ACS Northwest Regional Meeting (NORM)
Manuscript reviewer for the *Journal of Chemical Education*
Annotator for *Project Chemlab*, of the *Journal of Chemical Education*
Textbook reviewer, McGraw Hill and W. W. Norton

University

BSU Top Ten Scholars Selection Committee (Spring 2008 to present)
BSU Core Reform Task Force Member (November 2008 to present)
BSU Core Curriculum Committee Chair (August 2007 to Spring 2010)
Boise State Teaching Scholars Program—Undergraduate Research (September 2007 to May 2008)
BSU Core Curriculum Committee Member (September 2006 to May 2007)
BSU Service Learning Advisory Board Member (September 2003 to present)
BSU Wallace G. Kay - Phi Kappa Phi annual student writing contest, Judge (Spring 2004 and Spring 2005)
Service-Learning Teaching and Research Grants, Reviewer (Fall 2003 to Spring 2004)

College

College of Arts and Sciences Top Ten Scholars Selection Committee (Spring 2008)
College of Arts and Sciences (COAS) Curriculum Committee Member (September 2006 to present)
COAS Mini-Development Grant Selection Committee (Fall 2005)
Natural Science/Physical Science Endorsement Committee (Fall 2003)
Electronic Blackboard Committee (Fall 2003)

Department

Tenure and Promotion, (September 2008 to present)
Graduate Studies (September 2008 to present)
Curriculum Committee, Chair (September 2006 to present)
Scholarship and Awards Committee, Chair (Spring 2003 to May 2008)
BSU ACS Student Affiliates, Advisor (Spring 2003 to May 2006)
Chemistry Dept. Newsletter, Editor (Fall 2004 to May 2006)
Faculty and Instructor Search Committees, Chair (3) and Member (6) (Fall 2002 to present)
Advisor, 20 Chemistry Majors (Fall 2002 to present)

AFFILIATIONS

American Association for the Advancement of Science
American Chemical Society (*Division of Organic Chemistry* and *Division of Chemical Education)*
Council on Undergraduate Research
Idaho IDeA Network of Biomedical Research Excellence (Idaho INBRE)
Mountain States Tumor and Medical Research Institute

JOURNAL PUBLICATIONS (Undergraduate students mentored by D. L. Warner indicated with *)

1. "Reductive Deprotection of *N*-Trityl Aziridines" Vedejs, E.; Klapars, A.; Warner, D. L.; *Weiss, A. *J. Org. Chem.* **2001**, *66*, 7542.

2. "Synthetic Enantiopure Aziridinomitosenes; Preparation, Reactivity, and DNA Alkylation Studies" Vedejs, E.; Naidu, B. N.; Klapars, A.; Warner, D. L.; Li, V-s.; Na, Y.; Kohn, H. *J. Am. Chem. Soc.* **2003**, *125*, 15796.

3. "Sequence-Specific DNA Interstrand Cross-Linking by an Aziridinomitosene in the *Absence* of Exogenous Reductant" Rink, S. M.; Warner, D. L.; Klapars, A.; Vedejs, E. *Biochemistry* **2005**, *44*, 13981.

4. "Reduction of 13-Deoxydoxorubicin and Daunorubicinol Anthraquinones by Human Carbonyl Reductase" Slupe, A.; Williams, B.; Larson, C.; Lee, L. M.; Primbs, T.; Bruesch, A. J.; Bjorklund, C.; Warner, D. L.; Peloquin, J.; Shadle, S. E.; Gambliel, H. A.; Cusack, B. J.; Olson, R. D.; Charlier, Jr., H.A. *Cardiovascular Toxicology* **2005**, *5,* 365.

5. "*N*-Silyl Protecting Groups for Labile Aziridines: Application Toward the Synthesis of *N*-H Aziridinomitosenes" Warner, D. L.; *Hibberd, A. M.; *Kalman, M.; Klapars, A.; Vedejs, E. *J. Org. Chem.* **2007**, *72*, 8519.

6. "Internal Azomethine Ylide Cycloaddition Methodology Leading to the Substitution Pattern of Aziridinomitosene A" Bobeck, D. R.; Warner, D. L.; Vedejs, E. *J. Org. Chem.* **2007**, *72*, 8506.

7. "Synthesis of 3-[(N-carboalkoxy)ethylamino]-indazole-dione derivatives and their biological activities on human liver carbonyl reductase" Berhe, S.; Slupe, A.; Luster, C.; Charlier, H. A., Jr.; Warner, D. L.; Zalkow, L. H.; Burgess, E. M.; Enwerem, N. M.; Bakare, O. *Bioorganic & Medicinal Chemistry* **2010**, *18*, 134-141.

8. "Implementation of Gas Chromatography and Microscale Distillation into the General Chemistry Laboratory Curriculum as Vehicles for Examining Intermolecular Forces" Csizmar, C.; Force, D. A.; Warner, D. L. *Journal of Chemical Education*, **2011**, *88*, Article ASAP.

9. "A Rubric for Assessing Students' Experimental Problem Solving Ability" Shadle, S.; Brown, E.; Towns, M.; Warner, D. L. *Journal of Chemical Education*, under review.

10. "Examination of Bond Properties through Infrared Spectroscopy and Molecular Modeling in the General Chemistry Laboratory" Csizmar, C.; Force, D. A.; Warner, D. L. *Journal of Chemical Education*, under review.

11. "Recycling of Waste Acetone by Fractional Distillation" Weires, N. A.; Johnston, A.; Warner, D. L.; McCormick, M. M.; Hammond, K.; McDougal, O. M. *Journal of Chemical Education*, under review.

INVITED TALKS

1. "Using Synthetic Organic Chemistry to Solve Biologically Interesting Problems. Synthetic Analogs of the Mitomycins. " Warner, D. L. BSU Department of Chemistry, November, 2002."Synthesis and DNA Binding Properties of Aziridinomitosenes" Warner, D. L. Boise VA Medical Center, July, 2003.

2. "Chemical Warfare Agents: A Brief History, Their Mode of Action, and Detection Methods" Warner, D. L. Boise State University College of Engineering, April, 2004.

3. "An Organic Chemist's Perspective on the Pharmaceutical Industry" Warner, D. L. Boise State University Biology Bioethics Course, October, 2005.

4. "Synthesis and DNA Binding Properties of Aziridinomitosenes" Warner, D. L. Department of Chemistry, University of Idaho, April 2007.

5. "Synthesis and DNA Binding Properties of Aziridinomitosenes" Warner, D. L. Department of Chemistry, University of Vermont, May 2007.

6. "Synthesis and DNA Binding Properties of Aziridinomitosenes" Warner, Don L.; Haga, Matt K.; McKay, Mandalyn; Montgomery, Jamie; Olson, Richard D.; Penner, Megan; Radabaugh, Andrea S.; Rink, Stacia M. 88th Pacific Division Regional Meeting of the American Association for the Advancement of Science, Boise, ID, United States, June 17-21 (2007).

7. "DNA Binding Properties of Synthetic Aziridinomitosenes" Warner, D. L.; Department of Chemistry, University of Nevada, Reno, August 2007.

8. "Evaluation of DNA Cross-Linking by Aziridinomitosenes" Warner, D. L.; Invited presentation at the 50th Annual Meeting of the Idaho Academy of Sciences; Nampa, ID; March, 2008.

9. "DNA Binding Properties of Synthetic Aziridinomitosenes" Warner, D. L.; Whitman College; November, 2008.

10. "DNA Binding Properties of Synthetic Aziridinomitosenes" Warner, D. L.; Western Washington University; January, 2009.

POSTERS AND PRESENTATIONS

1. "Studies Toward the Total Synthesis of Aziridinomitosene B via an Oxazolium Salt-Azomethine Ylide Strategy" Vedejs, E.; Warner, D. L. National Organic Chemistry Symposium; Bozeman, MT; June, 2001.
2. "Synthesis of Aziridinomitosenes via an Oxazolium Salt-Azomethine Ylide Strategy" Vedejs, E.; Warner, D. L. American Chemical Society National Meeting; Chicago, IL; August, 2001.
3. "Silver Triflate-Mediated Oxazolium Salt Formation: Solvent Effects and Application Toward the Synthesis of Aziridinomitosenes" Vedejs, E.; Warner, D. L.; Hibberd, A. H.; Mayes, M. C. National Organic Chemistry Symposium; Bloomington, IN; June, 2003.
4. "Investigation of DNA Cross-Linking by Aziridinomitosenes" Don L. Warner, Amber M. Hibberd, and Stacia M. Rink; National Organic Chemistry Symposium; Salt Lake City, UT; June, 2005.
5. "Synthesis of and Interstrand DNA Cross-Linking by Aziridinomitosenes" Don L. Warner, Stacia M. Rink, Amber M. Hibberd, Byron Knowles, Christopher Liby, Andrea Radabaugh, Jennifer R. Spencer, and Amy C. Ulappa; American Chemical Society National Meeting; Atlanta, GA; March, 2006.
6. "Investigations of synthetic C6/C7 unsubstituted aziridinomitosenes that form DNA/protein cross-links" Warner, Don L.; Rink, Stacia M.; Montgomery, Jamie; McHail, Katherine M.; McInturff, Emma L.; Schimpf, Alina M.; American Chemical Society National Meeting; Philadelphia, PA; August, 2008.
7. "Assessment of student critical thinking skills in the Boise State undergraduate chemistry laboratory" Warner, Don L.; Brown, Eric C.; Shadle, Susan E.; Towns, Marcy H. American Chemical Society National Meeting; San Francisco, CA; March, 2010.
8. "Synthesis and study of synthetic aziridinomitosenes that form DNA adducts" Warner, Don L.; Fox, Katherine M.; Montgomery, Jamie M.; McInturff, Emma L.; Summers, Mikenna; Knox, Nichole D.;

Hildenbrand, Jennifer; Rink, Stacia M. American Chemical Society National Meeting; San Francisco, CA; March, 2010.

9. "Measuring the effect of an instrument-intensive curriculum on student critical thinking skills at Boise State University" Shadle, Susan E.; Warner, Don L.; Brown, Eric C.; Towns, Marcy H. American Chemical Society National Meeting; Boston, MA; August, 2010.

STUDENT POSTER PRESENTATIONS

1. "Synthesis of Substituted Aziridinomitosenes and their Interactions with DNA" Smith, C.; Warner, D. L.; 45th Annual Meeting of the Idaho Academy of Sciences; Lewiston, ID; April, 2003.

2. "Solvent Optimization for *N*-Methyl Aziridine Synthesis" Hibberd, A.; Warner, D. L.; 45th Annual Meeting of the Idaho Academy of Sciences; Lewiston, ID; April, 2003.

3. "Synthesis of a Cylcopentadithiophene: Monomer Unit in the Semi-Conductive Film of an Electrochemical Sensor" Wilson, T.; Russell, Dale; Warner, D. L.; 45th Annual Meeting of the Idaho Academy of Sciences; Lewiston, ID; April, 2003.

4. "Aziridinomitosene Synthesis for DNA Interaction Studies" Hibberd, A. M.; Warner, D. L.; 2003 Idaho BRIN Grant Undergraduate Research Symposium; Boise, ID; August, 2003.

5. "Efforts Toward The Total Synthesis Of An Aziridinomitosene: Synthetic Considerations For Aziridine Sensitivity" Amber M. Hibberd, Don L. Warner, Edwin Vedejs; 46th Annual Meeting of the Idaho Academy of Sciences; Pocatello, ID; March, 2004.

6. "Enantioselective Formation of Carbon-Carbon Bonds Through 1,2-Alkyl Migrations of Dihaloalkylsilanes" Eric A. Standley, Tyler W. Wilson and Don L. Warner; 46th Annual Meeting of the Idaho Academy of Sciences; Pocatello, ID; March, 2004.

7. "Synthesis of Monomer Units for Molecular Sensors" Jeff Multhaup, Cory Lindstrom, Sandra Stover, Tyler Wilson, Dr. Dale Russell, and Dr. Don Warner; 1st Annual Boise State Undergraduate Research Conference; April, 2004.

8. "Synthesis of Aziridinomitosene via Oxazole Precursors" Byron Knowles, Anna Block, Jennifer Spencer and Dr. Don Warner; 1st Annual Boise State Undergraduate Research Conference; April, 2004.

9. "Efforts Toward The Total Synthesis Of An Aziridinomitosene: Synthetic Considerations For Aziridine Sensitivity" Amber M. Hibberd, Don L. Warner, Edwin Vedejs; 1st Annual Boise State Undergraduate Research Conference; April, 2004.

10. "Enantioselective Formation of Carbon-Carbon Bonds Through 1,2-Alkyl Migrations of Dihaloalkylsilanes" Eric A. Standley, Tyler W. Wilson and Don L. Warner; 1st Annual Boise State Undergraduate Research Conference; April, 2004.

11. "Efforts Toward The Total Synthesis Of An Aziridinomitosene: Synthetic Considerations For Aziridine Sensitivity" Amber M. Hibberd, Don L. Warner, Edwin Vedejs; American Chemical Society National Meeting; Philadelphia, PA; August, 2004.

12. "Synthesis Of Aziridinomitosenes And Preliminary Investigations Into Their DNA Crosslinking Mechanism" Amber M. Hibberd; David M. Rasmussen; Don L. Warner; 2004 Idaho BRIN Undergraduate Research Symposium; Pocatello, ID; August, 2004.

13. "Aziridinomitosene Synthesis And Analyzing This Compound's Effect On DNA Alkylation Interactions" Christopher J. Liby, Amber M. Hibberd, Don L. Warner; 47th Annual Meeting of the Idaho Academy of Sciences; Caldwell, ID; April, 2005.

14. "Efforts Toward Electrocyclization of Vinyl Azomethine Ylides Generated via Electrocyclic Ring-Opening of 4-Oxazolines" Jessica L. Burleson, Amber M. Hibberd, Don L. Warner; 47th Annual Meeting of the Idaho Academy of Sciences; Caldwell, ID; April, 2005.

15. "Aziridinomitosene Synthesis And Analyzing This Compound's Effect On DNA Alkylation Interactions" Christopher J. Liby, Amber M. Hibberd, Don L. Warner; 2nd Annual Boise State Undergraduate Research Conference; April, 2005.

16. "Efforts Toward Electrocyclization of Vinyl Azomethine Ylides Generated via Electrocyclic Ring-Opening of 4-Oxazolines" Jessica L. Burleson, Amber M. Hibberd, Don L. Warner; 2nd Annual Boise State Undergraduate Research Conference; April, 2005.

17. "Importance Of Stereoselectivity In The Synthesis Of An Aziridinomitosene Analog" Andrea Radabaugh, Kate McDonough, Anna Block, and Don L. Warner; 2nd Annual Boise State Undergraduate Research Conference; April, 2005.

18. "Theoretical and Synthetic Investigations of 2-Pyrrolines via 1,5-dipolar Electrocyclizations" Amber M. Hibberd, Jess L. Burleson, Derrek N. Woodbury and Don L. Warner; National Organic Chemistry Symposium; Salt Lake City, UT; June, 2005.

19. "Theoretical and Synthetic Studies of 1,5-Dipolar Electrocyclizations for the Synthesis of 2-Pyrrolines" Amber M. Hibberd, Jess L. Burleson, Derrek N. Woodbury and Don L. Warner; American Chemical Society National Meeting; Atlanta, GA; March, 2006.

20. "Computational and synthetic investigations of dipolar and anionic electrocyclizations for the synthesis of 2-pyrrolines" Hibberd, Amber M.; Woodbury, Derrek N.; Schimpf, Alina M.; Warner, Don L. Abstracts, 61st Northwest Regional Meeting of the American Chemical Society, Reno, NV, United States, June 25-28, 2006.

21. "Investigation into the formation of an aziridinomitosene-DNA interstrand crosslink under nonreductive conditions" Radabaugh, Andrea S.; Warner, Don L.; Rink, Stacia M.; Montgomery, Jamie; Penner, Megan. Abstracts, 61st Northwest Regional Meeting of the American Chemical Society, Reno, NV, United States, June 25-28, 2006.

22. "Synthesis and Characterization of a 6-Methyl Substituted Aziridinomitosene" Montgomery, Jamie; Warner, Don L.; Rink, Stacia M.; Penner, Megan; Radabaugh, Andrea. 2006 Idaho INBRE Research Conference; Coeur d'Alene, ID; August, 2006.

23. "Computational and synthetic investigation of stabilized and nonstabilized azomethine ylides for the generation of azacycles" Schimpf, Alina M.; Hibberd, Amber M.; Warner, Don L. Abstracts of Papers, 233rd ACS National Meeting, Chicago, IL, United States, March 25-29, 2007.

24. "Synthesis of a 6-methyl substituted aziridinomitosene that arrests division in HL-60 cancer cells" Montgomery, Jamie; Warner, Don L.; Rink, Stacia M.; Radabaugh, Andrea S.; Penner, Megan; Haga, Matt K.; Abstracts, 62nd Northwest Regional Meeting of the American Chemical Society, Boise, ID, United States, June 17-21 (2007).

25. "Computational and experimental investigation of 4-oxazoline ring-opening and azomethine ylide generation" Schimpf, Alina M.; Hibberd, Amber M.; Warner, Don L. Abstracts, 62nd Northwest Regional Meeting of the American Chemical Society, Boise, ID, United States, June 17-21 (2007).

26. "Verification of a DNA-Protein Cross-Link by an Aziridinomitosene" McHail, Katherine, M.; Montgomery, Jamie; Warner, D. L. 2007 Idaho INBRE Research Conference; Moscow, ID; August, 2007.

27. "In Vitro Formation Of DNA-Protein Cross-Links By An Unsubstituted, Synthetic Aziridinomitosene" Katherine M. McHail, Emma L. McInturff, Jamie M. Montgomery, Stacia M. Rink, and Don L. Warner; 50th Annual Meeting of the Idaho Academy of Sciences; Nampa, ID; March, 2008.

28. "Initial investigations into the synthesis and electrochemical polymerization of thiophene-based molecular imprinted polymers for use as benzene sensor electrodes" Lisa Young, Matt Haga, and Don Warner; 50th Annual Meeting of the Idaho Academy of Sciences; Nampa, ID; March, 2008.

29. "In Vitro Formation Of DNA-Protein Cross-Links By An Unsubstituted, Synthetic Aziridinomitosene" Katherine M. McHail, Emma L. McInturff, Jamie M. Montgomery, Stacia M. Rink, and Don L. Warner; 5th Annual Boise State Undergraduate Research Conference; April, 2008.

30. "Initial investigations into the synthesis and electrochemical polymerization of thiophene-based molecular imprinted polymers for use as benzene sensor electrodes" Lisa Young, Matt Haga, and Don Warner; 5th Annual Boise State Undergraduate Research Conference; April, 2008.

31. "Investigations into the anti-cancer properties of highly potent synthetic aziridinomitosenes" Montgomery, J. M.; Warner, D. L.; Rink, S. M.; Haga, M.; McHail, K.; McInturff, E.; Schimpf, A.; Young, L.; Council on Undergraduate Research Posters on the Hill, Washington, D.C; April 30, 2008.

32. "Studies Investigating the Mechanism of DNA/Protein Cross-Linking by Synthetic Aziridinomitosenes" Katherine M. McHail, Emma L. McInturff, Jamie M. Montgomery, Stacia M. Rink, and Don L. Warner; 2008 Idaho INBRE Research Conference; Boise, ID; August, 2008.

33. "Investigation of the C10 electrophilic site in DNA interstrand cross-linking by synthetic aziridinomitosenes" McInturff, Emma L.; McHail, Katherine M.; Warner, Don L. From Abstracts of Papers, 237th ACS National Meeting, Salt Lake City, UT, United States, March 22-26, 2009.

34. "Initial investigations into the synthesis and electrochemical polymerization of thiophene-based molecular imprinted polymers for use as benzene sensor electrodes" Young, Lisa J.; Haga, Matt K.; Warner, Don L. From Abstracts of Papers, 237th ACS National Meeting, Salt Lake City, UT, United States, March 22-26, 2009.

35. "Studies investigating the nucleophilic activation of aziridinomitosenes for the formation of DNA adducts" McHail, Katherine M.; Rink, Stacia M.; Warner, Don L. From Abstracts of Papers, 237th ACS National Meeting, Salt Lake City, UT, United States, March 22-26, 2009.

36. "Synthesis of Quinone-Substituted Aziridinomitosenes to Further Investigate the DNA-Binding Mechanism of Potential Anticancer Drugs" Thomas Oswald and Don L. Warner; 6th Annual Boise State Undergraduate Research Conference; April, 2009.

37. "Investigation of the C10 Electctrophilic Site in DNA Interstrand Cross-Linking by Synthetic Aziridinomitosenes" Emma L. McInturff, Katherine M. McHail, and Don L. Warner; 6th Annual Boise State Undergraduate Research Conference; April, 2009.

38. "Initial Investigations into the Synthesis and Electctrochemical Polymerization of Thiophene-Based Molecular-Imprinted Polymers for use as Benzene Sensor Electctrodes" Lisa J. Young and Don L. Warner; 6th Annual Boise State Undergraduate Research Conference; April, 2009.

39. "Investigation and Development of a More Efficient Synthesis of Aziridinomitosene Anti-Cancer Agents" Clifford M. Csizmar and Dr. Don L. Warner; 2009 Idaho INBRE Research Conference; Pocatello, ID; August, 2009.

40. "Studies Investigating the Cytotoxicity and Mechanism of DNA Adduct Formation by Synthetic Aziridinomitosenes" Katherine M. Fox, Nichole D. Knox, Jennifer N. Hildenbrand, Stacia M. Rink, and Don L. Warner; 2009 Idaho INBRE Research Conference; Pocatello, ID; August, 2009.

41. "Synthesis of Aziridinomitosene Analogs for Analysis of the Role of the C6 and C7 Electrophilic Sites in DNA Interstrand Crosslink Formation" Jeremy Daniels, Mikenna Summers, Dr. Don Warner; 2009 Idaho INBRE Research Conference; Pocatello, ID; August, 2009.

42. "Investigation of Aziridinomitosene Cytotoxicity in Cultivated Cell Lines" Jennifer Hildenbrand, Nichole Knox, Don L. Warner, and Ken Cornell; 2009 Idaho INBRE Research Conference; Pocatello, ID; August, 2009.

43. "Synthesis of Aziridinomitosene Analogs for Analysis of the Role of the C6 and C7 Electrophilic Sites in DNA Interstrand Crosslink Formation" Jeremy Daniels, Mikenna Summers, Dr. Don Warner; 2009 Donald S. Matteson Symposium in Organic Chemistry; Washington State University; Pullman, WA; October, 2009.

44. "Development of a streamlined synthesis of aziridinomitosine analogs" Csizmar, Clifford M.; Daniels, Jeremy P.; Warner, Don L. From Abstracts of Papers, 239th ACS National Meeting, San Francisco, CA, March 21-25, 2010.

45. "Synthesis and electrochemical characterization of thiophene-based monomers for the construction of benzene-selective molecular-imprinted polymer sensors" Young, Lisa; Warner, Don L. From Abstracts of Papers, 239th ACS National Meeting, San Francisco, CA, March 21-25, 2010.

46. "Synthesis of fluorescently labeled aziridinomitosenes for use in evaluating the mechanism of cytotoxicity" Haga, Matt; Warner, Don L. From Abstracts of Papers, 239th ACS National Meeting, San Francisco, CA, March 21-25, 2010.

47. "Development of a streamlined synthesis of aziridinomitosine analogs" Csizmar, Clifford M.; Daniels, Jeremy P.; Warner, Don L. 7th Annual Boise State Undergraduate Research Conference; April, 2010.

48. "Pyrrolidine Synthesis Through Nucleophilic Addition to 4-Unsubstituted Oxazolium Salts" Daniels, J.; Warner, D. L. 2010 Idaho INBRE Research Conference; Moscow, ID; August, 2010.

49. "Development of a Convergent Synthesis of AZM Analogs" Csizmar, C. M.; Daniels, J.; Warner, D. L.2010 Idaho INBRE Research Conference; Moscow, ID; August, 2010.

50. "Synthesis of Aziridinomitosene Analogs for Evaluation as DNA Interstrand Crosslinking Agents" Davis, L.; Hoovis, T.; Summers, M.; Warner, D. L. 2010 Idaho INBRE Research Conference; Moscow, ID; August, 2010.

51. "Synthesis of an aziridinomitosene analog for investigating the role of the C6 and C7 electrophilic sites in DNA/protein crosslink formation" Summers, Mikenna M.; Warner, Don L. From Abstracts of Papers, 241st ACS National Meeting, Anaheim, CA, United States, March 27-31, 2011.

52. "Synthetic preparation of aziridinomitosene precursors" Csizmar, Clifford M.; Warner, Don L. From Abstracts of Papers, 241st ACS National Meeting, Anaheim, CA, United States, March 27-31, 2011.

53. "Synthetic Efforts Toward a C7-alkyl Substituted Aziridinomitosene" Davis, L.; Warner, Don L. From Abstracts of Papers, 241st ACS National Meeting, Anaheim, CA, United States, March 27-31, 2011.

54. "Nucleophilic addition to 4-unsubstituted oxazolium salts to form five-membered nitrogen heterocycles" Daniels, Jeremy; Warner, Don L. From Abstracts of Papers, 241st ACS National Meeting, Anaheim, CA, United States, March 27-31, 2011.

55. "Synthesis of C-6 alkyl substituted aziridinomitosene analogs" Hoovis, Tyler; Warner, Don L. From Abstracts of Papers, 241st ACS National Meeting, Anaheim, CA, United States, March 27-31, 2011.

56. "Synthesis of an aziridinomitosene analog for investigating the role of the C6 and C7 electrophilic sites in DNA/protein crosslink formation" Summers, Mikenna M.; Warner, Don L. 8th Annual Boise State Undergraduate Research Conference; April, 2011.

57. "Synthetic Efforts Toward a C7-alkyl Substituted Aziridinomitosene" Davis, L.; Warner, Don L. 8th Annual Boise State Undergraduate Research Conference; April, 2011.

58. Five students (Clifford Csizmar, Amber Hibberd (thrice), Cory Lindstrom, Jamie Montgomery, and Tyler Wilson) presented posters at BSU Day at the State Legislature, 2004, 2005, 2006, 2007, and 2010.

CURRICULUM VITAE: June 2011

Denise G. Wingett, Ph.D.

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Degrees:

Ph.D.	1991	Washington State University, Biochemistry
M.S.	1989	Washington State University, Biochemistry
B.S.	1986	Boise State University, Chemistry

Academic Appointments:

2010-present	Professor and Chair, Department of Biological Sciences, Boise State University
2007-2010	Associate Professor and Associate Chair, Department of Biological Sciences, Boise State University
2007	Graduate Studies Coordinator, Department of Biological Sciences, Boise State University
2006-present	Affiliate Faculty, Department of Medicine, Division of Gerontology and Geriatric Medicine, University of Washington School of Medicine
2003-2007	Assistant Professor, Department of Biology, Boise State University
2002-2006	Research Assistant Professor, Department of Medicine, Division of Gerontology and Geriatric Medicine, University of Washington School of Medicine
1998-present	Research Associate, Mountain States Tumor and Medical Research Institute, Boise, ID

Relevant Experience:

1998-2004	Medical Research Scientist, Boise VA Medical Center
1995-1998	Assistant Medical Research Scientist, Boise VA Medical Center
1994-1995	Research Assistant Professor, Neuroimmunology Department, Portland VA Medical Center/Oregon Health Sciences University
1992-1994	Post-doctoral Fellow, Washington State University, with Dr. Nancy Magnuson
1986-1991	Doctoral Student, Washington State University, with Dr. Raymond Reeves

PART I - TEACHING

Formal Courses Taught

Boise State University (2003-present)
Cell Biology - Biol 301
Immunology - Biol 420/420G
Bioinformatics - Biol 446/546
Immunology Laboratory –Biol 497/597
Infection and Immunity - Biol 498/598
Advanced Topics in Immunology - Biol 497/597
Introduction to Bioinformatics - Biol 297
Advanced Topics in the Biology of Cancer & Immunology - Biol 466/566
Flow Cytometry Techniques – Biol 497/597

Washington State University (Fall 1993)
Immunology - Micro 412/512

Graduate Student Advising

Major Advisor:
Janet Layne (graduated 2011)
Ashley Masterson (graduated 2010)
Cory Hanley (graduated 2009)
Alma Hodzic (graduated 2007)
Kelli Matthies (graduated 2006)
Mark Headley (graduated 2005)
Panayiota Louka – current student

Graduate Committee Member:
Charlene Creech (graduated 2009)
Amanda Bruesch (graduated 2007)
Eric Hallingstad (graduated 2007)
Peter Mouser (graduated 2006)
Mike Butler (graduated 2006)
Chadwick Davis – current student
David Chang – current student
Katie Irwin – current student

PART II-RESEARCH

Referred Publications

1. Wyatt CR, **Wingett D**, White JS, Buck CD, Knowles D, Reeves D, and Magnuson NS: Persistent infection of rabbits with bovine leukemia virus associated with development of immune dysfunction. *J Virol* **63** :4498-4506, 1989.
2. **Wingett D**, Reeves R, and Magnuson NS: Stability changes in *pim-1* proto-oncogene mRNA following mitogen stimulation of normal lymphocytes. *J Immunol* **147**: 3563-3659, 1991.
3. **Wingett D**, Reeves R, and Magnuson NS: Characterization of the testes-specific *Pim-1* transcript in rat. *Nucleic Acids Res* **20**: 3183-3189, 1992.
4. **Wingett D**, Stone D, Davis WC, and Magnuson NS: Expression of the *pim-1* proto-oncogene:

Differential inducibility between alpha/beta and gamma/delta-T cells and B cells. *Cell Immunol* **162**:123-130, 1995.

5. **Wingett D,** and Magnuson NS: *Pim-1* proto-oncogene expression in anti-CD3-mediated T cell activation is associated with protein kinase C activation and is independent of raf-1. *J Immunol* **156**: 549-557, 1996.
6. Whitham RD, **Wingett D**, Wineman J, Mass M, Wegmann K, Vandenbark A, and Offner H: Treatment of relapsing autoimmune encephalomyelitis with T cell receptor V beta-specific antibodies when proteolipid protein is the autoantigen. *J Neurosci Res* **45**: 104-116, 1996.
7. **Wingett D**, Forcier K, and Nielson CP: Glucocorticoid-medicated inhibition of RANTES expression in human T lymphocytes. *Febs Lett* **398**:308-311, 1996.
8. Hoover DS, **Wingett D**, Zhang J, Reeves R, and Magnuson NS: *Pim-1* protein expression is regulated by its 5'-untranslated region and translation initiation factor eIF-4E. *Cell Growth Diff* **8**: 1371-1380, 1997.
9. **Wingett D**, Vestal RE, Forcier K, Hadjokas N, and Nielson CP: CD40 is functionally expressed on human breast carcinomas: Variable inducibility by cytokines and enhancement of Fas-mediated apoptosis. *Breast Cancer Res Treat* **50**: 27-36, 1998.
10. **Wingett D**, Forcier K, and Nielson CP: Regulation of CD40L expression by cyclic AMP: Contrasting proinflammatory and inhibitory actions. *Cell Immunol* **192:** 203-212, 1999.
11. **Wingett D,** Forcier K, and Nielson CP: A role for CD99 in T cell activation. *Cell Immunol* **193**:17-23, 1999.
12. Nielson CP, and **Wingett D**: Endothelial cell and cAMP regulation of T cell CD40: Relevance of CaMKIV signaling. *Immunol* **105**: 430-440, 2002.
13. **Wingett D**, and Nielson CP: Cyclic AMP differentially modulates CD40L expression on human naive and memory $CD4^+$ T cells. *Biochem Pharm* **64**: 1169-1178, 2002.
14. **Wingett D**, and Nielson CP: Divergence in NK cell and cyclic AMP regulation of T cell CD40L expression in asthmatic subjects. *J Leuk Biol* **74**: 531-541, 2003.
15. Nielson C, and **Wingett D**: Intensive care and invasive ventilation in the elderly patient, implications of chronic lung disease and comorbidities. *Chron Respir Dis* **1**: 43-54, 2004.
16. Matthies KGM, Hodzic A, and **Wingett D**: Differential regulation of soluble and membrane CD40L protein in T cells. *Cell Immun* **241**: 47-58, 2006.
17. Olson RD, Headley MB, Walsh GM, and **Wingett D**: In vitro and in vivo immuno-suppressive activity of a novel anthracycline, 13-deoxy, 5-iminodoxorubicin. *International Immunopharmacology*, **7**: 734-743, 2007.
18. Reddy KM, Feris K, Bell J, **Wingett DG**, Hanley C, and Punnoose A: Selective toxicity of zinc oxide nanoparticles to prokaryotic and eukaryotic systems. *Applied Physics Letters*, **90**: 213902, 2007.
19. Hanley C, Layne J, Punnoose A, Reddy KM, Coombs I, Coombs A, Feris K, and **Wingett D:** Preferential killing of cancer cells and activated human T cells using zinc oxide nanoparticles, *Nanotechnology,* **19:** 295103, 2008.
20. Wang H, **Wingett D**, Engelhard ME, Feris K, Reddy KM, Turner P, Layne J, Hanley C, Bell J, Tenne D, Wang C, and Punnoose A: Fluorescent dye encapsulated ZnO particles with cell-specific toxicity for cancer treatment and bio-medical applications. *Journal of Material Science: Materials in Medicine,* **20:** 11-22, 2009.

21. Hanley C, Thurber, A, Hanna C, Punnoose A, Zhang J, and **Wingett D**: The influences of cell type and ZnO nanoparticle size on immune cell cytotoxicity and cytokine induction. *Nanoscale Research Letters,* **4:** 1409-1420, 2009.
22. Feris K, Otto C, Tinker J, **Wingett D**, Punnoose A, Thurber A, Quinn B, Hanna C, and Pink A: Electrostatic interactions affect nanoparticle-mediated toxicity to the Gram negative bacterium Pseudomonas aeruginosa PAO1, *Langmuir*, **26:** 4429-4436, 2010.
23. Rasmussen JW, Martinez E, Louka P, and **Wingett D**: Zinc oxide nanoparticles for selective destruction of tumor cells and potential for drug delivery applications. *Expert Opinion on Drug Delivery*, **7:** 1063-1077, 2010.
24. Zhang J, Thurber A, Tenne D, Rasmussen JW, **Wingett D**, Hanna C, and Punnoose A: Enhanced dye fluorescence in novel dye-ZnO nano-composites. *Advanced Functional Materials*, **20:** 4358, 2010.
25. Thurber A, **Wingett DG**, Rasmussen JW, Layne J, Johnson L, Tenne DA, Zhang, J, Hanna CB, and Punnoose A: Improving the selective cancer killing ability of ZnO nanoparticles using Fe doping. *Nanotoxicology,* in press, 2011.
26. Masterson A, Rasmussen J, and **Wingett D**: Immunomodulatory effects of diesel exhaust particles: DEP exposure alters T helper cell function, submitted 2011.

Other Publications (selected)

1. Carter J, **Wingett D**, Reeves R, and Magnuson NS: A rabbit model for lymphotropic retrovirus infection. *FASEB J* 2:A529, 1988.
2. **Wingett D**, Reeves R, and Magnuson N: Involvement of the *pim-1* proto-oncogene in erythroid differentiation and lymphocyte activation. *FASEB J* 4671, 1991.
3. Hoover DS, **Wingett D**, Reeves R, and Magnuson N. Multiple levels of *Pim-1* kinase regulation in hematopoietic cells. *J Cell Biol* BZ 333:269, 1993.
4. **Wingett D**, Reeves R, and Magnuson NS: Transcriptional and post-transcriptional regulation of *pim-1* gene expression in hemato-lymphoid cells. *J Cell Bio* B435: 133, 1993.
5. Olson RD, Headley MB, Walsh GM, and **Wingett D**: Immunosuppressive propterties of a novel anthracycline analog. Frontiers of Clinical Investigation Symposium, *Autoimmunity*: P 28, 2005.
6. Matthies KMG, and **Wingett D**: Differential regulation of soluble and membrane CD40L protein in T cells: implication of ADAM-10. Inflammation in Chronic Disease, *Days of Molecular Medicine 2006*: P138, 2006.
7. Hanley C, Reddy KM, Feris K, Layne J, Punnoose A, **Wingett D:** Evaluating toxicity of metal oxide nanoparticles and their potential utilization in treatment of autoimmune disease. *American Association for the Advancement of Science (AAAS), Pacific Division, 88th Annual Meeting,* Boise, ID, June 17-21 2007.
8. Layne J, Feris K, Reddy KM, Hanley C, Punnoose A, **Wingett D:** Susceptibility of cancer cells to ZnO nanoparticle toxicity-potential utility for treatment of cancer. *American Association for the Advancement of Science (AAAS), Pacific Division, 88th Annual Meeting,* Boise, ID, June 17-21 2007.
9. Masterson A, Hodzic A, **Wingett D:** Molecular mechanisms controlling CD40L gene expression: Implications in asthma. *American Association for the Advancement of Science (AAAS), Pacific Division, 88th Annual Meeting*, Boise, ID, June 17-21 2007.

10. Feris K, Bell J, Reddy KM, **Wingett D**, Hanley C, Layne J, Punnoose A: Selective toxicity of zinc oxide nanoparticles to gram-positive and gram-negative bacterial systems. *The American Society for Microbiology, 107th General Meeting in the Metro Toronto Convention Centre in Toronto,* Canada, May 21-25 2007.
11. Feris K, Bell J, Reddy KM, Coombs I, Wang H, Hanley C, Punnoose A, **Wingett D:** Antimicrobial effects and mechanisms of toxicity of metal oxide nanoparticles. *American Association for the Advancement of Science (AAAS), Pacific Division, 88th Annual Meeting,* Boise, ID, June 17-21 2007.
12. **Wingett D**, Feris K, Hanley C, Reddy KM, Wang H, Punnoose A: Evaluation of potential toxicity issues and nanomedicine based applications of ZnO nanoparticles. *Keystone Symposium "Nanotechnology in Biomedicine"*, Feb 11-16, Tahoe City, CA 2007.
13. Masterson A, and **Wingett D**: Air quality and you: The role of diesel exhaust particles in immune system activation. *National Science Foundation GK-12 Annual Meeting*, March 29, Washington DC, 2009.

Patents

1. **Wingett D**, Punnoose A, Reddy KM. Preferential killing of cancer cells and activated human T-cells using the selective toxicity of zinc oxide nanoparticles. Patent Pending. US Patent Application No. 60/974,460, and PCT Patent Application No. PCT/US08/077252, 2008.
2. Wang H, Punnoose A, **Wingett D**, Reddy KM, Feris K. Dye encapsulated fluorescent ZnO particles with cell-specific toxicity for cancer treatment and bio-medical applications. Patent Pending, US Patent Application No.60/974,461, and PCT Patent Application No. PCT/US08/77284, 2008.

Research Funding

2010-2011	Idaho State Board of Education: Development of a Biomolecular Immunology Lab Course: Integrating Advanced Technology, Bioinformatics, and 3-D Molecular Visualization **($19,800)**, Principal Investigator.
2010-2013	National Institutes of Health/National Cancer Institute: Preferential cytotoxic actions of metal oxide nanoparticles against cancer **($211,500)**, Principal Investigator.
2009-2010	Idaho State Board of Education: Development of a Biomolecular Immunology Lab Course **($104,800)**, Principal Investigator.
2009-2011	Department of Defense: Development of a West Nile Vaccine **($960,000**; total award), Co-Principal Investigator.
2009-2011	Department of Defense: DNA Safeguard **($96,944**; total award**)**, Co-Principal Investigator.
2009-2012	National Science Foundation: MRI: Acquisition of an LC-MS for multidisciplinary research and education **($676,964**; total award**)**, Co-Principal Investigator.

2008-2011	National Science Foundation: MRI: Acquisition of a FACS to support collaborative research and education in biomolecular sciences and nanomaterials applications **($503,775)**, Principal Investigator.
2008-2010	Mountain States Tumor and Medical Research Institute: Utility of zinc oxide nanoparticles for selective cancer cell killing **($5,000)**, Principal Investigator.
2007-2008	Mountain States Tumor and Medical Research Institute: Feasibility of nanomedicine based approaches for treatment of autoimmune disease **($5,000)**, Principal Investigator.
2005-2009	National Institutes of Health: Altered cAMP regulation of CD40L in asthma, grant #1R15 AI06277-01A1 **($195,696)**, Principal Investigator.
2005-2006	National Institutes of Health: Utility of a novel anthracycline analog in psoriasis, grant #1R43 AR052955-01 **($146,172)**, Principal Investigator.
2005-2006	Boise State University Faculty Research Associates Program **($5,000)**, Principal Investigator.
2005-2006	Mountain States Tumor and Medical Research Institute: Regulation of T cell CD40L gene expression **($5,000)**, Principal Investigator.
2005-2006	Boise State University Faculty Research Grant: Molecular mechanisms relevant to asthma that dysregulate CD40L **($5,000)**, Principal Investigator.
2004-2008	Gem Pharmaceuticals, LLC: Comparison of the dermatologic activities of Doxorubicin, GPX-100 and GPX-150 **($6,024)**, Principal Investigator.
2004-2005	Mountain States Tumor and Medical Research Institute: Identification of differentially expressed proteins on a regulatory NK cell subset in asthma **($5,000)**, Principal Investigator.
2004-2005	Boise State University Faculty Research Grant: Identification of molecular mechanisms leading to elevated CD40L protein in asthma **($5,000)**, Principal Investigator.
2003-2004	Mountain States Tumor and Medical Research Institute: Involvement of CD40L/CD40 interactions in Alzheimer's disease **($5,000)**, Principal Investigator.
2003-2004	Idaho Biomedical Research Infrastructure Network Program of NIH, National Center for Research Resources: Seed Grant, Functional and phenotypic characterization of a novel asthma-associated NK cell subset **($25,000)**, Principal Investigator.
2003-2004	Idaho Biomedical Research Infrastructure Network Program of NIH, National Center for Research Resources: Equipment supplement for NIH-BRIN seed grant proposal **($56,222)**, Principal Investigator.
2002-2003	Mountain States Tumor and Medical Research Institute: Involvement of novel NK cell subpopulations in asthma **($5,000)**, Principal Investigator.
2001-2004	Department of Veterans Affairs: Altered cAMP regulation of CD40L in asthma **($472,700)**, Principal Investigator.

2002-2003	Mountain States Tumor and Medical Research Institute: Involvement of novel NK cell subpopulations in asthma **($5,000)**, Principal Investigator.
1998-2001	Department of Veterans Affairs: Aberrant cAMP regulation of T cell CD40L expression in asthma **($343,000)**, Principal Investigator.
1998-2000	Expedition Inspiration: CD40 expression in breast cancer: Involvement in cytotoxicity and immune enhancement **($15,000)**, Principal Investigator.
1996-1997	Mountain States Medical Research Institute: CD40 signaling in breast and prostate carcinoma cells **($10,000)**, Principal Investigator.

Awards

2008	Health Care Hero Honoree, Educator Category, Idaho Business Review
2008	Women of the Year, Idaho Business Review
2008	Women Making Herstory Award, Boise State University Women's Center
1993-1995	National Research Service Award, Department of Health and Human Services, Washington State University

Membership in professional organizations

American Association for the Advancement of Science, Associate Member
American Association for Cancer Research, Associate Member
American Association for Immunologists, Associate Member
Sigma Xi Scientific Research Society, Full Member

PART III-SERVICE

Professional Service

Professional Committee Involvement

2010	Study Section (ad hoc), National Science Foundation, Major Research Instrumentation
2010	Editorial Board, *Journal of Nanoscience Letters*
2009	Study Section (ad hoc), Center for Scientific Review SBIR/STTR, Small Business: Arthritis, Connective Tissue and Skin (ACTS), NIH
2005-2010	Council Board Member, Mountain States Tumor and Medical Research Institute, St. Luke's Hospital, Boise, ID
2004-2006	Member, Central Idaho Asthma Coalition
2001-2002	Member of University Washington Human Subjects Review Committee (IRB), Seattle, Washington
2001-2003	Member of Research and Development Committee, Boise VAMC
2000-2001	Chairperson of Research and Development Committee, Boise VAMC
2000-2001	Chairperson of Scientific Review Subcommittee, Boise VAMC
1999-2005	Chairperson of Hospital Radiation Safety Committee, Boise VAMC
1998	Acting Cancer Section Head, Mountain States Medical Research Institute, Boise, ID

Institutional Service

University Committees

2007-present	Member, Biomolecular Sciences Ph.D. Curriculum Committee, BSU
2007-2009	Member, University Patent Committee, BSU
2007-2009	Member, University Top-Ten Scholars Selection Committee, BSU
2005	Member, University Chemical Hygiene Committee, BSU
2004-present	Member, University Radiation Safety Committee, BSU
2004	Member, Idaho BRIN Summer Research Undergraduate Fellowship Selection Committee, BSU

Departmental Committees

2010-present	Chair, Department of Biological Sciences, BSU
2007-2010	Associate Chair, Department of Biological Sciences, BSU
2009-2010	Member, Promotion & Tenure Committee, Dept. Biological Sciences, BSU
2007	Director, Graduate Studies Program, Dept. Biological Sciences, BSU
2004-2010	Member, Graduate Studies Committee, Dept. Biological Sciences, BSU
2006	Member, Raptor Research Student Grant Selection Committee, BSU
2005	Member, Systematist Faculty Position Search Committee, BSU
2005	Member, Raptor Research Student Grant Selection Committee, BSU
2004	Member, Environmental Microbiologist Faculty Search Committee, BSU
2003	Member, Microbiologist Faculty Position Search Committee, BSU

University-related projects

2008	Speaker, forum for new BSU faculty hires
2006	Judge for Undergraduate Research and Scholarship Conference
2005	Speaker, forum for NIH grant seekers, Sept. 22nd
2005	Departmental representative for BSU Graduate & Professional School Day, Oct. 27th
2004	Departmental representative for BSU Graduate & Professional School Day, Oct. 28th
2004	Co-host for the 4th Virtual Conference on Genomics and Bioinformatics, Sept. 21-24

BIOGRAPHICAL SKETCH
Provide the following information for the key personnel involved in this project.
Photocopy this page for follow this format for each person.

Name Danny Xu	Position Title Assistant Professor (Tenure-Track)

Education/Training (begin with baccalaureate or other initial professional education, such as nursing, and includes postdoctoral training)

Institution and Location	Degree (if applicable)	Year(s)	Field of Study
Nan Kai University, China	B.S.	1996	Chemistry
San Diego State University	M.S.	2003	Computational Chemistry
San Diego State University	Ph.D.	2007	Computational Chemistry
University of California, San Diego	Postdoc	2007-2010	Computational Biochemistry

A. Positions and Honors

Positions and Employment

2000 – 2007 Graduate Teaching Associate, San Diego State University
2003 – 2003 Software Engineering Intern, SONY Technology Center, San Diego
2005 – 2005 Research Scientist, Proctor & Gamble Pharmaceuticals, New York
2007 – 2010 Postdoctoral Research Scientist, University of California, San Diego
2010 – present Assistant Professor, Dept. of Chemistry and Biochemistry, Boise State University

Professional Memberships

2000 – present Member, American Chemical Society
2009 – present Member, Biophysical Society
2009 – present Member, Sigma Xi, The Scientific Research Society
2005 – present Member, American Association of Pharmaceutical Sciences

Media and News Coverage
"Fighting the flu", in Chemistry World. 2011, Royal Society of Chemistry: London, UK. p. 44-47.

B. Selected Peer-Reviewed Publications

[1] **Xu, D.**, Williamson, M. J., Walker, R. C., Advancements in molecular dynamics simulations of biomolecules on graphical processing units, *Annu. Rep. Comp. Chem*., 6, 2-19 (2010).

[2] Zou, W., **Xu D.**, Zajac P., Cooksy, A. L., Bersuker I. B., Liu, Y., Boggs, J. E., Symmetry breaking in linear ZnCl2+: A theoretical study, *J. Mol. Struct.*, 978, 263-268 (2010).

[3] **Xu, D.**, Newhouse, E. I., Amaro, R. E., Pao, H. C., Cheng, L. S., Markwick, P. R. L., McCammon, J. A., Li, W. W., Arzberger, P. W., Glycan topology for avian and human sialo-pentasaccharide receptor analogues upon binding different hemagglutinins: A molecular dynamics perspective. *J. Mol. Bio*. 387, 465-491 (2009).

[4] Newhouse, E. I., **Xu, D.**, Amaro, R. E., Pao, H. C., Markwick, P. R. L., Wu, k. J., Alam, M. McCammon, J. A., Li, W. W., Arzberger, P. W., Mechanism of glycan receptor recognition and specificity switch for avian, swine and human adapted influenza virus hemagglutinins: A

molecular dynamics perspective. *J. Am. Chem. Soc*., 131 (47), 17430–17442 (2009).

[5] Amaro, R. E., Cheng, X., Ivanov, I., **Xu, D.**, Mccammon, J. A. characterizing loop dynamics and ligand recognition in human- and avian-type influenza neuraminidases via generalized born molecular dynamics and end-point free energy calculations. *J. Am. Chem. Soc*., 131(13), 4702-4709 (2009).

[6] **Xu, D.**, Stare, J., Cooksy, A. L., Solving the vibrational schrodinger equation on an arbitrary multidimensional potential energy surface by the finite element method. *Comp. Phys. Comm*., 180, 2079-2094 (2009).

[7] Cheng, L., Amaro, R. E., **Xu, D.**, Li, W. W., Arzberger, P. W., McCammon, J. A., Ensemble-based virtual screening reveals novel antiviral compounds for avian influenza neuraminidase. *J. Med. Chem*., 51 (13), 3878–3894 (2008).

[8] **Xu, D.**, Redman-Furey, N., Statistical cluster analysis of pharmaceutical solvents. *Intl. J. Pharm*., 339, 18, 175-188 (2007).

[9] **Xu, D.**, Cooksy, A. L., Ab initio study of the torsional motion in tolane. *J. Mol. Struct*. *THEOCHEM*, 815, 1, 119-125 (2007).

[10] Zhang, K., Zhang, H., Xua, G., Xiang, S., **Xu, D.**, Liu, S., Li, H., Alkylation of phenol with tert-butyl alcohol catalyzed by large pore zeolites, *Applied Catalysis A: General*, 207, 183-190 (2001).

[11] Zhang K., **Xu D.**, Huang C., Zhang H., Xiang S., Liu S., Li H. Alkylation of phenol with tert-butyl alcohol catalysed by zeolite Hβ, *Applied Catalysis A: General*, 166 (1), 89-95 (1998).

B. List of Current Support

Boise State University New Faculty Start-up Fund $200,000 (Award Date: 08/01/10)

St. Luke's Mountain States Tumor and Medical Research Institute Small Project Grant $7,500 (Award Date: 05/26/11)

NSF Teragrid New PI Start-up Allocation TG-MCB110009 100,000SU (Award Date: 10/20/10 - 10/20/11)

DOE INCITE Computing Allocation at Oak Ridge National Lab World #1 Supercomputer Jaguar XT5 1,000,000 SU (Award Date: 07/01/10 - 07/31/11)

DOE Idaho National Laboratory Computing Allocation (Award Date: 12/07/10)

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SUBJECT

Pending Rule, Docket 08-0104-1101 Rules Governing Residency Classification

REFERENCE

June 2011	Board approved proposed rule changes to IDAPA 08.01.04, Rules Governing Residency Classification

APPLICABLE STATUTES, RULE OR POLICY

Section 33-3717B, Idaho Code

BACKGROUND / DISCUSSION

Current rule delegates the responsibility for determination of residency for professional health education programs to specific institutions. While some institutions provide some level of instruction for some of these professional health education programs, others do not.

Staff has identified programs for which one institution could provide evaluation and determination of residency for applicants of multiple programs. This could make the application process more user friendly for the student and increase efficiencies in the determination of residency for these programs.

There were no comments received during the 21 day open comment period. There have been no changes between the proposed and pending rule.

IMPACT

The approval of this proposed rule will allow the rule to move forward to the legislature for review.

ATTACHMENTS

Attachment 1 – Pending Rules Governing Residency Page 3

STAFF COMMENTS AND RECOMMENDATIONS

Pending rules approved by the Board will be posted in the next Administrative Bulletin and move forward to the legislature. Pending rules become effective at the end of the legislative session in which they are submitted if they are not rejected by the concurrent resolution of the legislature.

Staff recommends approval.

BOARD ACTION

I move to approve to the Pending Rule Docket 08-0104-1101 Rules Governing Residency Classification as submitted.

Moved by_____ Seconded by_____ Carried Yes____ No____

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IDAPA 08
TITLE 01
CHAPTER 04

08.01.04 - RULES GOVERNING RESIDENCY CLASSIFICATION THE STATE BOARD OF EDUCATION

105. RESIDENCY REQUIREMENTS FOR SPECIAL GRADUATE OR PROFESSIONAL PROGRAMS.

01. Residency Requirement. As provided in Section 33-3717B, Idaho Code, a residency requirement of at least one (1) calendar year is in effect for certain special graduate and professional programs. ( )

a. Those programs include, but are not limited to, the WAMI Regional Medical Program, the WICHE Professional Student Exchange Program, the Idaho Dental Education Program, the Creighton Dental Education Program, the WOI Regional Veterinary Program, and the University of Utah Medical Program. ( )

b. For purposes of this section, the requirement of "at least one (1) calendar year" means a period of twelve (12) consecutive months of continuous residency consistent with the requirements of Section 33- 3717B, Idaho Code, immediately prior to the date of application. (5-8-09)( )

~~**01. Delegation of Certification Administration.** The following office or institutions are delegated the responsibility for the evaluation of applicants and determination of residency for the special graduate and professional programs for purposes of certification. (7-1-93)~~

~~**a.** The University of Idaho -- WAMI Regional Medical Program, WOI Regional Veterinary Program. (7-1-93)~~( )

~~**b.** Idaho State University -- Idaho Dental Education Program and the University of Utah Medical Program. (6-30-95)~~( )

~~**c.** Office of the State Board of Education -- WICHE Professional Student Exchange Program. (6-30-95)~~

02. Appeal to the State Board of Education. Applicants for the special graduate and professional programs, upon institutional denial of residency status, may petition the Board for a hearing on the denial. The decision to grant such a hearing is discretionary with the Board and will be granted for errors in determination of residency pursuant to Section 33-3717B, Idaho Code. (5-8-09)

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SUBJECT

Pending Rule – Docket 08-0109-1101 – GEAR UP Idaho Scholarship

REFERENCE

June 2011 — Board approved proposed rule changes to IDAPA 08.01.09, Rules Governing GEAR UP Idaho Scholarship

APPLICABLE STATUTE, RULE, OR POLICY

Idaho Administrative code, IDAPA 08.01.09

BACKGROUND/DISCUSSION

The state of Idaho received the GEAR UP Idaho grant in 2006. A major component of this grant is scholarships for those students who have participated in the program. The first cohort of students will become eligible to receive these scholarships. The rule is patterned after the Opportunity Scholarship rule that is already in place and has functioned successfully for a number of years.

The rule outlines the eligibility requirements and applications process. The minimum award is equivalent to the maximum Pell for the year awarded and cannot exceed the cost of attendance.

There were no comments received during the 21 day open comment period. There have been no changes between the proposed and pending rule.

IMPACT

The proposed amendments will allow staff to efficiently administer the program.

ATTACHMENTS

Attachment 1 – Pending Rules Governing the GEAR UP Idaho Scholarship
Page 3

STAFF COMMENTS AND RECOMMENDATIONS

Pending rules approved by the Board will be posted in the next Administrative Bulletin and move forward to the legislature. Pending rules become effective at the end of the legislative session in which they are submitted if they are not rejected by concurrent resolution of the legislature.

Staff recommends approval.

BOARD ACTION

I move to approve Pending Rule Docket 08-0109-1101 as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

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IDAPA 08
TITLE 01
CHAPTER 09

08.01.09 – RULES GOVERNING THE GEAR UP IDAHO SCHOLARSHIP PROGRAM

000. LEGAL AUTHORITY. These rules are promulgated pursuant to the authority of the State Board of Education (Board) under Section 33-105, Idaho Code. (6-24-11)T

001. TITLE AND SCOPE. (6-24-11)T

01. Title. These rules shall be cited as IDAPA 08.01.09, "Rules Governing the GEAR UP Idaho Scholarship Program." (6-24-11)T

02. Scope. These rules constitute the requirements for the GEAR UP Idaho Scholarship Program. (6-24-11)T

002. WRITTEN INTERPRETATIONS. In accordance with Section 67-5201(19)(b)(iv), Idaho Code, written interpretations, if any, of the rules of this chapter are available at the Board. (6-24-11)T

003. ADMINISTRATIVE APPEALS. Unless otherwise provided for in the rules of the Board or in the Board Governing Policies and Procedures, all administrative appeals allowed by law shall be conducted as provided herein. (6-24-11)T

004. INCORPORATION BY REFERENCE. There are no documents that have been incorporated by reference into these rules. (6-24-11)T

005. OFFICE -- OFFICE HOURS -- MAILING ADDRESS AND STREET ADDRESS.
The principal place of business of the State Board of Education is in Boise, Idaho. (6-24-11)T

01. Mailing Address. The mailing address is PO Box 83720, Boise, Idaho 83720-0037. (6-24-11)T

02. Street Address. The State Board of Education's street address is 650 West State Street, Room 307, Boise, Idaho 83702. (6-24-11)T

03. Office Hours. The office hours are from 8 a.m. to 5 p.m., except Saturday, Sunday and legal holidays. (6-24-11)T

006. PUBLIC RECORDS ACT COMPLIANCE. These rules are subject to the provisions of the Idaho Public Records Act, Title 9, Chapter 3, Idaho Code. (6-24-11)T

007. --009. (RESERVED). (6-24-11)T

010. DEFINITIONS. (6-24-11)T

01. Dependable Strengths Report. A tool available on the Idaho Career Information System that assists students in assessing_ skills and abilities as they relate to career choices and options. Dependable Strengths is accessed via *My CIS Portfolio*. (6-24-11)T

02. Educational Costs. Student costs for tuition, fees, room and board, or expenses related to reasonable commuting, books and other expenses reasonably related to attendance of a postsecondary educational institution. This cost is determined by the postsecondary institution the student attends. (6-24-11)T

03. Eligible Institution. (6-24-11)T

a. A public postsecondary educational institution governed or supervised by the Board, or a board of trustees of a community college established pursuant to the provisions of Chapter 21, Title 33, Idaho Code; or (6-24-11)T

b. Any educational organization located in Idaho that is: (6-24-11)T

i. Operated privately; (6-24-11)T

ii. Classified as not-for-profit under the Idaho Code; (6-24-11)T

iii. Under the control of an independent board and not directly controlled or administered by a public or political subdivision; and (6-24-11)T

iv. Accredited by an organization recognized by the Board, as provided in section 33-2402, Idaho Code. (6-24-11)T

v. Eligible for receipt of federal financial aid funding. (6-24-11)T

04. Eligible Student. A student who: (6-24-11)T

a. Is an Idaho resident and who has participated in the early intervention component (7^{th} through 10^{th} grade) of the GEAR UP Idaho program and who has or will graduate from an accredited high school or equivalent in Idaho as determined by the Board in 2012, 2013, or 2014; (6-24-11)T

b. Has enrolled or applied as a full-time student in an eligible institution for a minimum of twenty-four (24) credit hours in an academic year. (6-24-11)T

05. Administrator. The Executive Director of the Idaho State Board of Education or his designee. (6-24-11)T

011. -- 099. (RESERVED). (6-24-11)T

100. OBJECTIVES OF THE GEAR UP IDAHO SCHOLARSHIP PROGRAM. The objectives of the GEAR UP Idaho scholarship program are as follows:(: (6-24-11)T

01. Continuation of Education. To support the continuation of education at the postsecondary level by providing qualified students with a scholarship; and. (6-24-11)T

02. Successful Completion of Program Activities. To recognize the successful completion of GEAR UP program activities by student participants. (6-24-11)T

101. ELIGIBILITY

01. **Eligible Student.** An applicant must be an eligible student and less than twenty-two (22) years of age at the time the student first receives a scholarship award. (6-24-11)T

02. Undergraduate Student. An eligible student must be enrolled full-time in an undergraduate program at an eligible institution. A student enrolled in an undergraduate program is eligible for consideration for a scholarship award, even if some of the student's courses are at the graduate level. (6-24-11)T

102. – 199. (RESERVED). (6-24-11)T

200. APPLICATION PROCESS (6-24-11)T

01. Initial Applications. (6-24-11)T

a. An eligible student who has not yet graduated from an accredited high school or its equivalent in the state of Idaho must complete and submit the GEAR UP Idaho Scholarship Application to the Board electronically on or before the date specified in the application, but not later than January 15th. An applicant without electronic capabilities may receive assistance in completing the electronic application from a high school counselor or from State Board of Education scholarship staff. Gear Up Idaho Scholarship Administrator through the United States Postal Service, which must be postmarked not later than January 15th. (6-24-11)T

b. An applicant must complete and submit the Free Application for Federal Student Aid (FAFSA) on or before February 15th of the year student will graduate from secondary school or its equivalent. (6-24-11)T

c. An applicant must submit with his or her application a copy of the applicant's Dependable Strengths Report or in lieu of submitting the applicant's Dependable Strengths Report an applicant may submit a one-page essay on the topic "My Unique Dependable Strengths." (6-24-11)T

02. Announcement of Award. Announcement of the award of initial scholarships for the 2012 – 2013 academic year will be made no later than May 15, 2012, with awards to be effective at the beginning of that academic year. The announcement of award recipients in future academic years will be made no later than May 1. (6-24-11)T

03. Communication with State Officials. Applicants for initial scholarships must respond by the date specified to any communication from officials of the GEAR UP Idaho Program. Failure to respond within the time period specified will result in cancellation of the application or forfeiture of the scholarship unless extenuating circumstances are involved. (6-24-11)T

201. – 299. (RESERVED). (6-24-11)T

300. SELECTION OF SCHOLARSHIP RECIPIENTS. Applications will be reviewed and awards selected based on financial need, hours of participation in the GEAR UP program and academic preparation based on a combination of the ACT score and cumulative high school grade point average (GPA). Priority will be given to applicants who are eligible to receive Pell grant funding, as determined by the Free Application for Federal Student Aid (FAFSA). (6-24-11)T

01. Academic Eligibility (6-24-11)T

~~**a.**~~

~~b.~~a. Applicants for the GEAR UP Idaho scholarship are selected as recipients, in part, on the basis of their academic performance. The student applicant's high school GPA and ACT composite score are weighed equally to determine an applicant's academic rank. (6-24-11)T

~~c.~~b. The academic ranking constitutes twenty percent (20%) of the selection ranking. (6-24-11)T

~~d.~~c. Grade point average (GPA). An eligible student's unweighted GPA will be used to determine the GPA value. (6-24-11)T

~~e.~~d. ACT Composite Score. Academic applicants must take the ACT exam. The highest composite score from any single test administration taken prior to the application deadline of January 15 will be considered. Applicants will be ranked against other applicants based upon the ACT composite score. (6-24-11)T

02. Financial Eligibility (6-24-11)T

a. Applicants for GEAR UP Idaho scholarship are selected as recipients, in part, on the basis of demonstrated financial need. The primary tool that will be used by the GEAR UP Scholarship Program officials to determine financial need will be the federal FAFSA, used by the United States Department of Education to determine eligibility for financial aid and an expected family's contribution (EFC) to a student's postsecondary education. The financial need of an applicant for a GEAR UP scholarship will be based upon the validated expected family contribution, as identified by the FAFSA report. (6-24-11)T

b. The financial need factor, as determined by FAFSA, will constitute sixty percent (60%) of the weighting for the selection of recipients of GEAR UP scholarships. (6-24-11)T

03. Participation Eligibility (6-24-11)T

i. Applicants for GEAR UP Idaho scholarships are selected in part on the basis of their participation in GEAR UP activities. (6-24-11)T

ii. The participation factor will constitute twenty percent (20%) of the selection ranking. (6-24-11)T

iii. Participation is reported in hours. Participation is determined based upon the hours a GEAR UP applicant participated in available GEAR UP activities offered at their school. Applicants will be compared to other applicants from the same school. (6-24-11)T

301. – 399. (RESERVED). (6-24-11)T

400. GEAR UP IDAHO SCHOLARSHIP AWARD (6-24-11)T

01. Distribution. GEAR UP Idaho scholarships will be awarded at each GEAR UP school with distribution based on school population in relation to the over-all state GEAR UP population. (6-24-11)T

02. Monetary Value of the Gear Up Idaho Scholarship. (6-24-11)T

a. The monetary value of the GEAR UP Idaho scholarship award to a student is set at the maximum amount of the Federal Pell Grant as established by the Federal government for the given year. (6-24-11)T

b. The total amount of financial aid from all sources shall not exceed the student's total educational costs. (6-24-11)T

03. Payment. Payment of scholarship awards will be made in the name of the recipient and will be sent to a designated official at the eligible institution in which the recipient is enrolled. The official must transmit the payment to the recipient within a reasonable time following receipt of the payment. (6-24-11)T

04. Duration. Scholarships will be awarded on an annual basis and payments will correspond to academic terms, semesters, quarters, or equivalent units. In no instance will the entire amount of a scholarship be paid in advance to, or on behalf of, a scholarship recipient. The scholarship covers up to one (1) educational year or equivalent for attendance at an eligible institution. Request for part-time study must have prior authorization by the GEAR UP Idaho administrator, and if granted, scholarship awards will be reduced proportionally. (6-24-11)T

05. Eligibility. If a student receives a scholarship payment and it is later determined that the student did not meet all of the eligibility requirements, then the student is considered in overpayment status, and must return program funds in accordance with the eligible institution's refund policy. (6-24-11)T

401. – 499. (RESERVED). (6-24-11)T

500. CONTINUING ELIGIBILITY To remain eligible for renewal of a GEAR UP Idaho scholarship, the recipient must comply with all of the provisions of the GEAR UP Idaho Program and these rules, in addition to the following requirements: (6-24-11)T

01. Renewal Application. A scholarship recipient must complete and submit a renewal application in order to be considered for a continuing scholarship for each succeeding year. A completed application for the renewal of a GEAR UP Idaho scholarship must be submitted to the Board electronically by the date established on the application, but not later than January 30. An applicant without electronic capabilities may submit an application on the form established by the GEAR UP Idaho Program administrator through the United States Postal Service, which must be postmarked no later than January 30. In addition, a scholarship recipient must update and submit the FAFSA on or prior to February 15. (6-24-11)T

02. Credit Hours. To remain eligible for renewal of a scholarship award, the scholarship recipient must have completed a minimum of twenty-four (24) credit hours or its equivalent for the academic year in which the student received a scholarship award. A student must be enrolled in full-time study each term unless prior approval by the program administrator is granted to attend part-time. If a student does not receive a minimum of twelve (12) credit hours in a term, they may not receive the second semester award without seeking approval from the scholarship administrator. (6-24-11)T

03. Satisfactory Academic Progress. To remain eligible for renewal of a scholarship, the scholarship recipient must have maintained a minimum grade point average of two point zero (2.0) on a scale of four point zero (4.0) during the time that the recipient received an award, and must be maintaining satisfactory academic progress, consistent within federal financial regulations as

implemented at the eligible Idaho postsecondary educational institution at which the scholarship recipient was enrolled. (6-24-11)T

04. Transfer Students. Scholarship recipients who transfer to another eligible institution remain eligible for scholarship renewal. (6-24-11)T

05. Maximum Scholarship Award. The award of a GEAR UP Idaho scholarship shall not exceed the equivalent of eight (8) continuous semesters or the equivalent of four (4) continuous academic years. (6-24-11)T

501. – 599. (RESERVED). (6-24-11)T

600. MISCELLANEOUS PROVISIONS (6-24-11)T

01. Interruption of Enrollment. A scholarship recipient who requests to take leave from and interrupt enrollment at an eligible institution must submit a letter of intent to interrupt continuous enrollment to the GEAR UP Idaho administrator no later than sixty (60) days prior to the first day of the academic term of the discontinued attendance. Requests can only be made after the completion of one (1) full academic year. Failure to do so may result in forfeiture of any continuing scholarship eligibility. The administrator will review each request for interruption and notify the individual of approval or denial of the request. In addition, the individual must file a statement with the administrator declaring his intent to re-enroll as a full-time undergraduate student at an eligible institution for the succeeding academic year no later than thirty (30) days prior to the first day of the academic term in which the individual intends to re-enroll. If a leave request is granted, the total time that the scholarship will be available to the student shall not exceed the four (4) academic years immediately following the student's graduation from secondary school or its equivalent. (6-24-11)T

02. Reassignment of Scholarships in Case of Discontinuance or Termination. If a scholarship recipient enrolled in an eligible institution permanently withdraws or is dismissed prior to completion of his or her four (4) academic year scholarship eligibility term, then the GEAR UP Idaho administrator may award the scholarship to another eligible GEAR UP applicant (an alternate recipient) in the same application year.. If there are no other alternates from that year, then the administrator may award the scholarship to another qualifying GEAR UP applicant. In the event that an award is made to an alternate recipient, then this new student shall assume the vacant scholarship of the Idaho GEAR UP student who has withdrawn or was dismissed. However, such student shall only receive the benefits of this scholarship for the remaining years of eligibility for the GEAR UP scholarship recipient who withdrew or was dismissed prior to completion of the scholarship eligibility term. (6-24-11)T

03. Reassignment in Case of Leave of Absence. If a GEAR UP scholarship recipient enrolled in an eligible institution requests and is granted a leave of absence during his or her four (4) academic year scholarship eligibility term, then the GEAR UP Idaho administrator may award the scholarship to another eligible GEAR UP applicant (an alternate recipient) from the same application year for the duration of the leave period. If there are no other alternates from that year, then the administrator may award the scholarship to another qualifying GEAR UP applicant. In the event that an award is made to an alternate recipient, then this new student shall assume the vacant scholarship of the Idaho GEAR UP student who is on an approved leave. However, such student shall only receive the benefits of this scholarship for the term of the leave. (6-24-11)T

601. – 699. (RESERVED). (6-24-11)T

700. RESPONSIBILITIES OF ELIGIBLE IDAHO POSTSECONDARY EDUCATIONAL INSTITUTIONS. (6-24-11)T

01. Statements of Continuing Eligibility. An eligible institution participating in this GEAR UP Idaho Scholarship Program must submit statements of continuing student eligibility to the GEAR UP Idaho administrator by the 30th day of each academic term. Such statements must include verification that the scholarship recipient is still enrolled, attending full time, maintaining satisfactory academic progress, and has not exceeded the award eligibility terms. (6-24-11)T

02. Other Requirements. An eligible institution must: (6-24-11)T

a. Be eligible to participate in Federal Title IV financial aid programs, and must provide prompt notification regarding any changes in this status to the State Board of Education; (6-24-11)T

b. Provide data on student enrollment and federal, state, and private financial aid for students to the GEAR UP Idaho administrator, and (6-24-11)T

c. Agree to permit periodic GEAR UP Idaho Scholarship Program audits to verify compliance with these rules. (6-24-11)T

701. ADMINISTRATION.
The GEAR UP Idaho administrator is responsible for: (6-24-11)T

01. Information. Releasing any public information regarding the GEAR UP Idaho Scholarship Program; (6-24-11)T

02. Recipient Determination. Determination of scholarship recipients; (6-24-11)T

03. Payment Procedures. Determination of procedures for payment of scholarships to recipients; (6-24-11)T

04. Accounting. Maintaining fiscal controls and accounting procedures; (6-24-11)T

05. Program Management. Authorizing release of all forms, affidavits, and certification necessary for the operation of the program. (6-24-11)T

703. -- 799. (RESERVED). (6-24-11)T

800. APPEALS. Any scholarship applicant or recipient adversely affected by a decision made under provisions of these rules may appeal such adverse decision as follows. The opportunity scholarship applicant or recipient must appeal in writing no later than thirty (30) days following notice of the decision, and the written statement must include a statement of the reason the scholarship applicant or recipient believes the decision should be changed. The appeal must be submitted to the GEAR UP Idaho administrator, who must acknowledge receipt of the appeal within seven (7) days. The GEAR UP Idaho administrator shall forward the appeal to the President of the Board. The Board may or may not agree to review the action, or may appoint a subcommittee of three (3) persons, including at least one (1) financial aid administrator at an eligible postsecondary educational institution in Idaho. (6-24-11)T

01. Transmittal to Subcommittee. If the appeal is transmitted to the subcommittee, the subcommittee will review the appeal and submit a written recommendation to the President of the Board within fifteen (15) days from the time the subcommittee receives the appeal document. The opportunity

scholarship applicant or recipient initiating the appeal will be notified by the chairperson of the subcommittee of the time and place when the subcommittee will consider the appeal and will be allowed to appear before the subcommittee to discuss the appeal. (6-24-11)T

02. Subcommittee Recommendations. Following the subcommittee's decision, the President of the Board will present the subcommittee's recommendation to the full Board at the next regularly scheduled meeting of the Board. The opportunity scholarship applicant or recipient initiating the appeal may, at the discretion of the President of the Board, be permitted to make a presentation to the Board. (6-24-11)T

03. Board Decision. The decision of the Board is final, binding, and ends all administrative remedies, unless otherwise specifically provided by the Board. The Board will inform the opportunity scholarship applicant or recipient in writing of the decision of the Board. (6-24-11)T

801. -- 999.(RESERVED). (6-24-11)T

SUBJECT

Pending Rule Docket 08-0111-1102 – Registration of Post-Secondary education Institutions and Proprietary Schools

REFERENCE

August 2011	Board approved proposed rule changes to IDAPA 08.01.11, Registration of Post-Secondary Education Institutions and Proprietary Schools

APPLICABLE STATUTE, RULE, OR POLICY

Idaho Administrative code, IDAPA 08.01.11. Section 33-2400, Idaho Code

BACKGROUND/DISCUSSION

The proposed changes to IDAPA 08.01.11 incorporate the language previously approved by the Board referencing the new enforcement section in section 33-2400, Idaho code and student complaint processes. Additionally, clarifying language has been added to the registration requirement for start-up entities, the definition of Idaho presence, and approval standards for proprietary schools.

The current language allowed for an approval process for postsecondary institutions which were not accredited. This section has been removed requiring all postsecondary institutions to be accredited by a national accreditation organization that is recognized by and in good standing with both the United States Department of Education and by the Council for Higher Education Accreditation in order to register.

Two comments were received during the 21 day open comment period. Comments expressed concern that:

- Schools that do not have a presence in Idaho, but recruit students from Idaho do not have to comply with the background check requirements.
- Beauty colleges, real estate schools and similar schools governed under another state entity do not have to register.
- Qualification requirements for owners are unrealistic given an owner may be a private investor or shareholder and not actually run the business.
- Some of the standards required to be met by proprietary schools are appropriate for vocational programs, but not necessary for proprietary schools that offer courses of a non vocational nature.
- Proprietary schools that are accredited by an approved accrediting body should be exempt from the surety bond requirements.
- There is no process for proprietary schools to transition to degree granting postsecondary institution status.

Schools that do not have a presence in Idaho or not required to register and are therefore exempt from the registration requirements such as the required background checks for agents. To address this concern would require all out of

state institutions who recruit students from Idaho to register, this would include public and private institutions throughout the US.
Trade boards are state regulatory bodies for specific occupations and professions whose primary mandate is to protect the health, safety, and welfare of the general public. For those schools that already have to follow the regulations of their individual boards it was determined at this time that it would be an undue burden to require them to also register with the Board of Education. The necessity to register these schools is monitored and assessed regularly. If it is determined that the public good is not being met this issue will be readdressed in the future.

The requirements for owners and agents to meet applicable qualifications already exists in rule. The changes to this section added instructors.

Proprietary schools delivering courses or programs of an avocational or recreational nature are exempt from registering and the registration standards.

Issues with the surety bond or addressed regularly the proposed changes help to clarify the requirements based on difficulty expressed by proprietary school owners this pass year. As the surety bond process matures additional changes may be identified and brought forward to the board in future years.

Board staff is currently analyzing the need for a process for proprietary schools to transition from a proprietary schools to a degree granting postsecondary institution, at this time no necessary changes to the process have been identified. If it is determined that there needs to be a change to the current process, that process will be brought back to the board at a future date for consideration.

There have been minor technical changes to rule language based on input from Administrative Rules, such as the addition of a definition for Executive Director.

IMPACT

The proposed changes will the rule into alignment with recent state legislative and federal rules.

ATTACHMENTS

Attachment 1 – Pending Rule IDAPA 08.01.11 Page 5

STAFF COMMENTS AND RECOMMENDATIONS

Pending rules approved by the Board will be posted in the next Administrative Bulletin and move forward to the legislature. Pending rules become effective at the end of the legislative session in which they are submitted if they are not rejected by concurrent resolution of the legislature.

Staff recommends approval.

BOARD ACTION

I move to approve the Pending Rule Docket 08-0111-1102 as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

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IDAPA 08
TITLE 01
CHAPTER 11

08.01.11 - Registration of Post-Secondary Educational Institutions and Proprietary Schools

010. DEFINITIONS.

01. **Accredited**. Defined in Section 33-2401(1), Idaho Code, and means that a post-secondary educational institution has been recognized or approved as meeting the standards established by an accrediting organization recognized by the Board. (4-9-09)

02. **Agent**. Defined in Section 33-2401(2), Idaho Code, and means any individual within the state of Idaho who solicits students for or on behalf of a proprietary school. (4-9-09)

03. **Agent's Certificate of Identification**. Defined in Section 33-2401(3), Idaho Code, and means a nontransferable written document issued to an agent by the proprietary school that the agent represents. (3-29-10)

04. **Course**. Defined in Section 33-2401(5), Idaho Code, and means instruction imparted in a series of lessons or class meetings to meet an educational objective. (4-9-09)

05. **Course or Courses of Study**. Defined in Section 33-2401(6), Idaho Code, and means either a single course or a set of related courses for which a student enrolls, either for academic credit or otherwise. A course of study is sometimes also referred to in this rule as a program. (4-9-09)

06. **Degree**. Defined in Section 33-2401(7), Idaho Code, and means any written or any academic title that contains, in any language, the word "associate," "bachelor," "baccalaureate," "masters," "doctor," or any abbreviation thereof, and that indicates or represents, or is intended to indicate or represent, that the person named thereon, in the case of any writing, or the person it is awarded thereto, in the case of any academic title, is learned in or has satisfactorily completed a prescribed course of study in a particular field or that the person has demonstrated proficiency in any field of endeavor as a result of formal preparation or training. (3-29-10)

07. **Executive Director**. Defined in Section 33-102A, shall mean the Executive Officer of the Office of the State Board of Education, or his designee. ( )

0~~7~~8. **Nonprofit**. Means an entity that is recognized under the Internal Revenue Code and applicable regulations as being tax exempt, or an entity such as a nonprofit or not-for-profit organization that possesses the following characteristics that distinguish it from a business enterprise: (a) contribution of significant amounts of resources from resource providers who do not expect commensurate or proportionate pecuniary return, (b) operating purposes other than to provide goods or services at a profit, and (c) absence of ownership interests like those of business enterprises. (4-9-09)

0~~8~~9. **Post-Secondary Educational Institution**. Sometimes referred to in this rule simply as an institution, is defined in Section 33-2401(8), Idaho Code, and means an individual, or educational, business or other entity, whether legally constituted or otherwise, which maintains a presence within, or which operates or purports to operate, from a location within, the state of Idaho, and which provides a course or courses of study that lead to a degree, or which provides, offers or sells degrees. (4-9-09)

0~~9~~10. **Proprietary School**. Sometimes referred to in this rule simply as a school, is defined in Section 33-2401(9), Idaho Code, and means an individual, or educational, business or other entity, whether legally constituted or otherwise, which maintains a presence within, or which operates or purports to operate, from a location within the state of Idaho and which conducts, provides, offers or sells a course or courses of study, but which does not provide, offer or sell degrees. (4-9-09)

11. Trade Board. An Idaho board with regulatory duties for specific occupations and professions.

012. -- 099. (RESERVED).

100. RECOGNITION OF ACCREDITATION ORGANIZATIONS.
For purposes of registration of post-secondary educational institutions, the Board recognizes the regional and ~~institutional~~ national accreditation organizations that are recognized by and in good standing with both the United States Department of Education and by the Council for Higher Education Accreditation, and which accredit entire colleges or universities~~,~~ and which do not accredit only courses or courses of study (such as specialized accreditation organizations). Further, the Board may recognize other accreditation organizations on a case-by-case basis. A request for recognition of other accreditation organizations for purposes of registration should be made to the Board's Chief Academic Officer, who will review and evaluate the request with the input and advice of the Board's Committee on Academic Affairs and Programs (CAAP). The Board will make a final decision based on such evaluation and review. ~~(4-7-11)~~( )

101. -- 199. (RESERVED).

200. REGISTRATION OF POST-SECONDARY EDUCATIONAL INSTITUTIONS.

01. Delegation. Section 33-2403, Idaho Code, provides that a post-secondary educational institution must hold a valid certificate of registration issued by the Board. The Board delegates authority to its executive director, or his designee, and the Office of the State Board of Education to administer the registration of post-secondary educational institution, in accordance with Title 33, Chapter 24, Idaho Code, and this rule. (4-7-11)

02. Registration Requirement. (4-9-09)

a. Unless exempted by statute or this rule, as provided herein, a post-secondary educational institution which maintains a presence within the state of Idaho, or that operates or purports to operate from a location within the state of Idaho, shall register and hold a valid certificate of registration issued by the Board. An institution shall not conduct, provide, offer, or sell a course or courses of study, or degree unless registered. ~~An institution shall not solicit students on behalf of such institution, or advertise in this state, unless registered.~~ ~~(3-29-10)~~ ( )

b. Registration shall be for the period beginning on the date a certificate of registration is issued and continue through June 30 of the next succeeding year. A registered post-secondary educational institution must renew its certificate of registration annually, and renewal of registration is not automatic. (3-29-10)

c. Renewal of registration shall be for the period beginning on July 1 of any year, and continue through June 30 of the next succeeding year. (4-9-09)

d. A new or start-up entity that desires to operate as a postsecondary educational institution in Idaho but which is not yet accredited by an accreditation organization recognized by the Board must register and operate as a proprietary school until accreditation is obtained. A new or start-up entity that is accredited and authorized to operate in another state, and which desires to operate as a postsecondary educational institution in Idaho offering degrees for which specialized program accreditation is required, may be granted approval to operate subject to the successful attainment of such program accreditation within the regular program accreditation cycle required by the accreditor. ( )

e. There is no inherent or private right to grant degrees in Idaho. That authority belongs only to institutions properly authorized to operate in Idaho under these rules. ( )

03. Idaho Presence.
a. An institution shall be deemed to have a presence in Idaho, or to be operating or purporting to be operating from a location within the state of Idaho, if it owns, rents, leases, or uses any office or other type of physical location in Idaho, including a mailing or shipping center, or if it represents in any way, such as on an electronic or Internet website, to have an Idaho street or mailing address, including a post office box in Idaho for

purposes of conducting, providing, offering or selling a course or courses of study or degrees. ~~(4-9-09)~~ ( )

b. Idaho presence shall include medical/osteopathic education clinical instruction occurring in the state of Idaho as part of a course of study leading to a degree pursuant to a formal arrangement or agreement between such clinic and an institution providing medical/osteopathic education instruction. ( )

c. Idaho presence shall not include: ( )

i) Distance or online education delivered by an institution located outside of the state of Idaho to students in this state when the institution does not otherwise have physical presence in Idaho, as provided in Subsection 03.a of this rule; ( )

ii) Medical education instruction occurring in the state of Idaho by an institution pursuant to a medical education program funded by the state of Idaho; ( )

iii) Internship or cooperative training programs occurring in the state of Idaho where students are employed by or provide services to a business or company in this state and receive course credit from an institution related to such activities; or ( )

iv) Activities limited to the recruiting or interviewing of applicants or potential students in the state of Idaho, whether conducted by a compensated employee, agent, or representative of an institution, or by volunteer alumnus of an institution, even if such individual is physically located in this state. ( )

04. Institutions Exempt from Registration. (4-9-09)

a. Idaho public post-secondary educational institutions. Section 33-2402(1), Idaho Code, provides that a public institution supported primarily by taxation from either the state of Idaho or a local source in Idaho shall not be required to register. (4-9-09)

b. Certain Idaho private, ~~not for~~ nonprofit, post-secondary educational institutions. A private, nonprofit, post-secondary educational institution that is already established and operational as of the ~~effective~~ date ~~of~~ when this rule first went into effect (Brigham Young University – Idaho, College of Idaho, Northwest Nazarene University, New Saint Andrews College, Boise Bible College), and located within the state of Idaho, and that is accredited by an accreditation organization recognized by the Board, as set forth in Section 100 of this rule, shall not be required to register. A private, nonprofit, institution is located within the state of Idaho only if it has been lawfully organized in the state of Idaho and its principal place of business is located within the state of Idaho. An institution exempt under this subsection may voluntarily register by following the procedure for registration provided herein. ~~(4-9-09)~~ ( )

c. Idaho religious institutions. A religious institution located within the state of Idaho that is owned, controlled, operated and maintained by a religious organization lawfully operating as a nonprofit religious corporation and that grants only religious degrees shall not be required to register. ( )

05. Institutions that Must Register. Unless exempt under subsection 200.04 of this rule, any entity that desires to operate as a postsecondary educational institution in Idaho must register as provided herein. ( )

~~a. Out-of-state public post-secondary educational institutions. A public institution that is supported primarily by taxation from another state, or from a local source not within the state of Idaho, must register as provided herein. (4-9-09)~~

~~**b.** Out-of-state private, nonprofit, post-secondary educational institutions. An out-of-state private, nonprofit, post-secondary educational institution must register as provided herein. (4-9-09)~~

~~**c.** Certain Idaho private, nonprofit, post-secondary educational institutions. A private, nonprofit, post-secondary educational institution that is located within the state of Idaho, but that is not exempt under~~

~~Subsection 200.04.b. of this rule, must register as provided herein. (4-9-09)~~

~~**d.** For profit post secondary educational institutions. A post secondary educational institution that operates for profit, or which is an operating subsidiary of a publicly or privately held corporation that operates for profit, must register as provided herein.~~ (4-9-09)

~~**06. Alternative to Registration Requirement for Certain Post Secondary Institutions**. (3-29-10)~~

~~**a.** A post secondary educational institution that demonstrates to the satisfaction of the Board that its primary mission and objectives are to offer courses or courses of study that do not lead to the awarding of degrees, may instead register as a proprietary school, in accordance with Section 300 of this rule. (4-9-09)~~

~~**b.** A request to register as a proprietary school must be submitted in writing to the Board by the first business day of December preceding a registration year. A decision on such request will be issued by the Board within thirty (30) days after it is received. A request to register as a proprietary school must be made on an annual basis. (4-9-09)~~

0~~7~~6. Application. A post-secondary educational institution that is required to register under this rule must submit to the Board office an application for registration (either an application for initial registration or renewal of registration, as applicable), on the form provided by the Board office. The application must include a list of each course, course of study, and degree the applicant institution intends to conduct, provide, offer, or sell in Idaho during the registration year. ~~(3-29-10)~~ ( )

0~~8~~7. Registration Fees. The Board shall assess an annual registration fee for initial registration or renewal of registration of a post-secondary educational institution. The registration fee must accompany the application for registration, and shall be in the amount of one-half of one percent (.5%) of the gross Idaho tuition revenue of the institution during the previous registration year, but not less than one hundred dollars ($100) and not to exceed five thousand dollars ($5,000). The institution must provide financial documentation to substantiate the amount of revenue reported. Registration fees are ~~not~~ nonrefundable. ~~(4-7-11)~~ ( )

0~~9~~8. Deadline for Registration. An initial application for registration may be submitted to the Board at anytime. An institution should expect the Board's review process for an initial registration to take approximately three (3) to five (5) months. An application for renewal of registration must be submitted to the Board on or before the first business day of May that precedes ~~a~~ the registration year. The renewal will be processed within thirty (30) days. Institutions that do not adhere to this schedule and whose renewals are not processed by July 1st must cease all active operations until approval of registration is received. ~~(4-9-09)~~ ( )

~~1~~09. Information Required.

a. ~~Such~~ An application must include all the information requested on the application form, as well as the following information: ~~(4-9-09)~~ ( )

~~**a.** If an institution that is required to register under this rule is accredited by an accreditation organization recognized by the Board in Section 100 of this rule, Such institution must submit documentation demonstrating that it has received accreditation status, and that it will maintain its accreditation from such agency during the entire registration year.~~ , ~~An institution that is so accredited qualifies for a streamlined registration process, and will not be required to submit information and/or documentation that documents compliance with Standards I through V, set forth in Section 201 of this rule. Such institution must submit the following information or documentation, or both, with its application for registration:~~ ~~(3-29-10)~~

i. Copy of most recent accreditation letter showing the period of approval; (4-7-11)

ii. Current list of chief officers - e.g. president, board chair, chief academic officer, chief fiscal officer; (4-9-09)

iii. Enrollment data for current and past two (2) years; (4-9-09)

iv. Copy of annual audited financial statement; (4-9-09)

v. Any additional information that the Board may request. (4-9-09)

~~**b.** All other institutions applying for registration must submit information and/or documentation with its application for registration that documents compliance with all of the Standards I through V, set forth in Section 201 of this rule. (3-29-10)~~

~~**c**~~**b.** The Board may, in connection with a renewal of registration~~;~~, request that an institution only submit information that documents changes from the previous year, provided that the institution certifies that all information and/or documentation submitted in a previous registration year remains current. The annual registration fee, described in Subsection 200.0~~8~~7 of this rule, shall remain applicable. ~~(3-29-10)~~ ( )

~~**201. APPROVAL STANDARDS FOR POST SECONDARY EDUCATIONAL INSTITUTIONS.**~~
~~Except as provided in Subsection 200.10.a. of this rule, an institution applying for registration must meet, or demonstrate that it will meet, all of the following standards: (4-9-09)~~

~~**01. Standard I - Legal Status and Administrative Structure**. The institution must be in compliance with all local, state, and federal laws, administrative rules, and other regulations applicable to post secondary educational institutions. (4-9-09)~~

~~**a.** The institution must have a clearly stated mission and objectives that are consistent with educational offerings under consideration for approval by the Board. The institution must demonstrate how its stated mission and objectives are being accomplished. (4-9-09)~~

~~**b.** The governing board or the board of directors must be comprised of at least five (5) members who are selected to represent students, faculty, and other constituents of the institution. Board members must be given the responsibility for assuring that the mission and objectives are achieved, for establishing policies and overseeing their implementation, and for providing oversight for the entire institution, including the financial stability of the institution. Board members should generally not be affiliated with the institution from an employment, contractual, familial, or financial standpoint. Any affiliation or financial interest in the institution must be fully disclosed, and provisions must be made to address any conflicts of interest. (4-9-09)~~

~~**c.** There must be sufficient distinction between roles and responsibilities of the institution's governing board and the administration, faculty, and staff to ensure appropriate separation and independence. (4-9-09)~~

~~**d.** Each of the administrative officers must be appropriately qualified with educational credentials to ensure programs are of high quality and that the rights of students are protected. In particular, the chief academic officer of the institution must be academically prepared at least at the Master's degree level, and have a minimum of five (5) years of post-secondary educational experience at an accredited institution. (4-9-09)~~

~~**e.** Administrators must be paid a fixed salary. Commissions may not be used for any portion of the compensation or to supplement an administrative salary. (4-9-09)~~

~~**f.** Policies must have been established to govern admissions, hiring procedures, and working conditions; evaluation/assessment of all employees and instructional offerings; awarding of credit and grades that are comparable to other institutions; academic freedom; student and faculty rights and responsibilities; grievance procedures; approval of the curriculum and other academic procedures, etc.; to ensure the quality of educational offerings. (4-9-09)~~

~~**g.** The administration must establish procedures for evaluating the effectiveness of the entire institution and for assessing the quality of instruction through established and recognized methods of instructional assessment. Evaluation and assessment results must be used to improve institutional programs and services. Evaluative/assessment processes must involve internal constituents from the institution and appropriate external~~

representatives. (4-9-09)

02. Standard II – Educational Program and Curriculum. Instruction must be the primary focus of the institution, and all instructional activities must be clearly related to the achievement of the institution's mission and objectives. (4-9-09)

a. The requirements for all instructional programs must be defined clearly, including applicable completion requirements for courses, credits, and clinicals. Faculty must be given the responsibility for developing the curriculum for all courses or courses of study or degrees, designing effective learning strategies for students, identifying and organizing all instructional materials and specialized facilities, identifying instructional assessment methods, and evaluating the effectiveness of the course offerings. (4-9-09)

b. The institution must identify the number of credits required to earn a degree based on the following guidelines. Forty five (45) clock hours of student involvement are required for each semester credit, which includes a minimum of fifteen (15) student contact hours for each semester credit. Degrees are: (4-9-09)

i. Associate of Applied Science Degree. A credential awarded for completion of requirements entailing at least two (2) years, but less than four (4) years, of full-time professional-technical study with a minimum of sixty (60) semester credits (includes a minimum of sixteen (16) general education credits) and includes mastery of specific competencies drawn from requirements of business/industry; (4-9-09)

ii. Associate Degree. A credential awarded for completion of requirements entailing at least two (2) years, but normally less than four (4) years, of full-time academic work; (4-9-09)

iii. Baccalaureate Degree. A credential awarded for completion of requirements entailing at least four (4) years of full-time academic work; (4-9-09)

iv. Master's Degree. A credential awarded for completion of requirements entailing at least one (1) year, but normally not more than two (2) years, of full-time academic work beyond the baccalaureate degree, including any required research; and (4-9-09)

v. Doctoral Degree. A credential awarded for completion of requirements entailing at least three (3) years of full-time academic work beyond the baccalaureate degree, including any required research. (4-9-09)

vi. Written course descriptions must be developed for all courses and for all courses within a program or degree and include the following: course overview, learning objectives and outcomes, course content, assessment, and grading criteria. A written inventory must be maintained for all course descriptions, and course descriptions must be provided to the faculty. Faculty must be expected to follow course descriptions. A syllabus must be developed for each course and distributed to students at the beginning of the course. (4-9-09)

vii. For each course or courses of study leading to a degree, the institution shall assure that such courses will be offered with sufficient frequency to enable students to complete the courses of study and degree within the minimum time for completion. (4-9-09)

03. Standard III – Student Support Services. The institution must have clearly defined written policies that are distributed to students through a variety of print and electronic means. Polices must address students' rights and responsibilities, grievance procedures, and must define what services are available to support students and instructional programs. (4-9-09)

a. The institution must develop a written admissions policy. The admission of students must be determined through an orderly process using published criteria which must be uniformly applied. Admissions must take into account the capacity of the student to undertake a course of study and the capacity of the institution to provide instructional and other support services the student needs to complete the program. (4-9-09)

b. There must be a clearly defined policy for the readmission of students dismissed from the institution for academic reasons. The readmission of students dismissed under this policy should be consistent with

~~the recognized academic standards of admission to the institution. (4-9-09)~~

~~**c.** The institution must establish and adhere to a clear and fair policy regarding due process in disciplinary matters, and publish this policy in a handbook, which must include other rights and responsibilities of the students and the grievance procedure. This handbook must be supplied to each student upon enrollment in the institution. The institution must provide the name and contact information for the individual who is responsible for dealing with student grievances and other complaints and for handling due process procedures. (4-9-09)~~

~~**d.** The institution must provide an effective program of academic advising for all students enrolled. The program must include orientation to the academic program, academic and personal counseling, career information and planning, placement assistance, and testing services. (4-9-09)~~

~~**e.** The institution must provide students, prospective students prior to enrollment, and other interested persons with a catalog containing, at a minimum, the following information: (4-9-09)~~

~~i. The institution's mission; (4-9-09)~~

~~ii. Admissions policies; (4-9-09)~~

~~iii. Information describing the purpose, length, and objectives for the courses or courses of study or degrees offered by the institution; (4-9-09)~~

~~iv. Credit requirements for all courses or courses of study or degrees offered by the institution; (4-9-09)~~

~~v. Procedures for awarding credit for work completed outside the collegiate setting; (4-9-09)~~

~~vi. Policies for acceptance of transfer credit; (4-9-09)~~

~~vii. The schedule of tuition, fees, and all other charges and expenses necessary for completion of the courses or courses of study or degrees; (4-9-09)~~

~~viii. Cancellation and refund policies; (4-9-09)~~

~~ix. A definition of the unit of credit as it applies at the institution; (4-9-09)~~

~~x. An explanation of satisfactory progress, including an explanation of the grading/assessment system; (4-9-09)~~

~~xi. The institution's calendar, including the beginning and ending dates for each instructional term, holidays, and registration dates; (4-9-09)~~

~~xii. A complete listing of each regularly employed faculty member showing name, area of assignment, rank, and each earned degree held, including degree level, degree designation, and institution that awarded the degree; (4-9-09)~~

~~xiii. A complete listing of each administrator showing name, title, area of assignment, and each earned degree held, including degree level, degree designation, and institution that awarded the degree; (4-9-09)~~

~~xiv. A statement of legal control with the names of the trustees, directors, and officers of the institution or corporation or other entity; (4-9-09)~~

~~xv. A complete listing of all scholarships offered, if any; (4-9-09)~~

~~xvi. A statement describing the nature and extent of available student services; (4-9-09)~~

xvii. Complete and clearly stated information about the transferability of credit to other post secondary educational institutions, including two (2) year and four (4) year colleges and universities; and (4-9-09)

xviii. Any such other material facts concerning the institution and the courses or courses of study as are reasonably likely to affect the decision of the student to enroll at the institution. (4-9-09)

f. Accurate and secure records must be kept for all aspects of the student academic record including, at a minimum, admissions information, transcripts, and financial transactions. Standards established by the American Association of Collegiate Registrars and Admissions Officers (AACRAO) must be used as a basis for establishing, maintaining, securing, and retaining student records. (4-9-09)

g. The institution must provide to each prospective student, newly enrolled student, and returning student, complete and clearly presented information indicating the institution's current graduation rate by courses of study, and job placement rate by course of study. (4-9-09)

04. Standard IV - Faculty Qualifications, Duties, and Compensation. Faculty qualifications must be clearly defined for each discipline and the assigned location for each faculty member must be identified. (4-9-09)

a. Faculty must be qualified through academic preparation appropriate to their assigned classes and degree level. For bachelor degree programs, faculty must have a master's degree from an accredited institution. At the graduate level, faculty must have a doctoral degree from an accredited institution. Relevant teaching experience or evidence to indicate they will be successful in the classroom must also be considered. Relevant work experience must also be considered. Transcripts for all faculty must be obtained, reviewed, and retained at the institution. Faculty must be recruited from a variety of institutions and backgrounds to enhance diversity and to avoid hiring a disproportionate number of individuals who are graduates of institutional programs. (4-9-09)

b. There shall be a sufficient number of full time faculty members to maintain the continuity and stability of academic programs and policies. At least one (1) full time faculty must be located in Idaho for each course or courses of study or degree, unless the institution can demonstrate specifically why this is not feasible, and identify what provisions have been, or will be, made to serve students effectively. (4-9-09)

c. A group of faculty must be organized and given responsibility in conjunction with the institution's chief academic officer for reviewing and approving all courses and courses of study and degrees offered by the institution. This group must also be responsible for overseeing instructional assessment activities and setting standards for program review/evaluation. The group must be of sufficient size to effectively represent a variety of instructional disciplines and faculty perspectives. (4-9-09)

d. The ratio of faculty to students in each course must be sufficient to assure effective instruction. (4-9-09)

e. Faculty must be paid a fixed salary. Commissions may not be used for any portion of the compensation, to supplement faculty salaries, or be connected to recruitment or retention of students. (4-9-09)

f. Procedures for evaluating faculty must be established, including provisions for promoting faculty and recognizing scholarly contributions to their academic discipline. (4-9-09)

g. A faculty development program must be established to encourage professional advancement and to enhance one's knowledge and instructional expertise. (4-9-09)

05. Standard V - Resources, Financial Resources, and Facilities. The institution must have adequate financial resources to accomplish its educational mission and objective. (4-9-09)

a. A financial officer in a managerial position must be designated for the institution and given responsibility for overseeing all of the financial aspects of the institution. (4-9-09)

b. Adequate financial resources must be provided to accomplish the institutional mission and to

~~effectively support the instructional programs, including teaching facilities (i.e., classrooms, labs), instructional materials, supplies and equipment, faculty, staff, library, and the physical and instructional technology infrastructure. (4-9-09)~~

~~**c.** The institution must have sufficient reserves so that, together with tuition and fees, it is able to complete its educational obligations to currently enrolled students, even if it were unable to admit any new students. (4-9-09)~~

~~**d.** Financial records and reports of the institution must be kept and made separate and distinct from those of any affiliated or sponsoring person or entity. Financial records and reports at a public or not for profit institution must be kept in accordance with the most current guidelines from the National Association of College and University Business Officers. Financial records and reports of a for profit institution must be kept in accordance with generally accepted accounting principles. A for profit institution must organize its reports and records under categories or cost centers comparable to accounting funds identified in the most current guidelines from the National Association of College and University Business Officers. (4-9-09)~~

~~**e.** An annual independent audit of all fiscal accounts of the educational institution must be authorized by the governing board, and must be performed by a properly authorized certified public accountant. (4-9-09)~~

~~**06. Standard VI - Library and Instructional Resources**. The institution must obtain and properly catalog library and other learning resources and make these resources readily available to its students and faculty. These holdings must be of sufficient quality and depth to support its mission and achievement of student and faculty learning objectives. (4-9-09)~~

~~**a.** The institution must have adequate library facilities for the library holdings, space for study, and workspace for the librarian and library staff. (4-9-09)~~

~~**b.** Library services and resources must be available for student and faculty use with sufficient regularity, and at appropriate hours, to support the mission of the institution and its instructional offerings. (4-9-09)~~

~~**c.** If the institution relies on other institutions or entities to provide library resources, or this is done through electronic means, the institution must demonstrate how these arrangements effectively meet the needs of students and faculty. These arrangements must be documented through written agreements. Student and faculty use must be documented and frequently evaluated to ensure quality services are being provided. (4-9-09)~~

~~**d.** The library must be administered by professionally trained staff supported by sufficient personnel.~~ (4-9-09)

20~~2~~1. THE BOARD MAY NOTIFY THE POST-SECONDARY EDUCATIONAL INSTITUTION OF ADDITIONAL INFORMATION REQUIRED.
If the Board is unable to determine the nature and activities of an institution on the basis of the information provided by the institution under this rule, then the Board may notify the institution of additional information that it will be required to provide in connection with the application for registration. (4-9-09)

01. Verification of Information. The Board may verify the accuracy of submitted information by inspection, visitation, or any other means it considers necessary. The applicant institution shall be responsible for any costs the Board incurs, including travel, associated with this review. (4-9-09)

02. Criteria for Approval of Registration. To be approved for registration, the institution must demonstrate that it is in compliance with Chapter 24, Title 33, Idaho Code and this rule. An institution must remain in compliance for the registration year. (4-9-09)

03. Public Information. All information submitted to the Board in connection with the application is ~~public information, and is~~ subject to disclosure as set forth in the Public Records Act, Title 9, Chapter 3, Idaho Code. ~~(4-9-09)~~ (____)

04. Certificate of Registration or Exemption. ~~(4-7-11)~~ ( )

a. A certificate of registration will be issued to a post-secondary educational institution that has paid its registration fee and has been approved under this rule. A certificate evidencing initial registration will be effective the date it is issued, and continue through June 30 of the next succeeding year. A renewal certificate will be for the period July 1 through June 30 of the next succeeding year. No institution that is registered with the Board shall advertise or represent in any manner that it is accredited by the Board. An institution may only represent that it is "Registered with the Idaho State Board of Education." Registration is not an endorsement of the institution or any of its courses, courses of study, or degrees. (4-7-11)

b. An institution exempt from registration under these rules may request a certificate of exemption. ( )

~~b~~**c.** If a post-secondary educational institution wishes to offer additional courses, courses of study, or degrees during a registration year that were not included in its annual registration application to the Board, then the institution must submit a letter to the Board Office along with documentation of its accrediting agency's approval of those specific curriculum changes. ~~(4-7-11)~~ ( )

05. Disapproval and Appeal. If a post-secondary educational institution's request for initial registration, or renewal of registration, is disapproved by the Board, then the institution may appeal such decision in accordance with Chapter 52, Title 67, Idaho Code. The request must be in writing and made to the Board office within thirty (30) days of the date the institution is notified of the disapproval. ~~(4-9-09)~~ ( )

06. Withdrawal of Approval. (4-9-09)

a. The Board may refuse to renew, or may revoke or suspend approval of, an institution's registration by giving written notice and the reasons therefore to the institution. The institution may request a hearing relating to such decision under IDAPA 04.11.01, "Idaho Rules of Administrative Procedure of the Attorney General." (4-9-09)

b. Withdrawal of approval may be for one (1) or more of the following reasons: (4-9-09)

i. Violation of Chapter 24, Title 33, Idaho Code or this rule; (4-9-09)

ii. Providing false, misleading, deceptive, or incomplete information to the Board; (4-9-09)

iii. Presenting to prospective or current students information about the institution which is false, fraudulent, misleading, deceptive, or inaccurate in a material respect; ~~or~~ ~~(4-9-09)~~ ( )

iv. Refusing to allow reasonable inspection or to supply reasonable information after a written request by the Board Office has been received; or ~~(4-9-09)~~ ( )

v. Loss of accreditation status.

c. If any information contained in the application submitted by the institution becomes incorrect or incomplete, then the registered institution shall notify the Board office of such change within thirty (30) days. An institution that ceases operation during the course of a registration year shall immediately inform the Board Office of this event. ~~(4-9-09)~~ ( )

203. -- 299. (RESERVED).

300. REGISTRATION OF PROPRIETARY SCHOOLS.

01. Delegation. Section 33-2403, Idaho Code, provides that a proprietary school must hold a valid certificate of registration issued by the Board. The Board delegates authority to its executive director~~, or his designee,~~ and the Office of the State Board of Education to administer the registration of proprietary schools, in accordance with Title 33, Chapter 24, Idaho Code, and this rule. (3-29-10)

02. Registration Requirement. (4-9-09)

a. Unless exempted by statute or this rule, as provided herein, a proprietary school which maintains a presence within the state of Idaho, or which operates or purports to operate from a location within the state of Idaho, shall register annually and hold a valid certificate of registration issued by the Board. A school shall not conduct, provide, offer, or sell a course or courses of study unless registered. A school shall not solicit students for or on behalf of such school, or advertise in this state, unless registered. (3-29-10)

b. Registration shall be for the period beginning July 1 of any year and continue through June 30 of the next succeeding year. For a school that has not previously registered with the Board, registration shall be for the period beginning on the date of issu~~e~~ance of a certificate of registration and continue through June 30 of the next succeeding year. A registered proprietary school must renew its certificate of registration annually and renewal of registration is not automatic. ~~(3-29-10)~~ ( )

c. Renewal of registration shall be for the period beginning on July 1 of any year, and continue through June 30 of the next succeeding year. (4-9-09)

03. Idaho Presence.

a. A school shall be deemed to have a presence in Idaho, or to be operating or purporting to be operating from a location within the state of Idaho, or if it owns, rents, leases, or uses any office or other type of physical location in Idaho, including a mailing or shipping center, or if it represents in any way, such as on an electronic or Internet website, to have an Idaho street or mailing address, including a post office box in Idaho, for purposes of conducting, providing, offering or selling a course or courses of study or degrees. ~~(4-9-09)~~ ( )

b. Idaho presence shall not include: ( )

i) Distance or online education delivered by an institution located outside of the state of Idaho to students in this state when the institution does not otherwise have physical presence in Idaho, as provided in Subsection 03.a of this rule; ( )

ii) Internship or cooperative training programs occurring in the state of Idaho where students are employed by or provide services to a business or company in this state and receive course credit from an institution related to such activities; or ( )

iii) Activities limited to the recruiting or interviewing of applicants or potential students in the state of Idaho, whether conducted by a compensated employee, agent, or representative of an institution, or by volunteer alumnus of an institution, even if such individual is physically located in this state. ( )

04. Exemptions from Registration. The following individuals or entities are specifically exempt from the registration requirements of this rule: (4-9-09)

a. An individual or entity that offers instruction or training solely ~~a~~ avocational or recreational in nature, as determined by the Board. ~~(4-9-09)~~ ( )

b. An individual or entity that offers courses recognized by the Board which comply in whole or in part with the compulsory education law. (4-9-09)

c. An individual or entity that offers a course or courses of study sponsored by an employer for the training and preparation of its own employees, and for which no tuition fee is charged to the student. (4-9-09)

d. An individual or entity which is otherwise regulated, licensed, or registered with another state agency pursuant to Title 54, Idaho Code. (4-9-09)

e. An individual or entity that offers intensive review courses designed to prepare students for

certified public accountancy tests, public accountancy tests, law school aptitude tests, bar examinations or medical college admissions tests, or similar instruction for test preparation. (4-9-09)

f. An individual or entity offering only workshops or seminars lasting no longer than three (3) calendar days and offered no more than four (4) times per year. ~~(4-9-09)~~( )

g. A parochial or denominational institution providing instruction or training relating solely to religion and for which degrees are not granted. (4-9-09)

h. An individual or entity that offers post-secondary credit through a consortium of public and private colleges and universities under the auspices of the ~~w~~Western ~~g~~Governors University. ~~(4-9-09)~~ ( )

i. An individual or entity that offers flight instruction and that accepts payment for services for such training on a per-flight basis after the training occurs, or that accepts advance payment or a deposit for such training in a de minimus amount equal to or less than fifteen (15) percent of the total course or program cost. ( )

05. Application. A proprietary school that is required to register under this rule must submit to the Board office an application for registration (either an application for initial registration, or renewal of registration, as applicable), on a form provided by the Board office. The application must include a list of each course or courses of study the applicant school intends to conduct, provide, offer or sell in Idaho during the registration year. (3-29-10)

06. Registration Fees. The Board shall assess an annual registration fee for initial registration or renewal of registration. The registration fee must accompany the application for registration, and shall be one-half of one percent (.5%) of the gross Idaho tuition revenue of the school during the previous registration year, but not less than one hundred dollars ($100) and not to exceed five thousand dollars ($5,000). The school shall provide documentation to substantiate the amount of revenue reported. Registration fees are ~~not~~ nonrefundable.~~(3-29-10)~~ ( )

07. Deadline for Registration. An initial application for registration may be submitted to the Board at anytime. An institution should expect the Board's review process for an initial registration to take approximately three (3) to five (5) months. An application for renewal of registration must be submitted to the Board on or before the first business day of May that precedes ~~a~~ the registration year. The renewal will be processed within thirty (30) days. ~~Schools that have not completed annual renewal of registration~~ Institutions that do not adhere to this schedule and whose renewals are not processed by July 1st must cease all active operations until approval of registration is received. ~~(3-29-10)~~ ( )

08. Information Required. Such application must include all the information requested on the application form. In addition, a school ~~applying for registration must submit information and/or documentation with its application for registration that documents~~ must attest by signature of the primary official on the application form that it is in compliance with Standards I through V set forth in Section 301 of this rule and must provide verification of compliance with Standards I through V set forth in Section 301 of this rule upon request. The Board may, in connection with a renewal of registration, request that a school only submit information that documents changes from the previous year, provided that the school certifies that all information and/or documentation submitted in a previous registration year remains current. The annual registration fee, described in Subsection 300.06 of this rule, shall remain applicable. ~~(3-29-10)~~ ( )

301. APPROVAL STANDARDS FOR REGISTRATION OF PROPRIETARY SCHOOLS.

The Board and its designee accepts the responsibility for setting and maintaining approval standards for proprietary schools that plan to offer courses or a set of related courses in or from Idaho in order to protect consumers and to ensure quality educational programs are provided throughout the state. A school must meet all of the standards prior to issuance of a certificate of registration and the school must provide required evidence to document compliance with the standards as identified in the application form. A certificate of registration may be denied if all of the standards are not met. (4-9-09)

01. Standard I - Legal Status and Administrative Structure. The school must be in compliance with all local, state and federal laws, administrative rules, and other regulations applicable to proprietary schools.

(4-9-09)

a. The school must have a clearly stated educational purpose that is consistent with the courses or a set of related courses under consideration for approval. (4-7-11)

b. The ownership of the school, its agents, and all school officials must be identified by name and title. (4-9-09)

c. Each owner, agent, instructor and/or school official must be appropriately qualified by the trade board (as applicable) to ensure courses are of high quality and the rights of students are protected. ~~(4-9-09)~~ ( )

d. Written policies must be established to govern admissions and re-admission of dismissed students, hiring procedures, and working conditions; evaluation/assessment of all employees and instructional offerings; student and instructor rights and responsibilities; grievance procedures; approval of the curriculum and other academic procedures to ensure the quality of educational offerings. (4-7-11)

e. Procedures for assessing/evaluating the effectiveness of instruction must be established. Evaluation and assessment results must be used to improve courses or courses of study. (4-9-09)

f. All advertising, pamphlets, and other literature used to solicit students and all contract forms must accurately represent the purpose of the school, its courses or courses of study, anticipated job opportunities, and other relevant information to assist students in making an informed decision to enroll. The school must provide to each new and returning student prior to enrolling complete and clearly presented information indicating the school's annual completion and field-related employment rates. The school must update the information annually. ~~(4-7-11)~~ ( )

02. Standard II - Courses or Courses of Study. Instruction must be the primary focus of the school~~, and all instructional activities must be clearly related to the achievement of the stated instructional objectives~~. All courses or courses of study must prepare students to enter employment upon completion of the program or prepare them for self-employment. ~~(4-9-09)~~ ( )

a. The requirements for each course or courses of study must be defined clearly including applicable completion requirements or other requirements such as practicums and clinicals. Courses or courses of study will follow applicable trade board training curriculum standards or be designed using effective learning strategies for students, identifying and organizing all instructional materials and specialized facilities, identifying instructional assessment methods, and evaluating the effectiveness of the course offerings. ~~(4-9-09)~~ ( )

b. Written course descriptions must be developed for all courses or courses of study. ~~including: course overview, learning objectives and outcomes, course content, assessment, and grading criteria. A written inventory must be maintained for all course descriptions and~~ Written course descriptions must be provided to instructors. Instructors ~~must be~~ are expected to follow course descriptions. A syllabus must be developed for each course and distributed to students at the beginning of the course. ~~(4-9-09)~~ ( )

c. The school must assure that a course or courses of study will be offered with sufficient frequency to enable students to complete courses or courses of study within the minimum time for completion. (4-9-09)

d. The school must clearly state the cost of each course or courses of study and identify the payment schedule. This information ~~must be provided in written form to students,~~ and the refund policy must ~~also~~ be given to students in writing. ~~(4-9-09)~~ ( )

~~**e.** All advertising, pamphlets, and other literature used to solicit students and all contract forms must accurately represent the purpose of the school, its courses or courses of study, job opportunities, and other relevant information to assist students in making an informed decision to enroll. The school must provide to each prospective student, newly-enrolled student, and returning student, complete and clearly presented information indicating the school's current completion and job placement rate. (4-9-09)~~

03. Standard III - Student Support Services. The school must have clearly defined written policies

that are ~~distributed~~ readily available to students ~~through a variety of print and electronic means~~. Polices must address students rights and responsibilities, grievance procedures, and define what services are available to support students.~~(4-9-09)~~ ( )

a. ~~The school must develop a written admissions policy. The admission of students must be determined through an orderly process using published criteria which must be uniformly applied. Admissions must take into account the capacity of the student to undertake a course or courses of study and the capacity of the school to provide instructional and other support services the student needs to complete the program.~~ The admission of students must be determined through an orderly process established in a written policy using published criteria which must be uniformly applied. Admissions decisions must take into account the capacity of the student to grasp and complete the instructional training program and the ability of the school to handle the unique needs of the students it accepts. ~~(4-9-09)~~ ( )

b. There must be a clearly defined policy ~~for the readmission of~~ to re-evaluate students dismissed from the school and, if appropriate, to readmit them. ~~The readmission of students dismissed under this policy must be consistent with the recognized standards of admission to the school.~~ ~~(4-9-09)~~ ( )

c. The school must establish and adhere to a clear and fair policy regarding due process in disciplinary matters for all students, ~~and publish this policy in a handbook, which must include other rights and responsibilities of the students and the grievance procedure. This handbook must be supplied~~ given to each student upon enrollment in the school. The school must provide the name and contact information for the individual who is responsible for dealing with student grievances and other complaints and for handling due process procedures.~~(4-9-09)~~ ( )

d. ~~The school must provide written information to prospective students p~~Prior to enrollment~~to include the following~~ all prospective students must receive the following information in writing: ~~(4-9-09)~~ ( )

i. Information describing the purpose, length, and objectives of the courses or courses of study; (4-9-09)

ii. Completion requirements for the courses or courses of study; (4-9-09)

iii. The schedule of tuition, fees, and all other charges and all expenses necessary for completion of the courses or courses of study; (4-9-09)

iv. Cancellation and refund policies; (4-9-09)

v. An explanation of satisfactory progress, including an explanation of the grading/assessment system; (4-9-09)

vi. The calendar of study including registration dates, beginning and ending dates for all courses, and holidays; (4-9-09)

vii. A complete list of instructors and their qualifications; (4-9-09)

viii. A listing of available student services; and (4-9-09)

~~ix. Other information about the courses or courses of study that are likely to affect the decision of the student to enroll in the school. (4-9-09)~~

e. Accurate and secure records must be kept for all aspects of the student record including, at minimum, admissions information, and the courses each student completed. (4-9-09)

04. Standard IV – Faculty/Instructor Qualifications and Compensation. ~~(4-9-09)~~ ( )

a. Instructor qualifications (training and experience) must be ~~described and the assigned location for each instructor must be identified~~ recorded and available to students. ~~(4-9-09)~~ ( )

b. There must be a sufficient number of full-time instructors to maintain the continuity and stability of courses. (4-9-09)

c. The ratio of instructors to students in each course must be sufficient to assure effective instruction. (4-9-09)

d. Commissions may not be used for any portion of the faculty compensation. (4-9-09)

e. Procedures for evaluating instructors must be established. Provisions for student evaluation are recommended. (4-9-09)

05. Standard V - Resources, Finance, Facilities, and Instructional Resources. (4-9-09)

a. Adequate financial resources must be provided to accomplish instructional objectives and to effectively support the instructional program, including ~~teaching~~ classroom and training facilities, instructional materials, supplies and equipment, instructors, staff, library, and the physical and instructional technology infrastructure. ~~(4-9-09)~~ ( )

b. The school must have sufficient instructional resources materials so that, together with tuition and fees, it is able to complete its educational obligations to currently enrolled students. If the school is unable to fulfill its obligations to students, the school must make arrangements for a comparable teach-out opportunity with another proprietary school ~~to have students complete a comparable course or courses of study (a teach-out provision).~~ or refund one hundred (100) percent of prepaid tuition. ~~(4-9-09)~~ ( )

c. School ~~F~~financial/business records and reports ~~of the school~~ must be kept ~~and made~~ separate and distinct from those of any affiliated or sponsoring person or entity. Financial records and reports at a school shall be kept in accordance recognized financial accounting methods. ~~(4-9-09)~~ ( )

d. The school must have adequate instructional resource materials available to students, either on site or through electronic means. These materials must be housed in a designated area and be available for students and instructors with sufficient regularity and at appropriate hours to support achievement of course objectives or to promote effective teaching. (4-9-09)

e. If the school relies on other schools or entities to provide library resources or instructional resources, the school must demonstrate how these arrangements effectively meet the needs of students and faculty. These arrangements must be documented through written agreements. Student and faculty use must be documented and frequently evaluated to ensure quality services are being provided. (4-9-09)

302. THE BOARD MAY NOTIFY THE PROPRIETARY SCHOOL OF ADDITIONAL INFORMATION REQUIRED.
If the Board is unable to determine the nature and activities of a school on the basis of the information provided by the school under this rule, then the Board may notify the school of additional information that it will be required to provide in connection with the application for registration. (3-29-10)

01. Verification of Information. The Board may verify the accuracy of submitted information by inspection, visitation, or any other means it considers necessary. The applicant school shall be responsible for any costs ~~PTE~~the Board incurs including travel, associated with this review. ~~(3-29-10)~~ ( )

02. Criteria for Approval or Denial of Registration. To be approved for registration, the school must demonstrate that it is in compliance with Chapter 24, Title 33, Idaho Code and this rule, including all of the standards described in Section 301 of this rule. A school must remain in compliance for the registration year. (3-29-10)

03. Public Information. All information submitted to the Board is ~~public information, and is~~ subject to disclosure as set forth in the Public Records Act, Title 9, Chapter 3, Idaho Code. ~~(3-29-10)~~ ( )

04. Certificate of Registration or Exemption. ~~(4-9-09)~~ ( )

a. A certificate of registration will be issued to a proprietary school that has paid its registration fee and been approved under this rule. A certificate evidencing initial registration will be effective the date it is issued, and continue through June 30 of the next succeeding year. A renewal certificate will be for the period July 1 through June 30 of the next succeeding year. No school that is registered with the Board shall advertise or represent in any manner that it is accredited by the Board. An institution may only represent that it is "Registered with Idaho State Board of Education." Registration is not an endorsement of the school. (4-7-11)

b. An institution exempt from registration under these rules may request a certificate of exemption. ( )

~~b~~**c.** If a school wishes to offer additional courses or courses of study during the course of a registration year that were not included in its application to the Board prior to issuance of the certificate of registration, then the school must submit a letter to the Board office along with appropriate approval documentation by the applicable professional or trade board, council, or commission. This letter will be added to the school's registration file.~~(4-7-11)~~ ( )

05. Disapproval and Appeal. If a proprietary school's request for initial registration or a renewal of registration is disapproved by the Board, then the school may appeal such decision in accordance with Chapter 52, Title 67, Idaho Code. The request must be in writing and made to the Board within thirty (30) days of the date the school is notified of the disapproval. (3-29-10)

06. Withdrawal of Approval. (4-9-09)

a. The Board may refuse to renew, or may revoke or suspend approval of a school's registration by giving written notice and the reasons therefore to the school. The school may request a hearing under IDAPA 04.11.01, "Idaho Rules of Administrative Procedure of the Attorney General." (3-29-10)

b. Withdrawal of approval may be for one (1) or more of the following reasons: (4-9-09)

i. Violation of Chapter 24, Title 33, Idaho Code or this rule. (4-9-09)

ii. Providing false, misleading, deceptive, or incomplete information to the Board. (3-29-10)

iii. Presenting to prospective or current students information about the school which is false, fraudulent, misleading, deceptive, or inaccurate in a material respect; or (4-9-09)

iv. Refusing to allow reasonable inspection or to supply reasonable information after a written request by the Board has been received. (3-29-10)

c. If any information contained in the application submitted by the school becomes incorrect or incomplete, then the registered school shall notify the Board of such change within thirty (30) days. A school that ceases operation during the course of a registration year shall immediately provide written notice to the Board of this event. (4-7-11)

07. Agent's Certificate of Identification. Each proprietary school shall ensure that its agents have a valid certificate of identification, and that all of its agents are in compliance with Section 33-2404, Idaho Code. The school shall complete a criminal history check that includes, at a minimum, the State Bureau of Identification, and statewide sex offender registry for each agent having unsupervised contact with minors in the minor's home or at secondary schools, prior to making application for the agent's certificate of identification. The criminal history check shall be valid for five (5) years and be kept on file by the school. When an employee returns to any proprietary school after a break in service of six (6) months or more a new criminal history check must be obtained. When an employee changes employment between proprietary schools, a new criminal history check must be obtained by the new employer. (4-7-11)

a. The Board shall revoke any agent's certificate of identification issued or authorized under this

Section and shall deny the application for issuance of a new certificate of identification of a person who pleads guilty to, or is found guilty of, notwithstanding the form of the judgment or withheld judgment, any of the following felony offenses against a child: (3-29-10)

i. The aggravated assault of a child, Section 18-905, Idaho Code, or the assault with intent to commit a serious felony against a child, Section 18-909, Idaho Code. (3-29-10)

ii. The aggravated battery of a child, Section 18-907, Idaho Code, or the battery with intent to commit a serious felony against a child, Section 18-911, Idaho Code. (3-29-10)

iii. The injury or death of a child, Section 18-1501, Idaho Code. (3-29-10)

iv. The sexual abuse of a child under sixteen (16) years of age, Section 18-1506, Idaho Code. (3-29-10)

v. The ritualized abuse of a child under eighteen (18) years of age, Section 18-1506A, Idaho Code. (3-29-10)

vi. The sexual exploitation of a child, Section 18-1507, Idaho Code. (3-29-10)

vii. Possession of photographic representations of sexual conduct involving a child, Section 18-1507A, Idaho Code. (3-29-10)

viii. Lewd conduct with a child under the age of sixteen (16) years, Section 18-1508, Idaho Code. (3-29-10)

ix. The sexual battery of a minor child sixteen (16) or seventeen (17) years of age, Section 18-1508A, Idaho Code. (3-29-10)

x. The sale or barter of a child for adoption or other purposes, Section 18-1511, Idaho Code. (3-29-10)

xi. The murder of a child, Section 18-4003, Idaho Code, or the voluntary manslaughter of a child, Section 18-4006 1., Idaho Code. (3-29-10)

xii. The kidnapping of a child, Section 18-4502, Idaho Code. (3-29-10)

xiii. The importation or exportation of a juvenile for immoral purposes, Section 18-5601, Idaho Code. (3-29-10)

xiv. The abduction of a person under eighteen (18) years of age for prostitution, Section 18-5610, Idaho Code. (3-29-10)

xv. The rape of a child, Section 18-6101 or 18-6108, Idaho Code. (3-29-10)

b. The general classes of felonies listed in Section 302 shall include equivalent laws of federal or other state jurisdictions. For the purpose of Subsection 302.07, "child" means a minor or juvenile as defined by the applicable state or federal law. (3-29-10)

08. Surety Bond. Each proprietary school shall comply with the provisions in Section 33-2406, Idaho Code, relating to a surety bond. (4-9-09)

a. The amount of the surety bond shall be not less than the total tuition and fees to be collected by the school from its students, currently engaged in instructional activities, that covers the period from the beginning through completion of ~~such students' instructional program at the school during the upcoming registration year~~ the course of instruction the student has contracted and paid for. This amount shall be based upon the projected tuition

and fees revenue for the coming registration year collected by the school from its students covering such period during the previous registration year, subject to modification in the event a school is beginning operations and has no previous revenue or satisfactorily demonstrates that it expects experiences significant changes in tuition and fee revenue during the upcoming current year. The Executive Director shall determine the appropriate format and method by which this bond value is to be calculated and reported. (3-29-10) ( )

b. Schools must keep a valid bond in force, via periodic renewal as needed, throughout the entire registration year with no lapse in coverage. Schools shall ensure that all bonds include "extended coverage" clauses to remain in effect for one hundred twenty (120) days after the date of a school's closure. (3-29-10) ( )

c. No party to the surety bond may cancel without one hundred twenty (120) day prior notice to all parties, including the Office of the State Board of Education. (3-29-10)

d. The Board shall be the beneficiary of the bond and shall oversee the distribution of funds to students who file claims. Schools shall provide proof of the required bond and submit said documentation with their registration applications. (3-29-10)

303. -- 399. (RESERVED).

400. ENFORCEMENT

The Board, acting by and through its Executive Director or his designee, may initiate on its own initiative any investigation relating to a violation of the state laws or rules relating to the requirement that an institution or school register with the Board pursuant to Idaho Code title 33, chapter 24.

401.-499. (RESERVED).

500. COMPLAINTS (6-24-11)T

A complaint concerning an institution or school operating in the State of Idaho (maintaining an Idaho presence) that pertains to a matter described herein shall be reviewed and acted upon as appropriate in accordance with the specific procedures described below: (6-24-11)T

01. Violations of State Consumer Protection Laws. A complaint alleging a violation of Idaho consumer protection laws shall be instituted, reviewed, and acted upon in accordance with IDAPA 04.02.01, Idaho Rules of Consumer Protection, Office of the Attorney General. (6-24-11)T

02. Violations of State Laws or Rules Related to the Registration of Postsecondary Educational Institutions and Proprietary Schools. A complaint alleging violations of state laws or rules related to the requirement that an institution or school register with the Board shall be submitted in writing to the Board's Executive Director or his designee for investigation and appropriate enforcement action, including the remedies specified in Idaho Code §33-2408. (6-24-11)T

03. Complaints Related to Quality of Education, or Other Matters (6-24-11)T

a. A complaint relating to the quality of education provided by an institution or school or accreditation matters, or any other matter related to the operations or practices of an institution or school other than a state consumer protection matter, shall be submitted on a form provided by the Board to the Executive Director or his designee for review and appropriate action. (6-24-11)T

b. If after initial review the Executive Director determines that the complaint relates to the quality of education or accreditation matters, the Executive Director may refer the matter to the accreditation organization of the institution or school at issue for review and recommendation. If a matter referred to an accreditation organization results in resolution of the complaint to the satisfaction of the complainant, then the matter shall be considered resolved and there shall be no further action on the matter. If the matter is not successfully resolved,

then the Executive Director or his designee will review the recommendation of the accreditation organization and follow the procedures for investigations of complaints described in subsection c. of this section. (6-24-11)T

c. If the complaint pertains to any other matter related to the operations or practices of an institution or school, other than a state consumer protection matter, then the Executive Director or his designee will review the complaint to determine whether such complaint falls within the regulatory authority of the Board. If it does not, then Board office will notify the complainant in writing of such determination, and may offer referral of such matter to an appropriate agency or entity. If after initial review the Executive Director determines that the complaint falls within the regulatory authority of the Board, then Board staff will notify both the complainant and the respondent institution or school of the complaint resolution process to be utilized and applicable timelines. The review and investigation of a complaint shall occur as expeditiously as possible. The parties may be asked to respond in writing to the complaint, to submit to interviews, and to provide additional records, documents, statements, or other collateral information as necessary. Any request by the investigator for additional information related to such complaint must be provided promptly. The Board's investigator will review the materials submitted by all parties and at the conclusion of the investigation prepare a summary of the allegations, the investigator's findings, and a recommendation for disposition to the Executive Director. If the Executive Director determines that the facts indicate a probable violation of law or rule over which the Board has regulatory authority, then the Executive Director shall issue a written decision on the disposition of such complaint. Within thirty (30) days after a decision is issued a party aggrieved by such decision may file with the Executive Director a request for a hearing. The provisions of the Idaho Administrative Procedure Act, chapter 52, title 67, Idaho Code, shall apply to such hearing and to judicial review of such decision. (6-24-11

d. If the Board office receives a complaint relating to an institution or school that is exempt from registration under Idaho law or these rules, and such institution or school has not elected to voluntarily register, then such institution or school shall be responsible for reimbursing the Board office for the actual costs incurred to process and act on such complaint. (6-24-11)T

501. -- 999. (RESERVED)

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SUBJECT

Pending Rule – Docket 08-0114-1101 – Idaho Rural Physician Incentive Program

REFERENCE

June 2011	Board approved proposed rule changes to IDAPA 08.01.14, Idaho Rural Physician Incentive Program.

APPLICABLE STATUTE, RULE, OR POLICY

Idaho Administrative code, IDAPA 08.01.14
Sections 33-333723 through 33-3725, Idaho Code

BACKGROUND/DISCUSSION

The Idaho Rural Physician Incentive Program was approved by the 2003 Idaho Legislature to encourage primary care physicians to practice in medically underserved areas of Idaho. Sections 33-3723–33-3725, Idaho Code establishes the authority of the Board, through an oversight committee, to administer the program and assess/collect the rural physician incentive fee.

In April 2010, the oversight committee selected four physicians to receive an award under this program. Current administrative code stipulates that qualified medical education debt repayments will be paid directly to the financial organization holding the debt. While processing the first payment to the financial organizations for these physicians, Board staff encountered unforeseen barriers in obtaining the necessary information and paperwork from the financial organizations in order to process the payment through the Statewide Accounting and Reporting System.

By modifying IDAPA 08.01.14 subsection 017.03 (Repayment of Qualified Medical Education Debt) and altering the payment structure so that the loan repayments are processed to an award recipient physician instead of the financial institution, Board staff will be able to process the payment immediately for the two physicians who have not received their award. Amendments will include requiring award recipient physicians to sign an affidavit provided by the Board office affirming the payment will be made to the financial institution.

Additional amendments to IDAPA 08.01.14 clarifies an eligible area in subsection 010 as a medically underserved area of Idaho designated by the U.S. Secretary of Health and Human Services and further defines it as a health professional shortage area in the category of primary care or mental health.

There were no comments received during the 21 day open comment period. There have been no changes between the proposed and pending rule.

IMPACT

The proposed amendments will allow staff administer the program more efficiently for future recipients and process the two loan repayments from the current round of awards that had not yet been processed.

ATTACHMENTS

Attachment 1 – Pending Rule IDAPA 08.01.14 Page 3

STAFF COMMENTS AND RECOMMENDATIONS

Pending rules approved by the Board will be posted in the next Administrative Bulletin and move forward to the legislature. Pending rules become effective at the end of the legislative session in which they are submitted if they are not rejected by concurrent resolution of the legislature.

Staff recommends approval.

BOARD ACTION

I move to approve the Pending Rule Docket 0114-1101 as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

IDAPA 08
TITLE 01
CHAPTER 14

08.01.14 - IDAHO RURAL PHYSICIAN INCENTIVE PROGRAM

010. DEFINITIONS.
These definitions are applicable to this chapter only. (3-29-10)

01. Community Sponsoring Organization. A hospital, medical clinic or other medical organization which is located in an eligible area and that employs physicians for purposes of providing primary care medical services to patients. (3-29-10)

02. Eligible Area. A medically underserved area of Idaho, further defined to mean an area designated by the U.S. Secretary of Health and Human Services as a ~~h~~Health ~~p~~Professions~~s~~al ~~s~~Shortage ~~area~~ in the category of Primary Care or Mental Health. ~~(3-29-10)~~( )

03. Oversight Committee. The committee constituted pursuant to Section 33-3724, Idaho Code, composed of knowledgeable individuals or organizations to assist in the administration of the rural physician incentive program. (3-29-10)

04. Primary Care Medicine. Family medicine, general internal medicine, and general pediatrics, but if there is a demonstrated high level of need in an eligible area, as determined by the oversight committee, may also include obstetrics and gynecology, general psychiatry, general surgery, and emergency medicine. (3-29-10)

05. Qualified Medical Education Debt. Debt with a financial aid program or financial institution incurred to meet the educational costs of attending a medical school. (3-29-10)

06. Rural Physician. A licensed Idaho physician, MD or DO, who spends a minimum of twenty-eight (28) hours per week, on average, providing primary care medicine services to patients in an eligible area. (3-29-10)

07. Rural Physician Incentive Fee. The fee assessed by the State to students preparing to be physicians in the fields of medicine or osteopathic medicine who are supported by the state pursuant to an interstate compact for professional education in those fields, as those fields are defined by the compact. (3-29-10)

08. Rural Physician Incentive Fund. The special revenue account in the state treasury created pursuant to Section 33-3724, Idaho Code, relating to the Rural Physician Incentive Program. (3-29-10)

(BREAK IN CONTINUITY OF SECTIONS)

014. ELIGIBILITY FOR A RURAL PHYSICIAN INCENTIVE PROGRAM AWARD.

01. Eligibility Requirements. A physician who meets the following requirements is eligible to apply for a Rural Physician Incentive Program award: (3-29-10)

a. During the period covered by the award, the physician must be a rural physician providing primary care medicine in an eligible area. A physician may provide patient care services in primary care medicine in more than one (1) eligible area; (3-29-10)

b. The physician must be a Doctor of Medicine (M.D.) or Doctor of Osteopathic Medicine (D.O.) and have completed an Accreditation Council of Graduate Medical Education or American Osteopathic Association residency; (3-29-10)

c. The physician must be Idaho Medical Board certified/Board eligible, ~~hold~~be eligible for an unrestricted Idaho medical license, and be able to meet the medical staffing requirements of the sponsoring organization when applicable; and ~~(3-29-10)~~ ( )

d. The physician must be eligible to care for Medicare and Medicaid patients within the scope of the physician's primary care medicine practice. (3-29-10)

02. Ineligibility. Notwithstanding Subsection 014.01 of these rules, a physician shall not be entitled to receive an award under this program if the physician is receiving payments for purposes of repaying qualified medical education debt from another state or from a federal debt repayment program. (3-29-10)

(BREAK IN CONTINUITY OF SECTIONS)

017. MONETARY VALUE OF THE AWARD.

01. Award Amounts. A physician selected to receive a Rural Physician Incentive Program award shall be entitled to receive qualified medical education debt repayments for a period not to exceed five (5) years in such amount as is determined annually. The award shall not exceed the qualified medical education debt incurred by the recipient, and the maximum amount of educational debt repayments that a rural physician may receive shall be fifty thousand dollars ($50,000) over such five (5) year period. Payments shall be limited to a maximum of ten thousand dollars ($10,000) in a single year. (3-29-10)

02. Establishing Award Amounts. Award amounts shall be established annually based on recommendations of the oversight committee utilizing such factors as availability of funding, the number of new applicants, and the hours an award recipient will devote to providing primary care services in an eligible area. (3-29-10)

03. Repayment of Qualified Medical Education Debt. All qualified medical education debt repayments shall be paid directly to the ~~financial organization~~ award-recipient physician who shall direct payment of an equal amount to the financial institution holding such debt. An award recipient physician shall sign an affidavit provided by the Office of the State Board of Education affirming that payment will be made to the financial institution. ~~(3-29-10)~~ ( )

04. Incentive Fund. Pursuant to Section 33-3725, Idaho Code, the total of all awards from the rural physician incentive fund contractually committed in a year shall not exceed the annual amount deposited in the rural physician incentive fund that same year. (3-29-10)

05. Annual Adjustments. An award payment to a recipient in a single year is not guaranteed or assured in subsequent years and may be increased or reduced. Annual award payments for new and existing award recipients will be announced no later than April 30th of each year. (3-29-10)

SUBJECT

Pending Rule Docket 08-0203-1102 – Rules Governing Thoroughness, Online Learning Graduation Requirement

REFERENCE

September 2011	Board approved proposed rule changes to IDAPA 08.01.04, Rules Governing Thoroughness, Online Learning Graduation Requirement

APPLICABLE STATUTE, RULE, OR POLICY

Idaho Administrative Code, IDAPA 08.02.03 – Rules Governing Thoroughness
Section 33-1002A and 33-1627, Idaho Code

BACKGROUND/DISCUSSION

Section 33-1627, Idaho Code specifies that the Board shall promulgate rules requiring online courses as a graduation requirement for those students graduating in 2016. Section 33-1002A defines an on line course as a "course which delivers a sequential program of synchronous and/or asynchronous instruction primarily through the use of technology, in which the instructor in not physically located at the school or place in which the student is receiving instruction. Nothing in this definition shall prohibit a blended course that includes face-to-face, in person instruction, provided that the majority of the instruction is delivered as stated herein." The proposed addition to IDAPA 08.02.03 sets out a definition for an online course, blended course and additional terms necessary to further clarify those definition's. Additionally, an on-line learning requirement has been added to the graduation requirement section of this rule.

The proposed graduation requirement specifies that each student earn two online learning credits, one (1) of which shall be from an asynchronous online course, the other can be from an online course or blended course. An online course is defined as a course where 80% or more of the content is delivered through technology and a blended course is defined as a course where 51% - 79% of the content is delivered through technology. In addition to this requirement an alternate measure is set for those students who attempt the credit in the asynchronous online course and do not pass, are on an Individual Education Plan, eligible to receive services under Section 504 of the federal Rehabilitation Act, or enrolled in a Limited English Proficient program for three (3) academic years or less. The alternate measure is designed by the school district, similar to the alternate measure for the proficiency requirement, and must at a minimum meet the Idaho technology content standards.

During the 21 day comment period one hundred and twelve (112) additional comments were received. The majority of the comments felt that there should not be an online learning requirement. Additional concerns were expressed regarding the financial burden to districts to purchase or contract with a provider

for online courses and the impact the Idaho Digital Learning Academy's (IDLA) new funding structure will have on school districts desiring to use IDLA to deliver these classes. No changes were made to the rule between the proposed and pending rule stages.

It is evident from the comments received that there is still confusion regarding the online learning requirement. Some individuals are confusing the on-line learning requirement with dual credit opportunities while others do not understand that school districts will not be required to purchase online courses if they choose to develop the course content locally, using existing staff and resources.

Board staff will work with the Department of Education in developing an appropriate mechanism to further inform school districts and the public in ways the online learning graduation requirement can be met.

IMPACT

Once approved students entering the 9th grade in the fall of 2012 will be required to earn two (2) online learning credits to graduate from high school or qualify for the alternate graduation measure. School districts and local education agencies will be required to develop an alternate measure, for all high school students that qualify, to meet the online learning requirement. The measure must include multiple measures and meet the Idaho technology content standards.

ATTACHMENTS

Attachment 1 – IDAPA 08.02.03.- Pending Rule Page 3

STAFF COMMENTS AND RECOMMENDATIONS

Pending rules approved by the Board will be posted in the next Administrative Bulletin and move forward to the legislature. Pending rules become effective at the end of the legislative session in which they are submitted if they are not rejected by the concurrent resolution of the legislature.

Staff recommends approval.

BOARD ACTION

I move to approve the Pending Rule Docket 08-0203-1102 – Rules Governing Thoroughness as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

IDAPA 08
TITLE 02
CHAPTER 03

08.02.03 - RULES GOVERNING THOROUGHNESS

007. DEFINITIONS A - G.

01. Achievement Standards. Define "below basic," "basic," "proficient," and "advanced" achievement levels on the Idaho Standards Achievement Tests (ISAT) and "beginning," "advanced beginning," "intermediate," "early fluent" and "fluent" on the Idaho English Language Assessment (IELA) by setting scale score cut points. These cut scores are paired with descriptions of how well students are mastering the material in the content standards. These descriptions are called performance level descriptors or PLDs, and are provided by performance level, by content area, and by grade. (4-2-08)

02. Advanced Opportunities. Are defined as Advanced Placement courses, Dual Credit courses, Tech Prep, or International Baccalaureate programs. (4-11-06)

03. Advanced Placement® (AP) - College Board. The Advanced Placement Program is administered by the College Board. AP students may take one (1) or more college level courses in a variety of subjects. AP courses are not tied to a specific college curriculum, but rather follow national College Board curricula. While taking the AP exam is optional, students can earn college credit by scoring well on the national exams. It is up to the discretion of the receiving college to accept the scores from the AP exams to award college credit or advanced standing. (4-11-06)

04. All Students. All students means all public school students, grades K-12. (4-11-06)

05. Alternative Assessment (Other Ways of Testing). Any type of assessment in which students create a response to a question rather than choose a response from a given list, as with multiple-choice or true/false. Alternative assessments can include short-answer questions, essays, oral presentations, exhibitions, and portfolios. (4-5-00)

06. Assessment. The process of quantifying, describing, or gathering information about skills, knowledge or performance. (4-5-00)

07. Assessment Standards. Statements setting forth guidelines for evaluating student work, as in the "Standards for the Assessment of Reading and Writing"; (4-5-00)

08. Asynchronous course. An online course in which an online platform is used to deliver all curricula. The majority of communication exchanges occur in elapsed time and allow students and teachers to participate according to their schedule. Asynchronous courses do not prohibit the use of a paraprofessional, certificated staff or other staff member being present at the physical location during instructional periods where instruction takes place such as a schools computer lab. ( )

~~08~~09. Authentic. Something that is meaningful because it reflects or engages the real world. An "authentic task" asks students to do something they might really have to do in the course of their lives, or to apply certain knowledge or skills to situations they might really encounter. (4-5-00)

~~09~~10. Basic Educational Skills Training. Instruction in basic skills toward the completion/attainment of a certificate of mastery, high school diploma, or GED. (4-5-00)

11. **Blended Course**. A blended course, sometimes called hybrid course, consists of a course having between fifty-one percent (51%) and seventy-nine percent (79%) of the course content delivered through the use of technology and may include models such as rotation model, flex model, or online lab model. ( )

a. **Flex Model.** Features an online platform that delivers most of the curricula. Teachers provide on-site support on a flexible and adaptive as-needed basis through in-person tutoring sessions and small group sessions. ( )

b. **Online Lab Model.** Programs rely on an online platform to deliver the entire course but in a brick-and-mortar lab environment. Paraprofessionals or other staff supervise, but offer little content expertise. ( )

c. **Rotation Model.** Students rotate on a fixed schedule between learning online in a self-paced environment and sitting in a classroom with a traditional face-to-face teacher. ( )

~~10~~2. **Classic Texts**. Literary or other works (e.g., films, speeches) that have been canonized, either continuously or intermittently, over a period of time beyond that of their initial publication and reception. (4-5-00)

~~11~~3. **Content Standards**. Describe the knowledge, concepts, and skills that students are expected to acquire at each grade level in each content area. (4-2-08)

~~12~~4. **Context (of a Performance Assessment)**. The surrounding circumstances within which the performance is embedded. For example, problem solving can be assessed in the context of a specific subject (such as mathematics) or in the context of a real-life laboratory problem requiring the use of mathematics, scientific, and communication skills. (4-5-00)

~~13~~5. **Cooperative Work Experience**. Classroom learning is integrated with a productive, structured work experience directly related to the goals and objectives of the educational program. Schools and participating businesses cooperatively develop training and evaluation plans to guide and measure the progress of the student. School credit is earned for successful completion, and the work may be paid or unpaid. Cooperative work experiences are also known as co-operative education or co-op. (4-5-00)

~~14~~6. **Criteria**. Guidelines, rules or principles by which student responses, products, or performances, are judged. What is valued and expected in the student performance, when written down and used in assessment, become rubrics or scoring guides. (4-5-00)

~~15~~7. **Cues**. Various sources of information used by readers to construct meaning. The language cueing systems include the graphophonic (also referred to as graphophonemic) system, which is the relationship between oral and written language (phonics); the syntactic system, which is the relationship among linguistic units such as prefixes, suffixes, words, phrases, and clauses (grammar); and semantic system, which is the study of meaning in language. Reading strategies and language cueing systems are also influenced by pragmatics-the knowledge readers have about the ways in which language is understood by others in their culture. (4-5-00)

~~16~~8. **"C" Average**. A combined average of courses taken on a four (4) point scale with "C" equal to two (2) points. (4-11-06)

~~17~~9. **Decode**. (4-5-00)

a. To analyze spoken or graphic symbols of a familiar language to ascertain their intended meaning. (4-5-00)

b. To change communication signals into messages, as to decode body language. (4-5-00)

~~18~~20. **Dual Credit**. Dual credit allows high school students to simultaneously earn credit toward a high school diploma and a postsecondary degree or certificate. Postsecondary institutions work closely with high schools to deliver college courses that are identical to those offered on the college campus. Credits earned in a dual credit class become part of the student's permanent college record. Students may enroll in dual credit programs taught at the high school or on the college campus. (4-11-06)

~~19~~21. **Emergent Literacy**. Development of the association of print with meaning that begins early in a child's life and continues until the child reaches the stage of conventional reading and writing. (4-5-00)

~~20~~22. **Employability Skills**. Work habits and social skills desirable to employers, such as responsibility, communication, cooperation, timeliness, organization, and flexibility. (4-5-00)

~~21~~23. **Entry-Level Skills**. The minimum education and skill qualifications necessary for obtaining and keeping a specific job; the starting point in a particular occupation or with a certain employer. (4-5-00)

~~22~~24. **Evaluation (Student)**. Judgment regarding the quality, value, or worth of a response, product, or performance based on established criteria, derived from multiple sources of information. Student evaluation and student assessment are often used interchangeably. (4-5-00)

~~23~~25. **Experiential Education (Application)**. Experiential education is a process through which a learner constructs knowledge, skill, and value from direct experiences. (4-5-00)

~~24~~26. **Exploratory Experience (Similar to a Job Shadow)**. An opportunity for a student to observe and participate in a variety of worksite activities to assist in defining career goals. An in-school exploratory experience is a school-based activity that simulates the workplace. (4-5-00)

~~25~~27. **Fluency**. The clear, rapid, and easy expression of ideas in writing or speaking; movements that flow smoothly, easily, and readily. (4-5-00)

~~26~~28. **Genre (Types of Literature)**. A category used to classify literary and other works, usually by form, technique, or content. Categories of fiction such as mystery, science fiction, romance, or adventure are considered genres. (4-5-00)

~~27~~29. **Graphophonic/Graphophonemic**. One (1) of three (3) cueing systems readers use to construct texts; the relationships between oral and written language (phonics). (4-5-00)

008. DEFINITIONS H - S.

01. Interdisciplinary or Integrated Assessment. Assessment based on tasks that measures a student's ability to apply concepts, principles, and processes from two (2) or more subject disciplines to a project, issue, or problem. (4-5-00)

02. International Baccalaureate (IB) - Administered by the International Baccalaureate Organization, the IB program provides a comprehensive liberal arts course of study for students in their junior and senior years of high school. IB students take end-of-course exams that may qualify for college credit. Successful completion of the full course of study leads to an IB diploma. (4-11-06)

03. Laboratory. A laboratory science course is defined as one in which at least one (1) class period each week is devoted to providing students with the opportunity to manipulate equipment, materials, specimens or develop skills in observation and analysis and discover, demonstrate, illustrate or test scientific principles or concepts. (4-11-06)

04. Learning Plan. The plan that outlines a student's program of study, which should include a rigorous academic core and a related sequence of electives in academic, professional-technical education (PTE), or humanities aligned with the student's post graduation goals. (4-11-06)

05. Narrative. Text in any form (print, oral, or visual) that recounts events or tells a story. (4-5-00)

06. Norm-Referenced Assessment. Comparing a student's performance or test result to performance of other similar groups of students; (e.g., he typed better than eighty percent (80%) of his classmates.) (4-5-00)

07. **On-Demand Assessment**. Assessment that takes place at a predetermined time and place. Quizzes, state tests, SATs, and most final exams are examples of on-demand assessment. (4-5-00)

08. **Online course.** A course in which at least eighty percent (80%) of the course content is delivered over the Internet or through the use of technology. An online course may be asynchronous or synchronous. Online teachers may perform the course work from an alternate location while a paraprofessional or other school staff member supervises students in a computer lab environment.

09. **Online learning.** Education in which the majority of course content is delivered online or through the use of technology. Courses may be delivered in an asynchronous or synchronous course format and may include blended or hybrid course models or fully online course models. Online learning does not include printed-based correspondence education, broadcast television or radio, videocassettes, and stand-alone education software programs that do not have a significant internet-based instructional component. Online learning is not simply computer based instruction, but rather requires that the online teacher and the student have ongoing access to one another for purposes of teaching, evaluating and providing assistance to the student throughout the duration of the course. All online learning must meet the Idaho content standards.

10. **Online teacher (instructor).** The teacher of record who holds an appropriate Idaho certification and provides the primary instruction for an online course.

~~08~~11. **Performance Assessment**. Direct observation of student performance or student work and professional judgment of the quality of that performance. Good quality performance assessment has pre-established performance criteria. (4-5-00)

~~09~~12. **Performance-Based Assessment**. The measurement of educational achievement by tasks that are similar or identical to those that are required in the instructional environment, as in performance assessment tasks, exhibitions, or projects, or in work that is assembled over time into portfolio collections. (4-5-00)

~~10~~3. **Performance Criteria**. A description of the characteristics that will be judged for a task. Performance criteria may be holistic, analytic trait, general or specific. Performance criteria are expressed as a rubric or scoring guide. Anchor points or benchmark performances may be used to identify each level of competency in the rubric or scoring guide. (4-5-00)

~~11~~4. **Phonics**. Generally used to refer to the system of sound-letter relationships used in reading and writing. Phonics begins with the understanding that each letter (or grapheme) of the English alphabet stands for one (1) or more sounds (or phonemes). (4-5-00)

~~12~~5. **Portfolio**. A collection of materials that documents and demonstrates a student's academic and work-based learning. Although there is no standard format for a portfolio, it typically includes many forms of information that exhibit the student's knowledge, skills, and interests. By building a portfolio, students can recognize their own growth and learn to take increased responsibility for their education. Teachers, mentors, and employers can use portfolios for assessment purposes and to record educational outcomes. (4-5-00)

~~13~~6. **Print Awareness**. In emergent literacy, a learner's growing awareness of print as a system of meaning, distinct from speech and visual modes of representation. (4-5-00)

~~14~~7. **Professional-Technical Education**. Formal preparation for semi-skilled, skilled, technical, or paraprofessional occupations, usually below the baccalaureate level. (4-11-06)

~~15~~8. **Proficiency**. Having or demonstrating a high degree of knowledge or skill in a particular area. (4-5-00)

~~16~~9. **School-to-Work Transition**. A restructuring effort that provides multiple learning options and seamless integrated pathways to increase all students' opportunities to pursue their career and educational interests. (4-5-00)

~~17~~20. **Service Learning**. Combining service with learning activities to allow students to participate in experiences in the community that meet actual human needs. Service learning activities are integrated into the academic curriculum and provide structured time for a student to think, talk, or write about what was done or seen during the actual service activity. Service learning provides students with opportunities to use newly acquired skills and knowledge in real-life situations in their communities, and helps foster the development of a sense of caring for others. (4-5-00)

~~18~~21. **Skill Certificate**. Portable, industry-recognized credential that certifies the holder has demonstrated competency on a core set of performance standards related to an occupational cluster area. Serving as a signal of skill mastery at benchmark levels, skill certificates may assist students in finding work within their community, state, or elsewhere. A National Skills Standards Board is presently charged with issuing skill voluntary standards in selected occupations based on the result of research and development work completed by twenty-two (2) contractors. (4-5-00)

~~19~~22. **Standards**. Statements about what is valued in a given field, such as English language arts, and/or descriptions of what is considered quality work. See content standards, assessment standards, and achievement standards. (4-2-08)

~~20~~3. **Standardization**. A set of consistent procedures for constructing, administering and scoring an assessment. The goal of standardization is to ensure that all students are assessed under uniform conditions so the interpretation of performance is comparable and not influenced by differing conditions. Standardization is an important consideration if comparisons are to be made between scores of different individuals or groups. (4-5-00)

~~21~~4. **Standards-Based Education**. Schooling based on defined knowledge and skills that students must attain in different subjects, coupled with an assessment system that measures their progress. (4-5-00)

~~22~~5. **Structured Work Experience**. A competency-based educational experience that occurs at the worksite but is tied to the classroom by curriculum through the integration of school-based instruction with worksite experiences. Structured work experience involves written training agreements between school and the worksite, and individual learning plans that link the student's worksite learning with classroom course work. Student progress is supervised and evaluated collaboratively by school and worksite personnel. Structured work experience may be paid or unpaid; may occur in a public, private, or non-profit organization; and may or may not result in academic credit and/or outcome verification. It involves no obligation on the part of the worksite employer to offer regular employment to the student subsequent to the experience. (4-5-00)

~~23~~6. **Student Learning Goals (Outcomes)**. Statements describing the general areas in which students will learn and achieve. Student learning goals typically reflect what students are expected to know by the time they leave high school, such as to read and communicate effectively; think critically and solve problems; develop positive self-concept, respect for others and healthy patterns of behavior; work effectively in groups as well as individually; show appreciation for the arts and creativity; demonstrate civic, global and environmental responsibility; recognize and celebrate multicultural diversity; exhibit technological literacy; have a well developed knowledge base which enhances understanding and decision making, and demonstrate positive problem solving and thinking skills. (4-5-00)

27. **Synchronous course.** A course in which the teacher and students interact at the same time. May be applied to both traditional and technology based courses.

(BREAK IN CONTINUITY OF SECTIONS)

105. HIGH SCHOOL GRADUATION REQUIREMENTS.
A student must meet all of the requirements identified in this section before the student will be eligible to graduate from an Idaho high school. The local school district or LEA may establish graduation requirements beyond the state minimum. (5-8-09)

01. Credit Requirements. The State minimum graduation requirement for all Idaho public high schools is forty-two (42) credits. The forty-two (42) credits must include twenty-five (25) credits in core subjects as identified in Paragraphs 105.01.c. through 105.01.h. All credit-bearing classes must be aligned with state high

school standards in the content areas for which standards exist. For all public school students who enter high school at the 9th grade level in Fall 2009 or later, the minimum graduation requirement will be forty-six (46) credits and must include twenty-nine (29) credits in core subjects as identified in Paragraphs 105.01.b. through 105.01.g. (3-29-10)

a. Credits. (Effective for all students who enter the ninth grade in the fall of 2010 or later.) One (1) credit shall equal sixty (60) hours of total instruction. School districts or LEA's may request a waiver from this provision by submitting a letter to the State Department of Education for approval, signed by the superintendent and chair of the board of trustees of the district or LEA. The waiver request shall provide information and documentation that substantiates the school district or LEA's reason for not requiring sixty (60) hours of total instruction per credit. (3-29-10)

b. Mastery. Students may also achieve credits by demonstrating mastery of a subject's content standards as defined and approved by the local school district or LEA. (3-29-10)

c. Secondary Language Arts and Communication. Nine (9) credits are required. Eight (8) credits of instruction in Language Arts. Each year of Language Arts shall consist of language study, composition, and literature and be aligned to the Idaho Content Standards for the appropriate grade level. One (1) credit of instruction in communications consisting of oral communication and technological applications that includes a course in speech, a course in debate, or a sequence of instructional activities that meet the Idaho Speech Content Standards requirements. (3-29-10)

d. Mathematics. Four (4) credits are required. Secondary mathematics includes Applied Mathematics, Business Mathematics, Algebra, Geometry, Trigonometry, Fundamentals of Calculus, Probability and Statistics, Discrete Mathematics, and courses in mathematical problem solving and reasoning. For all public school students who enter high school at the 9th grade level in Fall 2009 or later, six (6) semester credits are required. For such students, secondary mathematics includes instruction in the following areas: (3-29-10)

i. Two (2) credits of Algebra I or courses that meet the Idaho Algebra I Content Standards as approved by the State Department of Education; (3-29-10)

ii. Two (2) credits of Geometry or courses that meet the Idaho Geometry Content Standards as approved by the State Department of Education; and (3-29-10)

iii. Two (2) credits of mathematics of the student's choice. (3-29-10)

iv. Two (2) credits of the required six (6) credits of mathematics must be taken in the last year of high school. (3-29-10)

e. Science. Four (4) credits are required, two (2) of which will be laboratory based. Secondary sciences include instruction in applied sciences, earth and space sciences, physical sciences, and life sciences. (3-29-10)

i. Effective for all public school students who enter high school at the 9th grade level in Fall 2009 or later, six (6) credits will be required. (3-29-10)

ii. Secondary sciences include instruction in the following areas: biology, physical science or chemistry, and earth, space, environment, or approved applied science. Four (4) credits of these courses must be laboratory based. (3-29-10)

f. Social Studies. Five (5) credits are required, including government (two (2) credits), United States history (two (2) credits), and economics (one (1) credit). Courses such as geography, sociology, psychology, and world history may be offered as electives, but are not to be counted as a social studies requirement. (3-29-10)

g. Humanities. Two (2) credits are required. Humanities courses include instruction in visual arts, music, theatre, dance, or world language aligned to the Idaho content standards for those subjects. Other courses

such as literature, history, philosophy, architecture, or comparative world religions may satisfy the humanities standards if the course is aligned to the Idaho Interdisciplinary Humanities Content Standards. (3-29-10)

h. Health/Wellness. One (1) credit is required. Course must be aligned to the Idaho Health Content Standards. (3-29-10)

i. Online Learning Requirement. (Effective for all students who enter the ninth grade in the fall of 2012 or later.) Two (2) credits are required, one (1) of which shall be from an asynchronous online course. The second credit may be an online course or blended course credit, either asynchronous or synchronous..

i. A student who has taken one (1) credit asynchronous online course and failed to earn the credit may appeal to the school district or LEA and will be given an opportunity to demonstrate proficiency of the technology content standards through some other locally established plan. School districts or LEAs shall adopt an alternate plan and provide notice of that plan to all students who have not earned the credits to meet the online learning requirement prior to the fall semester of the student's junior year. All locally established alternate plans used to demonstrate proficiency shall be forwarded to the State Board of Education for review and information. Alternate plans must be promptly re-submitted to the Board whenever changes are made in such plans. ( )

1) Before entering an alternate measure, the student must be: ( )

a) Enrolled in a special education program and have an Individual Education Plan (IEP); or ( )

b) Has been identified as eligible to receive services under Section 504 of the federal Rehabilitation Act of 1973; or

c) Enrolled in an Limited English Proficient (LEP) program for three (3) academic years or less; ( )

2) The alternate plan must: ( )

a) Contain multiple measures of student achievement; ( )

b) Be aligned at a minimum to Idaho technology content standards; and ( )

c) Be valid and reliable ( )

02. Content Standards. Each student shall meet locally established subject area standards (using state content standards as minimum requirements) demonstrated through various measures of accountability including examinations or other measures. (3-29-10)

03. College Entrance Examination. (Effective for all public school students who enter high school at the 9th grade level in Fall 2009 or later.) A student must take one (1) of the following college entrance examinations before the end of the student's eleventh grade year: COMPASS, ACT or SAT. Scores must be included in the Learning Plan. (5-8-09)

04. Senior Project. (Effective for all public school students who enter high school at the 9th grade level in Fall 2009 or later.) A student must complete a senior project by the end of grade twelve (12). The project must include a written report and an oral presentation. Additional requirements for a senior project are at the discretion of the local school district or LEA. (3-29-10)

05. Middle School. If a student completes any required high school course with a grade of C or higher before entering grade nine (9), and if that course meets the same standards that are required in high school, then the student has met the high school content area requirement for such course. However, the student must complete the required number of credits in all high school core subjects as identified in Subsections 105.01.b. through 105.01.g. in addition to the courses completed in middle school. (3-29-10)

06. Proficiency. Each student must achieve a proficient or advanced score on the Grade 10 Idaho Standards Achievement Test (ISAT) in math, reading and language usage in order to graduate. A student who does not attain at least a proficient score prior to graduation may appeal to the school district or LEA, and will be given an opportunity to demonstrate proficiency of the content standards through some other locally established plan. School districts or LEAs shall adopt an alternate plan and provide notice of that plan to all students who have not achieved a proficient or advanced score on the Grade 10 Idaho Standards Achievement Test by the fall semester of the student's junior year. All locally established alternate plans used to demonstrate proficiency shall be forwarded to the State Board of Education for review and information. Alternate plans must be promptly re-submitted to the Board whenever changes are made in such plans. (4-7-11)

a. Before entering an alternate measure, the student must be: (4-2-08)

i. Enrolled in a special education program and have an Individual Education Plan (IEP); or (3-20-04)

ii. Enrolled in an Limited English Proficient (LEP) program for three (3) academic years or less; or (3-20-04)

iii. Enrolled in the fall semester of the senior year. (3-20-04)

b. The alternate plan must: (4-7-11)

i. Contain multiple measures of student achievement; (4-7-11)

ii. Be aligned at a minimum to tenth grade state content standards; (4-7-11)

iii. Be aligned to the state content standards for the subject matter in question; (4-7-11)

iv. Be valid and reliable; and (4-7-11)

v. Ninety percent (90%) of the alternate plan criteria must be based on academic proficiency and performance. (4-7-11)

c. A student is not required to achieve a proficient or advanced score on the ISAT if: (5-8-09)

i. The student received a proficient or advanced score on an exit exam from another state that requires a standards-based exam for graduation. The state's exit exam must approved by the State Board of Education and must measure skills at the tenth grade level and be in comparable subject areas to the ISAT; (5-8-09)

ii. The student completes another measure established by a school district or LEA and received by the Board as outlined in Subsection 105.06; or (3-29-10)

iii. The student has an IEP that outlines alternate requirements for graduation or adaptations are recommended on the test; (5-8-09)

iv. The student is considered an LEP student through a score determined on a language proficiency test and has been in an LEP program for three (3) academic years or less; (5-8-09)

07. Special Education Students. A student who is eligible for special education services under the Individuals With Disabilities Education Improvement Act must, with the assistance of the student's Individualized Education Program (IEP) team, refer to the current Idaho Special Education Manual for guidance in addressing graduation requirements. (4-11-06)

08. Foreign Exchange Students. Foreign exchange students may be eligible for graduation by completing a comparable program as approved by the school district or LEA. (4-11-06)

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SUBJECT

Pending Rule – Docket No. 08-0201-1101

REFERENCE

August 11, 2011 Board approved proposed rule changes to IDAPA 08.02.01.151 Rules Governing Administration – Negotiations

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-1272, Idaho Code
Section 33-1273A, Idaho Code
Sections 67-2343 through 67-2347, Idaho Code
Idaho Administrative Code, IDAPA 08.02.01.151, Negotiations

BACKGROUND/DISCUSSION

The clarifying changes made between the proposed rule stage and the pending rule stage are in response to comments received from the Idaho School Boards Association and public comments received during the open comment period.

This rule change deals with two aspects of collective bargaining and negotiations. First, the Students Come First law now requires district negotiations with personnel to be conducted in open session and available for the public to attend. This rule would clarify that open negotiations should adhere to Idaho's Open Meeting Law.

Second, the Students Come First law now limits collective bargaining to compensation and benefits. The State Department of Education received feedback from districts, after districts completed collective bargaining this year, that the definition of compensation and benefits needed to be further clarified. This rule change defines salary as "any monies paid to an employee pursuant to an employment contract, the form of which is approved by the Superintendent of Public Instruction pursuant to Section 33-513, Idaho Code, and the process by which the school district board of trustees will determine local student achievement share awards." The rule change also specifies that the inclusion of any other items in a negotiated agreement is prohibited.

ATTACHMENTS

Attachment 1 – Pending Rule – Docket No. 08-0201-1101 Page 3

BOARD ACTION

I move to approve Pending Rule – Docket No. 08-0201-1101, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

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151. NEGOTIATIONS

01. Open Meeting. For the purposes of Section 33-1273A, Idaho Code, all open meeting negotiations shall adhere to Sections 67-2343 through 67-2344 and 67-2346 through 67-2347, Idaho Code, including posting notices and agendas ~~and such~~. In addition, notices and agendas shall be posted on the main page of the school district's website. ( )

02. Collective Bargaining Limited to Compensation and Benefits. Items that may be included in master contracts or negotiated agreements shall be limited to the specific items defined under the terms "Compensation" and "Benefits" under Section 33-1272, Idaho Code. For the purposes of the definition of "Compensation" as stated in Section 33-1272, Idaho Code, the term "salary" means: (___)

a. Any monies provided through public funding that are paid to an employee pursuant to an employment contract, the form of which is approved by the Superintendent of Public Instruction pursuant to Section 33-513, Idaho Code; and ( )

b. The process by which the school district board of trustees will determine local student achievement share awards pursuant to Section 33-1004I, Idaho Code. ( )

c. The inclusion of any other items in a master contract or negotiated agreement is hereby prohibited. Any items included in violation of this provision are hereby declared null, void and of no force or effect. ( )

151~~1~~2. -- 199. (RESERVED)

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SUBJECT

Pending Rule – Docket No. 08-0202-1101

REFERENCE

June 23, 2011	M/S (Luna/Atchley): To approve the proposed rule change to IDAPA 08.02.02.004, Rules Governing Uniformity as submitted. Motion carried unanimously.
November 7, 2008	M/S (Luna/Agidius): To approve the changes to the Standards for Idaho School Buses and Operations to be incorporated by reference into rule. Motion carried unanimously.

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-105, Idaho Code
Idaho Administrative code, IDAPA 08.02.02 – Section 004, Incorporation by Reference

BACKGROUND/DISCUSSION

There were no public comments received during the open comment period.

In May of 2010 the National Congress on School Transportation (National Standards) enacted changes affecting Idaho's school transportation program. In accordance to § 33-1511(2), Idaho Code, *Standards for Idaho School Buses and Operations* (SISBO) must be modified to reflect changes in National Standards.

Significant discussion related to school transportation in Idaho continues following operations and funding changes enacted during the 2010 legislative session.

Recent changes enacted at the 2010 National Standards call for response by the State Department of Education Division of School Transportation. Consequently, the Department engaged in rulemaking related to school transportation in Idaho.

ATTACHMENTS

BOARD ACTION

I move to approve Pending Rule – Docket No. 08-0202-1101, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

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IDAPA 08
TITLE 02
CHAPTER 02

08.02.02 - RULES GOVERNING UNIFORMITY

004. INCORPORATION BY REFERENCE.

The State Board of Education adopts and incorporates by reference into its rules:(5-8-09)

01. Idaho Standards for the Initial Certification of Professional School Personnel as approved on November 17, 2010. Copies of this document can be found at www.boardofed.idaho.gov.

02. Standards for Idaho School Buses and Operations as approved on June 23, 2011. The Standards for Idaho School Buses and Operations are available at the Idaho State Department of Education, 650 W. State St., Boise, Idaho, 83702 and can also be accessed electronically at http://www.sde.idaho.gov/site/transportation/library.htm. ( )

03. Operating Procedures for Idaho Public Driver Education Programs as approved on November 17, 2010. The Operating Procedures for Idaho Public Driver Education Programs are available at the Idaho State Department of Education, 650 W. State St., Boise, Idaho, 83702 and can also be accessed at http://www.sde.idaho.gov/site/driver_edu/forms_curriculum.htm.

(4-7-11)

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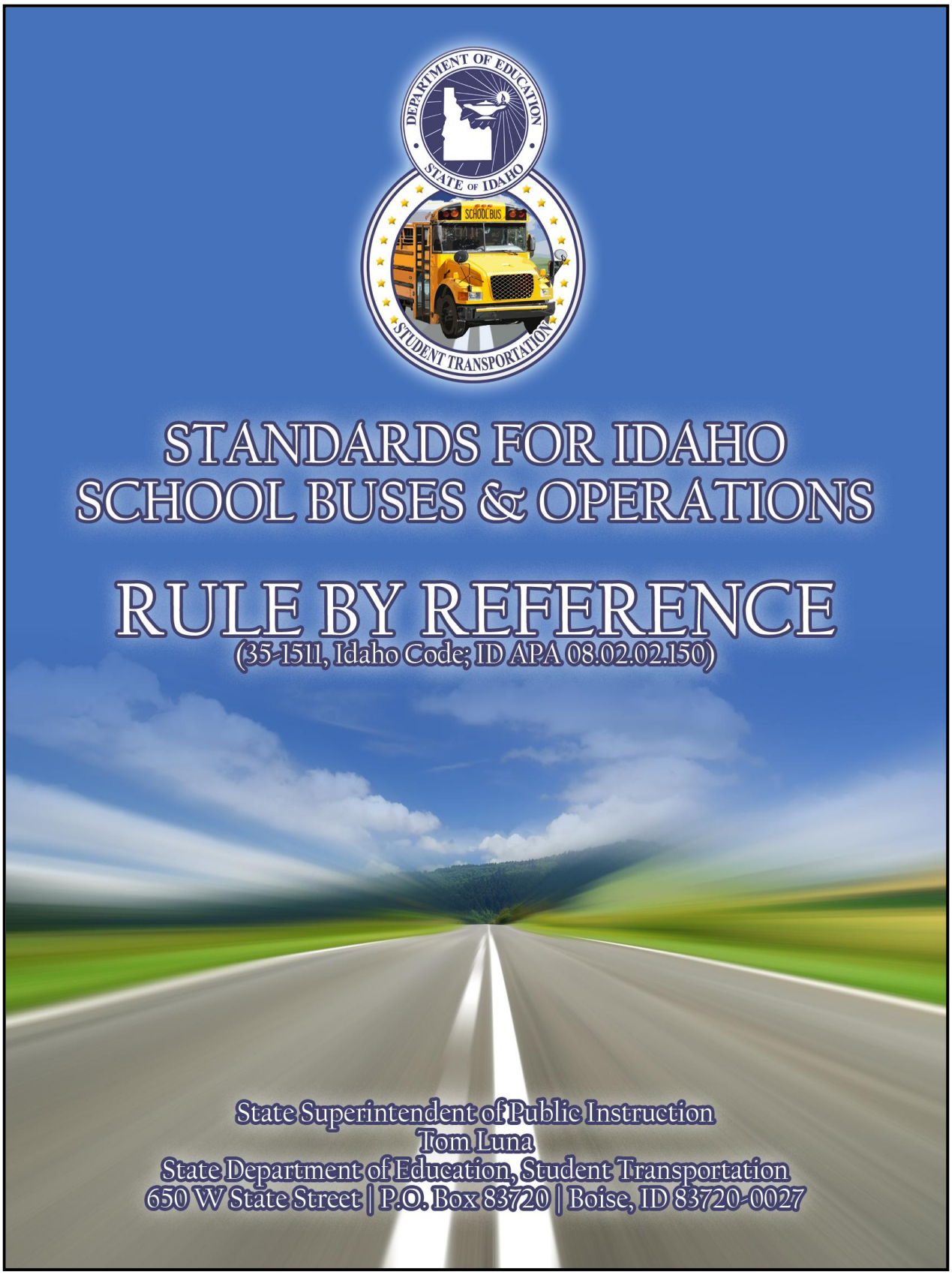
DEPARTMENT OF EDUCATION
STATE OF IDAHO
SCHOOL BUS
STUDENT TRANSPORTATION
STANDARDS FOR IDAHO
SCHOOL BUSES & OPERATIONS
RULE BY REFERENCE
(35-1511, Idaho Code; ID APA 08.02.02.150)
State Superintendent of Public Instruction
Tom Luna
State Department of Education, Student Transportation
650 W State Street | P.O. Box 83720 | Boise, ID 83720-0027

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STANDARDS FOR IDAHO SCHOOL BUSES AND OPERATIONS
(Rule by Reference – IDAPA 08.02.02.150-219)

STANDARDS FOR IDAHO SCHOOL BUSES AND OPERATIONS
(Rule by Reference – IDAPA 08.02.02.150-219)

INTRODUCTION TO SCHOOL BUS CONSTRUCTION STANDARDS

A. This edition of *Standards for Idaho School Buses and Operations –November,* is based on the latest report from the Fourteenth National Congress on School Transportation, Warrensburg, Missouri, May 2005 (*National School Transportation Specifications & Procedures*). (33-1511, Idaho Code)

B. This portion of *Standards for Idaho School Buses and Operations –November,* is divided into five sections: Chassis Standards, Body Standards, Standards for Specially Equipped School Buses, Standards for Alternative Fuel for School Buses and Removal from Service Criteria. There are two basic reasons for this format: (1) to define minimum chassis and body standards and (2) to assign responsibility for providing specific equipment. Items delineated in the chassis standards are to be provided by the chassis manufacturer. Items delineated in the body standards are to be provided by the body manufacturer. Most of the items delineated in the Specially Equipped School Bus Section are to be provided by the body manufacturer and most of the requirements for Standards for Alternative Fuel for School Buses are the responsibility of the chassis manufacturer. Therefore, whenever a school district purchases these types of vehicles, special attention must be given to both the chassis specifications and the body specification as they relate to the specific manufacturers.

C. For new vehicles, it is the responsibility of the vehicle manufacturers to certify compliance with applicable federal standards by installing a certification plate in the driver's area on each vehicle. However, as the vehicle is maintained over its useful life, it is the responsibility of those who supervise and perform work on the vehicle to assure on-going compliance with all applicable standards. When routine maintenance checks reveal any unsafe condition as defined in these standards, the school district will remove the vehicle from service and will eliminate the deficiency before returning the vehicle to service. For this reason, maintenance personnel training, quality components, quality workmanship and thorough maintenance records are essential.

STATUTORY AUTHORITY

A. The State Board of Education shall adopt, publish and distribute and from time to time as need therefore arises amend, minimum standards for the construction of school buses, the basis of which standards shall be those incorporated in the latest report of the National Conference on School Transportation, which report shall be filed with the Idaho State Police. (33-1511, Idaho Code)

B. All school buses shall at all times conform to the standards of construction prescribed therefore by the state board of education. Before any newly acquired school bus is used for transporting pupils it shall be inspected by a duly authorized representative of the state department of education, and if, upon inspection, it conforms to prescribed standards of construction, or such other standards prescribed by law or regulation, it may be used for transporting pupils; otherwise, no such school bus shall be used for that purpose. The board of trustees of each school district shall provide for an annual inspection of all school buses by district personnel or upon contract at intervals of not more than twelve (12) months. The district, over the signature of the superintendent, shall file with the state department of education its report of inspection of the school buses operated by the authority of the school district. At intervals of not more than sixty (60) days during each school year the board of trustees shall cause inspection to be made of all school buses operating under the authority of the board. In addition, the state department of education shall conduct random, spot inspections of school buses throughout the school year. Whenever any school bus is found, upon inspection, to be deficient in any of the prescribed standards, or is found in any way to be unsafe or unfit for the transportation of pupils, such vehicle shall be withdrawn from service and shall not be returned to service until the district certifies the necessary repairs have been made. (33-1506, Idaho Code)

C. Administrative Rules of the State Board of Education: IDAPA 08.02.02.150 and IDAPA 08.02.02.160.

RESPONSIBILITIES OF SUPPLIERS

A. Delivery Requirements: The school bus manufacturer shall provide the following materials to the purchaser of a new school bus at the time the unit is delivered to the purchasing school district or contractor. Also, the new school bus dealer, school district or contractor shall temporarily provide the following materials to the state school bus inspector at the time the unit undergoes its new school bus state inspection.

1. Line set tickets for each bus built as a complete unit, and a separate set of line set tickets for buses manufactured in two pieces.

2. A copy of a completed pre-delivery inspection (PDI) form for each individual unit.

3. Warranty book and statement of warranty for each individual unit. All warranties shall commence on the day that the purchaser accepts possession of the completed bus.

4. Service manual (or related resource) for each individual unit or group of identical units.

5. Parts manual (or related resource) for each individual unit or group of identical units.

6. A copy of district bid specifications with the dealerships comments.

DEFINITIONS

A. **National School Transportation Specifications & Procedures – School Bus Types**

1. ***Type A***

A Type "A" school bus is a van conversion or bus constructed utilizing a cutaway front-section vehicle with a left side driver's door. The entrance door is behind the front wheels. This definition includes two classifications: Type A1, with a Gross Vehicle Weight Rating (GVWR) less than or equal to 14,500 pounds; and Type A2, with a GVWR greater than 14,500 pounds and less than or equal to 21,500 pounds.

2. ***Type B***

A Type "B" school bus is constructed utilizing a stripped chassis. The entrance door is behind the front wheels. This definition includes two classifications; Type B1, with a GVWR less than or equal to 10,000 pounds; and Type B2, with a GVWR greater than 10,000 pounds.

3. ***Type C***

A Type "C" school bus is constructed utilizing a chassis with a hood and front fender assembly. The entrance door is behind the front wheels also known as a conventional style school bus. This type also includes the cut away truck chassis or truck chassis with cab with or without a left side door and with a GVWR greater than 21,500 pounds.

4. ***Type D***

A Type "D" school bus is constructed utilizing a stripped chassis. The entrance door is ahead of the front wheels also known as a rear engine or front engine transit style school bus.

B. **Code of Federal Regulations 49CFR390.5 - Definitions**

1. **Bus** means any motor vehicle designed, constructed, and or used for the transportation of passengers, including taxicabs.

2. **School bus** means a passenger motor vehicle~~,~~ which is designed or used to carry more than 10 passengers in addition to the driver, and which the Secretary determines is likely to be significantly used for the

purpose of transporting preprimary, primary, or secondary school students to such schools from home or from such schools to home.

3. **School bus operation** means the use of a school bus to transport only school children and/or personnel from home to school and from school to home.

C. **Idaho Code 33-1504 - School Buses**

A motor vehicle shall be deemed a "school bus" when it has a seating capacity of more than ten (10) persons and meets the current national and state minimum standards for school bus construction, and is owned and operated by a school district or a common carrier and is used exclusively for transporting pupils, or is owned by a transportation contractor and is used regularly for transporting pupils.

D. **Idaho Code 49-120 (5) – School Buses**

"School bus" means every motor vehicle that complies with the color and identification requirements set forth in the most recent edition of "Minimum Standards for School Buses" and is used to transport children to or from school or in connection with school approved activities and includes buses operated by contract carriers.

E. **Technology and Equipment, New**

1. It is the intent of these standards to accommodate new technologies and equipment that will better facilitate the transportation of all students. When a new technology, piece of equipment or component is desired to be applied to the school bus and it meets the following criteria, it may be acceptable.

2. The technology, equipment or component shall not compromise the effectiveness or integrity of any major safety system, unless it completely replaces the system. (Examples of safety systems include, but are not limited to, compartmentalization, the eight-light warning system, emergency exits, and the yellow color scheme.)

3. The technology, equipment or component shall not diminish the safe environment of the interior of the bus.

4. The technology, equipment or component shall not create additional risk to students who are boarding or exiting the bus or are in or near the school bus loading zone.

5. The technology, equipment or component shall not create undue additional activity and/or responsibility for the driver.

6. The technology, equipment or component shall generally increase efficiency and/or safety of the bus, or generally provide for a safer or more pleasant experience for the occupants and pedestrians in the vicinity of the bus or generally assist the driver or make his/her many tasks easier to perform.

WAIVERS

A. The State Board of Education may grant a waiver of any construction standard not required by state or federal law to any school district, school bus manufacturer, or school bus dealer upon written request. Written requests shall be submitted to the State Department of Education Student Transportation Section which shall make an appropriate recommendation to the State Board of Education subsequent to review by the Student Transportation Steering Committee. The Board will not grant waivers of any construction standard required by state or federal law. State and federal law includes case law (including consent decrees), statutes, constitutions, and federal regulations. (33-1506, Idaho Code; IDAPA 08.02.01.001)

BUS CHASSIS STANDARDS

A. Air Cleaner

1. A dry element type air cleaner shall be provided.

2. All diesel engine air filters shall include a latch-type restriction indicator that retains the maximum restriction developed during operation of the engine. The indicator should include a reset control so the indicator can be returned to zero when desired. Type A buses are not exempt from this requirement.

B. Air Conditioning (Non-Reimbursable Option – see exception)

1. Chassis installed air conditioning must meet the same requirements as those cited in the bus body standards under "Heating and Air Conditioning."

2. Reimbursement Exception: Air conditioning shall be reimbursable under the pupil transportation support program when the school district can demonstrate a need subsequent to an IDEA mandated related service.

C. Axles

The front and rear axle and suspension systems shall have gross axle weight rating ~~(GVWR)~~ (GAWR) at ground commensurate with the respective front and rear weight loads of the bus loaded to the rated passenger capacity.

D. Brakes (General)

1. The chassis brake system shall conform to the provisions of FMVSS No. 105, No. 106 and No. 121 as applicable.

2. The anti-lock brake system (ABS), provided in accordance with FMVSS No. 105 or No. 121, shall provide wheel speed sensors for each front wheel and for each wheel on at least one rear axle. The system shall provide anti-lock braking performance for each wheel equipped with sensors. (Four Channel System).

3. All brake systems should be designed to permit visual inspection of brake lining wear without removal of any chassis component(s).

4. The brake lines, booster-assist lines, and control cables shall be protected from excessive heat, vibration and corrosion and installed in a manner which prevents chafing.

5. The parking brake system for either air or hydraulic service brake systems may be of a power assisted design. The power parking brake actuator should be a device located on the instrument panel within seated reach of a 5th percentile female driver. As an option, the parking brake may be set by placing the automatic transmission shift control mechanism in the "park" position.

6. The power-operated parking brake system may be electronically interlocked to the engine key switch. Once the parking brake has been set and the ignition switch turned to the "off" position, the parking brake cannot be released until the key switch is turned back to the "on" position.

E. **Brakes (Hydraulic)**

Buses using a hydraulic assist brake shall be equipped with audible and visible warning signals that provide a continuous warning to the driver of loss of fluid flow from the primary source and of a failure of the back-up pump system. Type A and B buses may be OEM standard.

F. **Brakes (Air)**

1. The air pressure supply system shall include a desiccant-type air dryer installed according to the manufacturers' recommendations. The air pressure storage tank system may incorporate an automatic drain valve.

2. The Chassis manufacturer should provide an accessory outlet for air-operated systems installed by the body manufacturer. This outlet shall include a pressure protection valve to prevent loss of air pressure in the service brake reservoir.

3. For air brake systems, an air pressure gauge shall be provided in the instrument panel capable of complying with CDL pre-trip inspection requirements.

4. ~~All~~ Air brake-equipped buses may be equipped with a service brake interlock. If so equipped, the parking brake shall not release until the brake pedal is depressed.

5. Air brake systems shall include a system for anti-compounding of the service brakes and parking brakes.

6. Air brakes shall have both a visible and audible warning device whenever the air pressure falls below the level where warnings are required under FMVSS No. 121.

G. Bumper (Front)

1. All school buses shall be equipped with a front bumper. The front bumper shall be furnished by the chassis manufacturer as part of the chassis on all school bus types unless there is a specific arrangement between the chassis manufacturer and body manufacturer.

2. The front bumper shall be of pressed steel channel or equivalent material (except Type A-1 buses having a GVWR of 14,500 pounds or less which may be OEM supplied) at least 3/16" thick and not less than 8" wide (high). It shall extend beyond forward-most part of the body, grille, hood, and fenders and shall extend to outer edges of the fenders at the bumper's top line.

3. Type A buses having a GVWR of 14,500 pounds or less may be equipped with an OEM-supplied front bumper. The front bumper shall be of sufficient strength to permit being pushed by another vehicle on a smooth surface with a 5 degree, (8.7 percent) grade, without permanent distortion. The contact point on the front bumper is intended to be between the frame rails, with as wide a contact area as possible if the front bumper is used for lifting, the contact points shall be under the bumper attachments to the frame rail brackets unless the manufacturer specifies different lifting points in the owner's manual. Contact and lifting pressures should be applied simultaneously at both lifting points.

4. Front bumper, except breakaway bumper ends, shall be of sufficient strength to permit pushing a vehicle of equal gross vehicle weight without permanent distortion to the bumper, chassis, or body.

5. A towing device (hooks, eyes, bar) shall be furnished on all school bus types and attached so as not to project beyond the front bumper. Towing devices attached to the frame chassis shall be furnished by the chassis manufacturer. This installation shall be in accordance with the chassis manufacturer's specifications. Tow hooks or eyes shall have an individual strength rating of 13,500 pounds each, for a combined rating of 27,000 pounds. For pulling and lifting purposes, tow hooks are meant to be used simultaneously. For pulling, angularity applied to the tow hooks will decrease the capacities of the tow hooks.

6. **NOTE:** Type A buses are exempt from this requirement for front tow hooks or eyes due to built-in crush zones. Rear tow devices are addressed in the Bus Body Specifications under Towing Attachments Points.

7. The bumper shall be designed or reinforced so that it will not deform when the bus is lifted by a chain that is passed under the bumper (or through the bumper if holes are provided for this purpose) and attached to the towing (type A may be OEM) device(s). For the purpose of meeting this specification, the bus shall be empty and positioned on a level, hard surface and the towing device(s) shall share the load equally.

H. Certification

1. The chassis manufacturer, upon request of the Idaho State Department of Education Student Transportation Section, shall certify that its product meets all Idaho minimum construction standards on items not covered by the FMVSS certification requirements of 49 CFR, Part 567.

2. The body manufacturer upon request of the Idaho State Department of Education Student Transportation Section shall certify that its product meets all Idaho minimum construction standards (Standards for Idaho School Buses and Operations) for items not covered by the FMVSS certification requirements of 49 CFR, Part 567.

I. Clutch

1. Clutch torque capacity shall be equal to or greater than the engine torque output.

2. A starter interlock shall be installed to prevent actuation of the starter if the clutch pedal is not depressed.

J. Color

1. The chassis, including axle hubs and front bumper, shall be black. Body cowl, hood, and fenders shall be in national school bus yellow (NSBY). The flat top surface of the hood may be non-reflective black or non-reflective NSBY, according to School Bus Manufacturers Technical Council publication - 008.

2. Rims may be gray or black as received from the manufacturer.

3. Multi-Function School Activity Buses (MFSABs) shall be exempt from these requirements.

K. **Drive Shaft**

The drive shaft shall be protected by a metal guard or guards around the circumference of the drive shaft to reduce the possibility of its whipping through the floor or dropping to the ground, if broken.

L. **Electrical System**

1. *Battery:*

a. The storage battery shall have minimum cold cranking capacity rating (cold cranking amps) equal to the cranking current required for 30 seconds at 0 degrees Fahrenheit and a minimum reserve capacity rating of 120 minutes at 25 amps. Higher capacities may be required, depending upon optional equipment and local environmental conditions.

b. Since all batteries are to be secured in a sliding tray in the body (type A and B buses may be OEM), chassis manufacturers shall temporarily mount the battery on the chassis frame, except that van conversion or cutaway front-section chassis may be secured in accordance with the manufacturer's standard configuration. In these cases, the final location of the battery and the appropriate cable lengths shall be agreed upon mutually by the chassis and body manufacturer. However, in all cases the battery cable provided with the chassis shall have sufficient length to allow some slack, and be of sufficient gauge to carry the required amperage.

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2. *Alternator:*

a. All Type A-2 buses and Type B buses with a GVWR of 15,000 lbs or less shall have, at a minimum, a 130 ampere alternator.

b. Types A-2 and Type B buses over 15,000 lbs. GVWR and all type C and D buses shall be equipped with a heavy-duty truck or bus-type alternator ~~meeting SAE J 180~~, having a minimum output rating of ~~130~~ 160 amperes or higher, and should produce a minimum current output of 50 percent of the rating at engine idle speed.

c. Buses equipped with an electrically powered wheelchair lift, air conditioning or other accessories may be equipped with a device that monitors the electrical system voltage and advances the engine idle speed when the voltage drops to, or below, a pre-set level.

d. A belt alternator drive shall be capable of handling the rated capacity of the alternator with no detrimental effect on any other driven components. (See SBMTC; "School Bus Technical Reference," for estimating required alternator capacity, available at http://www.Nasdpts.org)

e. A direct drive alternator is permissible in lieu of a belt driven alternator.

3. *Wiring:*

a. All wiring shall conform to current applicable recommended practices of the Society of Automotive Engineers (SAE).

b. All wiring shall use color and at least one other method of identification. The other method shall be either a number code or name code, and each chassis shall be delivered with a wiring diagram that illustrates the wiring of the chassis.

c. The chassis manufacturer shall install a readily accessible terminal strip or plug on the body side of the cowl or in an accessible location in the engine compartment of vehicles designed without a cowl. The strip or plug shall contain the following terminals for the body connections:

(1) Main 100 amp body circuit

(2) Tail lamps

(3) Right turn signal

(4) Left turn signal

(5) Stop lamps

(6) Back up lamps

(7) Instrument panel lights (rheostat controlled)

d. Multiplex wiring is recommended and may exempt manufacturers from some of the above wiring standards.

4. *Circuits:*

a. An appropriate identifying diagram (color plus a name or number code) for all chassis electrical circuits shall be provided to the body manufacturer for distribution to the end user.

b. The headlight system must be wired separately from the body-controlled solenoid.

c. Multiplex wiring is recommended and may exempt manufacturers from some of the above circuitry standards.

5. *Daytime Running Lamps (DRL):*

A daytime running lamps system meeting chassis manufacturer's specifications shall be provided.

M. **Engine Fire Extinguisher (Non-Reimbursable Option – see exception)**

The chassis manufacturer may provide an automatic fire extinguisher system in the engine compartment, which may be reimbursable with prior approval.

N. **Exhaust System**

1. The exhaust pipe, muffler, ~~and~~ tailpipe, and after treatment system shall be outside the bus body compartment and attached to the chassis so as not to damage any other chassis component.

2. The tailpipe shall be constructed of a corrosion-resistant tubing material at least equal in strength and durability to 16-gauge steel tubing of equal diameter.

3. Chassis manufacturers shall furnish an exhaust system with tailpipe of sufficient length to exit the rear of the bus or at the left side of the bus body no more than 18 inches forward of the front edge of the rear wheel house opening. If designed to exit at the rear of the bus, the tailpipe shall extend at least five inches beyond the end of the chassis frame. If designed to exit to the side of the bus, the tailpipe shall extend at least 48.5 inches (51.5 inches if the body is to be 102 inches wide) outboard from the chassis centerline. The tailpipe may be flush with or shall not extend more than two inches beyond the perimeter of the body for side exit, or the rear bumper for rear exit pipe. The exhaust system shall be designed such that exhaust gas will not be trapped under the body of the bus.

4. On Types C and D vehicles, the tailpipe shall not exit beneath a fuel fill or emergency door exit.

5. Type A and B chassis may be furnished with the manufacturer's standard tailpipe configuration.

   a. **NOTE:** See Bus Body Standards under Tailpipe.

6. The exhaust system on a chassis shall be adequately insulated from the fuel system.

7. The muffler shall be constructed of corrosion-resistant material.

8. The exhaust system on the chassis may be routed to the left of the right frame rail to allow for the installation of a power lift unit on the right side of the vehicle.

9. Exceptions to Idaho exhaust system standards may be necessary in order to comply with changing federal emission standards on school buses. School bus manufacturers may submit a written request for an exception to an Idaho exhaust system standard to the State Department of Education Student Transportation Section. Any exhaust system exception to standard request must be linked to federal emission standards rationale. The request will then be reviewed by the Student Transportation Steering Committee.

10. The design of the after treatment systems shall not allow active (non-manual) regeneration of the particulate filter during the loading and unloading of passengers. Manual regeneration systems will be designed such that unintentional operation will not occur.

11. For after treatment systems that require Diesel Exhaust Fluid (DEF) to meet federally mandated emissions:

    a. The composition of Diesel Exhaust Fluid (DEF) must comply with International Standard ISO 22241-1. Refer to engine manufacturer for any additional DEF requirements.

    b. The DEF supply tank should be designed to meet a minimum ratio of 3 diesel fills to 1 DEF fill.

O. **Fenders: Front-Type C Vehicles**

1. Total spread of outer edges of front fenders, measured at fender line, shall exceed total spread of front tires when front wheels are in straight-ahead position.

2. Front fenders shall be properly braced and shall not require attachment to any part of the body.

P. **Frame**

1. Any secondary manufacturer that modifies the original chassis frame shall provide a warranty at least equal to the warranty offered by the original equipment manufacturer (OEM), and shall certify that the modification and other parts or equipment affected by the modification shall be free from defects in material and workmanship under normal use and service intended by the OEM.

2. Frames shall not be modified for the purpose of extending the wheelbase.

3. Holes in top or bottom flanges or side units of the frame, and welding to the frame, shall not be permitted except as provided or accepted by chassis manufacturer.

4. Frame lengths shall be established in accordance with the design criteria for the complete vehicle.

Q. **Fuel System**

1. Fuel tank (or tanks) having a minimum 30-gallon capacity shall be provided by the chassis manufacturer. The tank shall be filled and vented to the outside of the body and the fuel filler should be placed in a location where accidental fuel spillage will not drip or drain on any part of the exhaust system.

2. Fuel lines shall be mounted to the chassis frame in such a manner that the frame provides the maximum possible protections from damage.

3. The fuel system shall comply with FMVSS No. 301.

4. Fuel tank(s) may be mounted between the chassis frame rails or outboard of the frame rails on either the left or right side of the vehicle.

5. The actual draw capacity of each fuel tank shall be, at a minimum, 83 percent of the tank capacity.

6. Installation of alternative fuel systems, including fuel tanks and piping from tank to engine, shall comply with all applicable fire codes in effect on the date of manufacture of the bus.

7. Installation of LPG tanks shall comply with National Fire Protection Association (NFPA) 58.

8. Installation of Compressed Natural Gas (CNG) containers shall comply with FMVSS No. 304*, Compressed Natural Gas Fuel Container Integrity.*

9. The GNG Fuel System shall comply with FMVSS No. 303*, Fuel System Integrity of Compressed Natural Gas Vehicles.*

R. **Governor**

An electronic engine speed limiter shall be provided and set to limit engine speed, not to exceed the maximum revolutions per minute, as recommended by the engine manufacturer.

S. **Heating System, Provision for**

The chassis engine shall have plugged openings for the purpose of supplying hot water for the bus heating system. ~~The openings shall be suitable for attaching 3/4 inch pipe thread/hose connectors.~~ The engine shall be capable of supplying coolant at a temperature of at least 170 degrees Fahrenheit at the engine cooling thermostat opening temperature. The coolant flow rate shall be 50 pounds per minute at the return end of 30 feet of one-inch inside diameter automotive hot water heater hose, according to School Bus Manufacturers Technical Council publication - 001.

T. **Horn**

The bus shall be equipped with two horns of standard make with each horn capable of producing a complex sound in bands of audio frequencies between 250 and 2,000 cycles per second and tested in accordance with SAE J-377.

U. **Instruments and Instrument Panel**

1. The chassis shall be equipped with the instruments and gauges listed below. (Telltale warning lamps in lieu of gauges are not acceptable, except as noted.)

   a. Speedometer

   b. Tachometer (**Note:** For types B, C, and D buses, a tachometer shall be installed so as to be visible to the driver while seated in a normal driving position.)

   c. Odometer which will give accrued mileage (to seven digits), including tenths of miles, unless tenths of miles are registered on a

trip odometer. Odometer shall be available to read without use of the vehicle's key.

d. Voltmeter

(1) (An ammeter with graduated charge and discharge indications is permitted in lieu of a voltmeter; however, when used, the ammeter wiring must be compatible with the current flow of the system.)

e. Oil pressure gauge

f. Water temperature gauge

g. Fuel gauge

h. Upper beam headlight indicator

i. Brake air pressure gauge (air brakes), brake indicator lamp (vacuum/hydraulic brakes), or brake indicator lamp (hydraulic/hydraulic).

(1) (A telltale warning lamp indicator in lieu of gauge is permitted on a vehicle equipped with a hydraulic-over-hydraulic brake system.

j. Turn signal indicator

k. Glow-plug indicator light where appropriate

2. All instruments shall be easily accessible for maintenance and repair.

3. The instruments and gauges shall be mounted on the instrument panel so that each is clearly visible to the driver while seated in a normal driving position.

4. The instrument panel shall have lamps of sufficient candlepower to illuminate all instruments, gauges and shift selector indicator for the automatic transmission or as required by FMVSS No. 101.

5. Multi-function gauge (MFG) (Optional):

a. The driver must be able to manually select any displayable function of the gauge on a MFG whenever desired.

b. Whenever an out-of-limits condition that would be displayed on one or more functions of a MFG occurs, the MFG controller should automatically display this condition on the instrument cluster. This should be in the form of an illuminated telltale warning lamp as well as having the MFG automatically displays the out-of-limits indications. Should two or more functions displayed on the MFG go out of limits simultaneously, then the MFG should sequence automatically between those functions continuously until the condition(s) are corrected.

c. The use of a MFG does not relieve the need for audible warning devices, where required.

V. Mud Flaps

Rear vehicle mad flaps shall be required on all school buses, except when not provided as an option by the school bus manufacturer.

W. Oil Filter

An oil filter with a replaceable element shall be provided and connected by flexible oil lines if it is not a built-in or an engine-mounted design. The oil filter shall have a capacity in accordance with the engine manufacturer's recommendation.

X. Openings

All openings in the floorboard or firewall between the chassis and passenger compartment (e.g., for gearshift selector and parking brakes lever) shall be sealed.

Y. Passenger Load

1. Actual gross vehicle weight (GVW) is the sum of the chassis weight, plus the body weight, plus the driver's weight, plus total seated student weight. For purposes of calculation, the driver's weight is 150 pounds and the student weight is 120 pounds per student.

2. Actual GVW shall not exceed the chassis manufacturer's GVWR for the chassis, nor shall the actual weight carried on any axle exceed the chassis manufacturer's Gross Axle Weight Rating (GAWR).

3. When requested, the manufacturer's GVWR for a particular school bus shall be furnished by manufacturers in duplicate (unless more copies are requested) to the purchasing school district or contractor.

Z. **Retarder System(Optional Equipment)**

A retarder system, if used, shall limit the speed of a fully loaded school bus to 19.0 mph on a 7 percent grade for 3.6 miles.

AA. **Road Speed Control**

When it is desired to accurately control vehicle maximum speed, a vehicle speed limiter may be utilized.

BB. **Shock Absorbers**

The bus shall be equipped with double-action shock absorbers compatible with manufacturer's rated axle capacity at each wheel location. Shock absorbers shall be of sufficient length to allow for adequate travel in all situations without damage to the shock absorber or mounts.

CC. **Steering Gear**

1. The steering gear shall be approved by the chassis manufacturer and designed to ensure safe and accurate performance when the vehicle is operated with maximum load and at maximum speed.

2. If external adjustments are required, steering mechanism shall be accessible to make adjustments.

3. No changes shall be made in the steering apparatus which are not approved by the chassis manufacturer.

4. There shall be a clearance of at least two inches between the steering wheel and cowl, instrument panel, windshield, or any other surface.

5. Power steering is required and shall be of the integral type with integral valves.

6. The steering system shall be designed to provide a means for lubrication of all wear-points, which are not permanently lubricated.

DD. **Suspension Systems**

1. The capacity of springs or suspension assemblies shall be commensurate with the chassis manufacturer's GVWR.

2. Rear leaf springs shall be of a progressive rate or multi-stage design. Front leaf springs shall have a stationary eye at one end and shall be protected by a wrapped leaf, in addition to the main leaf.

EE. **Throttle**

The force required to operate the throttle shall not exceed 16 pounds throughout the full range of accelerator pedal travel.

FF. **Tires and Rims**

1. Rims of the proper size and tires of the proper size and load rating commensurate with the chassis manufacturer's gross vehicle weight rating shall be provided. The use of multi-piece rims and/or tube-type tires shall not be permitted on any school bus ordered after December 31, 1995.

2. Dual rear tires shall be provided on Type A-2, Type B, Type C and Type D school buses.

3. All tires on a vehicle shall be of the same size, and the load range of the tires shall meet or exceed the GVWR, as required by FMVSS 120.

4. If the vehicle is equipped with a spare tire and rim assembly, it shall be the same size as those mounted on the vehicle.

5. If a tire carrier is required, it shall be suitably mounted in an accessible location outside the passenger compartment.

GG. **Transmission**

1. Automatic transmissions shall have no fewer than three forward speeds and one reverse speed. Mechanical shift selectors shall provide a detent between each gear position when the gear selector quadrant and shift selector are not steering-column mounted.

2. In manual transmissions, second gear and higher shall be synchronized, except when incompatible with engine power. A minimum of three forward speeds and one reverse speed shall be provided.

3. ~~A transmission interlock, controlled by application of the service brake, shall be installed to prohibit accidental engagement of the automatic transmission.~~ Automatic transmissions incorporating a parking pawl shall have a transmission shifter interlock controlled by the application of the service brake to prohibit accidental engagement of the transmission. All non-park pawl transmissions shall incorporate a

park brake interlock that requires the service brake to be applied to allow release of the parking brake.

HH. **Turning Radius**

1. A chassis with a wheelbase of 264 inches or less shall have a right and left turning radius of not more than 42½ feet, curb-to-curb measurement.

2. A chassis with a wheelbase of 265 inches or more shall have a right and left turning radius of not more than 44½ feet, curb-to-curb measurement.

II. **Undercoating**

1. The chassis manufacturer, or its agent, shall coat the undersides of steel or metallic-constructed front fenders with a rust-proofing compound, for which the compound manufacturer has issued notarized certification of compliance to chassis builder that the compound meets or exceeds all performance and qualitative requirements of paragraph 3.4 of Federal Specification TT-C-520B, using modified tests.

   a. SAE J1959. The undercoating material shall be applied with suitable airless or conventional spray equipment to the undercoating material manufacturer recommended film thickness and shall show no evidence of voids in the cured film.

   b. The undercoating material shall not cover any exhaust components of the chassis.

BUS BODY STANDARDS

A. Air Conditioning (Non-Reimbursable Option – see exception)

1. Body manufacture, or after-market, installed air conditioning must meet the same requirements as those cited under “Heating and Air Conditioning.”

2. Reimbursement Exception: Air conditioning shall be reimbursable under the Pupil Transportation Support Program when the school district can demonstrate a need subsequent to an IDEA mandated related service.

B. Aisle

1. All emergency exit doors shall be accessible by a 12-inch minimum aisle. The aisle shall be unobstructed at all times by any type of barrier, seat, wheelchair or tiedown. Flip seats are not allowed.

2. ~~The seat backs shall be slanted sufficiently to give aisle clearance of 15 inches at tops of seat backs.~~

3. ~~Side emergency doors in excess of FMVSS and Standards for Idaho School Buses and Operations requirements may be secured and made inoperable; however, in doing so, all emergency door labeling, reflective markings, operation instructions, operating handles and all audible and visible warning devices shall be removed and no emergency egress aisle at that location shall exist.~~

C. Back-Up Warning Alarm

1. An automatic audible alarm shall be installed behind the rear axle and shall comply with the published Backup Alarm Standards (SAE J994B), providing a minimum of 112 dBA, or shall have a variable volume feature that allows the alarm to vary from 87 dBA to 112 dBA sound level, staying at least 5 dBA above the ambient noise level.

D. Battery

1. The battery is to be furnished by the chassis manufacturer.

2. When the battery is mounted as described in the "Bus Chassis Specifications", the body manufacturer shall securely attach the battery on a slide-out or swing-out tray in a closed, vented compartment in the body skirt, so that the battery is accessible for convenient servicing from the outside. The battery compartment

door or cover shall be hinged at the front or top, and be secured by an adequate and conveniently operated latch or other type fastener. Battery cables installed by the body manufacturer shall meet chassis manufacturer and SAE requirements. Battery cables shall be of sufficient length to allow the battery tray to fully extend. The battery compartment is required on Type A-1 diesel buses.

3. Buses may be equipped with a battery shut-off switch. If so equipped, the switch is to be placed in a location not readily accessible to the passengers.

E. **Bumper: Front**

On a Type D school bus, if the chassis manufacturer does not provide a bumper, it shall be provided by the body manufacturer. The bumper will conform to the standards described in the "Bus Chassis Specifications."

F. **Bumper: Rear**

1. The bumper shall be pressed steel channel at least 3/16 inch thick or equivalent strength material (except for Type A buses). Type A-1 bus bumper shall be a minimum of 8 inches wide (high) and Type A-2, B, C and D bus bumper shall be a minimum of 9 1/2 inches wide (high). The bumper shall be of sufficient strength to permit being pushed by another vehicle of similar size or lifted without permanent distortion.

2. The bumper on Type A-1 buses shall be a minimum of 8 inches wide (high). Bumpers on Types A-2, B, C and D buses shall be a minimum of 9½ inches wide (high). The bumper shall be of sufficient strength to permit being pushed by another vehicle of similar size and being lifted by the bumper without permanent distortion.

3. The bumper shall ~~be~~ wrapped around back corners of the bus. It shall extend forward at least 12 inches, measured from the rear-most point of the body at the floor line, and shall be flush-mounted to body sides or protected with an end panel.

4. The bumper shall be attached to the chassis frame in such a manner that it may be ~~easily~~ removed. It shall be ~~so~~ braced to resist deformation of the bumper resulting from ~~as to withstand~~ impact from the rear or side. It shall be ~~so~~ designed ~~attached as~~ to discourage hitching of rides by an individual.

5. The bumper shall extend at least 1 inch beyond the rear-most part of the body surface measured at the floor line.

6. The bottom of the rear bumper shall not be more than 30 inches above ground level.

G. Ceiling

See Insulation and Interior, this section.

H. Certification

The body manufacturer upon request of the Idaho State Department of Education Student Transportation Section shall certify that its product meets all Idaho minimum construction standards (Standards for Idaho School Buses and Operations) for items not covered by the FMVSS certification requirements of 49 CFR, Part 567.

I. Chains (Tire)

See Wheelhousing, this section.

J. Color

1. The school bus body shall be painted National School Bus Yellow (NSBY), according to School Bus Manufacturers Technical Council publication - 008.

2. The entire rubrail and body exterior paint trim shall be black. Entrance door exterior (excluding glass) shall be NSBY or black. Passenger and driver window frames shall be painted NSBY, black to match body trim, or shall be unpainted aluminum. The area between the passenger and driver window frames shall be NSBY (National School Bus Yellow).

3. Optionally, the roof of the bus may be painted white (non-reimbursable) except that the front and rear roof caps shall remain NSBY, according to National School Transportation Specifications & Procedures Placement of Reflective Markings. If required by automated painting processes a maximum three (3) inch black transition strip is allowed between the white roof cap and the NSBY body paint above the windows.

K. Communications

All school buses used to transport students shall be equipped with two-way voice communication other than CB radios.

L. **Construction**

1. **Side Intrusion Test:** The bus body shall be constructed to withstand an intrusion force equal to the curb weight of the vehicle, or exceed 20,000 pounds, whichever is less. Each vehicle shall be capable of meeting this requirement when tested in accordance with the procedures set forth below.

2. The complete body structure, or a representative seven-body section mock up with seats installed, shall be load-tested at a location 24 inches plus or minus two inches above the floor line, with a maximum 10-inch diameter cylinder, 48 inches long, mounted in a horizontal plane.

3. The cylinder shall be placed as close as practical to the mid-point of the tested structure, spanning two internal vertical structural members. The cylinder shall be statically loaded to the required force of curb weight or 20,000 pounds, whichever is less, in a horizontal plane with the load applied from the exterior toward the interior of the test structure. Once the minimum load has been applied, the penetration of the loading cylinder into the passenger compartment shall not exceed a maximum of ten inches from its original point of contact. There can be no separation of lapped panels or construction joints. Punctures, tears or breaks in the external panels are acceptable but are not permitted on any adjacent interior panel.

4. Body companies shall certify compliance with this intrusion requirement, including test results, if requested.

5. Construction shall be reasonably dust-proof and watertight.

M. **Crossing Control Arm (Optional)**

1. Buses may be equipped with a crossing control arm mounted on the right side of the front bumper. This arm when opened shall extend in a line parallel with the body side and positioned on a line with the right side wheels.

2. All components of the crossing control arm and all connections shall be weatherproofed.

3. The crossing control arm shall incorporate system connectors (electrical, vacuum or air) at the gate and shall be easily removable to allow for towing of the bus.

4. The crossing control arm shall be constructed of noncorrosive or nonferrous material or treated in accordance with the body sheet metal specifications. (see METAL TREATMENT)

5. There shall be no sharp edges or projections that could cause injury or be a hazard ~~hazard or injury~~ to students. The end of the arm shall be rounded.

6. The crossing control arm shall extend a minimum of 70 inches (measured from the bumper at the arm assembly attachment point) when in the extended position.

7. The crossing control arm shall extend simultaneously with the stop arm(s) by means of the stop arm controls.

8. An automatic recycling interrupt switch should be installed for temporary disabling of the crossing control arm.

9. The assembly shall include a device attached to the bumper near the end of the arm to automatically retain the arm while in the stowed position. That device shall not interfere with normal operations of the crossing control arm.

N. Defrosters

1. Defrosting and defogging equipment shall direct a sufficient flow of heated air onto the windshield, the window to the left of the driver and the glass in the viewing area directly to the right of the driver to eliminate frost, fog and snow. **Exception:** The requirement of this standard does not apply to the exterior surfaces of double pane storm windows.

2. The defrosting system shall conform to SAE J381.

3. The defroster and defogging system shall be capable of furnishing heated, outside ambient air, except that the part of the system furnishing additional air to the windshield, entrance door and stepwell may be of the recirculating air type.

4. Auxiliary fans are not considered defrosting or defogging systems.

5. ~~Buses shall be equipped with a switch that will cut all power to radio and fans for noise suppression purposes and it shall be mounted within easy reach of the driver.~~

6. ~~Portable heaters shall not be used. Low profile heaters are not allowed within the clear floor area required to accommodate a wheelchair.~~

O. **Doors, ~~Service~~ Entrance**

1. The entrance ~~service~~ door shall be in the driver's control, designed to afford easy release and to provide a positive latching device on manual operating doors to prevent accidental opening. When a hand lever is used, no part shall come together that will shear or crush fingers. Manual door controls shall not require more than 25 pounds of force to operate at any point throughout the range of operation, as tested on a 10 percent grade both uphill and downhill.

2. The entrance ~~service~~ door shall be located on the right side of the bus, opposite and within direct view of driver.

3. The entrance ~~service~~ door shall have a minimum horizontal opening of 24 inches and a minimum vertical opening of 68 inches.

4. Entrance ~~Service~~ door shall be a split-type door and shall open outward.

5. ~~Lower, as well as upper, door panels~~ All entrance door glass shall be ~~of~~ approved safety glass. The bottom of each lower glass panel shall not be more than ten inches from the top surface of the bottom step. The top of each upper glass panel when viewed from the interior shall not be more than three inches below the interior door control cover or header pad. ~~shall not be more than three inches from the top of the door.~~

6. Vertical closing edges on entrance doors shall be equipped with flexible material to protect children's fingers.

7. There shall be no door to left of driver on Type B, C or D vehicles. All Type A vehicles may be equipped with the chassis manufacturer's standard left-side door.

8. All doors shall be equipped with padding at the top edge of each door opening. Padding shall be at least three inches wide and one inch thick and extend the full width of the door opening.

9. On power-operated entrance ~~service~~ doors, the emergency release valve, switch or device to release the entrance ~~service~~ door must be placed above or to the immediate left or right of the entrance ~~service~~ door and must be clearly labeled. The emergency valve, switch or device shall work in the absence of power.

P. **Emergency Exits and Emergency Exit Alarm Systems**

1. ~~All~~ Any installed emergency exits and all exit alarm systems shall comply with the requirements of FMVSS No. 217.

2. The upper portion of the emergency door shall be equipped with approved safety glazing, the exposed area of which shall be at least 400 square inches. The lower portion of the rear emergency doors on Types A-2, B, C, and D vehicles shall be equipped with a minimum of 350 square inches of approved safety glazing.

3. There shall be no steps leading to an emergency door.

4. The words "EMERGENCY DOOR" or EMERGENCY EXIT," in letters at least 2" high, shall be placed at the top of or directly above the emergency exit, or on the door in the metal panel above the top glass, both inside and outside the bus.

5. The emergency door(s) shall be equipped with padding at the top edge of each door opening. Padding shall be at least three inches wide and one inch thick, and shall extend the full width of the door opening.

6. There shall be no obstruction higher than ¼ inch across the bottom of any emergency door opening. Fasteners used within the emergency exit opening, shall be free of sharp edges or burrs.

7. ~~Operation instructions shall be located at or near the emergency door exit release handle, both inside and outside of the bus.~~ In accordance with Federal Regulations Title 49 CFR 571.217 each school bus shall have the designation "Emergency Door" or ''Emergency Exit,'' as appropriate, in letters at least two inches high, of a color that contrasts with its background. For emergency exit doors, the designation shall be located at the top of, or directly above, the emergency exit door on both the inside and outside surfaces of the bus. Concise operating instructions describing the motions necessary to unlatch and open the emergency exit shall be located within six inches of the release mechanism on the inside surface of the bus. These instructions shall be in letters at least half an inch high and of a color that contrasts with its background. *Examples: (1) Lift to Unlatch, Push to Open (2) Turn Handle, Push Out to Open.* Outside may consist of a black arrow pointing in direction of handle travel. No other lettering shall obstruct or interfere with the placement of operation instructions mounted on the interior or exterior of the emergency exit door.

8. The rear emergency window shall have an assisted lifting assistance device that will aid in lifting and holding the rear emergency window open.

9. Each emergency exit door of a school bus shall be equipped with a positive door opening device that, after the release mechanism has been operated, bears the weight of the door; Keeps the door from closing past the point at which the door is perpendicular to the side of the bus body, regardless of the body's orientation; and provides a means for release or override. The positive door opening device shall perform without the need for additional action beyond opening the door past the point at which the door is perpendicular to the side of the bus body. (Title 49 CFR 571.217)

10. Types A, B, C and D vehicles shall be equipped with a total number of emergency exits as follows for the indicated capacities of vehicles. Exits required by FMVSS 217 may be included to comprise the total number of exits specified.

0 to 42 Passengers = 1 emergency exit per side and 1 roof hatch.
43 to 78 Passengers = 2 emergency exits per side and 2 roof hatches.
79 to 90 Passengers = 3 emergency exits per side and 2 roof hatches.

11. Side emergency exit windows, when installed, may be vertically hinged on the forward side of the window. Operation instructions shall be clearly readable of a contrasting color, and be located within 6" of the release mechanism. No side emergency exit window will be located above a stop arm. Emergency exit doors, side emergency exit windows and emergency exit roof hatches shall be strategically located for optimal egress during an emergency evacuation of the bus.

12. Emergency exit doors shall include an alarm system that includes an audible warning device at the emergency door exit and also in the driver's compartment. Emergency exit side windows shall include an alarm system that includes an audible warning device in the driver's compartment. Roof hatches do not require an alarm system, but if so equipped, they must be operable and include an audible warning device in the driver's compartment.

13. Vandal lock may be installed, if applicable, the interlock and vandal lock should be interconnected. (Look more closely into language, roof hatches?)

Q. Emergency Equipment

1. *Fire extinguisher:*

   a. The bus shall be equipped with at least one UL-approved pressurized, dry chemical fire extinguisher complete with hose. The extinguisher shall be mounted and secured in a bracket, located in the driver's compartment and readily accessible to the driver and passengers. A pressure gauge shall be mounted on the extinguisher and be easily read without moving the extinguisher from its mounted position. Fire extinguisher shall be mounted in such a way as to prevent the entanglement of clothing, backpack straps, drawstrings, etc.

   b. The fire extinguisher shall have a total rating of 2A10BC or greater. The operating mechanism shall be sealed with a type of seal (breakable) that will not interfere with the use of the fire extinguisher.

2. *First-aid kit:*

   a. The bus shall have a removable, moisture-proof and dust-proof first aid kit sealed with a breakable type seal and mounted in the driver's compartment in a location that is physically accessible to all drivers. It shall be properly mounted and secured and identified as a first aid kit. The location for the first aid kit shall be marked. First-aid kit shall be mounted in such a way as to prevent the entanglement of clothing, backpack straps, drawstrings, etc.

   b. Contents shall, at a minimum, include:

      (1) 2 - 1 inch x 2 1/2 yards adhesive tape rolls

      (2) 24 - sterile gauze pads 3 inches x 3 inches

      (3) 100 - 3/4 inch x 3 inches adhesive bandages

      (4) 8 - 2 inch bandage compress

      (5) 10 - 3 inch bandage compress

      (6) 2 - 2 inch x 6 feet sterile gauze roller bandages

      (7) 2 - non-sterile triangular bandages approximately 39 inches x 35 inches x 54 inches with 2 safety pins

(8) 3 - sterile gauze pads 36 inches x 36 inches

(9) 3 - sterile eye pads

(10) 1 - rounded-end scissors

(11) 1 - mouth-to-mouth airway

(12) 1 - pair medical examination gloves

3. *Body fluid clean-up kit:*

a. Each bus shall have a removable and moisture-proof body fluid clean-up kit. It shall be sealed with a breakable type seal. It shall be properly mounted in the driver's compartment in a location that is physically accessible to all drivers and identified as a body fluid clean-up kit. Body fluid clean-up kit shall be mounted in such a way as to prevent the entanglement of clothing, backpack straps, drawstrings, etc.

b. Contents shall, at a minimum, include:

(1) 1 - pair medical examination gloves

(2) Absorbent

(3) 1 - scoop

(4) 1 - scraper or hand broom

(5) Disinfectant

(6) 2 - plastic bags

4. *Warning devices:*

Each school bus shall contain at least three (3) reflectorized triangle road warning devices that meet requirements in FMVSS 125. The warning device(s) shall be enclosed in an approved box that shall be sealed with a breakable type seal. The warning device(s) and approved box shall be mounted in an accessible place within the driver's compartment of the bus and shall be mounted in such a way as to prevent the entanglement of clothing, backpack straps, drawstrings, etc. The lid of the approved box may be designed so as to reveal the contents of the box without opening the lid.

5. Any of the emergency equipment may be mounted in an enclosed compartment, provided the compartment is labeled in not less than one-inch letters, identifying each piece of equipment contained therein.

6. Tape(s) and silicone sealants do not meet breakable type seal requirement. Breakable type seal(s) shall be replaced as appropriate and necessary and also during every annual school bus inspection following a thorough inspection for deterioration and required contents.

7. Ignitable flares and axes are not allowed on school buses.

R. **Floors**

1. The floor in the under-seat area, including tops of wheelhousing, driver's compartment and toeboard, shall be covered with rubber floor covering or equivalent, having a minimum overall thickness of .125 inch, and a calculated burn rate of 0.1 or less, using the test methods, procedures and formulas listed in FMVSS No. 302. The driver's area on all Type A buses may be manufacturer's standard flooring and floor covering.

2. The floor covering in the aisles shall be of aisle-type rubber or equivalent, wear-resistant and ribbed. Minimum overall thickness shall be .187 inch measured from tops of ribs.

3. The floor covering must be permanently bonded to the floor and must not crack when subjected to sudden changes in temperature. Bonding or adhesive material shall be waterproof and shall be a type recommended by the manufacturer of floor-covering material. All seams must be sealed with waterproof sealer.

4. On Types B, C and D buses, a flush-mounted, screw-down plate that is secured and sealed shall be provided to access the fuel tank sending unit and /or fuel pump. This plate shall not be installed under flooring material.

5. ~~Low profile heaters are not allowed within the clear floor area required to accommodate a wheelchair~~.

S. **Handrails**

At least one handrail shall be installed. The handrail(s) shall assist passengers during entry or exit, and be designed to prevent

entanglement, as evidenced by the passage of the NHTSA string and nut test, as defined in National School Transportation Specifications & Procedures School Bus Inspection.

T. **Heaters and Air Conditioning Systems**

1. *Heating System:*

a. The heater shall be hot water and/or combustion type.

b. If only one heater is used, it shall be fresh-air or combination fresh-air and recirculation type.

c. If more than one heater is used, additional heaters may be recirculating air type.

d. The heating system shall be capable of maintaining bus interior temperatures as specified in SAE test procedure J2233.

e. ~~Buses shall be equipped with a switch that will cut all power to radio and fans for noise suppression purposes and it shall be mounted within easy reach of the driver.~~

f. Auxiliary fuel-fired heating systems (non-reimbursable) are permitted, provided they comply with the following:

(1) The auxiliary heating system fuel shall utilize the same type fuel as specified for the vehicle engine.

(2) The heater(s) may be direct hot air or connected to the engine's coolant system.

(3) An auxiliary heating system, when connected to the engine's coolant system, may be used to preheat the engine coolant or preheat and add supplementary heat to the bus's heating system.

(4) Auxiliary heating systems must be installed pursuant to the manufacturer's recommendations and shall not direct exhaust in such a manner that will endanger bus passengers.

(5) Auxiliary heating systems which operate on diesel fuel shall be capable of operating on #1, #2 or blended diesel fuel without the need for system adjustment.

(6) The auxiliary heating system shall be low voltage.

(7) Auxiliary heating systems shall comply with all applicable FMVSSs, including FMVSS No. 301, as well as with SAE test procedures.

g. All forced air heaters installed by body manufacturers shall bear a name plate that indicates the heater rating in accordance with SBMTC-001. The plate shall be affixed by the heater manufacturer and shall constitute certification that the heater performance is as shown on the plate. Low profile heaters are not allowed within the clear floor area required to accommodate a wheelchair.

h. Portable heaters shall not be allowed within a bus.

i. Heater hoses shall be adequately supported to guard against excessive wear due to vibration. The hoses shall not dangle or rub against the chassis or any sharp edges and shall not interfere with or restrict the operation of any engine function. Heater hoses shall conform to SAE J20c. Heater lines on the interior of bus shall be shielded to prevent scalding of the driver or passengers. All heater hose shields shall completely cover all parts of the hose and connectors in such a way as to prevent burning subsequent to significant heat transferring to the shield. They shall not incorporate any openings that would allow a passenger to be injured by sharp edges or hot surfaces.

j. Each hot water system installed by a body manufacturer shall include one shut-off valve in the pressure line and one shut-off valve in the return line with both valves at the engine in an accessible location, except that on all Types A and B buses, the valves may be installed in another accessible location.

k. ~~There shall be a water flow regulating valve installed in the pressure line for convenient operation by the driver while seated.~~ All heaters in the passenger compartment shall be equipped with a device, installed in the hot water pressure line, which regulates the water flow to all passenger heaters. The device shall be conveniently operated by the driver while seated. The driver and passenger heaters may operate independently of each other for maximum comfort.

l. All combustion heaters shall be in compliance with current Federal Motor Carrier Safety Administration Regulations.

m. Accessible bleeder valves shall be installed in an appropriate place in the return lines of body company-installed heaters to remove air from the heater lines.

n. Access panels shall be provided to make heater motors, cores, and fans readily accessible for service. An outside access panel may be provided for the driver's heater.

2. *Air Conditioning (Non-Reimbursable Option Except When Driven By IEP):*

a. The following specifications are applicable to all types of school buses that may be equipped with air conditioning. This section is divided into two parts: Part 1 covers performance specifications and Part 2 covers other requirements applicable to all buses.

b. **Part 1 - Performance Specifications:**

(1) The installed air conditioning system should cool the interior of the bus down to at least 80 degrees Fahrenheit, measured at a minimum of three points, located four feet above the floor at the longitudinal centerline of the bus. The three points shall be: (1) near the driver's location, (2) at the mid point of the body, and (3) two feet forward of the rear emergency door, or, for Type D rear-engine buses, two feet forward of the end of the aisle.

(2) The test conditions under which the above performance must be achieved shall consist of: (1) placing the bus in a room (such as a paint booth) where ambient temperature can be maintained at 100 degrees Fahrenheit (2) heat soaking the bus at 100 degrees Fahrenheit with windows open for at least one hour and (3) closing windows, turning on the air conditioner with the engine running at the chassis manufacturer's recommended low idle speed, and cooling the interior of the bus to 80 degrees Fahrenheit or lower within a maximum of 30 minutes while maintaining 100 degrees Fahrenheit outside temperature.

(3) Alternately, and at the user's discretion, this test may be performed under actual summer conditions, which consist of temperatures above 85 degrees Fahrenheit, humidity above 50 percent with normal sun loading of the bus and the engine running at the manufacturer's recommended low idle speed. After a minimum of one hour of heat soaking, the system shall be turned on and must provide a

minimum 20-degree temperature drop in the 30-minute time limit.

(4) The manufacturer shall provide facilities for the user or user's representative to confirm that a pilot model of each bus design meets the above performance requirements.

c. **Part 2 - Other Requirements:**

(1) Evaporator cases, lines and ducting (as equipped) shall be designed in such a manner that all condensation is effectively drained to the exterior of the bus below the floor level under all conditions of vehicle movement and without leakage on any interior portion of bus.

(2) Any evaporator or ducting system shall be designed and installed so as to be free of injury-prone projections or sharp edges. Any ductwork shall be installed so that exposed edges face the front of the bus and do not present sharp edges.

(3) On specially equipped school buses, the evaporator and ducting (if used) shall be placed high enough that they will not obstruct occupant securement shoulder strap upper attachment points. This clearance shall be provided along entire length of the passenger area on both sides of the bus interior to allow for potential retrofitting of new wheelchair positions and occupant securement devices throughout the bus.

(4) The body may be equipped with insulation, including sidewalls, roof, firewall, rear, inside body bows and plywood or composite floor insulation to aid in heat dissipation and reflection.

(5) All glass (windshield, ~~service~~ entrance and emergency doors, side and rear windows) may be equipped with maximum integral tinting allowed by federal, state or ANSI standards for the respective locations, except that windows rear of the driver's compartment, if tinted shall have approximately 28 percent light transmission.

(6) Electrical generating capacity shall be provided to accommodate the additional electrical demands imposed by the air conditioning system.

(7) Roofs may be painted white to aid in heat dissipation, according to National School Transportation Specifications & Procedures Placement of Reflective Markings.

U. Hinges

All exterior metal door hinges which do not have stainless steel, brass or nonmetallic hinge pins or other designs that prevent corrosion shall be designed to allow lubrication to be channeled to the center 75 percent of each hinge loop without disassembly.

V. Identification

1. The body shall bear the words “SCHOOL BUS” in black letters at least eight inches high on both front and rear of the body or on signs attached thereto. Lettering shall be placed as high as possible without impairment of its visibility. Letters shall conform to “Series B” of Standard Alphabets for Highway Signs. “SCHOOL BUS” lettering shall have a reflective background, or as an option, may be illuminated by backlighting.

2. MFSABs are exempt from these requirements.

3. *Required lettering and numbering shall include:*

   a. School district owned vehicles will be identified with black lettering (minimum four inches (4”) high) on both sides of the school bus using the district name and number listed in the Idaho Educational Directory. Contractor-owned school buses under contract with a school district must also comply with the same identification standards as district-owned buses and shall be identified by either the contractor or district name, as decided by the district.

   b. Each district-owned or contracted school bus will be separately identified with its own number in two (2) places on each side of the bus in the logo panel/belt line using six inch (6") high black numbers. Numbers on the passenger side shall be as close to the first and last passenger windows as possible and on the driver’s side as close to the stop arm and last passenger window as possible.

   c. Unauthorized entry placards shall be displayed in the most visible location when observed by persons approaching the vehicle with the door in the open position. Permanence of the placard should be a consideration when choosing a location for attachment. Placard shall read as follows:

WARNING
IT IS UNLAWFUL TO:
Enter a school bus with the intent to commit a crime
Enter a school bus and disrupt or interfere with the driver
Refuse to disembark after ordered to do so
(18-1522; 18-113, Idaho Code)

(1) State Department of Education Student Transportation Section may provide unauthorized entry placards.

d. Other lettering, numbering, or symbols, which may be displayed on the exterior of the bus, shall be limited to:

e. Bus identification number on the top, front and rear of the bus, in addition to the required numbering on the sides.

f. The location of the battery(ies) identified by the word “BATTERY” or “BATTERIES” on the battery compartment door in two-inch maximum lettering.

g. Symbols or letters not to exceed 64 square inches of total display near the entrance ~~service~~ door exterior displaying information for identification by the students of the bus or route served. No symbols, letters, or other signage shall be permitted on the first two passenger windows or on entrance door glass which may block or obscure clear visibility.

h. All other signage must have prior written SDE approval.

i. Manufacturer, dealer or school identification or logos displayed so as not to distract significantly from school bus body color and lettering specifications.

j. Symbols identifying the bus as equipped for or transporting students with special needs (see Specially Equipped School Bus section).

k. Lettering on the rear of the bus relating to school bus flashing signal lamps or railroad stop procedures. This lettering shall not obscure or interfere with the operation instructions displayed on the exterior portion of the rear emergency exit door.

l. Identification of fuel type in two-inch maximum lettering adjacent to the fuel filler opening.

m. One 4” x 10” (maximum) decal promoting school bus safety on rear bumper.

W. Inside Height

Inside body height shall be 72" or more, measured metal to metal, at any point on longitudinal centerline from front vertical bow to rear vertical bow. Inside body height of Type A-1 buses shall be 62" or more.

X. Insulation (Optional)

1. If thermal insulation is specified, it shall be fire-resistant, UL approved, with minimum R-value of 5.5. Insulation shall be installed so as to prevent sagging.

2. If floor insulation is required, it shall be five-ply nominal 5/8 inch thick plywood, and it shall equal or exceed properties of the exterior-type softwood plywood, C-D Grade, as specified in standard issued by U.S. Department of Commerce. When plywood is used, all exposed edges shall be sealed. Type A-1 buses may be equipped with nominal ½ inch thick plywood or equivalent material meeting the above requirements. Equivalent material may be used to replace plywood, provided it has an equal or greater insulation R-value, deterioration, sound abatement and moisture resistance properties.

Y. Interior

1. The interior of bus shall be free of all unnecessary projections, which include luggage racks and attendant handrails, to minimize the potential for injury. This specification requires inner lining on ceilings and walls. If the ceiling is constructed to contain lapped joints, the forward panel shall be lapped by rear panel and exposed edges shall be beaded, hemmed, flanged, or otherwise treated to minimize sharp edges. Buses may be equipped with a storage compartment for tools, tire chains and/or tow chains. (see STORAGE COMPARTMENT)

2. Non-reimbursable interior overhead storage compartments may be provided if they meet the following criteria:

   a. Meet head protection requirements of FMVSS 222, where applicable.

   b. Have a maximum rated capacity displayed for each compartment.

c. Be completely enclosed and equipped with latching doors which must be sufficient to withstand a force of five times the maximum rated capacity of the compartment.

d. Have all corners and edges rounded with a minimum radius of one-inch or padded equivalent to door header padding.

e. Be attached to the bus sufficiently to withstand a force equal to twenty times the maximum rated capacity of the compartment.

f. Have no protrusions greater than ¼ inch.

3. The driver's area forward of the foremost padded barriers will permit the mounting of required safety equipment and vehicle operation equipment. All equipment necessary for the operation of the vehicle shall be properly secured in such a way as to prevent the entanglement of clothing, backpack straps, drawstrings, etc.

4. Every school bus shall be constructed so that the noise level taken at the ear of the occupant nearest to the primary vehicle noise source shall not exceed 85 dbA when tested according to National School Transportation Specifications & Procedures Noise Test Procedure.

5. ~~Low profile heaters are not allowed within the clear floor area required to accommodate a wheelchair.~~

Z. **Lamps and Signals**

1. Interior lamps shall be provided which adequately illuminate the aisle and stepwell. The stepwell light shall be illuminated by an entrance ~~service~~ door-operated switch, to illuminate only when headlights and ~~or~~ clearance lights are on and the entrance ~~service~~ door is open. An additional exterior mounted light shall be mounted next to the entrance ~~service~~ door to adequately illuminate the outside approach to the door. It shall be actuated simultaneously with the stepwell light.

2. Body instrument panel lights shall be controlled by an independent rheostat switch.

3. *School Bus Alternately Flashing Signal Lamps:*

a. The bus shall be equipped with two red lamps at the rear of vehicle and two red lamps at the front of the vehicle.

b. In addition to the four red lamps described above, four amber lamps shall be installed so that one amber lamp is located near each red signal lamp, at the same level, but closer to the vertical centerline of bus. The system of red and amber signal lamps, when in its operational mode, shall be wired so that amber lamps are energized manually, and red lamps are automatically energized (with amber lamps being automatically de-energized) when stop signal arm is extended or when bus entrance ~~service~~ door is opened. An amber pilot light and a red pilot light shall be installed adjacent to the driver controls for the flashing signal lamp to indicate to the driver which lamp system is activated.

c. Air and electrically operated doors may be equipped with an over-ride switch that will allow the red lamps to be energized without opening the door, when the alternately flashing signal lamp system is in its operational mode. The use of such a device shall be in conformity with the law and SDE loading/unloading training procedures, as contained in Idaho's school bus driver training curriculum.

d. The area around the lenses of alternately flashing signal lamps extending outward from the edge of the lamps three inches (+/- ¼ inch) to the sides and top and minimum one inch to the bottom, shall be black in color on the body or roof area against which the signal lamp is seen (from a distance of 500 feet along axis of the vehicle).

e. Red lamps shall flash at any time the stop signal arm is extended.

f. All flashers for alternately flashing red and amber signal lamps shall be enclosed in the body in a readily accessible location.

4. *Turn Signal and Stop/Tail Lamps:*

a. Bus body shall be equipped with amber rear turn signal lamps that are at least seven inches in diameter or, if a shape other than round, a minimum 38 square inches of illuminated area and shall meet FMVSS No. 108. These signal lamps must be connected to the chassis hazard-warning switch to cause simultaneous flashing of turn signal lamps when needed as vehicular traffic hazard warning. Turn signal lamps are to be placed as wide apart as practical and their centerline shall be a maximum of 12 inches below the rear window. Type A-1 conversion vehicle front lamps must be at least 21 square inches in lens area and must be in the manufacturer's standard color.

b. Buses shall be equipped with amber side-mounted turn signal lights. One turn signal lamp on the left side shall be mounted rearward of the stop signal arm and one turn signal lamp on the right side shall be mounted rearward of the entrance ~~service~~ door. Both front side-mounted turn signal lamps shall be mounted forward of the bus center-line. An additional side mounted turn signal lamp may be mounted on each side of the bus to the rear of the bus center-line.

c. Buses shall be equipped with four combination red stop/tail lamps:

(1) Two combination lamps with a minimum diameter of seven inches, or if a shape other than round, a minimum 38 square inches of illuminated area shall be mounted on the rear of the bus just inside the turn signal lamps.

(2) Two combination lamps with a minimum diameter of four inches, or if a shape other than round, a minimum of 12 square inches of illuminated area, shall be placed on the rear of the body between the beltline and the floor line. The rear license plate lamp may be combined with one lower tail lamp. Stop lamps shall be activated by the service brakes and shall emit a steady light when illuminated. Type A-1 buses with bodies supplied by chassis manufacturer may be equipped with manufacturer's standard stop and tail lamps.

d. On buses equipped with a monitor for the front and rear lamps of the school bus, the monitor shall be mounted in full view of the driver. If the full circuit current passes through the monitor, each circuit shall be protected by a fuse ~~or~~ circuit breaker or electronic protection device against any short circuit or intermittent shorts.

e. An optional white flashing strobe light may be installed on the roof of a school bus, at a location not to exceed 1/3 the body length forward from the rear of the roof edge. The lightlamp shall have a single clear lens emitting light 360 degrees around its vertical axis and may not extend above the roof more than maximum legal height. A manual switch and a pilot lightlamp shall be included to indicate when lightlamp is in operation. Operation of the strobe lightlamp is limited to periods of inclement weather, nighttime driving, emergency situation or whenever students are on-board. Optionally, the strobe light may be mounted on the roof in the area directly over the restraining barrier on the driver's side, may be wired to activate with the amber alternately flashing signal lamps, continuing through the full loading or unloading cycle, and may be

equipped with an override switch to allow activation of the strobe at any time for use in inclement weather, nighttime driving or emergency situation.

f. The bus body shall be equipped with two white rear backup lamps ~~signals~~ that are at least four inches in diameter or, if a shape other than round, a minimum of 12 square inches of illuminated area, meeting FMVSS No. 108 and Idaho Code 49-920. If backup lamps are placed on the same horizontal line as the brake lamps and turn signal lamps, they shall be to the inside.

AA. **Metal Treatment**

1. All metal except high-grade stainless steel or aluminum used in construction of the bus body shall be zinc-coated or aluminum-coated or treated by an equivalent process before bus is constructed. Included are such items as structural members, inside and outside panels, door panels and floor sills. Excluded are such items as door handles, grab handles, interior decorative parts and other interior plated parts.

2. All metal parts that will be painted, in addition to the above requirements, shall be chemically cleaned, etched, zinc phosphate-coated and zinc chromate-or epoxy-primed, or the metal may be conditioned by an equivalent process. This includes but not limited to such items as crossing arm and stop arm.

3. In providing for these requirements, particular attention shall be given to lapped surfaces, welded connections of structural members, cut edges on punched or drilled hole areas in sheet metal, closed or box sections, unvented or undrained areas and surfaces subjected to abrasion during vehicle operation.

4. As evidence that the above requirements have been met, samples of materials and sections used in the construction of the bus body shall be subjected to a cyclic corrosion testing as outlined in SAE J1563 ~~not lose more than 10 percent of material by weight when subjected to a 1,000-hour salt spray test as provided for in the latest revision of ASTM Standard B-117.~~

BB. **Mirrors**

1. The interior mirror shall be either clear view laminated glass or clear view glass bonded to a backing which retains the glass in the event of breakage. The mirror shall have rounded corners and protected edges. All Type A buses shall have a minimum of a six-inch x 16-

inch mirror and Types B, C, and D buses shall have a minimum of a six-inch x 30-inch mirror.

2. Each school bus shall be equipped with exterior mirrors meeting the requirements of FMVSS No. 111. Mirrors shall be easily adjustable but shall be rigidly braced so as to reduce vibration. The right side rear view mirror shall not be obscured by the un-wiped portion of the windshield.

3. Heated external mirrors may be used.

4. Remote controlled external rear view mirrors may be used.

CC. **Mounting**

1. The chassis frame shall support the rear body cross member. The bus body shall be attached to chassis frame at each main floor sill, except where chassis components interfere, in such a manner as to prevent shifting or separation of the body from the chassis under severe operating conditions.

2. Isolators shall be installed at all contact points between body and chassis frame on Types A-2, B, C, and D buses, and shall be secured by a positive means to the chassis frame or body to prevent shifting, separation, or displacement of the isolators under severe operating conditions.

DD. **Overall Length**

Overall length of bus shall not exceed 45 feet, excluding accessories.

EE. **Overall Width**

Overall width of bus shall not exceed 102 inches, excluding accessories.

FF. **Public Address System**

1. Buses may be equipped with AM/FM audio and/or public address system having interior or exterior speakers.

2. No internal speakers, other than the driver's communication systems, may be installed within four feet of the driver's seat back in its rearmost upright position.

3. ~~Buses shall be equipped with a switch that will cut all power to radio and fans for noise suppression purposes and it shall be mounted within easy reach of the driver.~~

GG. **Reflective Material (See National School Transportation Specifications & Procedures Placement of Reflective Markings)**

1. The front and/or rear bumper may be marked diagonally 45 degrees down to centerline of pavement with two-inch ±¼ inch wide strips of non-contrasting reflective material.

2. The rear of bus body shall be marked with strips of reflective NSBY material to outline the perimeter of the back of the bus using material which conforms to the requirements of FMVSS No. 131, Table 1. The perimeter marking of rear emergency exits per FMVSS No. 217 and/or the use of reflective "SCHOOL BUS" signs partially accomplish the objective of this requirement. To complete the perimeter marking of the back of the bus, strips of at least one and three-quarters (1 ¾) inch reflective NSBY material shall be applied horizontally above the rear windows and above the rear bumper, extending from the rear emergency exit perimeter, marking outward to the left and right rear corners of the bus. Vertical strips shall be applied at the corners connecting these horizontal strips.

3. "SCHOOL BUS" signs, if not of lighted design, shall be marked with retroreflective NSBY material comprising background for lettering of the front and/or rear "SCHOOL BUS" signs.

4. Sides of bus body shall be marked with at least one and three-quarters (1 ¾) inch retroreflective NSBY material, extending the length of the bus body and located (vertically) between the floor line and the beltline.

5. Signs, if used, placed on the rear of the bus relating to school bus flashing signal lamps or railroad stop procedures may be of retroreflective NSBY material comprising background for lettering.

HH. **Rub Rails**

1. There shall be one rub rail located on each side of the bus approximately at seat cushion level which extends from the rear side of the entrance door completely around the bus body (except the emergency door or any maintenance access door) to the point of curvature near the outside cowl on the left side.

2. There shall be one additional rub rail located on each side at, or no more than ten inches above the floor line. The rub rail shall cover the

same longitudinal area as upper rub rail, except at the wheelhousings, and it shall, at a minimum, extend to radii of the right and left rear corners.

3. Both rub rails shall be attached at each body post and all other upright structural members.

4. Each rub rail shall be four inches or more in width in their finished form, shall be constructed of 16-gauge steel or suitable material of equivalent strength and shall be constructed in corrugated or ribbed fashion. Each entire rub rail shall be black in color.

5. Both rub rails shall be applied outside the body or outside the body posts. Pressed-in or snap-on rub rails do not satisfy this requirement. For Type A-1 vehicles using the body provided by the chassis manufacturer or for Types A-2, B, C and D buses using the rear luggage or the rear engine compartment, rub rails need not extend around the rear corners.

6. There shall be a rub rail or equivalent bracing located horizontally at the bottom edge of the body side skirts.

II. **Seats and Restraining Barriers**

1. *Passenger Seating:*

a. All seats shall have a minimum cushion depth of 15 inches, a seat back height of 24 inches above the seating reference point, and must comply with all requirements of FMVSS No. 222. School bus design capacities shall be in accordance with 49 CFR, Part 571.3 and FMVSS No. 222. In addition to the fastener that forms the pivot for each seat retaining clip, a secondary fastener may be used in each clip to prevent the clip from rotating and releasing the seat cushion unintentionally.

b. All restraining barriers and passenger seats may be constructed with non-reimbursable materials that enable them to meet the criteria contained in the School Bus Seat Upholstery Fire Block Test (National School Transportation Specifications & Procedures School Bus Seat Upholstery Fire Block Test).

c. Each seat leg shall be secured to the floor by a minimum of two bolts, washers, and nuts. Flange-head nuts may be used in lieu of nuts and washers, or seats may be track-mounted in conformance with FMVSS No. 222. If track seating is installed, the manufacturer shall supply minimum and maximum seat spacing dimensions

applicable to the bus, which comply with FMVSS No. 222. This information shall be on a label permanently affixed to the inside passenger compartment of the bus.

d. All seat frames attached to the seat rail shall be fastened with two bolts, washers and nuts or flange-head nuts.

e. All school buses (including Type A) shall be equipped with restraining barriers which conform to FMVSS No. 222.

f. The use of a “flip seat” adjacent to any side emergency door is prohibited.

2. *Pre School Age Seating:*

When installed, all passenger seats designed to accommodate a child or infant carrier seat shall comply with FMVSS No. 225. These seats shall be in compliance with NHTSA's "Guideline for the Safe Transportation of Pre-school Age Children in School Buses".

3. *Driver Seat:*

a. The driver's seat supplied by the body company shall be a high back seat with a minimum seat back adjustable to 15 degrees, without requiring the use of tools, and a head restraint to accommodate a 5th percentile female to a 95th percentile adult male, as defined in FMVSS No. 208. The driver's seat shall be secured with nuts, bolts and washers or flanged-head nuts.

b. Type A buses may use the standard driver's seat provided by the chassis manufacturer.

4. *Driver Restraint System:*

a. A Type 2 lap/shoulder belt shall be provided for the driver. On buses where the driver’s seat and upper anchorage for the shoulder belt are both attached to the body structure, a driver’s seat with an integrated Type 2 lap/shoulder belt may be substituted. On buses where the driver’s seat and upper anchorage for the shoulder belt are separately attached to both body and chassis structures (i.e., one attached to the chassis and the other attached to the body), a driver’s seat with an integrated Type 2 lap/shoulder belt should be used.

b. The assembly shall be equipped with an ~~automatic~~ emergency locking retractor for the continuous belt system. On all buses

except Type A equipped with a standard chassis manufacturer's driver's seat, the lap portion of the belt system shall be guided or anchored to prevent the driver from sliding sideways under it. The lap/shoulder belt shall be designed to allow for easy adjustment in order to fit properly and to effectively protect drivers varying in size from 5th percentile adult female to 95th percentile adult male.

c. Each bus shall be equipped with a durable webbing cuter having a full width handgrip and a protected, replaceable or non-corrodible blade. The required belt cutter shall be mounted in a location accessible to the seated driver in an easily detachable manner.

JJ. **Steering Wheel**

See Chassis section.

KK. **Steps**

1. The first step at entrance ~~service~~ door shall be not less than ten inches and not more than 14 inches from the ground when measured from top surface of the step to the ground, based on standard chassis specifications, except that on Type D vehicles, the first step at the entrance ~~service~~ door shall be 12 inches to 16 inches from the ground. On chassis modifications which may result in increased ground clearance (such as four-wheel drive) an auxiliary step shall be provided to compensate for the increase in ground-to-first-step clearance. The auxiliary step is not required to be enclosed.

2. Step risers shall not exceed a height of ten inches. When plywood is used on a steel floor or step, the riser height may be increased by the thickness of the plywood.

3. OEM steps shall be enclosed to prevent accumulation of ice and snow.

4. OEM, retrofit, or after-market steps shall not protrude beyond the side body line, except during the loading or unloading of passengers.

LL. **Step Treads**

1. All steps, including the floor line platform area, shall be covered with 3/16 inch rubber floor covering or other materials equal in wear and abrasion resistance to top grade rubber.

2. The metal back of the tread shall be permanently bonded to the step tread material.

3. Steps, including the floor line platform area, shall have a one ½-inch nosing that contrasts in color by at least 70 percent measured in accordance with the contrasting color specification in 36 CFR, Part 1192 ADA, Accessibility Guidelines for Transportation Vehicles.

4. Step treads shall have the following characteristics:

5. Abrasion resistance: Step tread material weight loss shall not exceed 0.40 percent, as tested under ASTM D-4060, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; (CS-17 Wheel, 1000 gram, 1000 cycle)

6. Weathering resistance: Step treads shall not break, crack, or check after ozone exposure (7 days at 50 phm at 40 degrees C) and Weatherometer exposure (ASTM D-750, Standard Test Method for Rubber Deterioration in Carbon-Arc Weathering Apparatus, 7 days)

7. Flame Resistance: Step treads shall have a calculated burn rate of .01 or less using the test methods, procedures and formulas listed in FMVSS No. 302, Flammability of Interior Materials

MM. **Stirrup Steps**

When the windshield and lamps are not easily accessible from the ground, there may be at least one folding stirrup step or recessed foothold and suitably located handles on each side of the front of the body for easy accessibility for cleaning. Steps are permitted in or on the front bumper in lieu of the stirrup steps, if the windshield and lamps are easily accessible for cleaning from that position.

NN. **Stop Signal Arm**

The stop signal arm(s) shall comply with the requirements of FMVSS No. 131.

OO. **Storage Compartment (Optional)**

A storage container for tools, tire chains, and/or tow chains may be located either inside or outside the passenger compartment. If inside, it shall have a cover capable of being securely latched and fastened to the floor (the seat cushion may not serve this purpose), convenient to either the entrance ~~service~~ door or the emergency door.

PP. **Sun Shield**

1. An interior adjustable transparent sun shield, with a finished edge and not less than six inches by 30 inches for Types B, C, and D vehicles, shall be installed in a position convenient for use by the driver.

2. On all Type A buses, the sun shield (visor) shall be installed according to the manufacturer's standard.

QQ. **Tail Pipe**

1. The tailpipe may be flush with, but shall not extend out more than two inches beyond, the perimeter of the body for side-exit pipe or the bumper for rear-exit pipe.

2. The tailpipe shall exit to the left or right of the emergency exit door in the rear of vehicle or to the left side of the bus in front or behind the rear drive axle. The tailpipe exit location on school bus types A-1 or B-1 buses may be according to the manufacturer's standard. The tailpipe shall not exit beneath any fuel filler location or beneath any emergency door.

RR. **Tow Attachment Points**

1. Rear towing devices (i.e. tow hooks, tow eyes, or other designated towing attachment points) shall be furnished to assist in the retrieval of buses that are stuck and/or for towing buses when a wrecker with a “wheel lift” or an “axle lift” is not available or cannot be applied to the towed vehicle.

2. Towing devices shall be attached to the chassis frame either by the chassis manufacturer or in accordance with the chassis manufacturer’s specifications.

3. Each rear towing device shall have a strength rating of 13,500 pounds with the force applied in the rearward direction, parallel to the ground, and parallel to the longitudinal axis of the chassis frame rail.

4. The towing devices shall be mounted such that they do not project rearward of the rear bumper.

SS. **Traction Assisting Devices (Optional)**

1. Where required or used, sanders shall:

   a. Be of hopper cartridge-valve type.

b. Have a metal hopper with all interior surfaces treated to prevent condensation of moisture.

c. Be of at least 100 pound (grit) capacity.

d. Have a cover on the filler opening of hopper, which screws into place, thereby sealing the unit airtight.

e. Have discharge tubes extending to the front of each rear wheel under the fender.

f. Have non-clogging discharge tubes with slush-proof, non-freezing rubber nozzles.

g. Be operated by an electric switch with a telltale pilot light mounted on the instrument panel.

h. Be exclusively driver-controlled.

i. Have a gauge to indicate that the hopper needs refilling when it reaches one-quarter full.

2. Automatic traction chains may be installed.

TT. **Trash Container and Holding Device (Optional)**

Where requested or used, the trash container shall be secured by a holding device that is designed to prevent movement and to allow easy removal and replacement; and it shall be installed in an accessible location in the driver's compartment, not obstructing passenger use of the entrance ~~service~~ door or the entrance grab handle, and in such a way as to prevent the entanglement of clothing, backpack straps, drawstrings, etc.

UU. **Undercoating**

1. The entire underside of the bus body, including floor sections, cross member and below floor line side panels, shall be coated with rust-proofing material for which the material manufacturer has issued a notarized certification of compliance to the bus body builder that materials meet or exceed all performance and qualitative requirements of paragraph 3.4 of Federal Specification TT-C-520b, using modified test procedures* for the following requirements:

a. Salt spray resistance-pass test modified to 5 percent salt and 1000 hours

b. Abrasion resistance-pass

c. Fire resistance-pass

d. *Test panels are to be prepared in accordance with paragraph 4.6.12 of TT-C-520b with modified procedure requiring that test be made on a 48-hour air-cured film at thickness recommended by compound manufacturer.

2. The undercoating material shall be applied with suitable airless or conventional spray equipment to the recommended film thickness and shall show no evidence of voids in the cured film. The undercoating material shall not cover any exhaust components of the chassis.

VV. **Ventilation**

1. Auxiliary fans shall meet the following requirements:

a. Fans for left and right sides shall be placed in a location where they can be adjusted for maximum effectiveness and where they do not obstruct vision to any mirror or through any critical windshield area. Note: Type A buses may be equipped with one fan.

b. Fans shall be of six inch nominal diameter.

c. Fan blades shall be covered with a protective cage. Each fan shall be controlled by a separate switch.

2. ~~Buses shall be equipped with a switch that will cut all power to radio and fans for noise suppression purposes and it shall be mounted within easy reach of the driver.~~

3. The bus body shall be equipped with a suitably controlled ventilating system of sufficient capacity to maintain proper quantity of air under operating conditions without having to open windows except in extremely warm weather.

4. Static-type, non-closeable exhaust ventilation shall be installed, preferably in a low-pressure area of the roof.

5. Roof hatches designed to provide ventilation in all types of exterior weather conditions may be provided.

WW. **Wheelhousing**

1. The wheelhousing opening shall allow for easy tire removal and service.

2. The wheelhousings shall be attached to floor sheets in such a manner so as to prevent any dust, water or fumes from entering the body. The wheelhousings shall be constructed of at least 16-gauge steel.

3. The inside height of the wheelhousing above the floor line shall not exceed 12 inches.

4. The wheelhousings shall provide clearance for installation and use of tire chains on single and dual (if so equipped) power-driving wheels.

5. No part of a raised wheelhousing shall extend into the emergency door opening.

XX. **Windows**

1. Each full side window, other than emergency exits designated to comply with FMVSS 217, shall provide an unobstructed opening of at least nine inches but not more than 13 inches high and at least 22 inches wide, obtained by lowering the window. One side window on each side of the bus may be less than 22 inches wide. Passenger and driver window frames shall be painted NSBY, black to match body trim, or shall be unpainted aluminum. The area between the passenger and driver window frames shall be NSBY (National School Bus Yellow).

2. Optional tinted (non-reimbursable) and/or frost-free glazing may be installed in all doors, windows, and windshields consistent with federal, state, and local regulations.

YY. **Windshield Washers**

A windshield washer system shall be provided.

ZZ. **Windshield Wipers**

1. A ~~two-speed or~~ two-speed ~~with variable speed~~ windshield wiping system with an intermittent time delay feature shall be provided.

2. The wipers shall meet the requirements of FMVSS No. 104.

AAA. **Wiring**

1. All wiring shall conform to current SAE standards.

2. Wiring shall be arranged in circuits, as required, with each circuit protected by a fuse, breaker or electronic protection device.

3. A system of color and number coding shall be used and an appropriate identifying diagram shall be provided to the end user, along with the wiring diagram provided by the chassis manufacturer. The wiring diagrams shall be specific to the bus model supplied and shall include any changes to wiring made by the body manufacturer. Chassis wiring diagrams shall be supplied to the end user. A system of color and number-coding shall be used on buses. The following body interconnecting circuits shall be color-coded as noted:

FUNCTION	**COLOR**
Left Rear Directional Lamp	Yellow
Right Rear Directional Lamp	Dark Green
Stop Lamps	Red
Back-up Lamps	Blue
Tail Lamps	Brown
Ground	White
Ignition Feed, Primary Feed	Black

4. The color of cables shall correspond to SAE J 1128.

5. Wiring shall be arranged in at least six regular circuits as follows:

   a. Head, tail, stop (brake) and instrument panel lamps

   b. Clearance lamps and stepwell lamps that shall be actuated when the entrance ~~service~~ door is open

   c. Dome lamps

   d. Ignition and emergency door signal

   e. Turn signal lamps

      (1) Alternately flashing signal lamps.

6. Any of the above combination circuits may be subdivided into additional independent circuits.

7. Heaters and defrosters shall be wired on an independent circuit.

8. There shall be a manual noise suppression switch installed in the control panel. The switch shall be labeled and alternately colored. This switch shall be an on/off (a momentary or spring loaded switch does

not meet this requirement) type that deactivates body equipment that produces noise, including, at least, the AM/FM radio, two–way communications, heaters, air conditioners, fans and defrosters. This switch shall not deactivate safety systems, such as windshield wipers or lighting systems.

9. ~~Buses shall be equipped with a switch that will cut all power to radio and fans for noise suppression purposes and it shall be mounted within easy reach of the driver.~~

10. Whenever possible, all other electrical functions (such as sanders and electric-type windshield wipers) shall be provided with independent and properly protected circuits.

11. Each body circuit shall be coded by number or letter on a diagram of circuits and shall be attached to the body in a readily accessible location.

12. The entire electrical system of the body shall be designed for the same voltage as the chassis on which the body is mounted.

13. All wiring shall have an amperage capacity exceeding the design load by at least 25 percent. All wiring splices are to be done at an accessible location and noted as splices on wiring diagram.

14. A body wiring diagram of a size that can be easily read shall be furnished with each bus body or affixed in an area convenient to the electrical accessory control panel.

15. The body power wire shall be attached to a special terminal on the chassis.

16. All wires passing through metal openings shall be protected by a grommet.

17. Wires not enclosed within the body shall be fastened securely at intervals of not more than 18 inches. All joints shall be soldered or joined by equally effective connectors, which shall be water-resistant and corrosion-resistant.

18. Multiplex wiring may exempt manufacturers from some of the above wiring standards.

19. Buses may be equipped with a 12-volt power port in the driver's area.

STANDARDS FOR SPECIALLY EQUIPPED SCHOOL BUSES

A. **Introduction**

1. Equipping buses to accommodate students with disabilities is dependent upon the needs of the passengers. While one bus may be fitted with a lift, another may have lap belts installed to secure child seats. Buses so equipped are not to be considered a separate class of school bus, but simply a regular school bus that is equipped for special accommodations.

2. The specifications in this section are intended to be supplementary to specifications in the chassis and body sections. In general, specially equipped buses shall meet all the requirements of the preceding sections plus those listed in this section. It is recognized by the entire industry that the field of special transportation is characterized by varied needs for individual cases and by a rapidly emerging technology for meeting those needs. A flexible, “common-sense” approach to the adoption and enforcement of specifications for these vehicles, therefore, is prudent

3. As defined by the Code of Federal Regulations (CFR) 49§571.3, "Bus means a motor vehicle with motive power, except a trailer, designed for carrying more than ten persons" (eleven or more including the driver). This definition also embraces the more specific category, school bus. Vehicles with ten or fewer passenger positions (including the driver) ~~cannot be~~ are not classified as buses. For this reason, the federal vehicle classification multipurpose passenger vehicle (CFR 49§571.3), or MPV, must be used by manufacturers for these vehicles in lieu of the classification school bus. The definition of designated seating position in 49 CFR § 571.3 states that, in the case of “vehicles sold or introduced into interstate commerce for purposes that include carrying students to and from school or related events” and which are “intended for securement of an occupied wheelchair during vehicle operation,” each wheelchair securement position shall be counted as four designated seating positions when determining the classification (whether school bus or IMPV). This classification system does not preclude state or local agencies or the National School Transportation Specifications & Procedures from requiring compliance of school bus-type MPVs with the more stringent federal standards for school buses. The following specifications address modifications as they pertain to school buses that, with standard seating arrangements prior to modifications, would accommodate eleven or more including the driver. If by addition of a power lift, mobile seating device positions or other modifications, the capacity is reduced such that vehicles become MPVs, the intent of these standards is to require these vehicles to

meet the same standards they would have had to meet prior to such modifications, and such MPVs are included in all references to school buses and requirements for school buses which follow.

B. **Definition**

A specially equipped school bus is any school bus that is designed, equipped, or modified to accommodate students with special transportation needs.

C. **General Requirements**

4. School buses designed for transporting students with special transportation needs shall comply with Standards for Idaho School Buses and Operations and with Federal Motor Vehicle Safety Standards (FMVSS) applicable to their Gross Vehicle Weight Rating (GVWR) category.

5. Any school bus to be used for the transportation of children who utilize a wheelchair or other mobile positioning device, or who require life-support equipment that prohibits use of the regular service entrance, shall be equipped with a power lift, unless a ramp is needed for unusual circumstances related to passenger needs.

D. **Aisles**

All school buses equipped with a power lift shall provide a minimum 30-inch ~~aisle~~ pathway leading from any wheelchair/mobility aid position to at least one 30" wide emergency exit door. A wheelchair securement position shall never be located directly in front of (blocking) a power lift door location.

E. **Communications**

All school buses that are used to transport individuals with disabilities shall be equipped with a two-way electronic voice communication system other than CB radio.

F. **Glazing**

Tinted glazing may be installed in all doors (non-reimbursable), windows (non-reimbursable), and windshields consistent with federal, state, and local regulations.

G. **Identification**

Buses with power lifts used for transporting individuals with disabilities shall display below the window line on the lift and rear doors the International Symbol of Accessibility. Such emblems shall be white on blue background,

shall not exceed 12 inches by 12 inches or be less than 4 inches by 4 inches in size, and shall be of a high-intensity reflectorized material meeting Federal Highway Administration (FHWA) FP-85 Standards.

H. **Passenger Capacity Rating**

In determining the passenger capacity of a school bus for purposes other than actual passenger load (e.g., vehicle classification or various billing/reimbursement models), any location in a school bus intended for securement of an occupied wheelchair/mobility aid during vehicle operations are regarded as four designated seating positions. Similarly, each lift area may be regarded as four designated seating positions.

I. **Power Lifts and Ramps**

1. The power lift shall be located on the right side of the bus body when not extended. Exception: The lift may be located on the left side of the bus if, and only if, the bus is primarily used to deliver students to the left side of one-way streets.

2. A ramp device may be used in lieu of a mechanical lift if the ramp meets all the requirements of the Americans with Disabilities Act (ADA) as found in 36 CFR §1192.23 Vehicle ramp.

3. A ramp device that does not meet the specifications of ADA but does meet the specifications delineated below may be installed and used, when, and only when, a power lift system is not adequate to load and unload students having special and unique needs. A readily accessible ramp may be installed for emergency exit use. If stowed in the passenger compartment, the ramp must be properly secured and placed away from general passenger contact. It must not obstruct or restrict any aisle or exit while in its stowed or deployed position.

4. All specially equipped school buses ~~vehicles covered by this standard~~ shall provide a level-change mechanism or boarding device (e.g., lift or ramp), complying with the Ramp Section with sufficient clearances to permit a wheelchair or other mobility aid user to reach a securement location.

J. **Vehicle Lifts & Installations**

1. Vehicle lifts and installations shall comply with the requirements set forth in FMVSS 403, Platform Lift Systems for Motor Vehicles, and FMVSS 404, Platform Lift Installations in Motor Vehicles.

2. The design load of the vehicle lift shall be at least 800 pounds. Working parts, such as cables, pulleys and shafts, which can be expected to wear, and upon which the vehicle lift depends for support of the load, shall have a safety factor of at least six, based on the ultimate strength of the material. Nonworking parts, such as platform, frame and attachment hardware that would not be expected to wear shall have a safety factor of at least three, based on the ultimate strength of the material.

3. The vehicle lifting mechanism and platform shall be capable of operating effectively with a wheelchair and occupant mass of at least 800 pounds.

4. Controls: (See 49 CFR 571.403, S6.7, *Control Systems*)

5. Emergency Operations: (See 49 CFR 571.403, S6.9, *backup Operation*)

6. Power or Equipment Failures: (See 49 CFR 571.403, S6.2.2, *Maximum Platform Velocity*)

7. Platform Barriers: (See 49 CFR 571.403, S6.4.2, S6.4.3, *Platform Requirements*) (See, also "Wheelchair or Mobility Aid Envelope" figure at the end of this section)

8. Platform Surface: (See 49 CFR 571.403,S6.4.2, S6.4.3, Platform Requirements) (See, also "Wheelchair or Mobility Aid Envelope" figure at the end of this subsection)

9. Platform Gaps and Entrance Ramps: (See 49 CFR 571.403, S6.4.4, *Gaps, Transitions, and Openings*)

10. Platform Deflection: (See 49 CFR 571.403, S6.4.5, *Platform Deflection*)

11. Platform Movement: (See 49 CFR 571.403, S6.2.3, *Maximum Platform Acceleration*)

12. Boarding Direction: The lift shall permit both inboard and outboard facing of wheelchair and mobility aid users.

13. Use by Standees: Lifts shall accommodate persons who are using other aids/devices other than a wheelchair (resulting in other than a seated position) who need to use to the lift. Such persons should use a wheelchair or other wheel-based mobility device for boarding or exiting the bus, and then should be transferred to a bus seat for the ride. During lift operations no one shall be allowed to stand on the lift platform, unless otherwise noted in an IEP or 504 in accordance with

an aide riding with a student on the lift. ~~walkers, crutches, canes or braces, or who otherwise have difficulty using steps. The platform may be marked to indicate a preferred standing position.~~ Note: This item refers to equipment specifications.

14. Handrails: (See 49 CFR 571.403, S6.4.9, *Handrails*)

15. Circuit Breaker: A resettable circuit breaker shall be installed between the power source and the lift motor if electrical power is used. It shall be located as close to the power source as possible, but not within the passenger/driver compartment.

16. Excessive Pressure: (See 49 CFR 571.403, S6.8 *Jacking Prevention*)

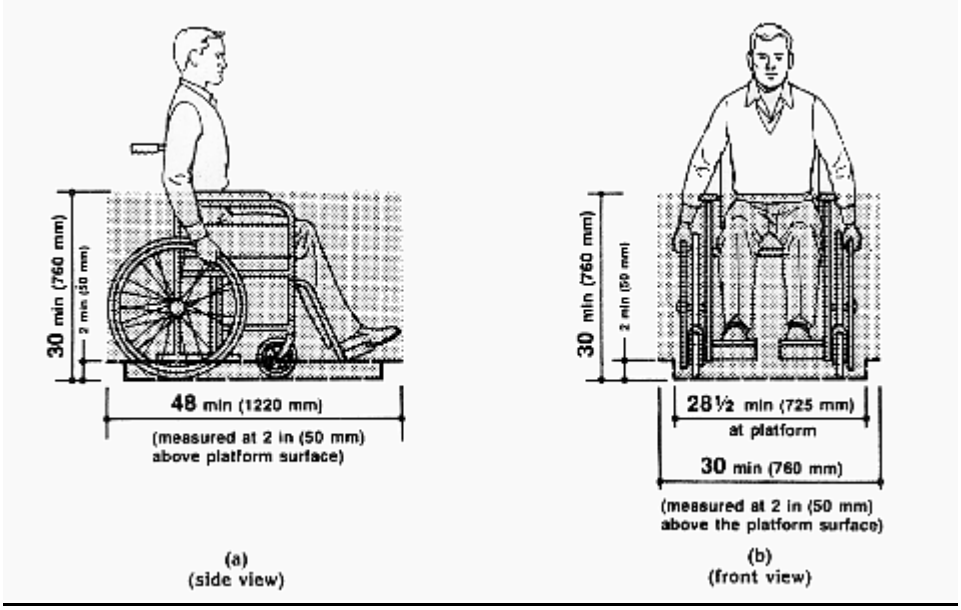
17. Documentation: the following information shall be provided with each vehicle equipped with a lift:

    a. A phone number where information can be obtained about installation, repair, and parts. (Detailed written instructions and a parts list shall be available upon request.)

    b. Detailed instructions regarding use of the lift shall be readily visible when the lift door is open, including a diagram showing the proper placement and positioning of wheelchair/mobility aids on the lift.

18. Training Materials: The lift manufacturer shall make training materials available to ensure the proper use and maintenance of the lift. These may include instructional videos, classroom curriculum, system test results or other related materials.

19. Identification and Certification: Each lift shall be permanently and legibly marked or shall incorporate a non-removable label or tag that states it confirms to all applicable requirements of the current National School Transportation Specifications and Procedures. In addition and upon request of the original titled purchaser, the lift manufacturer or an authorized representative shall provide a notarized Certificate of Conformance, either original or photocopied, which states that the lift system meets all the applicable requirements of the current National School Transportation Specifications and Procedures.



K. **Vehicle Ramp**

1. A ramp device may be used in lieu of a mechanical lift if the ramp meets all the requirements of the Americans with Disabilities Act (ADA) as found in 36 CFR §1192.23, Vehicle ramp.

2. A ramp device that does not meet the specifications of ADA, but does meet the specifications of paragraph 3 (a-d) of National School Transportation Specifications and Procedures (NSTSP of May 2010 Edition), this section, may be installed and used, when, and only when, a power lift system is not adequate to load and unload students having special and unique needs. A readily accessible ramp may be installed for emergency exit use.

3. If a ramp is used, it shall be of sufficient strength and rigidity to support at least 800 lbs. over an area of 26" x 26" ~~the special device, occupant and attendant(s)~~. It shall be equipped with a protective flange on each longitudinal side to keep the special device on the ramp.

4. The surface of the ramp shall be constructed of non-skid material.

5. The ramp shall be equipped with handles and shall be of weight and design to permit one person to put the ramp in place and return it to its storage place. It shall be stored outside the passenger compartment.

6. Ramps used for emergency evacuation purposes may be installed in raised floor buses by manufacturers. They shall not be installed as a substitute for a lift when a lift is capable of serving the need.

L. **Regular Service Entrance**

1. On power lift-equipped vehicles, the bottom step shall be the full width of the stepwell, excluding the thickness of the doors in open position.

2. In addition to the handrail required in the Bus Body and Chassis section, an additional handrail may be provided on all specially equipped school buses. This rail shall be located on the opposite side of the entrance door from the rail required in the Bus Body and Chassis section and shall meet the same requirements for handrails. ~~A suitable device shall be provided to assist passengers during entry or egress. This device shall allow for easy grasping or holding and shall have no openings or pinch points that might entangle clothing, accessories or limbs.~~

M. Restraining Devices

1. On power lift-equipped vehicles with a GVWR of 10,000 pounds or more, seat frames may be equipped with attachment points to which belt assemblies can be attached for use with child safety restraint systems (CSRSs) that comply with FMVSS No. 213, Child Restraint Systems. Any belt assembly anchorage shall comply with FMVSS No. 210, Seat Belt Assembly Anchorages. Seat frames may be equipped with attachments or devices to which belts, restraining harnesses or other devices may be attached. Attachment framework or anchorage devices, if installed, shall conform to FMVSS No. 210.

   a. Alternatively, a child restraint anchorage system that complies with FMVSS No. 225, *Child Restraint Anchorage Systems*, may be installed.

2. Belt assemblies, if installed, shall conform to FMVSS No. 209, Seat Belt Assemblies.

3. Child safety restraint systems, which are used to facilitate the transportation of children who in other modes of transportation would be required to use a child, infant, or booster seat, shall conform to FMVSS No. 213.

N. Seating Arrangements

Flexibility in seat spacing to accommodate special devices shall be permitted to meet passenger requirements. All seating shall be forward-facing, School Bus Passenger Seating and Crash Protection and meet requirements of FMVSS No. 222.

O. **Securement and Restraint System for Wheel Chair/~~Mobility Aid and Occupant~~ and Wheel Chair Seated Occupants**

1. For purposes of understanding the various aspects and components of this section, the term *securement and tiedown* and the phrases securement system or tiedown system are used exclusively in reference to the devices that anchor the wheelchair to the vehicle. The term *restraint* and the phrase *restraint system* are used exclusively in reference to the equipment that is intended to limit the movement of the wheelchair occupant in a crash or sudden maneuver. The term *wheelchair tiedown and occupant restraint system (WTORS)* is used to refer to the total system that secures the wheelchair and restrains the wheelchair occupant.

a. **WTORS—General Requirements**

b. A wheelchair tiedown and occupant restraint system installed in specially equipped school buses shall be designed, installed, and operated for the use with forward-facing wheelchair-seated passengers and shall comply with all applicable requirements of FMVSS 222, *School Bus Passenger Seating and Crash Protection*, and ~~Section 18 of ANSI/RESNA, *Wheelchair Standards*.~~ SAE J2249, Wheelchair Tie Down and occupant restraint systems for use in motor vehicles.

(1) The WTORS, including the anchorage track, floor plates, pockets or other anchorages, shall be provided by the same manufacturer or shall be certified to be compatible by manufacturers of all equipment/systems used.

(2) A device for storage of the WTORS shall be provided. When the system is not in use, the storage device shall allow for clean storage of the system, shall keep the system securely contained within the passenger compartment, shall provide reasonable protection from vandalism and shall enable the system to be readily accessed for use.

(3) The WTORS, including the storage device, shall meet the flammability standards established in FMVSS No. 302, *Flammability of Interior Materials*.

(4) The following information shall be provided with each vehicle equipped with a securement and restraint system:

(5) A phone number where information can be obtained about installation, repair, and parts. (Detailed written instructions and parts list shall be available upon request.)

(6) Detailed instructions regarding use, including a diagram showing the proper placement of the wheelchair/mobility aids and positioning of securement devices and occupant restraints, including correct belt angles.

(7) The WTORS manufacturer shall make training materials available to ensure the proper use and maintenance of the WTORS. These may include instructional videos, classroom curriculum, system test results or other related materials.

c. **Wheelchair Securement/Tiedown:** (See CFR 571.403, S5.4.1, S5.4.2)

Each wheelchair position in a specially equipped school bus shall have a minimum clear floor area of 30 inches laterally by 48 inches longitudinally. Additional floor area may be required for some wheelchairs. Consultation between the user and the manufacturer is recommended to insure that adequate area is provided.

d. **Occupant Restraint System:** (See CFR 571.403, S5.4.3, S5.4.4)

P. **Special Light**

Doorways in which lifts are installed shall have for use during lift operation a special light(s) providing a minimum of two foot-candles of illumination measured on the floor of the bus immediately adjacent to the lift.

Q. **Special Service Entrance**

1. Power lift-equipped buses shall have a special service entrance to accommodate the power lift.

Exception: If the lift is designed to operate within the regular service entrance, and is capable of stowing such that the regular service entrance is not blocked in any way, and that persons entering or exiting the bus are not impeded in any way, a special service entrance shall not be required.

2. The special service entrance and door shall be located on the right side of the bus and shall be designed so as not to obstruct the regular service entrance.

   Exception: A special service entrance and door may be located on the left side of the bus if, and only if, the bus is used primarily to deliver students to the left side of one-way streets and its use is limited to that function.

3. The opening may extend below the floor through the bottom of the body skirt. If such an opening is used, reinforcements shall be installed at the front and rear of the floor opening to support the floor and give the same strength as other floor openings.

4. A drip molding shall be installed above the opening to effectively divert water from entrance.

5. Door posts and headers at the entrance shall be reinforced sufficiently to provide support and strength equivalent to the areas of the side of the bus not used for the special service entrance.

R. **Special ~~Service~~ Entrance Doors**

1. A single door or double doors may be used for the special service entrance.

2. A single door shall be hinged to the forward side of the entrance unless doing so would obstruct the regular service entrance. If, due to the above condition, the door is hinged to the rearward side of the doorway, the door shall utilize a safety mechanism that will prevent the door from swinging open should the primary door latch fail. If double doors are used, the system shall be designed to prevent the door(s) from being blown open by the wind resistance created by the forward motion of the bus, and/or shall incorporate a safety mechanism to provide secondary protection should the primary latching mechanism(s) fail.

3. All doors shall have positive fastening devices to hold doors in the “open” position.

4. All doors shall be weather sealed.

5. When manually-operated dual doors are provided, the rear door shall have at least a one-point fastening device to the header. The forward-mounted door shall have at least three one-point fastening devices. One shall be to the header, one to the floor line of the body, and the

other shall be into the rear door. The door and hinge mechanism shall be of a strength that is greater than or equivalent to the emergency exit door.

6. Door materials, panels and structural strength shall be equivalent to the conventional ~~service~~ entrance and emergency doors. Color, rub rail extensions, lettering and other exterior features shall match adjacent sections of the body.

7. Each door shall have windows set in rubber that are visually similar in size and location to adjacent non-door windows. Glazing shall be of same type and tinting (if applicable) as standard fixed glass in other body locations.

8. Door(s) shall be equipped with a device that will actuate an audible or flashing signal located in the driver's compartment when door(s) is not securely closed and the ignition is in the "on" position.

9. A switch shall be installed so that the lifting mechanism will not operate when the lift platform door(s) is closed.

10. Special ~~service~~ entrance doors shall be equipped with padding at the top edge of the door opening. Padding shall be at least three inches wide and one inch thick and shall extend the full width of the door opening.

S. **Support Equipment and Accessories**

1. ~~Each bus which is set up to accommodate wheelchair/mobility aids or other assistive or restraint devices that utilize belts shall contain at least one belt cutter properly secured in a location within reach of the driver while belted into his/her driver's seat. The belt cutter shall be durable and designed to eliminate the possibility of the operator or others being cut during use.~~ In addition to the webbing cutter required in the BUS BODY AND CHASSIS section, each specially equipped school bus that is set up to accommodate wheelchairs or other assistive or restraint devices with belts attached shall contain an additional webbing cutter properly secured in a location to be determined by the purchaser. The belt cutter shall meet the requirements listed in the Bus Body and Chassis section.

2. Special equipment or supplies that are used on the bus for mobility assistance, health support or safety purposes shall meet any local, federal or engineering standards that may apply, including proper identification.

3. Equipment that may be used for these purposes includes, but is not limited to:

   a. Wheelchairs and other mobile seating devices. (See section on Securement and Restraint System for Wheelchair~~/Mobility Aid~~ and Wheelchair-seated Occupant.)

   b. Crutches, walkers, canes and other ambulating devices.

   c. Medical support equipment, which may include respiratory devices such as oxygen bottles (which should be no larger than 22 cubic feet for liquid oxygen and 38 cubic feet for compressed gas) or ventilators. Tanks and valves should be located and positioned to protect them from direct sunlight, bus heater vents or other heat sources. Other equipment may include intravenous and fluid drainage apparatus.

4. All portable equipment and special accessory items, including the equipment listed above, shall be secured at the mounting location to withstand a pulling force of five times the weight of the item or shall be retained in an enclosed, latched compartment. The compartment shall be capable of withstanding forces applied to its interior equal to five times the weight of its contents without failure to the box's integrity and securement to the bus. Exception: If these standards provide specific requirements for securement of a particular type of equipment, the specific standard shall prevail (e.g., wheelchairs).

T. **Technology and Equipment**

It is the intent of these specifications to accommodate new technologies and equipment that will better facilitate the transportation of students with special needs. New technology and equipment is acceptable for use in specially equipped vehicles if:

1. It does not compromise the effectiveness or integrity of any major safety system. (Examples of safety systems include, but are not limited to, compartmentalization, the eight-lamp warning system, emergency exits and the approved color scheme.)

2. It does not diminish the safety of the bus interior.

3. It does not create additional risk to students who are boarding or exiting the bus or are in or near the school bus loading zone.

4. It does not require undue additional activity and/or responsibility for the driver.

5. It generally increases efficiency and/or safety of the bus, generally provides for a safer or more pleasant experience for the occupants and pedestrians in the vicinity of the bus and/or generally assists the driver and makes his/her many tasks easier to perform.

STANDARDS FOR ALTERNATIVE FUELS

A. Introduction

This section is designed to be used as an overview of the alternative fuels being utilized for student school transportation. It is not designed to replace current applicable federal, state, manufacturing or safety specifications that may exceed requirements within this section. There may be advancements in engineering and improvements in equipment fabrication methods and operating practices that differ from those specifically called for in this section. Such deviations or improvements may provide safety and may meet the intent of, and be compatible with, this section. Entities wishing to purchase alternative fuel school buses should use this section only as a starting point. More detailed specifications, including specific design and performance criteria and safety specifications, should be researched by prospective purchasers of alternative-fuel school buses.

B. General Requirements

1. Alternative fuel school buses shall meet the following requirements:

   a. Chassis shall meet all standards previously mentioned in BUS CHASSIS STANDARDS.

   b. Chassis shall meet all applicable Federal Motor Vehicle Safety Standards (FMVSS).

   c. The fuel system integrity shall meet the specified leakage performance standards when impacted by a moving contoured barrier in accordance with test conditions specified in FMVSS No. 301 or FMVSS No. 303, as applicable.

   d. Original equipment manufacturers (OEMs) and conversion systems using compressed natural gas (CNG) shall comply with National Fire Protection Association (NFPA) Specification 52 A, “Compressed Natural Gas Vehicular Fuel Systems,” in effect at the time of installation. Fuel systems using liquefied petroleum gas (LPG) shall comply with NFPA Specification 58 A, “Liquefied Petroleum Gases Engine Fuel Systems” in effect at the time of installation.

   e. All alternative fuel buses shall be capable of traveling not less than 200 miles with a full load, except those powered by electricity shall be capable of traveling not less than 80 miles.

f. Natural gas-powered buses shall be equipped with an interior/exterior gas detection system. All natural gas-powered buses shall be equipped with an automatic or manual fire detection and suppression system.

g. All materials and assemblies used to transfer or store alternative fuels shall be installed outside the passenger/driver compartment.

h. All Types C and D buses using alternative fuels shall meet the same base requirements of BUS CHASSIS STANDARDS for passenger load.

i. The total weight shall not exceed the GVWR when loaded to rated capacity.

j. The manufacturer supplying the alternative fuel equipment must provide the owner and operator with adequate training and certification in fueling procedures, scheduled maintenance, troubleshooting and repair of alternative fuel equipment.

k. All fueling equipment shall be designed specifically for fueling motor vehicles and shall be certified by the manufacturer as meeting all applicable federal, state and industry standards.

l. All on-board fuel supply containers shall meet all appropriate requirements of the American Society for Mechanical Engineering (ASME) code, DOT regulations or applicable FMVSSs and NFPA standards.

m. All fuel supply containers shall be securely mounted to withstand a static force of eight times their weight in any direction.

n. All safety devices that discharge to the atmosphere shall be vented to the outside of the vehicle. The discharge line from the safety relief valve on all school buses shall be located in a manner appropriate to the characteristics of the alternative fuel. Discharge lines shall not pass through the passenger compartment.

o. A positive quick-acting (¼ turn) shut-off control valve shall be installed in each gaseous fuel supply line, as close as possible to the fuel supply containers. The valve controls shall be placed in a location easily operable from the exterior of the vehicle. The location of the valve control shall be clearly marked on the exterior surface of the bus.

p. An electrical grounding system shall be required for grounding of the fuel system during maintenance-related venting.

q. Bio-Diesel must conform to the specifications of ASTM 6751, *Biodiesel Standards*.

r. High voltage-powered school buses utilizing a high voltage propulsion system (more than 48 nominal volts) shall meet the requirements of FMVSS 305, except for the following:

(1) The propulsion power source (batteries, fuel cells, etc.) shall be located outside the passenger compartment.

(2) The propulsion power source enclosure shall be constructed to conform to the power source manufacturer's requirements and recommendations.

(3) Due to the much larger size and quantities of the propulsion power sources on large vehicles, buses over 10,000 lbs. are permitted to exceed the 5.0 liter spillage constraint of Section S5.1, "Electrolyte damage from propulsion batteries."

C. Characteristics of Alternative Fuels

1. For the purpose of this section, alternative fuels refer to the specific fuels listed below. A brief description of each fuel is shown. (See National School Transportation Specifications & Procedures Alternative Fuels Comparison Chart)

2. Note: Two other more exotic fuels are being examined, hydrogen and solar power. These two energy sources are in their infancy as alternative fuels for motor vehicles and are not covered within the scope of this section.

3. *Liquid Alternative Fuels:*

a. Methanol, a liquid at normal ambient temperatures, is colorless, and is made primarily from natural gas or coal. Extensive experiments have been conducted with automobile and truck engines powered by methanol. There are a number of urban transit bus fleets currently using methanol. California has experience with methanol as an alternative fuel for school buses through their School Bus Demonstration Project. The findings clearly determined methanol fuel to be costly to operate and unreliable. (Advantages

and disadvantages listed in National School Transportation Specifications and Procedures May 2010 – Alternative Fuels.)

b. Ethanol is a distilled agricultural alcohol product that is a liquid and is colorless at normal ambient temperatures. Corn is the current primary grain source. It has many of the same characteristics as methanol. Currently, ethanol is used primarily in a mixture with gasoline, usually no more than 10% ethanol.

c. Clean diesel was one of the alternative fuels approved in the Clean Air Act Amendments of 1990. The first step to be undertaken was further refining to reduce sulfur content and hence the significant particulate emissions caused by the sulfur. Significant advancement in this process has resulted in the development of ultra-low sulfur content diesel fuel. Refinery techniques can now produce diesel fuel with a sulfur content below 15 parts per million (PPM). The availability of this fuel supports the installation of an advanced exhaust after-treatment device in the form of a continuously regenerating trap (CRT). This CRT technology reduces the exhaust particulate content by approximately 90 percent from currently mandated levels (to essentially zero) and the hydrocarbons to an unmeasurable level (to essentially zero). Further steps are being developed to add cetane boosters, which increase efficient combustion. (Advantages and disadvantages listed in National School Transportation Specifications and Procedures May 2010 – Alternative Fuels.)

d. ~~Biodiesel is a fuel manufactured from vegetable oils, recycled cooking greases, or animal fats. The term "biodiesel" refers to the pure fuel. Biodiesel blends or BXX refers, to a fuel that is composed of XX% biodiesel and XX% diesel fuel. The City of Seattle, for example, has been using B20 which is 20% biodiesel blended with 80% low sulfur diesel. B100 is pure biodiesel. The diesel fuel can be No. 1 or No. 2. Biodiesel and biodiesel blends should only be used in compression-ignition engines that are designed to be operated on diesel fuel as described in ASTM 975 or related military specifications. Biodiesel or blends should never be put into a gasoline engine. Biodiesel fuel can be used in compression-ignition engines in cars, trucks, construction equipment, boats, generators, and in most other applications where diesel is typically used. Biodiesel fuel is renewable, is domestically produced and is commercially available in all fifty (50) states. It provides similar performance to diesel; has high cetane, high lubricity, high flash point, and is the safest of all fuels to store and handle. Biodiesel has the highest BTU content of any alternative fuel~~.

e. Reformulated gasoline is a specially blended fuel with the following properties: (1) lower vapor pressure that reduces evaporation during operation and refueling, and (2) more efficient combustion through the addition of high-octane oxygenates. Reformulated gasoline aromatic levels have been lowered, which provides less in the way of hydrocarbon tail pipe emissions. Reformulated gasoline (RFG) is required by the EPA in certain metropolitan areas. However, those areas are becoming fewer. (Advantages and disadvantages listed in National School Transportation Specifications and Procedures May 2010 – Alternative Fuels.)

4. *Gaseous Alternative Fuels:*

a. Natural gas is primarily methane as it comes from the well, and it burns quite cleanly in its unprocessed state. Natural gas has a higher ignition point (temperature) and a narrower fuel/oxygen mixture combustion range than other fuels. Energy is consumed in processing natural gas to achieve sufficient vehicle storage (i.e., compression or cryogenic processes). (See Compressed Natural Gas and Liquid Natural Gas below.) Natural gas is lighter than air in ambient conditions and does not pool on the ground, a condition that requires buildings used for indoor housing of natural gas vehicles to be adequately ventilated at the ceiling.

b. Compressed natural gas, or CNG, consists primarily of mixtures of hydrocarbon gases and vapors, consisting principally of methane (CH_4) in gaseous form, which is compressed for use as a vehicular fuel. (Advantages and disadvantages listed in National School Transportation Specifications and Procedures May 2010 – Alternative Fuels.)

c. Liquid natural gas, or LNG, utilizes the same natural gas source (primarily methane) as CNG, but requires purification of the gas and cooling and storage below -260 degrees Fahrenheit to liquefy the natural gas. Converting natural gas to liquid form provides storage of a much greater amount on the vehicle than can be achieved in the gaseous state. The process of liquefying the natural gas also yields almost pure methane gas with predictable performance characteristics. (Advantages and disadvantages listed in National School Transportation Specifications and Procedures May 2010 – Alternative Fuels.)

d. Propane, also known as Liquefied Petroleum Gas or LPG, is sometimes available directly from wells, but is normally produced as a by-product of the gasoline refining process. It has been used

for a number of years in light-duty commercial vehicles in urban areas around the world. (Advantages and disadvantages listed in National School Transportation Specifications and Procedures May 2010 – Alternative Fuels.)

e. Electric Power or the use of electricity as a power source for school buses is an emerging technology that is under considerable research due to the potential for reduced overall emissions. Research is centering on ways to increase the capacity and reduce the weight of batteries, as well as improving the motors used to power the vehicles and the associated electronics. Recharging technology is also developing rapidly. Most of these efforts have the goals of improving the range and performance of electric vehicles, reducing their cost and addressing operational concerns, such as recharging.

f. Hybrid electric and plug-in hybrid electric vehicles, while technically not an alternative fuel, are treated as such in most federal and state programs due to the novel approach to energy use. Straight hybrid electric vehicles are, by far, the largest and fastest growing sector of alternative fuel vehicles. Plug-in hybrid electric vehicles take advantage of the straight hybrid system, but also allow the user to precharge the battery packs to gain additional range and reduce combustion engine usage. (Advantages and disadvantages listed in National School Transportation Specifications and Procedures May 2010 – Alternative Fuels.)

g. Biodiesel is a fuel manufactured from vegetable oils, recycled cooking greases, or animal fats. The term “biodiesel” refers to the pure fuel. Biodiesel blends or BXX refers, to a fuel that is composed of XX% biodiesel and XX% diesel fuel. The City of Seattle, for example, has been using B20 which is 20% biodiesel blended with 80% low sulfur diesel. B100 is pure biodiesel. The diesel fuel can be No. 1 or No. 2. Biodiesel and biodiesel blends should only be used in compression-ignition engines that are designed to be operated on diesel fuel as described in ASTM 975 or related military specifications. Biodiesel or blends should never be put into a gasoline engine. Biodiesel fuel can be used in compression-ignition engines in cars, trucks, construction equipment, boats, generators, and in most other applications where diesel is typically used. Biodiesel fuel is renewable, is domestically produced and is commercially available in all fifty (50) states. It provides similar performance to diesel; has high cetane, high lubricity, high flash point, and is the safest of all fuels to store and handle. Biodiesel has the highest BTU content of any alternative fuel.

h. Clean diesel was one of the alternative fuels approved in the Clean Air Act Amendments of 1990. The first step to be undertaken was further refining to reduce sulfur contents and hence the significant particulate emissions caused by the sulfur. Significant advancement in this process has resulted in the development of ultra-low sulfur content diesel fuel. Refinery techniques can now produce diesel fuel with a sulfur content below 15 parts per million (PPM). The availability of this fuel supports the continuously regenerating filter, known as a diesel particulate filter, This technology reduces the exhaust particulate content by approximately 90 percent from currently mandated levels (to essentially zero). Further steps are being developed to add cetane booster, which increase efficient combustion. (Advantages and disadvantages listed in National School Transportation Specifications and Procedures May 2010 – Alternative Fuels.)

SCHOOL BUS WITHDRAWAL FROM SERVICE STANDARDS

The State Department of Education shall develop, maintain and periodically distribute out-of-service criteria (a matrix), the basis of which shall be the latest published document from the most recent National Conference on School Transportation. The Out-of-Service Matrix shall be subsequent to input from the Student Transportation Steering Committee and new school bus state inspectors, as needed. These standards are intended to ensure that all Idaho school buses are maintained in a safe manner. When inspection of a bus reveals a maintenance condition that is below an out-of-service standard it shall be the duty of the technician performing the inspection to remove the vehicle from service until the discrepancy has been corrected. These standards shall apply to both new and used buses and shall be the criteria used whenever an Idaho school bus is inspected. These standards are to be used whenever a 60-day, Annual or New School Bus Inspection is being performed by state inspectors or district, contractor, or outside contracted maintenance personnel. (33-1506, Idaho Code)

STANDARDS FOR STUDENT TRANSPORTATION OPERATIONS

A. Introduction

The success of any school transportation operation depends largely on the performance and degree of dedication displayed by those involved. The school bus is an extension of the classroom and as such, the ride to school should be safe, efficient in an atmosphere conducive to learning readiness. Open and honest communication between all stakeholders is vital for the success of the transportation program. Transportation is critical to the education process, and the school bus is the safest form of transportation. Therefore, transportation to and from school on a school bus shall be offered to all eligible students. Districts or the governing body responsible for pupil transportation shall have an eligibility policy, which takes safety into account, addressing distances from school for all age groups. If transportation eligibility is maximized, the result will be more students on buses.

B. School Travel Choices

1. Children in the United States travel to and from pre-school, school and related activities by a variety of modes. Administrators, parents and students often choose or encourage the use of modes of travel for reasons other than maximizing safety or minimizing risk (e.g., convenience, flexibility, and budget). **It is recommended that all school students be transported in a school bus.**

2. Each travel mode has its inherent risks, which vary from community to community, school to school and program to program, and any shifts from one mode to another can have a marked effect on the overall safety of travel for a particular community, school or program. The goal is to improve safety for all children traveling to and from pre-school, school and related activities and to provide communities with the information needed to make informed choices that balance their needs and resources.

C. Administration

1. In compliance with 33-1511, Idaho Code, the State Department of Education shall provide the following:

   a. Leadership in the development of a comprehensive student transportation program for statewide application.

b. A state supervisor of student transportation with the staff and resources necessary for optimal job performance.

c. A comprehensive school bus operator and school bus technician training program.

d. Frequent visits to local school districts and charter schools to audit, inspect, review and evaluate student transportation programs and financial systems (including reimbursement claim accuracy) and provide direction as necessary. Adequate frequency shall be defined as, at least once every three years.

e. The supervisor of student transportation, based upon results of program reviews, fiscal audits, and spot inspections as set forth in section 33-1506, Idaho Code, will provide school districts a list of required corrective actions, when necessary (33-1511, Idaho Code).

f. Follow-up visits to ensure implementation of corrective action plans. The supervisor of student transportation shall require school districts to submit progress reports on those corrective actions developed by the supervisor of school transportation to the state department of education at prescribed intervals until deficiencies are corrected or the corrective actions no longer apply (33-1511, Idaho Code).

g. The supervisor of student transportation may withhold all or a portion of a district's pupil transportation reimbursement funding in instances of noncompliance with the requirements of § 33-1511(6) or § 33-1506 Idaho Codes.

h. Managing the state's student transportation program to include planning, budgeting, and forecasting requirements for the operation.

i. Collecting and analyzing statistical and financial data.

j. Developing, preparing and organizing manuals, handbooks and written training programs for student transportation personnel.

D. Local School District Administration

1. The local district responsible for student transportation should supervise the overall transportation operation within the respective district.

2. Assign adequately trained staff responsible for implementing and/or supervising a comprehensive student transportation program.

3. Ensure compliance with federal and state student transportation laws, regulations and policies, including drug/alcohol testing programs as required in the Omnibus Transportation Employee Testing Act of 1991, and in compliance with 49 CFR, Parts 40 and 382.

E. Written Policies

1. In compliance with 33-1501 through 33-1512, Idaho Code, the local board of trustees will establish and adopt a set of written policies governing the student transportation system, including policies for disabled students. Contracting school districts shall ensure compliance to written policies by student transportation contractors. The district's written policies shall, at a minimum, include:

   a. Student transportation operations, including participation in training programs for all transportation personnel.

   b. The evaluation of school bus routes and the periodic evaluation of student transportation personnel. The transportation supervisor or the district's school bus driver trainer shall evaluate a minimum of once per year each route and each driver for the purpose of assessing driver performance and the safety of routes and bus stops (*National School Transportation Specifications & Procedures, Identification and Evaluation of School Bus Route and Hazard Marking Systems*). The time schedule for pickup and delivery of children shall be followed as accurately as possible. Documentation of the driver and route evaluation shall be retained in the driver's personnel file. The State Department of Education shall develop and maintain model evaluation procedures and forms.

   c. The investigation and reporting of accidents and other transportation problems. Drivers shall report all school bus accidents to local school authorities and the appropriate law enforcement agency in accordance with Title 49, Chapter 13 of Idaho Code. Subsequent to the accident or incident, a Uniform School Bus Accident/Injury or appropriate Incident Report Form shall be completed by the driver or transportation supervisor and submitted to the State Department of Education within fifteen (15) days.

   d. Providing supervision of loading and unloading areas at or near schools during unloading and loading of school buses. School districts shall provide an adequate number of supervisors for the

size of the loading area and number of students present and ensure close, continuous and interactive supervision whenever students and/or buses are present in the loading area.

e. ~~Providing emergency training and periodic evacuation drills for students and drivers in accordance with National Highway Safety Program Guideline 17. Documentation of all evacuation drills shall be maintained for a period of three years by the school district in either a batch file or in the driver's individual file.~~ Ensure that instruction in passenger safety, including student participation in emergency evacuation drills, is an integral part of the school curriculum. Instruction should comply with state requirements and/or Federal Highway Safety Guideline 17 and with 45 CFR 1310, as may be applicable. Instruction should include, but not be limited to, the following:

(1) At least once each school semester, provide all students transported to and from schools in a school bus or multifunction school activity bus with instruction in the location and operation of all emergency exits. Also, provide supervised emergency exit drills to each student transported to or from schools in a school bus or multifunction school activity bus.

(2) Before departure on each activity trip, provide all students transported in a school bus, school-chartered bus or multifunction school activity bus instruction on the location of all emergency exits and demonstrations of their operation. Instruction should include a general review of safe riding practices, rules and procedures.

(3) Limit the amount of carry-on items, especially large items such as luggage, coolers, sports/band equipment, etc., in school buses, school-chartered buses or multifunction school activity buses. Aisles and emergency exits in school buses, school-chartered buses and multifunction school activity buses must be kept clear at all times. Any item that is brought on board must be safely stowed and secured away from any aisle or emergency exit.

f. ~~Promoting public understanding of, and support for, the student transportation program in general.~~ Provide the necessary library of resources to ensure that transportation personnel have the proper tools to operate a safe and efficient program. These resources include, but are not limited to:

(1) Applicable federal, state and local laws, codes and regulations.

(2) Applicable manuals and guidelines.

(3) On-line connectivity for access to all internet and other resources.

(4) Applicable trade journals and organizations' publications.

g. Provide contract management (if applicable). If a private carrier is utilized in a school transportation operation, it is imperative that a clear partnership is established with all parties. Clear expectations and contract review, along with on-going training, communication and practice/procedure development should be developed with a working partnership in mind.

F. Personnel Qualifications and Training

1. In compliance with Federal Motor Carrier Safety Administration Regulations (Part 383) and 33-130, 33-1508 and 33-1509, Idaho Code, the local board of trustees/administration will establish and adopt a set of written prerequisite qualifications and job descriptions governing student transportation personnel, which shall, at a minimum, include:

a. Completion of an application form, which includes a personal and occupational history.

b. A satisfactory driving record as revealed through pre-employment and annual checks with the state driver licensing division.

c. A satisfactory work history as verified through professional references.

d. The ability to manage resources, students and personnel necessary to achieve a desired objective.

2. **Insulin-Treated Diabetes Mellitus**

a. In compliance with Federal Motor Carrier Safety Administration Regulations (Parts 381 and 383) and 33-1509, Idaho Code, the State Department of Education Student Transportation Section will establish an exemption process governing student transportation personnel diagnosed with insulin-treated diabetes mellitus (ITDM). In considering exemptions, the Department must ensure that the issuance of diabetes exemptions will not be contrary to the public interest and that the exemption achieves an acceptable level of safety. Therefore, the Department will only consider granting exemptions to ITDM individuals who meet certain conditions and who submit the following information and documentation:

(1) Number of years driving school bus.

(2) Approximate number of miles per year driving school bus.

(3) Estimated number of miles driven per week.

(4) Estimated number of daylight driving hours per week.

(5) Estimated number of nighttime driving hours per week.

(6) Supporting documentation of current Commercial Drivers License to drive school bus issued by the State of Idaho.

(7) Supporting documentation certifying applicant has operated a commercial motor vehicle (CMV) with a diabetic condition controlled by the use of insulin while under the care of a endocrinologist (may have consulting relationship with driver's personal physician) familiar with the treatment and monitoring of Diabetes Mellitus.

(8) Idaho Transportation Department driving record (for the three-year period immediately preceding application) containing no suspensions or revocations, no involvement in an accident for which the applicant received a citation for a moving traffic violation while operating a CMV, no involvement in an accident for which the applicant contributed to the cause of the accident, and no convictions for a disqualifying offense or more than one serious traffic violation, as defined in 49 CFR 383.5, while operating a CMV.

(9) Supporting documentation certifying no other disqualifying conditions including diabetes related complications.

(10) Supporting documentation certifying no recurrent (two or more) hypoglycemic reactions resulting in a loss of consciousness or seizure within the past five years. A period of one year of demonstrated stability is required following the first episode of hypoglycemia.

(11) Supporting documentation certifying no recurrent hypoglycemic reactions requiring the assistance of another person within the past five years. A period of one year of demonstrated stability is required following the first episode of hypoglycemia.

(12) Supporting documentation certifying no recurrent hypoglycemic reactions resulting in impaired cognitive function that occurred without warning symptoms within the past five years. A period of one year of demonstrated stability is required following the first episode of hypoglycemia.

(13) Supporting documentation certifying the applicant has been examined by a board-certified or board-eligible endocrinologist (who is knowledgeable about diabetes) who has conducted a complete medical examination. The complete medical examination must consist of a comprehensive evaluation of the applicant's medical history and current status with a report including:

- The date insulin use began;
- Diabetes diagnosis and disease history;
- Hospitalization records;
- Consultation notes for diagnostic examinations;
- Special studies pertaining to the diabetes;
- Follow-up reports;
- Reports of any hypoglycemic insulin reactions within the last five years;
- Two measures of glycosylated hemoglobin, the first 90 days before the last and current measure;
- Insulin dosages and types, diet utilized for control and any significant factors such as smoking, alcohol use, and other medications or drugs taken; and
- Examinations to detect any peripheral neuropathy or circulatory insufficiency of the extremities.

(14) Submits a signed statement from an examining endocrinologist indicating the following medical determinations:

- The endocrinologist is familiar with the applicant's medical history for the past five years, either through actual treatment over that time or through consultation with a physician who has treated the applicant during that time;

- The applicant has been using insulin to control his/her diabetes from the date of the application back to the date driving experience began or the previous three years, whichever is less;

- The applicant has been educated in diabetes and its management, thoroughly informed of and understands the procedures which must be followed to monitor and manage his/her diabetes and what procedures should be followed if complications arise; and

- The applicant has the ability and has demonstrated willingness to properly monitor and manage his/her diabetes.

(15) Submits a separate signed statement from an ophthalmologist or optometrist that the applicant has been examined and that the applicant does not have diabetic retinopathy and meets the vision standard at 49 CFR 391.41(b) (10), or has been issued a valid medical exemption. If the applicant has any evidence of diabetic retinopathy, he or she must be examined by an ophthalmologist and submit a separate signed statement from the ophthalmologist that he or she does not have unstable proliferative diabetic retinopathy (i.e., unstable advancing disease of blood vessels in the retina).

b. There are special conditions attached to the issuance of any exemption for ITDM. The Department will impose the following requirements:

(1) Individuals with ITDM shall maintain appropriate medical supplies for glucose management while preparing for the operation of a CMV and during its operation. The supplies shall include the following:

- An acceptable glucose monitor with memory;

- Supplies needed to obtain adequate blood samples and to measure blood glucose;
- Insulin to be used as necessary; and
- An amount of rapidly absorbable glucose to be used as necessary.

c. Prior to and while driving, the individual with ITDM shall adhere to the following protocol for monitoring and maintaining appropriate blood glucose levels:

(1) Check glucose before starting to drive and take corrective action if necessary. If glucose is less than 100 milligrams per deciliter (mg/dl), take glucose or food and recheck in 30 minutes. Do not drive if glucose is less than 100 mg/dl. Repeat the process until glucose is greater than 100 mg/dl;

(2) While driving check glucose every two to four hours and take appropriate action to maintain it in the range of 100 to 400 mg/dl;

(3) Have food available at all times when driving. If glucose is less than 100 mg/dl, stop driving and eat. Recheck in 30 minutes and repeat procedure until glucose is greater than 100 mg/dl; and

(4) If glucose is greater than 400 mg/dl, stop driving until glucose returns to the 100 to 400 mg/dl range. If more than two hours after last insulin injection and eating, take additional insulin. Recheck blood glucose in 30 minutes. Do not resume driving until glucose is less than 400 mg/dl.

d. In addition to the requirements for controlling ITDM, the Department will monitor exemption recipients during the period that the exemption is valid. The Department will conduct monitoring by requiring the exemption recipients to submit the following information to the Idaho State Department of Education Student Transportation Section:

(1) Provide written confirmation from the endocrinologist on a quarterly basis:

- The make and model of the glucose monitoring device with memory; and

- The individual's blood glucose measurements and glycosylated hemoglobin are generally in an adequate range based on daily glucose measurements taken with the glucose monitoring device and correlated with the daily records of driving time and a current measurement of glycosylated hemoglobin.

(2) Submit on an annual basis, a comprehensive medical evaluation by an endocrinologist. The evaluation will include a general physical examination and a report of glycosylated hemoglobin concentration. The evaluation will also involve an assessment of the individual's willingness and ability to monitor and manage the diabetic condition.

e. Provide on an annual basis confirmation by an ophthalmologist or optometrist that there is no diabetic retinopathy and the individual meets the current vision standards at 49 CFR 391.41(b) (10). If there is any evidence of diabetic retinopathy, provide annual documentation by an ophthalmologist that the individual does not have unstable proliferative diabetic retinopathy.

f. Submit annual documentation by an endocrinologist of ongoing education in management of diabetes and hypoglycemia awareness.

g. Report all episodes of severe hypoglycemia, significant complications, or inability to manage diabetes.

h. Report any involvement in an accident or any other adverse event whether or not they are related to an episode of hypoglycemia.

i. School bus drivers applying for ITDM exemption should refer to Federal Highway Administration Diabetes Waiver Program – Appendix A.

3. *School Bus Driver Training*

a. All new school bus drivers will complete a prior-approved school bus driver training program, which shall include documented knowledge and skill tests, as well as ten (10) inclusive hours of behind-the-wheel and/or route observation, before being allowed to drive a school bus loaded with students. As a support to school

district personnel, the State Department of Education shall develop and maintain model classroom and behind-the-wheel training curricula incorporating nationally recognized driver training methods and resources. (Sections 33-1508; 33-1509; 33-1511, Idaho Code)

b. All experienced school bus drivers will complete at least ten (10) hours refresher school bus driver training each fiscal school year. At least three (3) hours of pre-service training shall be provided before school begins in the fall. In addition, at least three (3) in-service training sessions shall be provided during the school year utilizing, at a minimum, thirty (30) minute, topic specific and documented, training blocks.

c. School districts shall request documentation of all previous school bus driver training and driving experience, in accordance with Federal Motor Carrier Safety Administration CDL licensing requirements. Documentation of previous training, similar to State Board of Education training requirements, may be used to comply with new school bus driver training hours. Regardless of any previous out-of-district training, all newly hired school bus drivers shall have sufficient training provided by the hiring district or contractor, along with accompanying documentation, illustrating proficient school bus driving skills. If the district is unable to obtain documentation of previous school bus driver training, the individual shall complete the training requirements for new school bus drivers. If the applicant has gaps in excess of four years of ongoing school bus driving experience, the individual shall complete the training requirements for new school bus drivers.

4. *Student Transportation Personnel File*

a. Each district that operates or contracts student transportation services shall cause to have filed for each school bus driver, in a secure area with limited access, the following information: (33-1506, 33-1508 and 33-1509, Idaho Code)

(1) Copy of original application to drive school bus.

(2) Copy of current original physical examination form, along with any applicable waivers.

(3) ~~Historical record of all topic specific school bus driver training supported by a training program agenda.~~ Historical training records should contain, at a minimum, accurate information certifying attendance and satisfactory completion of all state, or district and or company required training. Details about all topic

specific school bus drivers training supported by a training program agenda, including the number of hours of instruction, date of instruction, instructor and drivers signature. The following is a list of minimum training to be documented:

- Classroom Training
- Pre-service
- In-Service
- Behind-the-wheel training

(4) Copy of current commercial driver's license.

(5) Copy of annual driving record check in compliance with CDL licensing requirements. The district shall request each fiscal year a driving record check report from the Idaho (or neighboring state or both states, as applicable) State Transportation Department, Motor Vehicles Division, for those individuals who are going to drive a school bus during the current fiscal school year.

(6) Copy of all annual driver and route evaluations. New drivers shall have a driver evaluation before being allowed to drive a school bus loaded with students.

(7) Copies of a driver emergency evacuation drills shall be maintained for a period of three years.

5. *Student Transportation Maintenance and Service Personnel*

a. Each district that operates or contracts student transportation services shall perform maintenance functions on a timely basis consistent with safe transportation and work environments. (33-1506, Idaho Code)

b. The SDE Student Transportation Section shall develop and maintain student transportation staffing guidelines designed to promote efficiency and cost containment. These guidelines shall be for informational purposes. School districts shall not be financially penalized when falling outside SDE staffing guidelines.

G. **Vehicle Operation**

1. All school districts and school bus drivers must meet all operations and performance requirements in conformity with law and with rules and regulations of the Department of Law Enforcement and the State Board of Education (33-1508, Idaho Code). The Board of Trustees or

its designee shall be responsible for delineating in writing vehicle operations and the duties of bus drivers, which shall, at a minimum, include:

a. The driver shall ensure the safe condition of the school bus by conducting an initial and thorough daily pre-trip school bus inspection. The district shall provide drivers with a pre-trip inspection form. The State Department of Education shall develop and maintain a model pre-trip inspection form using nationally recognized criteria for the school bus pre-trip inspection. Each subsequent trip shall require an additional pre-trip school bus inspection, which at a minimum shall ensure that all safety equipment is in working order, i.e., brakes, tires, lights, steering and horn. All defects shall be reported by the school bus driver.

b. A school bus shall be backed only as a last resort. Buses shall not back to turn around on a public roadway, unless the local board finds there is no alternative to backing buses on certain roads. The local board then, by official action, may allow backing of school buses on certain public roadways. (33-1502, Idaho Code)

c. No passenger shall be permitted to operate the school bus.

d. The school bus driver shall not allow guns or inflammable or explosive substances such as gasoline to be carried on a school bus. School districts shall develop policy identifying other perceived unsafe items prohibited from being transported in the passenger compartment of a school bus, such as skis, skateboards, large instruments, etc. Students are to only carry objects on to the bus that can fit safely within the seat compartment, preferably on the student's lap. The student shall not carry hazardous materials, objects, or potentially disruptive animals on the bus.

e. School bus drivers shall properly wear a seat belt whenever the bus is in motion.

f. School bus doors shall remain closed while the bus is in motion. No school bus shall start in motion before all passengers have been seated. The driver shall require each passenger on the bus to be seated in a manufacturer's school bus passenger seat. No student shall be allowed to stand while the bus is in motion.

g. School districts shall establish school bus stops in safe locations with at least one hundred (100) yards clear visibility in both directions, whenever possible, and at least forty (40) feet from intersections, whenever possible. No bus stop shall be established

less than one and one-half (1 1/2) miles from the nearest appropriate school except when, in the judgment of the Board of Trustees, the age or health or safety of the student warrants. (Sections 33-1501 and 33-1502, Idaho Code)

h. All school buses shall stop to load/unload passengers at designated bus stops in accordance with the law (49-1422, Idaho Code). The State Department of Education shall maintain model student loading/unloading training curriculum, the basis of which shall be in conformity with nationally recognized procedures (*National School Transportation Specifications & Procedures*). The student shall not leave or board the bus at locations other than the assigned home stop or assigned school unless arrangements for doing so have been approved by appropriate authority. Appropriate authority and the approval process shall be defined in local district policy.

i. School bus drivers shall load and unload from the right side of the roadway. School bus drivers shall not allow students to cross roadways having more than three (3) lanes for purposes of loading or unloading and shall only load or unload students who live on the right side of such a roadway, except at locations having easily accessible traffic control signals. (49-1422, Idaho Code)

j. When it is necessary for the student to cross the roadway, the driver shall require the student to cross ~~ten (10)~~ twelve (12) feet in front of the bus in accordance with state loading/unloading training curriculum.

k. School bus drivers shall report the license number of any vehicle, which violates any law endangering school children to his/her immediate supervisor (33-1509, Idaho Code).

l. Student transportation operations shall be included in the district's crises planning and related training shall be provided to school bus drivers related to district crises plans. School bus drivers shall remain vigilant and report suspicious behavior or conditions which could become harmful to students or be indicative of impending acts of terror. School bus drivers shall be provided training in homeland security awareness.

m. A driver on a school bus route shall not leave an occupied bus. In case of a breakdown the driver shall request assistance via two-way communication whenever possible. Otherwise, the driver should ask a passing motorist to make contact with the district,

send a school bus aide or at least two responsible students to make contact with the district, or wait for help.

n. Whenever it is necessary for the school bus driver to leave an unoccupied bus or leave the driver's seat of an occupied bus, he/she should shut off the motor, curb the wheels where appropriate, set the brakes and remove the ignition key.

o. The school bus driver shall give consideration to engine idling during extended wait times. Consideration should be given to varying climate conditions. All buses equipped with an auxiliary heater shall not be allowed to idle for more than three to five consecutive minutes. (Exceptions: pre-trips, passenger stops, etc.) Heater shall be used to provide pre-heated water in the cooling system for starting cold engines as well as providing heat to the passenger compartment during cold weather without running the engine. Reduced idling will reduce student transportation costs and improve air quality. Allowing engines to idle for more than three minutes may cause districts (including contracted districts) to lose funding for purchasing fuel.

p. All school and activity buses shall stop at all railroad grade crossings in accordance with the law (33-1508; 49-648 and 49-649 Idaho Codes). The State Department of Education shall develop and maintain railroad grade crossing training curriculum, the basis of which shall be in conformity with nationally recognized procedures (*National School Transportation Specifications & Procedures*).

q. School districts shall limit on-duty and driving time of school bus drivers similar to the limitations imposed by the Federal Motor Carrier Safety Administration regulations for drivers of similar commercial motor vehicles. Drivers shall use FMCSA over-the-road hours-of-service trip logs, a trip agenda, or other trip documentation validating applicable driving hours on all out-of-district trips in excess of one-hundred (100) miles (*FMCSA Regulations, Hours of Service of Drivers*).

r. At no time shall a driver exceed sixty-five (65) miles per hour or a lesser posted speed limit.

H. Student Management

1. Student transportation is another component in the school district's overall education program. An effective student transportation management program must have the support of the school district administration,

school bus drivers, students, and parents. Each school district should institute a comprehensive student-management program that is designed to share the responsibility for student safety and well-being, as well as protecting the interests of all others involved in the program.

2. Every school district which operates a student transportation system shall have a written policy which sets forth the student's right to "due process" when disciplinary action is taken and defines the duties and responsibilities of students when taking advantage of student transportation. The school district's student transportation student management policy, including the duties and responsibilities of students, teachers and drivers shall be in concert with the district's written classroom policies. (33-512, Idaho Code)

3. School bus drivers shall establish proper rapport with students. Drivers should instruct students in appropriate behavior in accordance with the district's student management policy. Drivers should be aware that they represent the school system and present a positive image in dress, language, and manner.

4. The State Department of Education shall develop and maintain model student management guidelines, suggested rules and regulations in its school bus driver training curriculum.

I. Student Eligibility

1. *Eligible Students*

a. Student eligibility for state funded student transportation services is defined in 33-1501 ~~and~~, 33-1502, and 33-5208 Idaho Code.

b. A student with disabilities who's Individualized Education Plan (IEP) requires transportation is eligible for transportation as a related service (IDEA) under the Student Transportation Support Program regardless of distance from the school.

c. It is the aim of the State Department of Education, in keeping with the "inclusion" concept, to arrange transportation for the student with disabilities as closely as possible to that of the student without disabilities. Whenever possible, students with disabilities will ride with students without disabilities on regular routes.

d. Students who attend school at an alternate location as assigned by the local board of trustees may be expected to walk reasonable distances between schools (33-1501, Idaho Code). Transporting

or shuttling students between schools or buildings in conjunction with non-reimbursable programs is a non-reimbursable expense and all such mileage shall be documented and tracked as non-reimbursable shuttle miles.

2. *Ineligible Students*

a. An ineligible student shall be defined as any properly enrolled public school student who does not otherwise meet ridership eligibility by virtue of school or district boundary, distance, age, health, or safety.

b. If a school district allows ineligible but properly enrolled public school students on a bus and their presence does not create an appreciable increase in the cost of the bus run, as determined by the State Department of Education (in computing to and from school state allocations), the district shall not be penalized.

c. Ineligible students may ride existing bus runs, and to and from an existing bus stop, on a "space available" basis provided that neither time, mileage, or other appreciable cost is added as a result of this service. Ineligible students shall be reported as such on the bus ridership count report and are not eligible for additional rider count funding.

d. Properly enrolled students living in district of residence but attending school in a non-resident district, under the provisions of 33-1402, Idaho Code (enrollment options), may be transported; however, all related “yellow school bus” mileage shall be reported as non-reimbursable. Exceptions shall be permitted when transporting student(s) to out-of-district school demonstrates cost effectiveness, as determined by the State Department of Education, in which case the related mileage shall be reported as reimbursable. Other exceptions include but are not limited to, mileage related to provisions of the McKinney-Vento Homeless Assistance Act and the “No Child Left Behind Act (NCLB)” in concert with Idaho’s Academic Yearly Progress Plan (when school districts opt to provide transportation services to a neighboring school district). In any event, cooperative written agreements, as detailed in 33-1402, Idaho Code, shall be required.

3. *Non-Public (Private or Parochial) School Students*

The cost of transporting non-public school students must be deducted when submitting the transportation reimbursement claim. Each school district must recover the full cost of transporting non-

public school students, and in no event may that cost be determined to be zero (0). (Section 33-1501, Idaho Code)

4. *Non-Student Rider*

A non-student rider shall be defined as any transported person who is not properly enrolled in a pre-K through twelve school program. Each school district must recover the full cost of transporting non-students, except that dependent children of young mothers who are properly enrolled in a public school program, SDE student transportation staff, district supervisory personnel and/or administrators and aides may ride on to and from school bus routes. Other persons and teachers who have officially been appointed as chaperones may be allowed on a school bus for field and extracurricular trips. If the local district policy allows, exceptions may be made for passengers other than properly enrolled school students to ride the bus when special circumstances exist and space is available. An appropriate authority must give prior permission before non-students may ride. No eligible transported student is to be displaced or required to stand in order to make room for an ineligible, non-public, or non-student rider.

J. Student Transportation Support Program – Financial Reporting

1. Each school district operates motor vehicles of many sizes and types, such as school buses, small and large trucks, cars for administration and driver education, pickups, delivery vans, and other miscellaneous small motor vehicles. All school district vehicle operating costs must be charged to the appropriate individual account or accounts according to their use. Costs for transporting eligible students to and from school or related activities shall be accounted for separately in accordance with State Board of Education approved procedures. (33-1006, Idaho Code)

2. Accurate mileage records shall be kept for reimbursable and non-reimbursable programs so eligible and non-eligible miles can be accurately determined. No indirect costs are allowed. Financial supporting documents shall be maintained throughout the fiscal year for each program category for audit purposes.

3. Annual odometer readings (end of day June 30 or start of day July 1) on all district owned or contracted “yellow school buses” used to transport students to and from school or related activities shall be annually submitted to the State Department of Education upon

request. No "yellow school bus" used to transport public school students shall be excluded.

4. School districts shall annually report all miles linked to a "yellow school bus" as reimbursable or non-reimbursable on Schedule C of the Student Transportation Reimbursement Claim Form.

5. Revenues generated from the use or lease of a district owned "yellow school bus" shall be reported as follows:

   a. When the revenues correlate to reported "reimbursable" miles and their related costs, the revenue shall be reported on the student transportation reimbursement claim form under revenues received.

   b. When the revenues correlate to reported "non-reimbursable" miles and their related costs, the revenue shall not be reported.

6. Each school district that operates a student transportation system will maintain accurate records of operations including runs, run mileage, categorized bus mileage, student rider counts and other related costs on uniform record-keeping forms provided by the Department of Education.

7. The Department of Education Student Transportation Section shall conduct on-site spot inspections of school district student transportation operations at a frequency adequate to ensure compliance with state law, accuracy of data and reimbursement claims, and safety of school buses. Priority for selecting districts for review and audit shall be given to those districts that exceed both the most recent annual state average reimbursable cost per mile and the state average reimbursable cost per rider as calculated by the Department, unless the supervisor of student transportation determines otherwise (33-1511, Idaho Code). Adequate frequency shall be defined as, at least once every three years.

8. The Department of Education Student Transportation Section shall, subsequent to on-site review and spot inspection, provide school district with a list of required corrective actions, as necessary. School districts shall submit to the Department written corrective action plans at prescribed intervals until deficiencies are corrected or the corrective action no longer applies (subject to the provisions of 33-1511, Idaho Code).

9. The Department shall annually review school district student transportation claims and make available analyses of reported and adjusted costs, including specific cost trends, to individual school

districts and charter schools in a secure website location or published document.

10. Information will be made available to the Department of Education for audit purposes upon request. Information will be compiled and retained for a minimum of four (4) years, including the current fiscal year, in the following areas: (Section 33-1006, Idaho Code)

K. Administrative and Program Operation Costs

1. The school district administrative reimbursement will be seven and one half percent (7.5%) of all approved reimbursable operation costs for transporting pupils except administration costs, depreciation, and contracted services, as reported to the State Department of Education on the Annual Pupil Transportation Claim for Reimbursement (Schedule B); or

2. Actual administrative costs, program operation costs, operation of plant, maintenance of plant, fixed costs, and other pupil transportation costs identified in 33-1006, Idaho Code, which are directly related, charged and reported as transportation costs to the State Department of Education on the Annual Student Transportation Claim for Reimbursement (Schedule A).

3. Districts will be permitted flexibility in scheduling bus routes; however, before-school and after-school activity or other program busing that result in duplicating transportation service to a geographic area is not reimbursable, except that the Idaho Reading Indicator (IRI) shall be reimbursable under the Pupil Transportation Support Program. Transportation costs for other before-school and after-school academic programs may be reimbursable and will be considered on a case-by-case basis when specific written requests for consideration are submitted to the State Department of Education on or before March 31 of the school year in which the busing began.

4. All academic and activity summer programs will be non-reimbursable under the Student Transportation Support Program, except transportation costs for Migrant Summer School, the Idaho Reading Indicator (IRI), and Extended School Year (ESY) Special Needs programs will be reimbursable.

5. The State Department of Education shall develop support staffing (supervisor, driver trainer, secretary/dispatcher, etc.) and school bus inventory guidelines for school district student transportation operations.

6. The district will maintain accurate records of all bus routes and runs, including rider counts, mileage and other related operation and vehicle maintenance costs (33-1006, Idaho Code). A "route" is defined as anything one bus does during the morning (a.m. route), midday (noon route), or afternoon (p.m. route) and may be comprised of one or more morning, midday, or afternoon to –from school "run(s)." The Department shall require school districts to submit ~~annually~~ triannually a data specific "~~run~~ route report" including but not limited to, number of riders ~~and percent occupancy~~. Additionally, for purposes of equity and accuracy, school districts shall take ridership counts on specific dates and frequency (minimum of ten counts per school year) annually set by the Department, which shall be reported and submitted in a format approved by the Department.

7. If the local board of trustees authorizes the use of school buses to transport students to and from school-sponsored activities or field trips, the local board will use school buses that are in safe mechanical condition. No school bus shall be operated, loaded, or equipped in such a way as to constitute a hazard to the safety of the students being transported. School bus emergency egress systems shall remain operable and the bus aisle shall remain clear of obstruction while students are being transported. (33-1506, Idaho Code)

8. If the local board of trustees authorizes the use of non-conforming vehicles to transport students to and from school-sponsored activities or field trips, the local board will use vehicles that are in safe mechanical condition. No non-conforming vehicle shall be operated, loaded, or equipped in such a way as to constitute a hazard to the safety of the students being transported.

9. The district shall maintain accurate records of all trips in all school buses and non-conforming vehicles used in the transportation of students and transportation personnel, including the purposes of the trip, mileage and operation and vehicle maintenance costs. An annual odometer reading will be taken at the end of each fiscal school year (June 30) on all district owned vehicles used in the transportation of students. The district shall reconcile annual mileage reports with all recorded reimbursable and non-reimbursable program miles. School districts that contract for student transportation services shall report all reimbursable and non-reimbursable program miles. The district shall maintain accurate mileage records of all trips in all district owned non-conforming vehicles used for shuttling school bus drivers to and from their school buses for purposes of efficiency and cost containment. The district shall maintain accurate mileage records of all trips in all district-owned shop trucks and

supervisor/trainer cars used in support of yellow school buses to repair school buses, deliver parts, and check road/route/bus stop conditions. Support mileage will be tracked separately and reimbursed at the State Board of Examiners rate established at the beginning of each school year. Mileage for transportation personnel home-to-work-to-home that is not cost effective in lieu of using a bus for home-to-work-to-home; or mileage in vans or other non-conforming vehicles used to transport students is non-reimbursable.

10. ~~Field trips will be reimbursable when they are approved school activities that are an integral part of the total education program, are class-curriculum driven, occur during the regular school year and extend not more than one hundred (100) miles beyond the boundaries of the state. Field trips that are for non-graded student performance, social, recreational, competition, or reward purposes or incorporate overnight lodging or occur outside the regularly-scheduled (4 or 5 day) school week are not reimbursable, except that a local, non-competitive performance event held within the school district (e.g., musical performance) shall be reimbursable.~~ The costs of transporting athletes or students to and from extracurricular activities and field trips are not reimbursable.

11. ~~The following activities which are under the jurisdiction and sponsorship of the Idaho High School Activities Association will not be reimbursable, including but not limited to: baseball, basketball, cross-country, debate, drama, drill team, football, golf, instrumental music, soccer, softball, speech, tennis, track, vocal music, volleyball, and wrestling. In addition to these, any other school activity that is scheduled and held for competition purposes is not reimbursable.~~

12. Shuttle trip mileage is reimbursable only if directly associated with transporting students for the purposes of regular school attendance during regular days and hours. Shuttle trip mileage is limited to miles between any district-owned or exclusively-leased facility for regularly reoccurring days of that individual class, which transportation is for regular school attendance during regular days and hours.

L. Safety Busing

All school districts submitting applications for ~~new~~ safety busing reimbursement approval shall have established a board policy for evaluating and rating all safety busing requests and shall have on file a completed measuring or rating instrument for all submitted requests. The State Department of Education staff shall develop and maintain a measuring instrument model, which shall include an element for validating contacts with responsible organizations or persons responsible for

improving or minimizing hazardous conditions. Each applying district will be required to annually affirm that conditions of all prior approved safety busing requests are unchanged. The local board of trustees shall annually, by official action (33-1502, Idaho Code), approve all ~~new~~ safety busing locations. School districts that receive state reimbursement of costs associated with safety busing will re-evaluate all safety busing sites at intervals of at least every three years using the local board adopted measuring or scoring instrument. In order to qualify for reimbursement the local school board will, by official action, approve the initial safety busing request and allow the students in question to be transported before the application is sent to the state. Consideration for reimbursement will be contingent on the application for ~~new~~ safety busing being received by the State Department of Education Transportation Section on or before March 31 of the school year in which the safety busing began.

M. Contract For Transportation Services

1. Any district that contracts for student transportation services will have a copy of its current contract on file with the State Department of Education, Supervisor of Transportation Services (Section 33-1510, Idaho Code). The State Department of Education shall develop and maintain a model contract. School districts shall use the Department's model contract, but may attach to the model contract addenda to meet local requirements. School districts that contract for student transportation services shall submit contracts to the State Department of Education Student Transportation Section prior to signing. The Department will then approve or disapprove the submitted contract(s) in compliance to Section 33-1510, Idaho Code, including any contract extension.

2. The State Department of Education shall develop guidelines for use in advertising for transportation bids, reviewing transportation bids and awarding transportation bids. School districts that contract shall require contractors to accurately track all mileage related to student transportation and said mileage shall not be considered to be proprietary. However, mechanisms and methodologies used in calculating actual costs for purposes of bidding (using district non-proprietary route mileages and route data) may be proprietary (9-340D, Idaho Code).

3. School districts that contract for the provision of student transportation services must report actual contractual costs to the State Department of Education for reimbursement on the annual Student Transportation Reimbursement Claim form (Schedule C). In addition, school districts that contract for the provision of student transportation services may also report the costs of employing not more than one

(1) transportation contract manager for reimbursement on the annual Student Transportation Reimbursement Claim form (Schedule A). Notwithstanding, the total reimbursement to school districts that contract for the provision of student transportation services shall not exceed the limits provided under Idaho law (33-1006(5), Idaho Code).

4. School districts that contract student transportation services and also operate a district-owned student transportation program may submit specific costs related to district salaries benefits, purchased services, supplies, etc. (Schedule A or Schedule B) when the costs can be reconciled to district-owned and operated school buses.

5. Accurate mileage and contract costs (reimbursable and non-reimbursable) must be reported and submitted annually. School districts that contract shall require contractors to accurately track all mileage related to student transportation.

6. Contracting school districts shall be responsible for determining and reporting reimbursable and non-reimbursable trip mileage and shall be able to reconcile all mileage to contractor invoices.

N. Leasing District-Owned Buses

School districts will develop and use a policy approved by the local board of trustees delineating responsibility and use of rental or leased buses. Any costs to the district will not be reimbursable under the Transportation Support Program. A school district that allows a school bus to be operated by a non-district employee as part of a lease or rental agreement might not be insured under the terms of its insurance policy. Therefore, districts will maintain adequate liability insurance coverage on rented or leased buses and shall notify its insurance carrier when renting or leasing a school bus and shall request written confirmation of continued insurance coverage during the particular circumstances of the rental or lease arrangement. Districts will maintain accurate records on all district-owned leased buses, including mileage, to whom leased and revenues received. (Section 33-1512, Idaho Code)

O. Ineligible Vehicles

Costs incurred when transporting students in any vehicle that does not meet all State Board of Education, state and federal standards for a school bus will not be reimbursable within the Transportation Support Program, except as permitted in 33-1006, Idaho Code.

P. Liability Insurance

1. Every policy or contract of insurance or comprehensive liability plan for each contractor-owned school bus shall provide that the insurance carrier pay on behalf of the insured local school district to a limit of not less than five hundred thousand dollars ($500,000) per person limited to three million dollars ($3,000,000) (Look into amount-State Board – Board checking into it) for bodily or personal injury, death, or property damage or loss as the result of any one (1) occurrence or accident, regardless of the number of persons injured or the number of claimants. (Section 33-1507, Idaho Code)

2. Every policy or contract of insurance or comprehensive liability plan for each district-owned school bus will provide that the insurance carrier pay on behalf of the insured local school district to a limit of not less than five hundred thousand dollars ($500,000) for bodily or personal injury, death, or property damage or loss as the result of any one (1) occurrence or accident, regardless of the number of persons injured or the number of claimants. (Sections 6-924 and 33-1507, Idaho Code)

Q. Non-Traditional Educational Programs

Costs of transporting students for purposes of accessing alternate, special or unique educational programs outside normal school hours or outside the normal school year are not reimbursable. However, districts will not be financially penalized for incorporating the transportation of ineligible student riders into a reimbursable educational run when there is no subsequent appreciable increase in the allocation of transportation resources.

R. Capital Investment

Purchase of school buses with approved reimbursable options and two-way voice communication radios installed in a new bus will be the only capital investment items allowed in the reimbursement program. Reasonable cellular telephone basic service contract costs and reasonable repeater service contract costs are reimbursable. No more than two (2) basic cellular telephone service contracts will be allowed per school district. Reimbursement for basic cellular telephone service contract costs in excess of two (2) must have prior approval. Mobile cellular telephone, additional cellular airtime, roaming and long distance charges are non-reimbursable costs. The cost of a cellular telephone may be reimbursable when the cost is in-lieu of a hard-wired two-way voice radio.

S. Depreciation

1. The purchase date for purposes of depreciation is determined to be July 1 of the state fiscal year in which the bus is delivered. Buses will be placed on a depreciation schedule after they have been inspected by personnel from the State Department of Education. When a bus is sold or traded prior to its life expectancy according to the district's SDE generated depreciation schedule, the district shall forfeit an amount equal to total depreciation received, minus depreciation calculated at straight-line method, plus fifty-percent (50%) of the projected depreciation amount for the year in which the bus is sold or traded. Emergency circumstances resulting of property loss (school bus) or documented high maintenance costs ("lemon bus") may exempt a school district from this penalty. (33-1006, Idaho Code)

2. Before any newly acquired school bus is used for transporting pupils it shall be inspected by a duly authorized representative of the State Department of Education. (33-1506, Idaho Code)

3. *Depreciation Ineligibility*

   Any used school bus purchased by a district will not be eligible for depreciation if the bus is over five (5) years old, using the body manufacturer's and state inspection fiscal year dates. Used school buses new to the State no older than five (5) years will be placed on the district's depreciation schedule, using an accelerated declining balance method of calculating depreciation, which shall include a percentage rate equal to one (1), divided by the remaining years life expectancy of the bus (according to a life expectancy of ten (10) years), multiplied by two (2). Used bus depreciation maximums will be based on used bus values in the most current Yellow School Bus Book and subject to review by the Student Transportation Steering Committee.

4. *Depreciation Standards*

   In order to be eligible for depreciation and operation costs a school bus must meet all federal and Idaho minimum construction standards and State Board of Education standards. Further, the bus shall be assigned and used daily on to and from school routes, except that new buses purchased for spare, activity and field trip purposes may be placed on the district's depreciation schedule if they are also used on to -from school routes.

5. *Retrofit Standards*

a. Any vehicle that has been retrofitted to be used as a school bus will meet current Idaho minimum construction standards.

b. Any school bus that undergoes a partial retrofit will meet current Idaho minimum construction standards applicable to the retrofitted part(s).

6. *Size Categories*

All school buses will be categorized by size as follows: eighty-five (85) students and up, seventy-three to eighty-four (73-84) students, fifty-nine to seventy-two (59-72) students, forty-seven to fifty-eight (47-58) students, thirty-five to forty-six (35-46) students, twenty to thirty-four (20-34) students, and one to nineteen (1-19) students.

7. *Basic Bus*

The State Department of Education Pupil Transportation Section shall ~~annually~~ write bid specifications for the purpose of defining Idaho's basic school bus(es) and shall advertise for an indefinite contract, indefinite quantity bid. The bid award shall be used to establish a "depreciation reimbursement benchmark" for statewide district school bus purchases for specific size categories. For purposes of depreciation reimbursement, add-on bus component costs may be allowed specific to school district needs that are in accord with 33-1006, Idaho Code, ~~subject to review by the student transportation steering committee~~. (33-601, 67-2803, and 67-2806 Idaho Codes)

8. *Life Expectancy*

a. For depreciation purposes, all school buses will be categorized according to size and depreciated according to a twelve (12)-year life expectancy or a life expectancy based on use and mileage (as defined by the student transportation steering committee and approved by the State Department of Education Student Transportation Section), whichever is most advantageous to the school district (see SDE "Depreciation Calculator"). Activity and lift-equipped buses will be categorized for purchase and depreciation purposes as if they had full seating capacity. The cost of activity bus options (e.g., air conditioning, partially reclining passenger seats, interior overhead storage compartments, etc.) will not be included when calculating depreciation.

b. ~~District school bus purchases that fall outside "Idaho's basic bus" categories defined annually in written specifications may be placed~~

~~on the district's depreciation schedule subsequent to student transportation steering committee review.~~

9. *Twelve-year (12) Depreciation*

The school bus depreciation schedule within the allowable costs of the Pupil Transportation Support Program, for school buses with life expectancy of twelve (12) years will be determined by using an accelerated declining balance method of calculating depreciation (declining balance schedule to include a percentage rate of sixteen and sixty-seven hundredths percent (16.67%) per year for useful life expectancy of twelve (12) years). (Section 33-1006, Idaho Code)

10. *Use and Mileage Depreciation*

The school bus use and mileage depreciation schedule within the allowable costs of the Pupil Transportation Support Program will be determined by using an accelerated declining balance method of calculating depreciation (use and mileage declining balance schedule to include a variable percentage rate triggered by use and mileage categories as defined by the State Department of Education Student Transportation Section). (See SDE "Depreciation Calculator")

11. *Purchase Price*

a. The purchase price of each bus will include the total chassis, body, special equipment, freight costs, pre-delivery inspection fees and any other costs directly related to acquiring the bus within the constraints of Idaho's basic bus specifications, indefinite contract/quantity bid award and Idaho Code. Costs of non-reimbursable options will be subtracted for purposes of calculating the district's reimbursable bus depreciation, as necessary. (33-1006; 33-1506, Idaho Code)

b. Any or all bid quotations may be rejected by the school district; however, all bid prices will be evaluated and adjusted as necessary by the State Department of Education Pupil Transportation Section with recommendations for depreciation adjustment from the Pupil Transportation Steering Committee. The lowest responsive and responsible bid will be used in calculating the district's depreciation reimbursement. Verifiable differences in school bus construction quality may be justification for bid rejection.

c. School districts may purchase from a contract issued by the State Department of Education secondary to awarding an indefinite contract/quantity or through a contract that has been competitively bid by the state of Idaho, one (1) of its subdivisions, or an agency of the federal government (67-2803 and 67-2806 Idaho Code).

12. *School Bus Delivery Costs*

a. The State Department of Education Pupil Transportation Section may consider (subject to the constraints of Idaho's basic bus specifications, indefinite contract/quantity bid award and Idaho Code) FOB district bus delivery costs reflected in school district bid specifications and subsequent vendor invoice to be considered part of the bus purchase price for purposes of depreciation reimbursement.

b. Districts will not report any new school bus delivery mileage on the Pupil Transportation Reimbursement Claim form. Districts will record the initial mileage on all new school buses delivered to the district and will track and record all subsequent mileage for purposes of reimbursement.

13. *Nonreimbursable Costs*

No finance charges, leases, rent, or interest will be included in the purchase price. These are not reimbursable costs on the depreciation schedule. A school district that leases a school bus on a short-term emergency basis must receive prior approval, for purposes of reimbursement.

14. *Inoperable Bus*

Any school bus that is wrecked, sold, inoperable, or for any other reason does not or cannot meet all federal, state and State Board of Education construction and operational standards will be removed from the depreciation schedule. Revenues received subsequent to an insurance claim, associated with any district owned vehicle that receives state pupil transportation reimbursement consideration, shall be reported on the pupil transportation reimbursement claim form under revenues/reimbursements received or as a credit to the district's parts and supplies budget account.

15. *Bus Trade-In*

Trade-in values reflected in district bid specifications and subsequent invoicing will not be subtracted from the purchase price of the new bus for purposes of depreciation reimbursement.

T. **Program Support**

1. The State Department of Education shall develop a "best practice" model and cost containment guidelines for school district pupil transportation operations, which shall include school bus lifecycle costing and school bus replacement models based on mileage, age and use criteria.

2. The State Department of Education shall develop guidelines for use in advertising for transportation bids, reviewing transportation bids and awarding transportation bids.

U. **Depreciation Account**

~~All school bus depreciation money received by school districts from the state shall be placed into a separate account and used only for the purchase of school buses.~~ All school bus depreciation money received by school districts from the state shall be placed into a separate account and used only for the purchase of school buses. Any revenue received by the school district subsequent to the sale of any used school bus will be placed into a separate account and used only for the purchase of school buses. Trade-in values reflected in district bid specifications and subsequent invoicing will not be subtracted from the purchase price of the new bus for purposes of depreciation reimbursement.

V. **Reimbursement/Non-Reimbursement Matrix**

The State Department of Education will, as a matter of policy, periodically publish and distribute a reimbursement matrix.

W. **Appeals and Waivers**

1. The State Board of Education may grant a waiver of any rule not required by state or federal law to any school district upon written request, as provided in IDAPA 08.02.01.001. Written requests for such a waiver shall be submitted to the State Department of Education Student Transportation Section using the waiver request form. The State Department of Education shall submit the waiver request to the State Board of Education, along with any appropriate recommendation(s). All waiver requests must include supporting rationale and detailed justification for the request. The Board will not grant waivers of any rule required by state or federal law. State and

federal law includes case law (including consent decrees), statutes, constitutions, and federal regulations.

2. A school district may appeal the application of the one hundred three percent (103%) limit on reimbursable costs to the State Board of Education, as provided in 33-1006(5), Idaho Code. Appeals must be submitted to the State Department of Education Pupil Transportation Section using the appeal application form. The State Department of Education shall submit the appeal to the State Board of Education, along with any appropriate recommendation(s). All appeals must include supporting documents demonstrating qualifying hardship bus runs (33-1006, Idaho Code).

SUBJECT

Pending Rule – Docket No. 08-0202-1102

REFERENCE

August 11, 2011	Board approved proposed rule changes to IDAPA 08.02.02.140 Rules Governing Uniformity, Accreditation.
August 9-10, 2007	M/S (Luna/Soltman): To approve the request by the State Department of Education to amend IDAPA 08.02.02.140 as submitted. *Motion carried unanimously.*

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-119, Idaho Code
Idaho Administrative Code, IDAPA 08.02.02 – Section 140, Accreditation

BACKGROUND/DISCUSSION

There were no public comments received during the open comment period.

Idaho Code, Section 33-119, requires the State Board of Education to establish standards for the accreditation of any secondary school and set standards for all elementary schools as it may deem necessary. In August, 2007, the State Board of Education eliminated the Idaho State Accreditation process and adopted the Northwest Association of Accredited Schools (NAAS) standards for accreditation purposes due to the fact that a duplication of efforts existed between the two processes. This change allowed the State Department of Education to reallocate funding to other program areas within the department and provided an opportunity to divert some of those funds back into classrooms across Idaho.

Since that time, the Northwest Association of Accredited Schools has changed their name to the Northwest Accreditation Commission (NWAC) to better reflect their organizational structure as a commission rather than an association due to changes in membership and representation. The standards by which schools are accredited in Idaho have not changed as a result of this name change.

ATTACHMENTS

BOARD ACTION

I move to approve Pending Rule – Docket No. 08-0202-1102, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

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IDAPA 08
TITLE 02
CHAPTER 02

08.02.02 - RULES GOVERNING UNIFORMITY

140. ACCREDITATION.

All public secondary schools, serving any grade(s) 9-12, will be accredited. Accreditation is voluntary for elementary schools, grades K-8, and private and parochial schools. (Section 33- 119, Idaho Code) (4-2-08)

01. Continuous School Improvement Plan. Schools will develop continuous school improvement plans focused on the improvement of student performance. (4-2-08)

02. Standards. Schools will meet the accreditation standards of the Northwest Accreditation Commission. ( )

03. Reporting. An annual accreditation report will be submitted to the State Board of Education.

(4-2-08)

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SUBJECT

Pending Rule – Docket No. 08-0202-1103

REFERENCE

August 11, 2011 Board approved proposed rule changes to IDAPA 08.02.02, Sections 021, 023, and 027, Rules Governing Uniformity.

APPLICABLE STATUTE, RULE, OR POLICY

Sections 33-1254, 33-1258, and 33-114, Idaho Code

BACKGROUND/DISCUSSION

The clarifying change made between the proposed rule stage and the pending rule stage is in response to a public comment received during the open comment period.

08.02.02.021 Endorsements

The Exceptional Child Certificate is not a stand-alone certificate and must include an endorsement. IDAPA 08.02.02.021 does not include the *Exceptional Child Certificate* as one of the certificates eligible for endorsement.

08.02.02.023.04 English as a New Language (ENL) (K-12)

This rule clarification is in response to the need for a more clearly stated intent of the endorsement language. The manner in which the endorsement language is worded, unfortunately allows for interpretation that any *Modern Language* could meet the four (4) semester credit hour requirement. If that were the case, any four (4) credits of English, for example, could be argued as meeting the requirement. The intent of the endorsement is that the candidate shall have four (4) semester credit hours of a modern language other than English to better serve ENL students. By making this revision to the endorsement language, current and best practices will be more accurately reflected.

08.02.02.027.02 School Psychologist Endorsement

The Idaho School Psychologists Association (ISPA) proposed to the Professional Standards Commission (PSC) that the Idaho State Department of Education accept National Certification requirements for School Psychologists (NCSP) in place of the standard six (6) professional development credits. This program is offered through the National Association of School Psychologists (NASP), and should be considered as an additional avenue to meet state certification and recertification requirements.

ATTACHMENTS

Attachment 1 – Pending Rule – Docket No. 08-0202-1103 Page 3

BOARD ACTION

I move to approve Pending Rule – Docket No. 08-0202-1103, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

IDAPA 08
TITLE 02
CHAPTER 02

08.02.02 - RULES GOVERNING UNIFORMITY

021. ENDORSEMENTS.

Holders of a Secondary Certificate or a Standard Elementary Certificate, Exceptional Child Certificate, Standard Occupational Specialist Certificate, and Advanced Occupational Specialist Certificate may be granted endorsements in subject areas as provided herein. An official statement of competency in a teaching area or field is acceptable in lieu of courses for a teaching major or minor if such statements originate in the department or division of the accredited college or university in which the competency is established and are approved by the director of teacher education of the recommending college or university. To add an endorsement to an existing credential, an individual shall complete the credit hour requirements as provided herein and shall also meet or exceed the state qualifying score on appropriate, state approved content, pedagogy and performance assessments. When converting semester credit hours to quarter credit hours, two (2) semester credit hours is equal to three (3) quarter credit hours. ( )

(BREAK IN CONTINUITY OF SECTIONS)

023. ENDORSEMENTS E - L.

01. Earth Science (6-12). Twenty (20) semester credit hours including course work in each of the following: Earth Science, Astronomy, and Geology. (4-11-06)

02. Economics (6-12). Twenty (20) semester credit hours to include a minimum of three (3) semester credit hours of micro-economics, a minimum of three (3) semester credit hours of macro-economics, and a minimum of six (6) semester credit hours of Personal Finance/Consumer Economics/Economics Methods. Remaining course work may be selected from economics and finance course work in one (1) or more of the following areas: Agriculture Science and Technology, Business Education, Economics, Family and Consumer Science, or Marketing Education. (4-11-06)

03. English (6-12). Twenty (20) semester credit hours, including three (3) semester credit hours in Linguistics/Grammar, three (3) semester credit hours in American Literature, three (3) semester credit hours in English Literature, six (6) semester credit hours in Advanced Composition, excluding the introductory sequence designed to meet general education requirements. Remaining credits must be completed in the English Department, and must include some course work in Writing Methods for Teachers of Secondary Students. (3-16-04)

04. English as a New Language (ENL) (K-12). Twenty (20) semester credit hours to include four (4) semester credit hours in ~~Modern Foreign Languages~~a modern language other than English; three (3) semester credit hours in Cultural Diversity; three (3) semester credit hours in ENL Methods; three (3) semester credits in Linguistics; three (3) semester credit hours in Foundations, Federal and State Law, Theory, Testing/Identification of Limited English Proficient Students; one (1) semester credit in ENL Practicum or Field Experience; and three (3) semester credit hours in an ENL related elective. ( )

05. Family and Consumer Science (6-12). (3-16-04)

a. Thirty (30) semester credit hours to include coursework in each of the following: Child/Human Development; Human/Family Relations; Directed Laboratory Experience in Childcare; Clothing and Textiles, Cultural Dress, Fashion Merchandising, or Design Nutrition; Food Preparation, Food Production, or Culinary Arts; Housing, Interior Design, Home Management, or Equipment; Consumer Economics or Family Resource Management; Introduction to Family Consumer Sciences; and, Integration of Family Consumer Sciences or Family Consumer Science Methods. (3-16-04)

b. Occupational Teacher Preparation as provided in Sections 034 through 038. (3-16-04)

06. Foreign Language (6-12 or K-12). Twenty (20) semester credit hours in a specific foreign language including course work in two (2) or more of the following areas: Grammar, Conversation, Composition, Culture, and Literature; and course work in Foreign Language Methods. To obtain an endorsement in a specific foreign language (K-12), applicants holding a Secondary Certificate must complete an elementary methods course.

(4-11-06)

07. Geography (6-12). Twenty (20) semester credit hours including course work in Cultural Geography and Physical Geography, and a maximum of six (6) semester credit hours in World History Survey. Remaining semester credit hours must be selected from Geography. (4-11-06)

08. Geology (6-12). Twenty (20) semester credit hours in the area of Geology. (3-16-04)

09. Gifted and Talented (K-12). Twenty (20) semester credit hours, to include a minimum of three (3) semester credits hours in each of the following: Foundations of Gifted and Talented Education; Creative/Critical Thinking Skills for Gifted and Talented Students; Social and Emotional Needs of Gifted and Talented Students; Curriculum and Instruction for Gifted and Talented Students; and Practicum and Program Design for Gifted and Talented Education. Remaining course work must be in the area of gifted education. (5-8-09)

10. Health (6-12 or K-12). Twenty (20) semester credit hours to include course work in Organization/Administration/Planning of a School Health Program; Health and Wellness; Secondary Methods of Teaching Health; Elementary methods of Teaching Health; Mental/Emotional Health; Nutrition; Human Sexuality; Substance Use and Abuse. Remaining semester credits must be in health-related course work. (4-7-11)

11. History (6-12). Twenty (20) semester credit hours to include a minimum of six (6) semester credit hours of U.S. History Survey and a minimum of six (6) semester credit hours of World History Survey. Remaining course work must be in History. Course work may include three (3) semester credit hours in American Government. (4-11-06)

12. Humanities (6-12). An endorsement in English, History, Music, Visual Art, Drama, or Foreign Language and twenty (20) semester credit hours in one of the following areas or ten (10) semester credit hours in each of two (2) of the following areas: Literature, Music, Foreign Language, Humanities Survey, History, Visual Art, Philosophy, Drama, Comparative World Religion, Architecture, and Dance. (4-11-06)

13. Journalism (6-12). Follow one (1) of the following options: (3-16-04)

a. Option I: Twenty (20) semester credit hours to include a minimum of sixteen (16) semester credit hours in Journalism and four (4) semester credit hours in English. (3-16-04)

b. Option II: Possess an English endorsement with a minimum of six (6) semester credit hours in Journalism. (3-16-04)

14. Library Media Specialist (K-12). Twenty (20) semester credit hours in the field of Education Media or Library Science, including a minimum of: (5-8-09)

a. Collection Development/Materials Selection; (5-8-09)

b. Literature for Youth or Children; (5-8-09)

c. Organization of Information (Cataloging and Classification); (5-8-09)

d. School Library Administration/Management; and (5-8-09)

e. Library Information Technologies and Information Literacy. (5-8-09)

15. Literacy (K-12). Twenty (20) semester credit hours in the area of Literacy including a minimum of three (3) semester credit hours in each of the following areas: Foundations of Reading or Developmental Reading; Reading in the Content Area; Literature for Youth; Psycholinguistics or Language Development; Corrective/Diagnostic/Remedial Reading; and Teaching Writing. To obtain a Literacy

endorsement, applicants must complete the Idaho Comprehensive Literacy Course or the Idaho Comprehensive Literacy Assessment. Remaining credits must be taken in the area of teaching literacy. (5-8-09)

(BREAK IN CONTINUITY OF SECTIONS)

027. PUPIL PERSONNEL SERVICES CERTIFICATE.

Persons who serve as school counselors, school psychologists, speech-language pathologists, school social workers, school nurses and school audiologists are required to hold the Pupil Personnel Services Certificate, with the respective endorsement(s) for which they qualify. (3-16-04)

01. Counselor Endorsement (K-12). To be eligible for a Pupil Personnel Services Certificate endorsed Counselor K-12, a candidate must have satisfied the following requirements. The Pupil Personnel Services Certificate with a Counselor endorsement is valid for five (5) years. Six (6) semester credit hours are required every five (5) years in order to renew the endorsement. (5-8-09)

a. Hold a master's degree and provide verification of completion of an approved program of graduate study in school guidance and counseling from a college or university approved by the Idaho State Board of Education or the state educational agency of the state in which the program was completed. The program must include successful completion of seven hundred (700) clock hours of supervised field experience, seventy-five percent (75%) of which must be in a K-12 school setting. Substantial amounts of this K-12 experience must be in each of the following levels: elementary, middle/junior high, and high school. Previous school counseling experience may be considered to help offset the field experience clock hour requirement. (5-8-09)

b. An institutional recommendation is required for a Counselor K-12 Endorsement. (5-8-09)

02. School Psychologist Endorsement. This endorsement is valid for five (5) years. In order to renew the endorsement, six (6) professional development credits are required every five (5) years. The renewal credit requirement may be waived if the applicant holds a current valid National Certification for School Psychologists (NCSP) offered through the National Association of School Psychologists (NASP). To be eligible for initial endorsement, a candidate must complete a minimum of sixty (60) graduate semester credit hours which must be accomplished through one (1) of the following options: ( )

a. Completion of an approved thirty (30) semester credit hour, or forty-five (45) quarter credit hours, master's degree in education or psychology and completion of an approved thirty (30) semester credit hour, or forty-five (45) quarter credit hour, School Psychology Specialist Degree program, and completion of a minimum of twelve

hundred (1,200) clock-hour internship within a school district under the supervision of the training institution and direct supervision of a certificated school psychologist.(4-7-11)

b. Completion of an approved sixty (60) semester credit hour, or ninety (90) quarter credit hour, master's degree program in School Psychology, and completion of a minimum of twelve hundred (1,200) clock-hour internship within a school district under the supervision of the training institution and direct supervision of a certificated school psychologist. (4-7-11)

c. Completion of an approved sixty (60) semester credit hour, or ninety (90) quarter credit hour, School Psychology Specialist degree program which did not require a master's degree as a prerequisite, with laboratory experience in a classroom, which may include professional teaching experience, student teaching or special education practicum, and completion of a minimum twelve hundred (1,200) clock-hour internship within a school district under the supervision of the training institution and direct supervision of a certificated school psychologist. (5-8-09)

d. Earn a current and valid National Certification for School Psychologists (NCSP) issued by the National Association of School Psychologists (NASP). ( )

03. School Nurse Endorsement. This endorsement is valid for five (5) years. Six (6) credits are required every five (5) years in order to renew the endorsement. Initial endorsement may be accomplished through completion of either requirements in Subsections 027.03.a. or 027.03.b. in addition to the requirement of Subsection 027.03.c. (3-29-10)

a. The candidate must possess a valid nursing (RN) license issued by the Idaho State Board of Nursing, and a bachelor's degree in nursing, education, or a health-related field from an accredited institution.

(5-8-09)

b. The candidate must possess a valid professional nursing (RN) license issued by the Idaho State Board of Nursing and have completed nine (9) semester credit hours from a university or college in at least three (3) of the following areas:(5-8-09)

i. Health program management; (5-8-09)

ii. Child and adolescent health issues; (5-8-09)

iii. Counseling, psychology, or social work; or (5-8-09)

iv. Methods of instruction. (5-8-09)

c. Additionally, each candidate must have two (2) years' full-time (or part-time equivalent) school nursing, community health nursing, or any area of pediatric, adolescent, or family nursing experience. (5-8-09)

04. Interim Endorsement - School Nurse. This certificate will be granted for those who do not meet the educational and/or experience requirements but who hold a valid professional nursing (RN) license in Idaho. An Interim Certificate - will be issued for three (3) years while the applicant is meeting the educational requirements, and it is not renewable. (3-29-10)

05. Speech-Language Pathologist Endorsement. This endorsement is valid for five (5) years. Six (6) credits are required every five (5) years in order to renew the endorsement. Initial endorsement will be issued to candidates who possess a master's degree from an accredited college or university in a speech/language pathology program approved by the State Board of Education, and who receive an institutional recommendation from an accredited college or university. (3-16-04)

06. Audiology Endorsement. This endorsement is valid for five (5) years. Six (6) credits are required every five (5) years in order to renew the endorsement. Initial endorsement will be issued to candidates who possess a master's degree from an accredited college or university in an audiology program approved by the State Board of Education, and who receive an institutional recommendation from an accredited college or university. (3-16-04)

07. School Social Worker Endorsement. This endorsement is valid for five (5) years. Six (6) credit hours are required every five (5) years in order to renew the endorsement. Initial endorsement may be accomplished through possession of a social work certificate issued by the Idaho Bureau of Occupational Licenses, an institutional recommendation, and completion of one (1) of the following options: (3-16-04)

a. A master's degree in social work from an Idaho college or university approved by the State Board of Education, or a master's degree in social work from an out-of-state college or university. The program must be currently approved by the state educational agency of the state in which the program was completed. (3-16-04)

b. A master's degree in guidance and counseling, sociology, or psychology plus thirty (30) semester credit hours of graduate work in social work education, including course work in all the following areas: understanding the individual; casework method; field placement; social welfare programs and community resources; and research methods. (3-16-04)

08. Interim Endorsement-Speech Language Pathologist. This certificate will be granted for those who do not meet the educational requirements but who hold a bachelor's degree in Speech language pathology and are pursuing a master's degree in order to obtain the pupil personnel services certificate endorsed in speech language pathology. An Interim Certificate will be issued for three (3) years while the applicant is meeting the educational requirements, and it is not renewable. (3-29-10)

SUBJECT

Pending Rule – Docket No. 08-0202-1104

REFERENCE

August 11, 2011	Board approved proposed rule changes to IDAPA 08.02.02.015, Rules Governing Uniformity – Idaho Interim Certificate.
June 13-14, 2007	Appeared on the State Board of Education Agenda for approval but was pulled from discussion pending further consideration. The intent of pulling this topic from the agenda was to determine whether or not the Reinstatement of an Expired Certificate belong under the Idaho Interim Certificate or in another section of IDAPA.

APPLICABLE STATUTE, RULE, OR POLICY

Sections 33-114, 33-1254, and 33-1258, Idaho Code

BACKGROUND/DISCUSSION

The clarifying change made between the proposed rule stage and the pending rule stage is in response to a public comment received during the open comment period.

This rule change was initially brought before the Board during its June 13-14, 2007 meeting but was pulled from the agenda pending further discussion. The necessary discussion surrounding the topic was to determine whether or not the Reinstatement of an Expired Certificate belonged under the Idaho Interim Certificate or in another section of Idaho Administrative Rules. After much discussion between the Professional Standards Commission and the Department's Teacher Certification Office, it was ultimately determined that the reinstatement of an expired certificate did mandate a nonrenewable three (3) year Interim Certificate. The most appropriate location for the Reinstatement of an Expired Certificate is under the Idaho Interim Certificate; IDAPA 08.02.02.015

The need for an Interim Certificate for the Reinstatement of an Expired Certificate still exists today. This rule change responds to a statewide challenge in meeting federal guidelines for Highly Qualified teacher status and teacher shortages. This allows for greater flexibility and a shorter timeline for Idaho-trained educators to return to the teaching field with the necessary certification. This change allows for a three (3) year interim certificate to be issued to any Idaho-trained educator whose certificate has expired.

ATTACHMENTS

Attachment 1 – Pending Rule – Docket No. 08-0202-1104 Page 3

BOARD ACTION

I move to approve Pending Rule – Docket No. 08-0202-1104, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

IDAPA 08
TITLE 02
CHAPTER 02

08.02.02 - RULES GOVERNING UNIFORMITY

015. IDAHO INTERIM CERTIFICATE.

01. Issuance of Interim Certificate. The State Department of Education is authorized to issue a three-year (3) interim certificate to those applicants who hold a valid certificate/license from another state or other entity that participates in the National Association of State Directors of Teacher Education and Certification (NASDTEC) Interstate Agreement. An interim certificate is nonrenewable except under extenuating circumstances.

(4-2-08)

a. Idaho Comprehensive Literacy Course. For all Idaho teachers working on interim certificates, alternate routes or coming from out of the state, completion of a state approved reading instruction course shall be a one-time requirement for full certification. (4-7-11)

b. Technology. Out-of-state applicants will be reviewed by the hiring district for technology deficiencies and may be required to take technology courses to improve their technology skills. (4-7-11)

02. Reinstatement of Expired Certificate. An individual holding an expired Idaho certificate~~, that has lapsed for one year or greater,~~ may be issued a nonrenewable three (3) year interim certificate. During the validity period of the interim certificate, the applicant must meet all current requirements listed for the specific certificate and endorsement(s) including the appropriate content, pedagogy and performance assessments. ( )

03. Foreign Institutions. An educator having graduated from a foreign institution that is listed in the Accredited Degree-Granting Institutions section of the "Accredited Institutions of Postsecondary Education" and having a valid/current teaching certificate/license from the country or province in which the foreign institution is located, may be issued a non-renewable, three (3) year interim certificate. The applicant must also complete the requirements listed in Section 013 of these rules. ( )

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SUBJECT

Pending Rule – Docket No. 08-0202-1105

REFERENCE

August 11, 2011 Board approved proposed rule changes to IDAPA 08.02.02.100, Rules Governing Uniformity – Official Vehicle for Approving Teacher Education Programs.

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-1254, 33-1258, and 33-114, Idaho Code

BACKGROUND/DISCUSSION

Changes made between the proposed rule stage and the pending rule stage are in response to confusion expressed in public comments received during the open comment period. The primary change is reinstating reference to the National Council for Accreditation of Teacher Education (NCATE).

The utilization of, and emphasis on, the Idaho Standards for Initial Certification of Professional School Personnel, enables the Idaho State Board of Education to have more oversight of the teacher preparation program approval process. The state will begin to conduct focused reviews of state-specific, core teaching requirements that may be adjusted over time, depending upon state-wide initiatives. The emphasis on state reviews anticipated over the next decade will include integration of technology and use of student data, as well as pre-service preparation that will address effective K-12 practices in the teaching of the *Common Core Standards.*

ATTACHMENTS

Attachment 1 – Pending Rule – Docket No. 08-0202-1105 Page 3

BOARD ACTION

I move to approve Pending Rule – Docket No. 08-0202-1105, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

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IDAPA 08
TITLE 02
CHAPTER 02

08.02.02 - RULES GOVERNING UNIFORMITY

100. OFFICIAL VEHICLE FOR APPROVING TEACHER EDUCATION PROGRAMS.
(Section 33-114, Idaho Code) (4-1-97)

01. The Official Vehicle for the Approval of Teacher Education Programs. The official vehicle for the approval of teacher education programs will be the National Council for Accreditation of Teacher Education (NCATE) approved Idaho Standards for the Initial Certification of Professional School Personnel. ~~which~~ The Idaho Standards are based upon the accepted national standards for ~~the accreditation of~~ educator preparation and include state-specific, core teaching requirements. The State Department of Education will transmit to the head of each Idaho college or department of education a copy of all revisions to the Idaho Standards for the Initial Certification of Professional School Personnel. Such revisions will take effect and must be implemented within a period not to exceed two (2) years after notification of such revision. ( )

02. Reference Availability. The Idaho Standards for the Initial Certification of Professional School Personnel, incorporated by reference in Subsection 004.01, are available for inspection ~~Copies of this document can be found~~ on the Office of the State Board of Education website at www.boardofed.idaho.gov. ( )

03. Continuing Approval.

a. The state of Idaho will follow the ~~a N~~national ~~accreditation C~~council for Accreditation of Teacher Education (NCATE) model by which institutions shall pursue continuing approval through a full program review every seven (7) years. The full program review shall be based upon the Idaho Standards for Initial Certification of Professional School Personnel. ( )

b. The state of Idaho will additionally conduct focused reviews of state-specific, core teaching requirements in the interim, not to exceed every third year following the full program review. ( )

04. Payment Responsibilities for Teacher Preparation Program Reviews. The Professional Standards Commission is responsible for Idaho teacher preparation program reviews, including assigning responsibility for paying for program reviews. To implement the reviews, it is necessary that: (4-6-05)

a. The Professional Standards Commission pay for all in-state expenses for on-site teacher preparation reviews from its budget. (4-6-05)

b. Requesting institutions pay for all out-of-state expenses related to on-site teacher preparation program reviews. (4-6-05)

SUBJECT

Pending Rule – Docket No. 08-0202-1106

REFERENCE

August 11, 2011	Board approved proposed rule changes to IDAPA 08.02.02.120, Rules Governing Uniformity – Local District Evaluation Policy.
August 20, 2009	M/S (Luna/Soltman): To approve the pending rule – Docket 08-0202-901 – Local District Evaluation Policy. *Motion carried unanimously.*

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-513, Idaho Code
Section 33-514, Idaho Code
Idaho Administrative Code, IDAPA 08.02.02.120, Local District Evaluation Policy

BACKGROUND/DISCUSSION

The change made between the proposed rule stage and the pending rule stage are due to comments received from the Idaho School Boards Association and public comments received during the open comment period. Idaho Code statute does not refer to a specific start date for Parent Input.

The Students Come First laws require that parent input be included in teacher and school-based administrator evaluations and that at least fifty percent (50%) of administrator and teacher evaluations are based on growth in student achievement, as determined by the board of trustees. The changes to this rule further clarify the new parent input and growth in student achievement requirements. They also make the domains and components of the teacher evaluation framework consistent with Charlotte Danielson's Framework for Teaching, Second Edition (as referenced in the rule) and correct Idaho Code citations.

ATTACHMENTS

BOARD ACTION

I move to approve Pending Rule – Docket No. 08-0202-1106, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

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120. LOCAL DISTRICT EVALUATION POLICY.

Each school district board of trustees will develop and adopt policies for teacher performance evaluation in which criteria and procedures for the evaluation of certificated personnel are research based and aligned to Charlotte Danielson's Framework for Teaching Second Edition domains and components of instruction. The process of developing criteria and procedures for certificated personnel evaluation will allow opportunities for input from those affected by the evaluation; i.e., trustees, administrators and teachers. The evaluation policy will be a matter of public record and communicated to the certificated personnel for whom it is written. (3-29-10)

01. Standards. Each district evaluation model shall be aligned to state minimum standards that are based on Charlotte Danielson's Framework for Teaching Second Edition domains and components of instruction. Those domains and components include: (3-29-10)

a. Domain 1 - Planning and Preparation: (3-29-10)

i. Demonstrating Knowledge of Content and Pedagogy; (3-29-10)

ii. Demonstrating Knowledge of Students; (3-29-10)

iii. Setting Instructional Outcomes; ( )

iv. Demonstrating Knowledge of Resources; (3-29-10)

v. Designing Coherent Instruction; and (3-29-10)

vi. Designing Student Assessments. ( )

b. Domain 2 – The Classroom Environment: ( )

i. Creating an Environment of Respect and Rapport; (3-29-10)

ii. Establishing a Culture for Learning; (3-29-10)

iii. Managing Classroom Procedures; (3-29-10)

iv. Managing Student Behavior; and (3-29-10)

v. Organizing Physical Space. (3-29-10)

c. Domain 3 - Instruction and Use of Assessment: (3-29-10)

i. Communicating with Students; ( )

ii. Using Questioning and Discussion Techniques; (3-29-10)

iii. Engaging Students in Learning; (3-29-10)

iv. Using Assessment in Instruction; and ( )

v. Demonstrating Flexibility and Responsiveness. (3-29-10)

d. Domain 4 - Professional Responsibilities: (3-29-10)

i. Reflecting on Teaching; (3-29-10)

ii. Maintaining Accurate Records; (3-29-10)

iii. Communicating with Families; (3-29-10)

iv. Participating in a Professional Community; ( )

v. Growing and Developing Professionally; and (3-29-10)

vi. Showing Professionalism. (3-29-10)

02. Parent Input. ~~For evaluations conducted on or after July 1, 2012, i~~Input from the parents and guardians of students shall be considered as a factor in the evaluation of any school-based certificated employees. For such certificated employees on a Category A, B or grandfathered renewable contract, this input shall be part of the first ~~half~~portion of the evaluation (as stipulated in 33-514, subsection 4, Idaho Code) that must be completed before February 1 of each year (Section 33-513 and 33-514, Idaho Code). ( )

03. Student Achievement. For evaluations conducted on or after July 1, 2012, all certificated employees must receive an evaluation in which at least 50% of the evaluation results are based on objective measures of growth in student achievement as determined by the board of trustees. This student achievement portion of the evaluation shall be completed by the end of the school year in which the evaluation takes place (Section 33-513 and 33-514, Idaho Code). ( )

04. Participants. Each district evaluation policy will include provisions for evaluating all certificated employees identified in Section 33-1001, Idaho Code, Subsection 16, and each school nurse and librarian. Policies for evaluating certificated employees should identify the differences, if any, in the conduct of evaluations for nonrenewable contract personnel and renewable contract personnel. ( )

05. Evaluation Policy - Content. Local school district policies will include, at a minimum, the following information: (4-1-97)

a. Purpose -- statements that identify the purpose or purposes for which the evaluation is being conducted; e.g., individual instructional improvement, personnel decisions. (4-1-97)

b. Evaluation criteria -- statements of the general criteria upon which certificated personnel will be evaluated. (4-1-97)

c. Evaluator -- identification of the individuals responsible for appraising or evaluating certificated personnel performance. The individuals assigned this responsibility should have received training in evaluation. (4-1-97)

d. Sources of data -- description of the sources of data used in conducting certificated personnel evaluations. For classroom teaching personnel, classroom observation should be included as one (1) source of data. (4-1-97)

e. Procedure -- description of the procedure used in the conduct of certificated personnel evaluations. (4-1-97)

f. Communication of results -- the method by which certificated personnel are informed of the results of evaluation. (4-1-97)

g. Personnel actions -- the action, if any, available to the school district as a result of the evaluation and the procedures for implementing these actions; e.g., job status change. Note: in the event the action taken as a result of evaluation is to not renew an individual's contract or to renew an individual's contract at a reduced rate, school districts should take proper steps to follow the procedures outlined in Sections 33-513 through 33-515, Idaho Code in order to assure the due process rights of all personnel. (4-1-97)

h. Appeal -- the procedure available to the individual for appeal or rebuttal when disagreement exists regarding the results of certificated personnel evaluations. (4-1-97)

i. Remediation -- the procedure available to provide remediation in those instances where remediation is determined to be an appropriate course of action.(4-1-97)

j. Monitoring and evaluation. -- A description of the method used to monitor and evaluate the district's personnel evaluation system. (4-1-97)

k. Professional development and training -- a plan for ongoing training for

evaluators/administrators and teachers on the districts evaluation standards, tool and process. (3-29-10)

l. Funding -- a plan for funding ongoing training and professional development for administrators in evaluation. (3-29-10)

m. Collecting and using data -- a plan for collecting and using data gathered from the evaluation tool that will be used to inform professional development. (3-29-10)

n. A plan for how evaluations will be used to identify proficiency and define a process that identifies and assists teachers in need of improvement. (3-29-10)

o. A plan for including all stakeholders including, but not limited to, teachers, board members, and administrators in the development and ongoing review of their teacher evaluation plan. (3-29-10)

06. Evaluation Policy - Frequency of Evaluation. The evaluation policy should include a provision for evaluating all certificated personnel on a fair and consistent basis. All contract personnel shall be evaluated at least once annually. ( )

07. Evaluation Policy - Personnel Records. Permanent records of each certificated personnel evaluation will be maintained in the employee's personnel file. All evaluation records will be kept confidential within the parameters identified in federal and state regulations regarding the right to privacy (Section 33-518, Idaho Code).(4-1-97)

SUBJECT

Pending Rule – Docket No. 08-0203-1101

REFERENCE

May 18, 2011	M/S (Edmunds/Atchley): To approve the temporary and proposed rule IDAPA 08.02.03.004.07, Rules Governing Thoroughness, Incorporation by Reference, The Idaho Alternative Assessment Extended Achievement Standards.
September 28, 2010	M/S (Agidius/Lewis): To approve the Proficiency Level Achievement Scores and Performance Level Descriptors for the Idaho Standards Achievement Tests-Alternate in Reading, Language Usage, Mathematics and Science, as submitted. *Motion carried unanimously.* M/S (Agidius/Lewis): to approve the temporary rule IDAPA 08.02.03.004.07, Rules Governing Thoroughness, Incorporation by Reference, the Idaho Alternative Assessment Extended Achievement Standards, as submitted. *Motion carried unanimously.*

APPLICABLE STATUTE, RULE, OR POLICY

Sections 33-105, 33-107, 33-2002, Idaho Code
34 CFR Part 200 Elementary and Secondary Education Act

BACKGROUND/DISCUSSION

There were no public comments received during the open comment period.

In September 2010, the ISAT-Alternate Achievement Standards were approved by the State Board of Education as a temporary rule. Idaho had been granted a waiver to develop a new alternate assessment to meet the Individuals with Disabilities Act (IDEA 2004) and the Elementary and Secondary Education Act of 1965 as reauthorized in 2001 and called the No Child Left Behind Act (NCLB). That waiver and timeline for development required that a temporary rule be put into place in order for the state to complete and report Adequate Yearly Progress (AYP). As a temporary rule, this authority expired at the end of the 2011 legislative session. This item is being brought forward in May 2011 as a temporary and proposed rule to put these achievement levels into place long term. The Reading and Language Usage achievement levels are exactly the same as was presented in September 2010. The Science and Mathematics achievement levels were reset in April 2011 based on the recommendations of the standards setting participants to add a fourth complexity level.

ATTACHMENTS

BOARD ACTION

A motion to approve Pending Rule – Docket No. 08-0203-1101, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

IDAPA 08
TITLE 02
CHAPTER 03

08.02.03 - RULES GOVERNING THOROUGHNESS

004. INCORPORATION BY REFERENCE.

The following documents are incorporated into this rule: (3-30-07)

01. The Idaho Content Standards. The Idaho Content Standards as adopted by the State Board of Education. Individual subject content standards are adopted in various years in relation to the curricular materials adoption schedule. Copies of the document can be found on the State Board of Education www.boardofed.idaho.gov. (3-29-10)

a. Driver Education, as revised and adopted on August 21, 2008. (3-29-10)

b. Health, as revised and adopted on April 17, 2009. (3-29-10)

c. Humanities Categories: (3-29-10)

i. Art, as revised and adopted on April 17, 2009; (3-29-10)

ii. Dance, as revised and adopted on April 17, 2009; (3-29-10)

iii. Drama, as revised and adopted on April 17, 2009; (3-29-10)

iv. Interdisciplinary, as revised and adopted on April 17, 2009; (3-29-10)

v. Music, as revised and adopted on April 17, 2009; (3-29-10)

vi. World languages, as revised and adopted on April 17, 2009. (3-29-10)

d. English Language Arts, as revised and adopted on August 11, 2010. (4-7-11)

e. Limited English Proficiency, as revised and adopted on August 21, 2008. (3-29-10)

f. Mathematics, as revised and adopted on August 11, 2010. (4-7-11)

g. Physical Education, as revised and adopted on April 17, 2009. (3-29-10)

h. Science, as revised and adopted on April 17, 2009. (3-29-10)

i. Social Studies, as revised and adopted on April 17, 2009. (3-29-10)

j. Information and Communication Technology, as revised and adopted on April 22, 2010. (4-7-11)

02. The Idaho English Language Development Standards. The Idaho English Language Development Standards as adopted by the State Board of Education on August 10, 2006. Copies of the document can be found on the State Board of Education at www.boardofed.idaho.gov. (4-2-08)

03. The Limited English Proficiency Program Annual Measurable Achievement Objectives (AMAOs) and Accountability Procedures. The Limited English Proficiency Program Annual Measurable Achievement Objectives and Accountability Procedures as adopted by the State Board of Education on November 11, 2009. Copies of the document can be found on the State Department of Education www.boardofed.idaho.gov. (4-7-11)

04. The Idaho English Language Assessment (IELA) Achievement Standards. The Idaho English Language Assessment (IELA) Achievement Standards as adopted by the State Board of Education on November 11, 2009. Copies of the document can be found on the State Department of Education www.boardofed.idaho.gov. (4-7-11)

05. The Idaho Standards Achievement Tests (ISAT) Achievement Standards. Achievement Standards as adopted by the State Board of Education on May 30, 2007. Copies of the document can be found on the State Board of Education www.boardofed.idaho.gov. (4-2-08)

06. The Idaho Extended Content Standards. The Idaho Extended Content Standards as adopted by the State Board of Education on April 17, 2008. Copies of the document can be found at the State Board of Education www.boardofed.idaho.gov. (5-8-09)

07. The Idaho Alternative Assessment Achievement Standards. Alternative Assessment Achievement Standards as adopted by the State Board of Education on May 18, 2011. Copies of the document can be found on the State Board of Education www.boardofed.idaho.gov. (5-18-11)T

08. The Idaho Standards for Infants, Toddlers, Children, and Youth Who Are Deaf or Hard of Hearing. As adopted by the State Board of Education on October 11, 2007. Copies of the document can be found on the State Board of Education www.boardofed.idaho.gov. (4-2-08)

09. The Idaho Standards for Infants, Toddlers, Children, and Youth Who Are Blind or Visually Impaired. As adopted by the State Board of Education on October 11, 2007. Copies of the document can be found on the State Board of Education www.boardofed.idaho.gov. (4-2-08)

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SUBJECT

Pending Rule – Docket No. 08-0203-1103

REFERENCE

August 11, 2011	Board approved proposed rule changes to IDAPA 08.02.03.111, Rules Governing Thoroughness – Assessment in the Public Schools.
June 17, 2010	M/S (Atchley/Edmunds): To approve the request by the Idaho State Department of Education to waive IDAPA 08.02.03.111.07.b for the 2010-2011 school year which requires the State Department of Education to administer the Direct Math and Direct Writing Assessment. *Motion carried unanimously.*

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-105, Idaho Code, Rules—Executive department;
Idaho Administrative Code, IDAPA 08.02.03 Rules Governing Thoroughness; Section 111, Assessment in the Public Schools; Subsections 03, 06, and 07

BACKGROUND/DISCUSSION

There were no public comments received during the open comment period. The changes made between the proposed rule stage and the pending rule reflect removal of additional references to the Direct Math Assessment (DMA) and Direct Writing Assessment (DWA) tests; and a change to correct the grade levels in IDAPA 08.02.03.111.13a.

IDAPA 08.02.01.001, allows the State Board of Education to grant a waiver of any rule not required by state or federal law to any school district upon written request. In June, 2010, the State Department of Education (SDE) received a waiver to discontinue the Direct Math (DMA) and Direct Writing Assessments (DWA) under IDAPA 08.02.03.111 for the 2010-2011 school year. SDE sought the waiver because the state is moving to the next generation of assessments through using the state's Common Core Standards and associated assessments. There were concerns about reliability in scoring the tests as they are hand scored. Previous resources used to fund DWA and DMA are now being used to develop end of course assessments.

The Department requested changing the IDAPA rules cited by removing reference to Direct Writing Assessment (DMA) and Direct Math Assessment (DMA). The DWA and DMA have served their purpose, and SDE is focusing efforts on end of course assessments, the next generation of assessments, and the administration of a college entrance exam for all juniors.

ATTACHMENTS

Attachment 1 – Pending Rule – Docket No. 08-0203-1103 Page 3

BOARD ACTION

I move to approve Pending Rule – Docket No. 08-0203-1103, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

IDAPA 08
TITLE 02
CHAPTER 03

08.02.03 - RULES GOVERNING THOROUGHNESS

111. ASSESSMENT IN THE PUBLIC SCHOOLS.

03. Content. The comprehensive assessment program will consist of multiple assessments, including, the Idaho Reading Indicator (IRI), the National Assessment of Educational Progress (NAEP), the Idaho English Language Assessment, the Idaho Standards Achievement Tests (ISAT), the Idaho Alternate Assessment, and a college entrance exam. ( )

(BREAK IN CONTINUITY OF SECTIONS)

06. Comprehensive Assessment Program. The State approved comprehensive assessment program is outlined in Subsections 111.06.a. through 111.06.l. Each assessment will be comprehensive of and aligned to the Idaho State Content Standards it is intended to assess. In addition, districts are responsible for writing and implementing assessments in those standards not assessed by the state assessment program. (4-2-08)

a. Kindergarten - Idaho Reading Indicator, Idaho Alternate Assessment, Idaho English Language Assessment. (4-2-08)

b. Grade 1 - Idaho Reading Indicator, Idaho Alternate Assessment, Idaho English Language Assessment. (4-2-08)

c. Grade 2 - Idaho Reading Indicator, Grade 2 Idaho Standards Achievement Tests, Idaho Alternate Assessment, Idaho English Language Assessment. (4-2-08)

d. Grade 3 - Idaho Reading Indicator, Grade 3 Idaho Standards Achievement Tests, Idaho Alternate Assessment, Idaho English Language Assessment. (4-2-08)

e. Grade 4 - National Assessment of Educational Progress, Grade 4 Idaho Standards Achievement Tests, Idaho Alternate Assessment, Idaho English Language Assessment. ( )

f. Grade 5 - Grade 5 Idaho Standards Achievement Tests, Idaho Alternate Assessment, Idaho English Language Assessment. ( )

g. Grade 6 - Grade 6 Idaho Standards Achievement Tests, Idaho Alternate Assessment, Idaho English Language Assessment. ( )

h. Grade 7 - Grade 7 Idaho Standards Achievement Tests, Idaho Alternate Assessment, Idaho English Language Assessment. ( )

i. Grade 8 - National Assessment of Educational Progress, Grade 8 Idaho Standards Achievement Tests, Idaho Alternate Assessment, Idaho English Language Assessment. ( )

j. Grade 9 - Grade 9 Idaho Standards Achievement Tests, Idaho Alternate Assessment, Idaho English Language Assessment. ( )

k. Grade 10 - High School Idaho Standards Achievement Tests, Idaho Alternate Assessment, Idaho English Language Assessment. (4-2-08)

l. Grade 11 - Idaho English Language Assessment, college entrance exam. ( )

m. Grade 12 - National Assessment of Educational Progress, Idaho English Language Assessment. (4-2-08)

n. Students who achieve a proficient or advanced score on a portion or portions of the ISAT, or the Idaho Alternate Assessment, offered in their tenth grade year or later are not required to continue taking that portion or portions. (5-8-09)

07. Comprehensive Assessment Program Schedule. (5-3-03)

a. The Idaho Reading Indicator will be administered in accordance with Section 33-1614, Idaho Code. (3-15-02)

b . The National Assessment of Educational Progress will be administered in timeframe specified by the U.S. Department of Education. ( )

c . The Idaho Standards Achievement Tests will be administered twice annually in the Fall and Spring in a time period specified by the State Board of Education. ( )

d . The Idaho Alternate Assessment will be administered in a time period specified by the State Board of Education. ( )

e . The Idaho English Language Assessment will be administered in a time period specified by the State Board of Education. ( )

08. Costs Paid by the State. Costs for the following testing activities will be paid by the state: (4-1-97)

a. All consumable and non-consumable materials needed to conduct the prescribed statewide comprehensive assessment program; (3-15-02)

b. Statewide distribution of all assessment materials; and, ~~(3-15-02)~~( )

c. Processing and scoring student response forms, distribution of prescribed reports for the statewide comprehensive assessment program~~; and~~. ~~(3-15-02)~~( )

~~**d.** Implementation, processing, scoring and distribution of prescribed reports for the Direct Writing Assessment and the Direct Mathematics Assessment. (3-15-02)~~

(BREAK IN CONTINUITY OF SECTIONS)

13. Dual Enrollment. For the purpose of non-public school student participation in non-academic public school activities as outlined in Section 33-203, Idaho Code, the Idaho State Board of Education recognizes the following: (3-15-02)

a. The Idaho Standards Achievement Tests (grades ~~2~~3-9 and High School). ~~(5-3-03)~~( )

b. A portfolio demonstrating grade level proficiency in at least five (5) of the subject areas listed in Subsections 111.13.b.i. through 111.13.b.vi. Portfolios are to be judged and confirmed by a committee comprised of at least one (1) teacher from each subject area presented in the portfolio and the building principal at the school where dual enrollment is desired. (4-6-05)

i. Language Arts/Communications. (3-15-02)

ii. Math. (3-15-02)

iii. Science. (3-15-02)

iv. Social Studies. (3-15-02)

v. Health. (3-15-02)

vi. Humanities. (3-15-02)

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SUBJECT

Pending Rules – Docket No. 08-0203-1104

REFERENCE

August 11, 2011	Board approved proposed rule changes to IDAPA 08.02.03.105 and 08.02.03.106, Rules Governing Thoroughness.
August 19, 2009	M/S (Luna/Soltman): To approve the proposed amendments to Idaho Administrative Code, IDAPA 08.02.03.105, Rules Governing Thoroughness, High School Graduation Requirements. *Motion carried unanimously.*

APPLICABLE STATUTE, RULE, OR POLICY

Section 33-1626, Idaho Code
Idaho Administrative Code, IDAPA 08.02.03.105, High School Graduation Requirements
Idaho Administrative Code, IDAPA 08.02.03.106, Advanced Opportunities

BACKGROUND/DISCUSSION

The clarifying changes made between the proposed rule stage and the pending rule stage are in response to comments received from the Idaho School Boards Association and public comments received during the open comment period.

This rule change deals with two aspects of high school graduation requirements: dual credit as it pertains to the senior project requirements and college entrance examinations.

IMPACT

The state could potentially save a small amount of money in the statewide contract with either SAT or ACT if a significant portion of the special education or LEP (3 years or less) populations decide to not take the test.

ATTACHMENTS

BOARD ACTION

I move to approve Pending Rules – Docket No. 08-0203-1104, as submitted.

Moved by _____ Seconded by _____ Carried Yes _____ No _____

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IDAPA 08
TITLE 02
CHAPTER 03

08.02.03 - RULES GOVERNING THOROUGHNESS

105. HIGH SCHOOL GRADUATION REQUIREMENTS.

A student must meet all of the requirements identified in this section before the student will be eligible to graduate from an Idaho high school. The local school district or LEA may establish graduation requirements beyond the state minimum. (5-8-09)

01. Credit Requirements. The State minimum graduation requirement for all Idaho public high schools is forty-two (42) credits. The forty-two (42) credits must include twenty-five (25) credits in core subjects as identified in Paragraphs 105.01.c. through 105.01.h. All credit-bearing classes must be aligned with state high school standards in the content areas for which standards exist. For all public school students who enter high school at the 9th grade level in Fall 2009 or later, the minimum graduation requirement will be forty-six (46) credits and must include twenty-nine (29) credits in core subjects as identified in Paragraphs 105.01.c. through 105.01.h.

(8-11-11)T

a. Credits. (Effective for all students who enter the ninth grade in the fall of 2010 or later.) One (1) credit shall equal sixty (60) hours of total instruction. School districts or LEA's may request a waiver from this provision by submitting a letter to the State Department of Education for approval, signed by the superintendent and chair of the board of trustees of the district or LEA. The waiver request shall provide information and documentation that substantiates the school district or LEA's reason for not requiring sixty (60) hours of total instruction per credit.

(3-29-10)

b. Mastery. Students may also achieve credits by demonstrating mastery of a subject's content standards as defined and approved by the local school district or LEA. (3-29-10)

c. Secondary Language Arts and Communication. Nine (9) credits are required. Eight (8) credits of instruction in Language Arts. Each year of Language Arts shall consist of language study, composition, and literature and be aligned to the Idaho Content Standards for the appropriate grade level. One (1) credit of instruction in communications consisting of oral communication and technological applications that includes a course in speech, a course in debate, or a sequence of instructional activities that meet the Idaho Speech Content Standards requirements. (3-29-10)

d. Mathematics. Four (4) credits are required. Secondary mathematics includes Applied Mathematics, Business Mathematics, Algebra, Geometry,

Trigonometry, Fundamentals of Calculus, Probability and Statistics, Discrete Mathematics, and courses in mathematical problem solving and reasoning. For all public school students who enter high school at the 9th grade level in Fall 2009 or later, six (6) semester credits are required. For such students, secondary mathematics includes instruction in the following areas: (3-29-10)

i. Two (2) credits of Algebra I or courses that meet the Idaho Algebra I Content Standards as approved by the State Department of Education; (3-29-10)

ii. Two (2) credits of Geometry or courses that meet the Idaho Geometry Content Standards as approved by the State Department of Education; and (3-29-10)

iii. Two (2) credits of mathematics of the student's choice. (3-29-10)

iv. Two (2) credits of the required six (6) credits of mathematics must be taken in the last year of high school. (3-29-10)

e. Science. Four (4) credits are required, two (2) of which will be laboratory based. Secondary sciences include instruction in applied sciences, earth and space sciences, physical sciences, and life sciences. (3-29-10)

i. Effective for all public school students who enter high school at the 9th grade level in Fall 2009 or later, six (6) credits will be required. (3-29-10)

ii. Secondary sciences include instruction in the following areas: biology, physical science or chemistry, and earth, space, environment, or approved applied science. Four (4) credits of these courses must be laboratory based. (3-29-10)

f. Social Studies. Five (5) credits are required, including government (two (2) credits), United States history (two (2) credits), and economics (one (1) credit). Courses such as geography, sociology, psychology, and world history may be offered as electives, but are not to be counted as a social studies requirement. (3-29-10)

g. Humanities. Two (2) credits are required. Humanities courses include instruction in visual arts, music, theatre, dance, or world language aligned to the Idaho content standards for those subjects. Other courses such as literature, history, philosophy, architecture, or comparative world religions may satisfy the humanities standards if the course is aligned to the Idaho Interdisciplinary Humanities Content Standards. (3-29-10)

h. Health/Wellness. One (1) credit is required. Course must be aligned to the Idaho Health Content Standards. (3-29-10)

02. Content Standards. Each student shall meet locally established subject area standards (using state content standards as minimum requirements) demonstrated

through various measures of accountability including examinations or other measures. (3-29-10)

03. College Entrance Examination. (Effective for all public school students who enter high school at the 9th grade level in Fall 2009 or later.)

a. A student must take one (1) of the following college entrance examinations before the end of the student's eleventh grade year: COMPASS, ACCUPLACER, ACT or SAT. Scores must be included in the Learning Plan. (8-11-11)T

b. A student may elect an exemption in their 11th grade year from the college entrance exam requirement if the student is: (8-11-11)T

i. Enrolled in a special education program and have an Individual Education Plan (IEP) that specifies accommodations not allowed for a reportable score on the approved tests; or (8-11-11)T

ii. Enrolled in a Limited English Proficient (LEP) program for three (3) academic years or less. (8-11-11)T

04. Senior Project. (Effective for all public school students who enter high school at the 9th grade level in Fall 2009 or later.) A student must complete a senior project by the end of grade twelve (12). The project must include a written report and an oral presentation. Additional requirements for a senior project are at the discretion of the local school district or LEA. (3-29-10)

05. Middle School. If a student completes any required high school course with a grade of C or higher before entering grade nine (9), and if that course meets the same standards that are required in high school, then the student has met the high school content area requirement for such course. However, the student must complete the required number of credits in all high school core subjects as identified in Subsections 105.01.c. through 105.01.h. in addition to the courses completed in middle school. (8-11-11)T

06. Proficiency. Each student must achieve a proficient or advanced score on the Grade 10 Idaho Standards Achievement Test (ISAT) in math, reading and language usage in order to graduate. A student who does not attain at least a proficient score prior to graduation may appeal to the school district or LEA, and will be given an opportunity to demonstrate proficiency of the content standards through some other locally established plan. School districts or LEAs shall adopt an alternate plan and provide notice of that plan to all students who have not achieved a proficient or advanced score on the Grade 10 Idaho Standards Achievement Test by the fall semester of the student's junior year. All locally established alternate plans used to demonstrate proficiency shall be forwarded to the State Board of Education for review

and information. Alternate plans must be promptly re-submitted to the Board whenever changes are made in such plans. (4-7-11)

a. Before entering an alternate measure, the student must be: (4-2-08)

i. Enrolled in a special education program and have an Individual Education Plan (IEP); or (3-20-04)

ii. Enrolled in an Limited English Proficient (LEP) program for three (3) academic years or less; or (3-20-04)

iii. Enrolled in the fall semester of the senior year. (3-20-04)

b. The alternate plan must: (4-7-11)

i. Contain multiple measures of student achievement; (4-7-11)

ii. Be aligned at a minimum to tenth grade state content standards; (4-7-11)

iii. Be aligned to the state content standards for the subject matter in question; (4-7-11)

iv. Be valid and reliable; and (4-7-11)

v. Ninety percent (90%) of the alternate plan criteria must be based on academic proficiency and performance. (4-7-11)

c. A student is not required to achieve a proficient or advanced score on the ISAT if: (5-8-09)

i. The student received a proficient or advanced score on an exit exam from another state that requires a standards-based exam for graduation. The state's exit exam must approved by the State Board of Education and must measure skills at the tenth grade level and be in comparable subject areas to the ISAT; (5-8-09)

ii. The student completes another measure established by a school district or LEA and received by the Board as outlined in Subsection 105.06; or (3-29-10)

iii. The student has an IEP that outlines alternate requirements for graduation or adaptations are recommended on the test; (5-8-09)

iv. The student is considered an LEP student through a score determined on a language proficiency test and has been in an LEP program for three (3) academic years or less; (5-8-09)

07. Special Education Students. A student who is eligible for special education services under the Individuals With Disabilities Education Improvement Act must, with the assistance of the student's Individualized Education Program (IEP) team, refer to the current Idaho Special Education Manual for guidance in addressing graduation requirements. (4-11-06)

08. Foreign Exchange Students. Foreign exchange students may be eligible for graduation by completing a comparable program as approved by the school district or LEA. (4-11-06)

106. ADVANCED OPPORTUNITIES (EFFECTIVE JULY 1, 2008).

01. Advanced Opportunities Requirement. All high schools in Idaho shall be required to provide Advanced Opportunities, as defined in Subsection 007.01, or provide opportunities for students to take courses at the postsecondary campus. (8-11-11)T

02. Dual Credit. Students participating in the Dual Credit for Early Completers program (33-1626, Idaho Code) need not have completed their senior project prior to being eligible. However, students must still complete a senior project by the end of grade twelve (12) or their final year of high school. (8-11-11)T

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BOISE STATE UNIVERSITY

SUBJECT

Boise State University requests permission to change conference affiliation for its intercollegiate athletics teams

BACKGROUND/DISCUSSION

President Kustra has informed the Board, and news media organizations have reported, that Boise State is one of several institutions under consideration for potential membership in the Big East Conference for its intercollegiate football team. These discussions are a result of the conference realignment precipitated by the changing membership of many schools in the eastern and mid-west conferences. The domino effect of these changes has caused the potential for a conference change for Boise State. While no invitation to join has been extended at this time, the University anticipates an offer is imminent and is requesting Board approval to proceed in the best interests of the University should an offer be extended.

IMPACT

The primary impact will be the increase in conference revenue. Currently, the Mountain West conference-wide payout is roughly between $1,400,000 and $1,900,000 per year, depending upon football bowl and basketball post season performance of conference teams. If the expansion plans of the Big East proceed as reported, there will be 12 football playing schools in the Big East. Under the current Big East media agreements (which will lapse and come due for renegotiation in 2012), the payouts to the football playing schools would be approximately $3,700,000 annually. However, the Big East Conference is the only member of the BCS automatic qualifying conferences that has its media rights package coming due for renewal in 2012. The Big East expects that bidding its media rights on the open market in the fall of 2012 will result in a significant increase in the conference media revenue. Finally, the Big East is considered one of the premier conferences in men's and women's basketball. While Boise State will not be a basketball playing member, the increased exposure to the affiliation with such a strong conference will be good for the University and is part of what will drive the increased media value for the 2012 media rights bids.

As noted, the Big East is also a member of the BCS. As such its conference champion is guaranteed a placement in one of the five BCS bowl games. This exposure is important to the University and its football program for various reasons. The Big East is guaranteed the automatic qualifying status through the 2013 season (for the January 2014 BCS bowl games). In addition, the Big East has bowl tie-ins with several other prominent bowl games.

The Big East plans to adopt a 12 team football conference with an East and West Division. The two division alignment allows the addition of a championship game at the end of the season. A conference championship game is expected to also add value to the media rights of the conference.

The University expects increased travel costs in association with the longer charter flights for conference games. However, since the University already charters planes for all away football games, the increased cost is only the incremental cost over the already chartered flights to Mountain West Conference games. The University estimates this increase at approximately $200,000 to $300,000 annually.

Another important impact of joining the Big East as a football only member will be that the University will be required to have all other sports in a conference as well. The University has pursued this by inquiring of several potential conferences. Such discussions are ongoing and the University is confident its quality programs will be a welcome addition to one of those conferences.

The conference change is anticipated to occur July 1, 2013. With more than one year advance notice the University will not pay the $5,000,000 exit penalty to the Mountain West Conference and will, instead, only forfeit the annual conference-wide distribution for the 2012 season.

BOARD ACTION

I move to authorize the President of Boise State University to make the final decision as to whether it is in the best interests of the University to accept an invitation to the Big East Conference as a football only member and to another conference for the University's remaining intercollegiate sports, and in so doing to comply with all Board policies and procedures.

Moved by _____ Seconded by _____ Carried Yes _____ No _____