




COVER SHEET FOR GRANT PROPOSALS

State Board of Education

SBOE PROPOSAL NUMBER: (to be assigned by SBOE)		AMOUNT REQUESTED: \$49,600	
TITLE OF PROPOSED PROJECT: Academic liaison with Industry: from big D little r to big D big R is good for Idaho			
SPECIFIC PROJECT FOCUS: We will <u>develop, market, manufacture, and distribute</u> three new industrial cleaners that substitute eco-friendly polymers, green chelatants, multi-surfactant systems, and ethoxylated alcohols for phosphorus and NPE components.			
PROJECT START DATE: July 1, 2011		PROJECT END DATE: July 1, 2012	
NAME OF INSTITUTION: Boise State University		DEPARTMENT: Chemistry & Biochemistry	
ADDRESS: 1910 University Drive, Boise, ID 83725			
		E-MAIL ADDRESS: owenmcdougal@boisestate.edu	PI PHONE NUMBER: 208-409-7012 (cell) or 208-426-3964 (office)
NAME:		TITLE:	
SIGNATURE:			
PROJECT DIRECTOR	Owen M. McDougal	Associate Professor	
CO-PRINCIPAL INVESTIGATOR			
CO-PRINCIPAL INVESTIGATOR			
NAME:		SIGNATURE:	
Authorized Organizational Representative	Karen Henry		
	Mary Givens		

Academic liaison with industry: from big D little r to big D big R is good for Idaho

Project director: Owen McDougal, Chemistry & Biochemistry, Boise State University

The problem: A new Environmental Protection Agency (EPA) mandate takes effect in 2013 that limits discharge from municipal water treatment facilities to 70 µg/L of total phosphorus; current levels in Idaho are ~5000 µg/L. Cities can either 1) restrict phosphorus intake from customers or 2) implement costly remediation technology. **The City of Nampa estimates the cost of phosphorus remediation technology at \$100,000,000.** Idaho tax payers and water users will fund these upgrades. Approx. 40% of phosphorus load to municipal waste water comes from cleaners/ detergents used in industrial processes. Similarly, nonylphenol ethoxylate (NPE)-containing detergents/ emulsifiers have recently been proven to accumulate in the environment, resulting in toxicity to fish; a recreational attraction for tourism in Idaho. The EPA has initiated a voluntary phase-out program for NPEs called the Safer Detergents Stewardship Initiative (SDSI).

PROJECT OBJECTIVE

We will develop, market, manufacture, and distribute three new industrial cleaners/ detergents that substitute eco-friendly polymers, green chelatants, multi-surfactant systems, and ethoxylated alcohols for phosphorus and NPE components. HERC funds (\$49,600) are requested to advance a collaborative research & development effort between faculty and students at Boise State University (BSU) & scientists at BHS Marketing LLC (BHS) to reverse engineer and reformulate cleansers/ detergents used by food, agriculture, & dairy businesses in Idaho.

BSU PRIORITIES & RESOURCE COMMITMENTS

Strategic initiatives at BSU have prioritized student preparation, community responsibility, and access to meaningful research experience. The collaborative project proposed here is directly aligned with these objectives in the following ways: 1) ***Student preparation:*** Students working on this project will meet weekly with Ben Parker, BHS R&D and Process Manager, and Drs. Owen McDougal and Dr. Brad Bammel from BSU. The students will use their chemistry

education to qualitate and quantitate commercial products that have real-world application in Idaho's food, agriculture, and dairy industry to address a pending EPA mandate to minimize phosphorus load in municipal waste water. Students will gain working knowledge of the connection between federal mandates, industrial processes, repercussions on state agencies, and methods to develop solutions thru an interdisciplinary team approach. 2) *Community responsibility*: BHS is committed to fostering a long-term collaborative relationship with BSU that will support both graduate and undergraduate research focused on technical improvements to sustainable, eco-friendly cleaning and sanitation products in the food and beverage industry. They are in the process of turning a development operation (big D/ little r) responsible for commercial formulation of industrial detergents into a laboratory-based research division (big D/ big R). This process has just begun; their available instrumentation is NOT sufficient to support current demand, let alone accommodate future growth. *BSU has the facilities, students, and faculty expertise to complement the R&D growth of BHS.* 3) *Research experience*: The collaboration described in this proposal will provide students with valuable experience in the research laboratory with facilities available at BSU for the purpose of solving industrial problems. New products and an expanded R&D focus by BHS will result in jobs for students with a skill-set developed through the proposed work.

ECONOMIC IMPACT ON IDAHO: BHS is a \$50 million dollar a year chemical distribution and custom blending company with < 50 employees; its primary manufacturing facility is located in Nampa, ID. New investors acquired the company in July 2010 with the goal of growing annual revenue to \$150 million dollars by 2015. BHS specializes in cleaning/ sanitation products for the industrial food/ beverage process industry. Bulk raw material chemicals are brought in railcar, bulk, tote, and drum sizes and formulated in one of seven blending vessels ranging in size from 2,000 - 6,000 gal. BHS produces over 1.8 million lbs of phosphorus-containing and 700,000 lbs of NPE-containing cleaning products annually. This

level of production equates to ~\$400,000 in sales to Idaho's food, agriculture, and dairy industry. A total of 16 businesses located across 7 Idaho counties purchase these products from BHS and its associate distributors.

We will develop, market, manufacture, and distribute novel cleaning products made in Idaho to as many as 115 businesses located in 26 Idaho counties. BHS currently sells ~\$400,000 worth of product in Idaho to a customer-base that represents ~\$5,750,000 in annual consumption within the state alone. By funding BHS R&D interests at BSU the HERC grant will catalyze work to be accomplished in Idaho currently supplied by out-of-state vendors, resulting in the promotion of business development and growth for in-state supply of chemical products. BHS is the only custom manufacturer of industrial cleaners in the region providing a market advantage in transportation costs compared to their out-of-state competition.

Idaho jobs: BHS currently employs Idahoans as customer service personnel, sales representatives, production workers, truck drivers, quality control laboratory technicians, and research and development (R&D) laboratory scientists that design and develop new products, and implement production in plant operations. The Nampa facility is operating at ~30% capacity based on blending tank throughput capability. A new R&D and Quality Control laboratory has been constructed that comes online in June 2011 that can accommodate up to six technicians per shift; currently BHS employs a full time R&D and Process Manager, a Quality Manager, and one part-time Lab Technician. To achieve the BHS company goal of tripling annual revenue by 2015, many new jobs will be created at the Nampa facility.

PROJECT PLAN

We will develop, market, manufacture, and distribute three new industrial cleaners that substitute eco-friendly polymers, green chelatants, multi-surfactant systems, and ethoxylated alcohols for phosphorus and NPE components. BSU faculty and students will reverse engineer current market products and develop formulations that are environmentally suitable,

while maintaining product efficacy and affordability. Novel formulations will be patented when appropriate through a joint venture with BHS; BHS will market, scale production, manufacture and distribute the products to customers in Idaho and the Pacific Northwest.

AIM 1: Reverse engineering of commercial products to quantitate and qualitate components. We will reverse engineer six commercial cleaning products to separate, identify, and determine the role of chemical components in standard formulations. Two cleaning products will be selected from each of the following categories: 1) alkaline cleaner, 2) acid cleaner, and 3) chlorine-alkaline cleaner, and analyzed according to the protocol established by Drs. Owen McDougal and Brad Bammel of BSU in consultation with Ben Parker and Phil Johnson of BHS.

Reverse engineering protocol

- 1) ***Literature background:*** BSU library resources will be used to obtain material safety data sheets (MSDSs)/ hazard information, product uses, generic product component identification, i.e. active/ non-active ingredient classification.
- 2) ***Physical property testing:*** The pH of standard product formulation will be assessed by standard acid/ base titration, density, melting/ boiling point, and solubility.
- 3) ***Component separation (quantitative):*** Extraction and chromatographic separation will be used to isolate surfactants, polymers, chelating/ sequestrants, builders, enzymes, and miscellaneous chemicals providing the amount of each component per formulation.
- 4) ***Component identification (qualitative):*** Instrumentation available at BSU will be used to identify components of either original formulations (i.e. mixtures) or separated pure components (see step 3). A combination of infrared (IR), mass spectrometry (MS), and nuclear magnetic resonance (NMR) spectroscopy will be used for the identification of product components.

5) **Reverse engineering:** Analysis of qualitative and quantitative data will allow the recipe of product formulation to be constructed. This knowledge will enable reformulation of products with direct application to food, agriculture, and dairy industrial customers.

Undergraduate student Petr Malek will determine the identity and amount of each component in common formulations of six commercial cleaners. This effort will result in a recipe for standard product formulation that will guide the creation of new green-cleaners. Petr is a junior chemistry major that has worked on this project for one semester. He is proficient in chromatographic separation techniques to determine the identities of chemical components in the products of interest and is learning how to use high pressure liquid chromatography (HPLC), IR, MS, and NMR spectroscopy to separate and analyze product components. He will commit full time effort on this project; three months of summer salary is requested for Petr (\$4,000). A summary of the approach he has taken and an example of his results are provided in Figure 1.

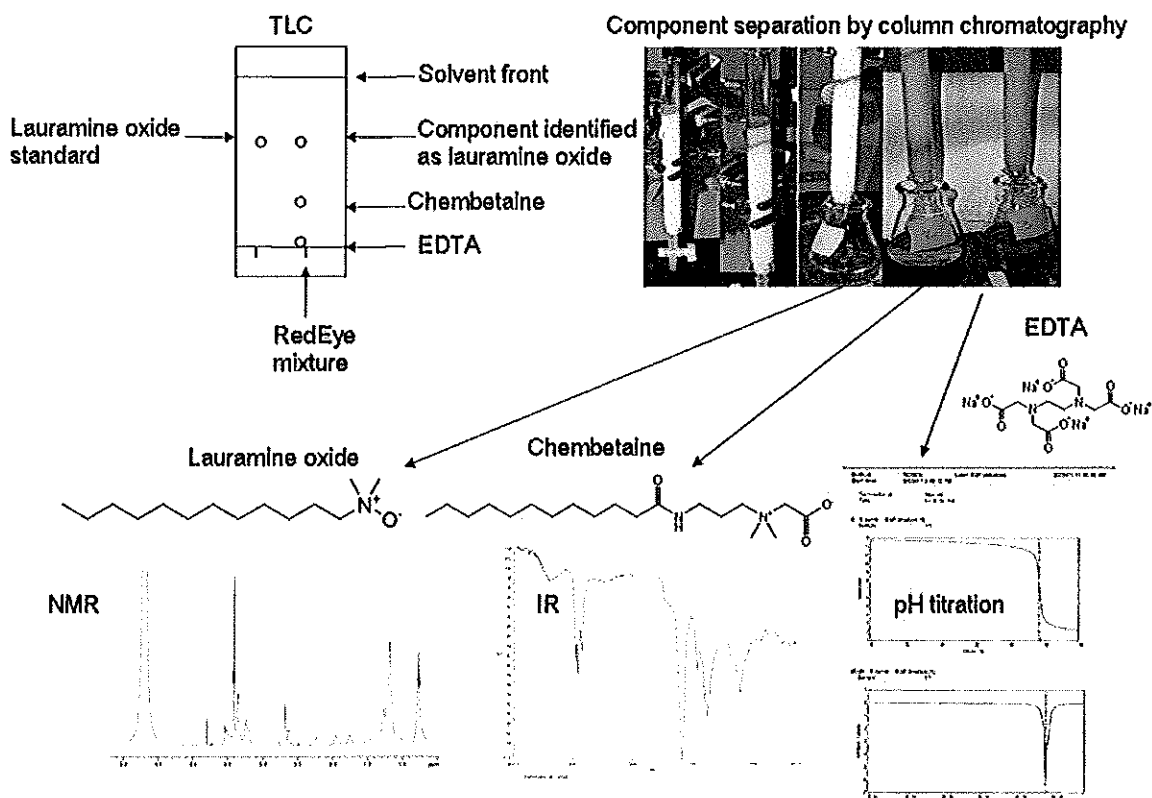


Figure 1. Reverse engineering of RedEye: quantitative/ qualitative analysis.

AIM 2: Reformulation to create new products. Current BHS formulations, containing phosphorous and NPE, will be used as a template for creating new products. The phosphorous and NPE components of commercial products will be replaced with eco-friendly polymers, chelatants, mixed-surfactant systems, and ethoxylated alcohols to achieve commensurate metal ion sequestration, detergency, and emulsifying/ foaming activity.

Metal ion sequestration: Phosphorous compounds used in cleaning formulations perform multiple functions: 1) sequestration of metal ions, i.e. calcium and magnesium, 2) increase detergency, and 3) provide pH-buffering. Replacement of phosphorus components requires substitutes that collectively arrive at the same functionality at a comparable cost. Metal ions interfere with surfactant function and can decrease cleaning efficiency. The degree to which metal ions are present is dependent on customer soil-type. There are three eco-friendly alternatives to phosphorus that we will initially explore for the purpose of metal ion sequestration: 1) poly-acrylate polymers, 2) bio-polymers, and 3) green chelatants. *Poly-acrylate polymers* are considered eco-friendly because they are non-hazardous, but they exhibit low biodegradability and have a relatively high expense compared to bio-polymers. *Bio-polymers are derivatives of cellulose* that are bio-degradable and economical. *Green chelatants* have recently been introduced that can be used in combination with or in exclusion to polymers for metal ion sequestration. They have the added benefit of being able to buffer pH (i.e. acidity/ alkalinity).

Detergency: Phosphorus-containing compounds are excellent at removing soils from surfaces (detergency). Multi-surfactant systems have been shown to achieve comparable detergency when surfactants and ratios of surfactants are properly formulated. Knowledge of surfactant structure, physical/ chemical properties is required to optimize these multi-surfactant blends.

Emulsifying & Foaming: In cleaning formulations, NPEs used as emulsifying and foaming agents will be replaced with ethoxylated alcohols. Ethoxylated alcohols have been shown to provide similar emulsifying/ foaming properties and are environmentally acceptable.

Reformulation protocol

1) *Evaluation of current market standards:*

A thorough literature investigation of polymers, chelatants, and surfactants used in cleaning products, supplier-guided market search for available raw materials, MSDS, product label, active ingredients, and the recommended formulation per desired application will be used to guide the development of novel cleansers.

2) *Product reformulation:* BHS customers require custom product formulation based on soil calcium/ magnesium content, acidity, nitrogen/ phosphorus levels, and food grade/ non-food grade application. Customized BHS-products provide a significant motivation for the customer to “Buy Idaho.” BHS will direct the reformulation of products for phase stability & efficacy as a cleanser/ detergent, and metal ion sequestrant (see Aim 1).

3) *Efficacy testing, scale up, production:* Upon successful formulation, new products will be compared to market standards for efficacy according to American Society for Testing & Materials (ASTM) methods. Once the cleaners have obtained the desired activity, BHS will site-test new products in small quantities (~5 gal), optimize formulation, assess customer demand, scale production, and then manufacture, sell/ distribute product.

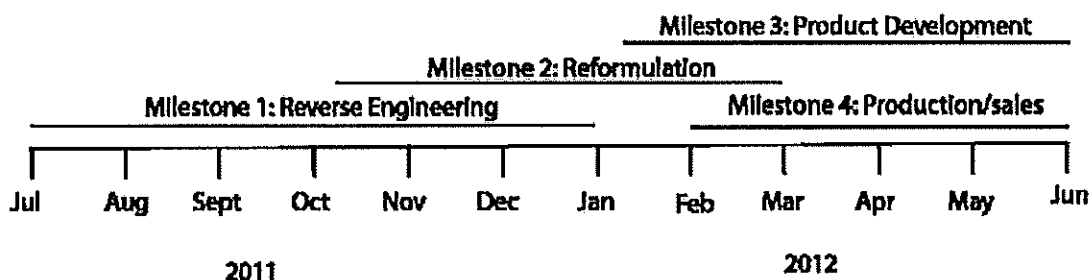
Aim 2 will be achieved through the dedicated full-time effort of graduate student Emily Drussel for one year (\$22,000). Emily will become the resident expert: 1) on product literature, 2) reverse engineering protocols, 3) separation techniques, 4) in-lab oversight and guidance to Petr Malek, 5) devising, evaluating, and testing new product formulations, and 6) justifying commercialization potential (cost to efficacy ratio) of new products.

Emily spent the past two years of her undergraduate chemistry degree researching surfactant-assisted transport in biphasic (aqueous/ organic) reaction systems by NMR spectroscopy. She is a proficient user of HPLC, IR, MS, and NMR. Successful funding of this HERC award will allow Emily to remain employed in the research lab and support her as a graduate student for one year.

Dr. Owen McDougal has coordinated weekly meetings with the research team consisting of Dr. Brad Bammel (BSU), Petr Malek (BSU), and Ben Parker (BHS), since January 2011. His laboratory is well-suited with HPLC and other instrumentation to accommodate the research goals outlined in this proposal. One month of summer salary is requested for Dr. McDougal (\$6,800) to manage the project, file reports, mentor students, and manage supply purchase and budgets. Dr. Brad Bammel will volunteer his time, provide input to guide the project during weekly meetings, and assist students with the use of departmental instrumentation.

Milestones and performance metrics

This proposal request \$49,600 in funding from July, 2011 thru June, 2012. A timeline to accomplish project milestones is provided below.



Milestone 1: A total of six commercial products will be reverse engineered beginning with literature research, physical/ chemical component characterization, and qualitative/ quantitative analysis. This work will occur primarily at BSU.

Milestone 2: Reformulation to create *three new products*, followed by efficacy testing of novel formulations devoid of phosphorus and NPE. This will occur primarily at BSU.

Milestone 3: New product development; this involves the production of trial size batches (~5 gal), customer site-testing, and creation of a customer base. Preparation of product labels, MSDS data, labels, patents, product registration, etc. will occur primarily at BHS.

Milestone 4: New product production and sales will involve the scale up from 5 gal trial sizes to 2,000 - 6,000 gal vats. Production, quality control testing, marketing, transportation, and sales will be handled through existing processes existent at BHS. This will occur primarily at BHS.

Within one year, we will create three new environmentally acceptable cleaning products for use under acidic, alkaline, or chlorinated alkaline reaction conditions that will replace existing technology in the food, agriculture and dairy industry. These changes that will save Idaho business' money as new EPA mandates go into effect.

Commercialization Plan: Products created at BSU will be evaluated for patentability with BHS. BHS will scale production and manufacture sufficient quantities of material to meet customer demand at their Nampa facility. The BHS sales team will market the products to current and new customers. BHS has targeted 115 businesses over 26 Idaho counties that currently use BHS products or who obtain commensurate supplies from out-of-state vendors. BHS customers comprise 7% of the businesses that will be impacted by the new EPA mandates, providing the majority of the market share as growth potential. Upon achieving manufacturing efficiency and capacity to deploy sufficient product to Idaho customers, expansion to neighboring states will occur. The market in Washington and Oregon consists of > 500 food process businesses, many of whom are already BHS customers. The BHS manufacturing facility in Nampa, ID will employ Idahoans and contribute to the recovery of the Idaho economy.

EDUCATION AND OUTREACH

This research project will impact two BSU chemistry faculty, Brad Bammel and Owen McDougal, one undergraduate student (Petr Malek), and one graduate student (Emily Drussel). Drs. McDougal & Bammel have met weekly with students and BHS personnel identified products for reverse engineering/ reformulation, developed laboratory protocols, purchased necessary laboratory glassware/ equipment, and trained students.

This research will be conducted in the laboratory of Dr. Owen McDougal; it is one of five projects, worked on by eight students. Research students meet weekly with Dr. McDougal to discuss progress; this provides exposure to the work performed on all projects in the lab. It is anticipated that all students working for Dr. McDougal will be knowledgeable of the BHS

project and all will contribute ideas and facilitate student-training toward the success of the proposed research. Independent weekly meetings specifically focused on the BHS project will occur in addition to regular lab meetings for the research team.

INSTITUTIONAL AND OTHER SECTOR SUPPORT

BSU maintains open access instrumentation staffed by Ph.D. scientists that will be utilized for this research. The Chemistry Department houses state-of-the-art IR, MS, and a 600 MHz Bruker Avance III NMR spectrometer. BHS has provided seed funds (\$13,000) and employee time contribution to start this project. CEO Phil Johnson of BHS has committed 10% effort for R&D and Process Manager, Ben Parker to participate in weekly meetings with the BSU faculty and students. *The level of support BHS can provide to the BSU team is NOT sufficient to move this work toward production of commercial products without HERC support.* Seed money from BHS will allow time toward the pursuit of federal funding and support for an undergraduate student. To make meaningful progress on this project, a dedicated graduate student will be required. The majority of funds requested in this HERC proposal support a full-time graduate student. *BHS currently has an academic liaison with industry contract in place and has a signed Intellectual property nondisclosure agreement on file with BSU.* Dr. McDougal has laboratory space dedicated to this project, competent students, and institutional support for the proposed activity (instrumentation access). The new 390 ft² R&D and Quality Control laboratory at BHS will be utilized for this project as need.

SUMMARY PROPOSAL BUDGET

Name of Institution: Boise State University
 Name of Project Director: Owen M. McDougal

A. FACULTY AND STAFF

Name/ Title	Rate of Pay	No. of Months			Dollar Amount Requested
		CAL	ACA	SUM	
Owen M. McDougal/ Associate Professor	\$6,800/mo			1.0	\$6,800
% OF TOTAL BUDGET:		SUBTOTAL:			6800

B. VISITING PROFESSORS

Name/ Title	Rate of Pay	No. of Months			Dollar Amount Requested
		CAL	ACA	SUM	
% OF TOTAL BUDGET:		SUBTOTAL:			

C. POST DOCTORAL ASSOCIATES / OTHER PROFESSIONALS

Name/ Title	Rate of Pay	No. of Months			Dollar Amount Requested
		CAL	ACA	SUM	
% OF TOTAL BUDGET:		SUBTOTAL:			

D. GRADUATE / UNDERGRADUATE STUDENTS

Name/ Title	Rate of Pay	No. of Months			Dollar Amount Requested
		CAL	ACA	SUM	
Emily Drusse/ Graduate Student	\$1,833/mo	12			\$22,000
Petr Malek/ Undergraduate Student	\$1,333/mo			3	\$4,000
% OF TOTAL BUDGET:		SUBTOTAL:			26000

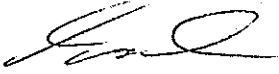
E. FRINGE BENEFITS		
Rate of Pay (%)	Salary Base	Dollar Amount Requested
32% (PI)	\$6,800	\$2,200
10% summer (graduate student)	\$5,000	\$500
3% academic year (graduate student)	\$17,000	\$500
10% summer (undergraduate student)	\$4,000	\$400
SUBTOTAL:		3600

F. EQUIPMENT: (List each item with a cost in excess of \$1000.00.)		Dollar Amount Requested
Item/Description		
SUBTOTAL:		

G. TRAVEL:						
Dates of Travel (from/to)	No. of Persons	Total Days	Transportation	Lodging	Per Diem	Dollar Amount Requested
SUBTOTAL:						

H. Participant Support Costs:		Dollar Amount Requested
1. Stipends		
2. Travel (other than listed in section G)		
3. Subsistence		
4. Other		
SUBTOTAL:		

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I. Other Direct Costs:	Dollar Amount Requested
1. Materials and Supplies	\$5,000
2. Publication Costs/Page Charges	
3. Consultant Services (Include Travel Expenses)	
4. Computer Services	
5. Subcontracts	
6. Other (specify nature & breakdown if over \$1000) Graduate Student Tuition and Fees	\$8,200
SUBTOTAL:	13200
J. Total Costs: (Add subtotals, sections A through I) TOTAL:	49600
K. Amount Requested: TOTAL:	\$49,600
Project Director's Signature: 	Date: 5/26/2011

INSTITUTIONAL AND OTHER SECTOR SUPPORT
(add additional pages as necessary)

A. INSTITUTIONAL / OTHER SECTOR DOLLARS

Source / Description	Amount
BHS Marketing LLC. (a Nampa, ID company)/ Seed funds have been provided to begin reverse engineering and reformulation collaborative research projects involving BHS CEO: Phil Johnson, Senior Scientist: Ben Parker (past BSU chemistry graduate), and Associate Professors Owen M. McDougal (former research mentor for Ben Parker) and Brad Bammel. These monies provide marginal support to get the reverse engineering project started. HERC funding will dramatically accelerate the commercialization potential and contribute to the success of the project.	\$13,000

B. FACULTY / STAFF POSITIONS

Description
Drs. McDougal (Program Director) and Bammel are the faculty liaisons that have met with BHS Marketing R&D and Process Manager Ben Parker since January 2011. Together this team has initiated an effort where BSU students can engage in research activities that have the potential to directly benefit BHS Marketing LLC and the Idaho economy.
Both Drs. McDougal and Bammel have volunteered their time to establish the feasibility of this collaborative effort.
Drs. Jeff Habig and Gerry Chingas are instrumentation managers in the Department of Chemistry and Biochemistry at Boise State University. They oversee the maintenance, student training, and data acquisition on the mass spectrometers and nuclear magnetic resonance spectrometers, respectively.
Ben Parker (R&D and Process Manager) has been engaged in weekly meetings with BSU collaborators. He oversees the project for BHS, communicates project priorities, and provides critical knowledge/ expertise in industrial cleaning formulations and processes. He has been allocated 10% of his weekly workload to ensure the success of the BSU collaboration.

C. CAPITAL EQUIPMENT

Description
Instrumentation for this research is available in the laboratory of Dr. McDougal (PI), the Chemistry Department. Specifically, this project will involve the use of high pressure liquid chromatography, liquid chromatography-mass spectrometry, gas chromatography-mass spectrometry, and nuclear magnetic resonance spectroscopy.

D. FACILITIES & INSTRUMENTATION

Description
The McDougal lab currently utilized for this project is 750 ft ² with 7 networked computer workstations (3 for computational chemistry: programming/ bioinformatics, and 4 for standard student use and data analysis i.e., NMR processing software), an HPLC, peptide synthesizer, UV-Vis spectrometer, pH meter, lyophilizer, speed vac, pipettors, glassware, centrifuge, and miscellaneous laboratory equipment. Reverse engineering of commercial products will occur in the lab. Quantitative and qualitative analysis will occur on the open access mass spectrometers and nuclear magnetic resonance spectrometer managed by Drs. Jeff Habig and Gerry Chingas, respectively.
BHS has a new 390 ft ² lab that will support work on this project as needed. Key competencies of this lab include auto-titration, UV-Vis spectroscopy, density, viscosity, conductivity, pH, and efficacy testing for cleaning formulations.

Curriculum Vitae Owen Michael McDougal, Ph.D.

<http://chemistry.boisestate.edu/people/owenmcdougal/index.html>

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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, “³¹P 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 SPS³RE 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 $\alpha 1$ 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 Morocco, 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 Morocco, 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
Jemimah Fernandez	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)

<u>Student</u>	<u>Degree Path</u>	<u>Project</u>
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 Technician	Biphasic slice imaging NMR 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 Brasseur	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.

Benjamin A. Parker

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Boise, ID 83704

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Professional Experience

Mr. Parker is an up coming expert in the area of cleaning and sanitation formulations for the food process industry. He is currently the R&D and Process Manager at BHS Marketing where he oversees all research and development activities as well as implementation of new technical processes in manufacturing.

BHS Marketing manufactures and supplies products primarily to the Food and Water Treatment industries including food cleaning and sanitation products as well as fluoride and other products for drinking water. BHS also distributes products to industrial applications in Mining, Aluminum, and Oil/Gas industries.

Mr. Parker's relationship with BHS Marketing began in June 2006 when he was hired as a lab technician intern during his sophomore year in the Chemistry program at Boise State University. During the course of this internship, which extended to January 2008, Mr. Parker was involved in quality control testing and R&D activities for all cleaning and sanitation products produced at BHS. In addition to his QC and R&D responsibilities, he worked in manufacturing and blending during the summer months and became intimately acquainted with plant operations and processes.

In addition to his internship at BHS Marketing, Mr. Parker took an internship with Boise Technology Inc. in July 2007 working part time for both organizations. BTI is a scientific research company specializing in the investigation of surface chemistries by non-linear optical spectroscopy and chemical physics. At BTI, Mr. Parker learned the rigors of fundamental research and was involved in investigating liquid/liquid biphasic reaction systems for the decontamination of chemical warfare agents in collaboration with Dr. McDougal and Charlier of the Department of Chemistry and Biochemistry at Boise State University. During this work, he became well trained in chemical analysis techniques of surface tension, UV/Vis, and NMR spectroscopies, as well as acquainted with SHG-laser spectroscopy. His work at BTI which was concluded in January 2009, doubled as Mr. Parker's culminating senior research experience in the Chemistry program at BSU. Mr. Parker had the opportunity to present his work in a seminar at BSU and at the National ACS Conference in the spring of 2009.

In January 2009, with his bachelors work nearly completed, Mr. Parker accepted a full-time position with BHS Marketing as the Assistant Risk and Quality Control Manager. In this role, given the knowledge and experience gained during his internship, he was able to quickly adapt to performing the necessary functions of planning and scheduling production, overseeing quality control, managing the laboratory, along with assisting the Risk and Quality Manger in quality, regulatory, and safety, affairs. BHS Marketing was merged and recapitalized through a partnership with private equity groups in July 2010. At this point, Mr. Parker's roll at BHS changed to the R&D and Process Manger thus enabling his full energies to progress the growing research and development division of BHS. Mr. Parker has been key in establishing research collaboration between BHS Marketing and Boise State University. He has directed the research efforts of interns and research students on various R&D projects and overseen the planning and construction of a new 390 ft² laboratory at the BHS Marketing facility in Nampa, ID.

EDUCATION/TECHNICAL ADVANCEMENT

Boise State University, College of Arts and Sciences presented Mr. Parker with an ACS certified Bachelor of Science Degree in Chemistry with a Professional Emphasis in the spring of 2009.

Mr. Parker is a member of both the American Chemical Society (ACS) and the American Oil Chemists Society (AOCS). By regularly attending meetings and sponsored events from both societies he stays current with technical advancements in the field of surfactant and detergent chemistries. He has found the Division of Surfactants and Detergent of the AOCS to be particularly influential to R&D functions at BHS Marketing LLC.

In 2010 he attended a short course sponsored by the ACS called Dispersions in Liquids (Suspensions, Emulsions, and Foams) taught by Dr. Ian Morrison of Harvard University.

PUBLIC RELATIONS/LEADERSHIP

Mr. Parker has been involved as a wrestling coach and a counselor for summer youth groups. He served a two-year Later-Day-Saint mission to Arkansas and western Tennessee and has presided over various church organizations and groups. He has been a Cub Master in the Cub-Scout organization and is currently a Venture/Varsity Scout leader in a local scout troupe.

INTERESTS/PERSONAL

Mr. Parker and his wife Cara are the proud parents of a three-year-old son and one-year-old twin girls. They enjoy spending time as a family and have many adventures together. Being raised in rural Idaho and working on farms and ranches throughout his youth, Mr. Parker has gained a love for the outdoors and enjoys fishing, camping, horseback riding, and hunting. He also enjoys an athletic nature and participating in sports.

Career History

An experienced chemical executive, Mr. Johnson combines sales and operations expertise with technical and business know-how. He has a proven record of developing and implementing innovative strategic plans, increasing market share and generating growth for such industry leaders as ExxonMobil, Hercules, and Dixie Chemical Company. Most recently he has partnered with private equity groups to purchase 3 companies and recapitalize them into a single entity, BHS Marketing LLC, and is the Chairman & CEO of the newly formed corporation.

BHS Marketing is a manufacturer and supplier of proprietary products to primarily the Food and Water Treatment industries providing products for food cleaning and sanitation as well as fluoride and other products for drinking water. BHS also distributes products to industrial applications in Mining, Aluminum, and Oil/Gas industries. As CEO, Mr. Johnson's challenge is to enhance the technical production, R&D activities, and field sales to allow for significant growth of direct food contact products that will be acceptable for human consumption.

Mr. Johnson held three positions at Dixie Chemical. In addition to being the President of the parent company, he was also the President and CEO of DX Pharma, Dixie's pharmaceutical subsidiary, and the President and CEO of DX Oilfield. He assumed responsibility at Dixie Chemical when the company's profitability was negative and restructured the operations, marketing and technology functions which was responsible for returning the company to profitability.

Earlier in his career, Mr. Johnson enjoyed a successful 11 year tenure at ExxonMobil Chemical having served in roles of increasing responsibility in manufacturing, R&D, site expansion projects, sales/marketing, and strategic planning with experience in North America, Europe, and Singapore.

Mr. Johnson started his chemical career at Hercules Inc. in the Aerospace Division working at Hercules' Radford Arsenal then transferred to the Specialty Polymers Division focusing on polymers utilized in Water Treatment for cogeneration, high pressure steam generation, industrial process and waste water applications.

Mr. Johnson has also been active in industry associations serving on the Board of Governors for SOCMA, Synthetic Organic Chemical Manufacturer's Association, and Executive Contact Board for ACC, American Chemical Council.

Education

Tulane University, A.B. Freeman School of Business, awarded Mr. Johnson an MBA in Finance and Operations in conjunction with International Marketing studies earned at Hautes Etudes Commerciales (HEC) in Paris, France where he also interned with the U.S. Embassy/International Management Center in Budapest, Hungary. Earlier he received a Bachelor's degree in Chemistry and Russian from Bucknell University in Lewisburg, PA.

Public Service and Personal

In addition to a successful career, Mr. Johnson served as Mayor and member of the City Council for the city of Nassau Bay, TX responsible for city staff, police, fire, EMS, public works, and capital projects. He also led the creation of the Economic Development Corporation to facilitate and finance redevelopment in the city which borders the Johnson Space Center. He served as EDC President for four years and successfully spearheaded the effort along with county and state governments to widen, upgrade, and beautify the road infrastructure and facilitated the redevelopment of over 40 acres of vacant commercial property into a multipurpose planned urban development center.

Mr. Johnson and his wife Catherine have four children, ages 24, 21, 21, and 17. In his free time, he enjoys sailing, canoeing, camping, and golf.

Short Biographical for Brad P. Bammel

Educational background

Postdoctoral Research Associate at Georgia State University 1983 - 1988

Ph.D. in Analytical Chemistry from the University of New Orleans 1983

Analytical Chemist at Keil Chemical in Hammond Indiana 1976 - 1978

B.S. in Chemistry from Illinois State University 1976

After receiving his Bachelors of Science degree in Chemistry from Illinois State University in 1976, Brad Bammel worked as a Quality Control and Customer Service Chemist at Keil Chemical in Hammond Indiana until 1978. Approximately 50% of his effort at Keil Chemical was analysis of complex mixtures of industrial lubricants. A significant portion of the work to be done with BHS is analysis of complex mixtures of industrial surfactants and lubricants. This experience will directly benefit the proposed work with BHS.

After completing his PhD in analytical chemistry at the University of New Orleans and working as a postdoctoral assistant at Georgia State University Dr. Bammel joined the chemistry faculty at Boise State University in 1988 where he teaches analytical chemistry. This teaching experience keeps him familiar with the chromatography and mass spectroscopy equipment that will be needed for the "Academic liaison with industry: from big D little r to big D big R is good for Idaho" project.

Dr. Bammel has no other funding or research projects at this time.

BHS Marketing

Nampa

May 25, 2011

Chemistry and Biochemistry Department
Boise State University
1910 University Drive
Boise, ID 83725-1520

Dr. McDougal,

BHS Marketing LLC is committed to serving Idaho and the Pacific Northwest as a research and development company focused on custom manufacturing of chemical products for the food and beverage industry. We have recently invested in a research laboratory that will have the capacity to evaluate product quality prior to shipping to our customers in the region. By partnering with you and Dr. Brad Bammel at Boise State University, we hope to foster a long-term collaborative relationship that will engage undergraduate and graduate students in research activities of market value.

Through reverse engineering and reformulation of phosphorus and nonylphenol ethoxylate containing detergents and cleaning products for the food, agriculture, and dairy industry, there exists great potential for our collaboration to be fruitful for both parties. Your effort to secure funding through this HERC award offers the opportunity to dramatically accelerate the productivity of our partnership. BHS is interested in the establishment of a Center of Excellence focused on technical improvements in the food and beverage industry. To this end, we have committed \$13,000 in seed money and direct BHS personnel to this effort to begin our working relationship. I am confident that we will be productive. The initial steps of agreeing on the terms of a non-disclosure agreement that is now in place, and the ability to work with the Office of Sponsored Projects, especially Mary Givens to come to the terms of a contractual agreement between Boise State and BHS are obstacles that are now behind us.

As we enter the summer months, productivity will be a significant driving force. Having met the students dedicated to our collaborative work and having met with you and Dr. Bammel on a number of occasions, I am excited at the direction of our combined effort. While we can only provide seed money to initiate work, I can attest to the commitment of BHS through the use of our direct R&D personnel to support and help ensure a meaningful experience to the student researchers that work on this project. The funding of this HERC proposal would have a substantial impact on the scope of work we are able to achieve. I have read the proposal and contributed to the BHS employment, sales, manufacturing, marketing, and commercialization of new products. I have ensured that Ben Parker, R&D Product Manager has committed his time to ensure the HERC proposal contains accurate information from our organization. Ben is the lead person from BHS that will guide the research effort and serve as a liaison between you, me and the students.



BHS Marketing

Nampa



I have seen the initial work done by Petr Malek, the undergraduate student working in your laboratory on this project. We have been very pleased with Petr's progress and have offered him an internship at BHS until the results of the HERC award are finalized. The instrumentation and laboratory facilities at Boise State provide opportunities that are highly valuable to advancing our research effort at BHS. Engaging the academic resources in the area is good for advancing our growing research and development sector and it is good for training students in our business so that we have a qualified pool of prospective employees in the region.

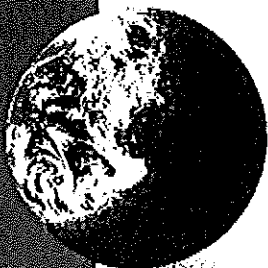
I am dedicated to working with Boise State to develop student research ability to the mutual benefit of all that are involved. I understand that student training takes time, but what better place to spend that time than while seeking a degree. As our business expands in Nampa, we have a need for qualified scientists. Our new research laboratory, to be completed at the beginning of June, has the capacity to accommodate another five full time research technicians. The work that Petr is doing would prepare him well to work for us upon completion of his chemistry degree. We are excited to be involved in developing the skill set of students that enhance their market value in the region.

As the Chariman & Chief Executive Officer of BHS Marketing LLC, I can attest to the commitment of BHS to ensure the success of this collaboration. I wish you the best of luck for the successful funding of the HERC proposal.

Best regards,

A handwritten signature in black ink, appearing to read "Philip Johnson", is written over a white background.

Philip Johnson
Chairman & CEO
BHS Marketing LLC



BHS Marketing LLC



Quality • Responsibility • Stewardship

Nampa

May 12, 2011

Chemistry and Biochemistry Department
Boise State University
1910 University Drive
Boise, Id 83725-1520

Dear Dr. McDougal,

I am writing to express my appreciation for the relevant research experience that was provided to me through work in your laboratory that has led to my current employment at BHS Marketing LLC in Nampa, ID. Your training and leadership, as well as that of your colleagues in the department of Chemistry and Biochemistry at BSU, have given me the breath and scope of knowledge required to find a place as a chemist in Idaho's industrial workforce. My success is directly linked to two key internship experiences, the first at BHS Marketing LLC and the second at Boise Technology Inc. The opportunity to engage, as an intern, in R&D work with industrial partners has had a profound impact on my ability to understand and learn practical applications of chemistry. I regard these two experiences as monumental capstones to my undergraduate training. Due to the industrial experience I gained working between these companies and BSU, I was offered employment with both organizations. I choose BHS Marketing and am now working as the R&D and Process manager.

In my role as the R&D and Process manager, I am responsible for coordinating the growth of our research division. BHS is focused on improving and developing chemistries utilized in the food industry. We strive to establish core competencies in this area. We have begun work on a new research and development laboratory that will significantly expand our ability to respond to market demand. Construction of this facility will be completed in June 2011. Despite these improvements, our customer demand is in excess of what we are able to accommodate. Our goal is to address these limitations through a collaborative relationship with Boise State University. This collaboration will be mutually advantageous to both organizations. By working together we will build a response mechanism for market demand on product development that will allow us to rapidly bring products to Idaho's food and dairy process industry. We will lay the foundation for continued technological advancement in food process chemistries and train the next generation of chemists in this field as they move through the BSU chemistry program.

I will serve as the liaison between BSU and BHS. In this role, I will work together with you to educate students on the broad scope of product development and pass on the information that provides real world application to student research activities. A portion of my time will be spent working with you to guide this research effort through weekly or biweekly research meetings with students. It is my pleasure to extend my commitment to work with you to create new training opportunities for students in a way that will lead to their eventual employment in Idaho.

Sincerely

A handwritten signature in black ink, appearing to read "Benjamin A. Parker".

Benjamin A. Parker
R&D and Process Manager



College of Arts and Sciences

Department of Chemistry and Biochemistry

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phone 208-426-3000

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chemistry@boisestate.edu

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25 May 2011

Dear Dr. McDougal,

I am writing to express my support for the collaborative project between BHS Marketing LLC (BHS) and Boise State University (BSU). Since January of this year, I have participated in weekly meetings between Ben Parker of BHS, BSU undergraduate students Petr Malek and Erin Groenewold, and you. Together we have made substantial progress in identifying products to reverse engineer, developing a protocol for reverse engineering, and training students to be productive in the laboratory and proficient with departmental instrumentation.

As the internship coordinator for the Department of Chemistry and Biochemistry at BSU, I am committed to fostering ties between local industry and our department that engage students in relevant research experiences as chemists. I am particularly impressed with the level of involvement of R&D Process Manager, Ben Parker and Chief Executive Officer of BHS, Phil Johnson. Meeting with Phil on several occasions and hearing his vision for establishing a "Center of Excellence" at BSU has gotten me excited to participate in this collaboration.

I am dedicated to continue mentoring and training students, participating in regular meetings to guide project progress, and offering my expertise as necessary to advance this collaboration. Funding of the HERC grant would provide a much needed boost for this project that would ensure productivity. In the absence of the HERC award, progress will be incremental and limited in scope.

Best wishes for the success of your proposal.

A handwritten signature in cursive script that reads "Brad P. Bammel".

Brad Bammel
Associate Professor of Chemistry and Biochemistry