2012
Annual Report
Department of Biological Sciences

Missouri University of Science & Technology

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Note: This Annual Report is prepared to improve communications with the S&T Biological Sciences community. To reduce the environmental impact of our activities, the report is published online; printed copies are available upon request. We publish the calendar annual report in February of the following year. We hope you find this information useful and the format accessible. Your feedback and ideas are welcome.

Useful BioSci Links

Department	biosci.mst.edu
Missouri S&T	www.mst.edu
cDNA Resource Center	www.cdna.org
BioSci Donations	givingtomst.missouri.edu
BS&T Biology FaceBook	Missouri S&T Biology

Department of Biological Sciences

Chair's Summary - 2012

Robert S. Aronstam

Department Update

The Missouri S&T Department of Biological Sciences embodies an academic community focused on learning and discovery. The S&T BioSci community provides a supportive, collegial, challenging and rewarding environment for its faculty, students and staff.

Economic conditions are slowly improving, and we are heartened by the campus- and system-wide strategic planning efforts that will direct our operations and initiatives for the next several years. As always, we plan to continue our consistent focus on maintaining and enhancing the quality of our programs.

Faculty:

BioSci faculty were honored with numerous notable and appointments and awards this year. Three faculty members received Faculty Achievement Awards in February: **Dr. Ronald Frank** received a Faculty Teaching Award, **Dr.**





David Westenberg received a Faculty Service Award and **Dr. Katie Shannon** received a Service Learning Award. **Dr. Westenberg** and **Ms. Terry Wilson** earned CERTI (Center for Educational Research and Teaching Innovation) awards based on student evaluations, while **Mr**. **Adam Martin** earned a CERTI commendation.

Dr. Yue-wern Huang was promoted to the academic rank of full professor. Dr. Huang joined the S&T faculty as an Assistant Professor in September 2000 serves as director of the Laboratory of Environmental Toxicology. Dr. Huang has maintained a vigorous research program in several key areas, notably the *in vitro* and *in vivo* toxicity of nanoparticles and the use of arginine-rich peptides as protein transduction domains to deliver cargoes (proteins, probes and therapeutic agents) into cells. Dr. Huang's research program has been consistently productive; in the most recent 3-year period, Dr. Huang published 11 papers and 3 book chapters. Dr. Huang's research has been supported by10 grants during his years at S&T.

Two patents were issued to **Dr. Melanie Mormile** and her colleagues in 2012. These inventions involved fossil fuel-free processing of lignocellulose (dry plant matter) to produce bio-fuels and hydrogen.

Dr. Katie Shannon was promoted to Associate Teaching Professor Dr. Shannon joined the BioSci faculty in 2005 and leads the Laboratory of Cytokinesis. Dr. Shannon will provide leadership for the undergraduate teaching committee and will continue her research on the molecular control of cytokinesis. Dr. Shannon also received an institutional grant to incorporate e-Learning technology into her Cell Biology class.

Dr. Katie Shannon and **Mr. Adam Martin** were named S&T eFellows, receiving support to redesign their courses to incorporate new educational technology. These efforts include the adoption of online access tools.

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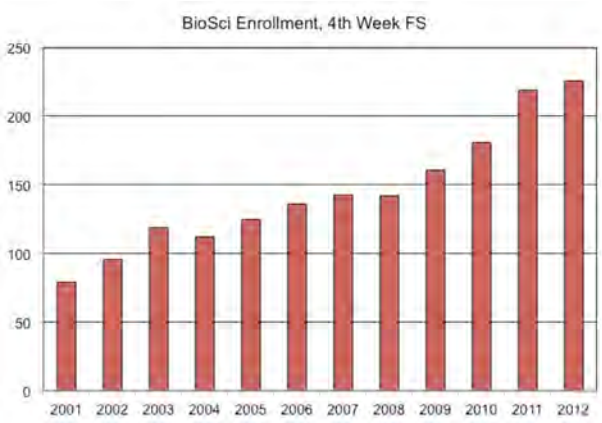
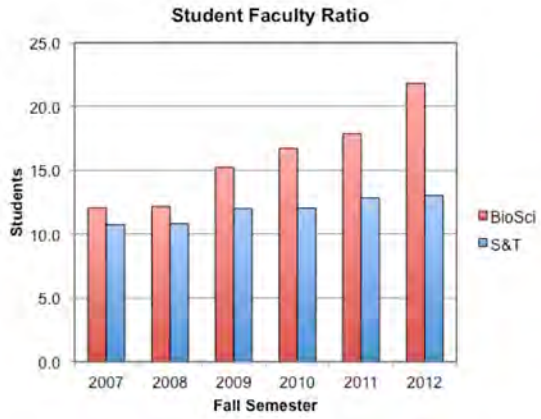
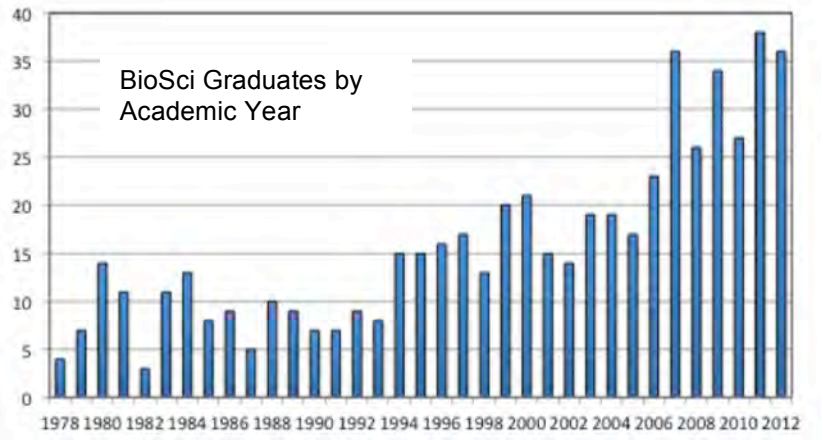


Students:

Degrees were awarded to 36 undergraduates and 4 graduate students at our May and December 2012 commencement ceremonies. This brings the number of BioSci graduates to 568 since the department was formed in 1978. Our entering class of first year students was the second highest in history, while the number of transfer students (23) set a new record.



The BioSci department continues to enjoy steady increases in undergradaute enrollment. The offical fall semester 4th week enrollment was 226 students. In terms of enrollment, we are now the 6th largest department on campus. The downside to this growth is illustrated in the graph on the right: The BioSci student: faculty ratio has risen to > 21:1, well above the S&T average. In the short run this poses a number of problems, especially is the area of providing meaningful research opportunities for our undergraduate students (a critical feature of our active learning program). In the somewhat longer run, this growth will occasion the addition of faculty lines to the BioSci department, broadening our intellectual resources.



Teaching. Big Deal: In AY2012, weighted student evaluations of the teaching efforts of BioSci faculty averaged **3.47** (47% response rate). This is outrageously high; the average BioSci faculty teaching score was on the threshold required for teaching award recognition. Individual faculty teaching awards are listed above.

We continue to offer an exceptionally broad biology curriculum (40+ courses). Our summer session included field courses in Ecology and Ozark Vegetation. This year we will offer a Cave Biology course for the first time.

Project Lead the Way. We hosted 5 training sessions for 72 master high school teachers involved in the Project Lead The Way – Biomedical Sciences curriculum. For the first time we offered training session in Medical Interventions. Under the direction of **Ms. Terry Wilson**, these sessions went exceptionally well**,** and we took full advantage of the opportunity to inform our guests about the unique training programs in biological sciences at Missouri S&T. We now offer academic credit to students in this remarkable program; we expect to be able to offer graduate credit for teachers this summer.

Alexis Martin and Erica Shannon;
Laboratory of Neurobiology

Research. In 2012 BioSci faculty members published 12 peer reviewed research publications, presented 12 papers at national and international meetings, and were invited to give 9 talks in various professional venues. Six visiting scholars from Taiwan National Normal University spent part of 2011 in our department; five others will join us in the spring semester of 2012. Clones sales from the cDNA Resource Center have totaled 0ver $2 million since FY2005. The sequences of 24 signaling proteins were submitted to GenBank, and 31 clones were introduced to the collection and made available to the scientific community.

BioSci Research Laboratories and Directors

• Animal Physiology	Chen Hou
• Biomaterials	Roger Brown
• Cytokinesis	Katie Shannon
• Environmental Microbiology	Melanie Mormile
• Environmental Toxicology	Yue-wern Huang
• Freshwater Ecology	Dev Niyogi
• Neurobiology	Robert Aronstam
• Plant Molecular Genetics	Ronald Frank
• Rhizosphere Microbiology	David Westenberg
• Sleep Behavior	Matt Thimgan

The faculty has identified the need for research program support as one of our greatest priorities. While faculty members actively pursue extramural finding opportunities, we are exploring ways to develop additional sources of support. Accordingly, three years ago the department established faculty research accounts funded with income from 1) summer session tuition, 2) grant overhead incentives, 3) donations, 4) biotech sales, 5) research endowment income, and 6) PLTW course credits. In 2012 the amount of distributed money more than doubled to >$42,000. This is an innovative approach that we seek to expand.

Student Affairs: Student organizations (Helix, Scrubs, iGEM and Phi Sigma) associated with the BioSci department had very active years, with invited speakers, service projects, and field trips (see accompanying reports). The department hosted weekly faculty-student teas, two graduation receptions, and a holiday party. Our weekly student newsletter (BioConnection) completed its sixth year of publication. The revamped departmental FaceBook page ("Missouri S&T Biology") provides an interesting snapshot of departmental activities. The iGEM cellular design team competed in its 5th national event.

Summer session Field Ecology courser at Bray Conservation Area

May 2012 Graduation Reception

Senior Megan Koerner at Undergraduate Research day, April 2012

Facilities. The department occupied space in Centennial Hall (Laboratory of Plant Molecular Genetics, cDNA Resource Center operations center, two faculty offices and a small conference room). Two of our teaching laboratories received minor renovations. Construction of the new Chemical Engineering Building has begun. In two years, we will assume former ChemEng space in the newer section of Schrenk Hall, while our present, ancient wing of Schrenk is renovated for classroom and office use.

Refurbished teaching lab in Schrenk Hall

Strategic Plan.
Among the strategic plan goals receiving particular attention at our most recent (August 2012) retreat were 1) defining curriculum learning objectives, 2) improving our research infrastructure, 3) increasing scientific publication, 4) developing a doctoral training program, 5) increasing faculty research/development funding from internal sources by at least $1,000/year, and 6) strengthening funding streams from PLTW activity, summer teaching, donations, and endowments. Progress has been made in all of these areas, as outlined in the present report. Notably, we are pleased with increases in our faculty research funding, development efforts, and in our research infrastructure (new space, HPLC, flow cytometer). A faculty group has been meeting regularly to examine teaching objectives and initiatives.

I am pleased to provide you with this report. Your comments and suggestions are welcome. As always, I invite you to visit the department for a tour and update on our work.

Sincerely,

Robert S. Aronstam, Ph.D.
Professor and Chair, Biological Sciences

Department of Biological Sciences
Mission Statement

To promote **learning** and **discovery** in the biological sciences while functioning as an inclusive academic community that is supportive, collegial, challenging and rewarding, and that values the personal and professional development of all its members (students, faculty, and staff).

Specific goals:

- Fostering the biology education of all students (majors and non-majors), and increasing the general public's awareness of contemporary issues related to biology;
- Facilitating students' mastery of biological knowledge, engaging them in the process of scientific discovery, and developing their ability to think critically and communicate effectively; and
- Conducting and communicating the results of innovative biological research

Robert S. Aronstam, Ph.D.

Professor and Chair, Department of Biological Sciences
Director, Laboratory of Neurobiology
Director, Missouri S&T cDNA Resource Center

Research Interests

Neurochemical, pharmacological and toxicological characterization of muscarinic acetylcholine receptors
G Protein Coupled Receptors signaling pathways: second messenger production, calcium imaging, altered gene expression, posttranslational receptor processing

Research Group: Adam Martin, M.S. (Senior Research Associate); Vanessa Kaighin (Research Technician); P.J. Kung (NTNU Visiting Scholar); Student Researchers: Hannah Frye, Anne Safron, Derrick Callahan, Jeremy Whilhoite, Katie Payne, Brittany Brand.

2012 Presentations

Huang, Y.-W., C.C. Chusuei, S. Mallavarapu and R.S. Aronstam, Mechanisms of Action of Cytotoxicity of Transition Metal Oxide Nanoparticles in Human Lung Cells, Experimental Biology, 2012.

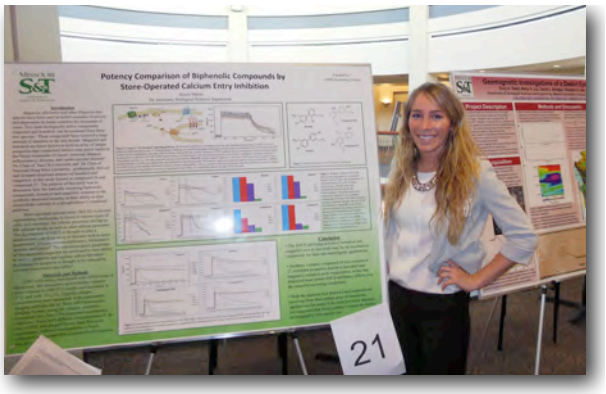
Huang, Y.-W., A. G. Martin, H-J. Wang, P-K. Chao, A. L. Martin1, E. K. Shannon, R. A. Reichard, M-H. Chang, and R.S. Aronstam Biphenols block calcium entry in response to activation of the M3 muscarinic receptor, Experimental Biology, 2012.

Aronstam, R.A., K.Z. Williams, H.L. Chambers, R.A. Reichard, E.K. Shannon, H.-J. Wang, A.G. Martin, and A.L. Martin, Orphan G protein coupled receptors: signaling pathways, Annual Meeting, American Society for Neurochemistry, Baltimore, MD, 2012.

Shannon, E.K., A.L. Martin, V.A. Kaighin, A.G.. Martin and R.S. Aronstam, Transcriptional regulation mediated by muscarinic acetylcholine receptors with native and constitutively active phenotypes, Annual Meeting, American Society for Neurochemistry, Baltimore, MD, 2012

2012-2013 Teaching

FS12: Cellular Biology (BioSci 211)
SP12: Pharmacology (BioSci 383)
SP13: Neurobiology (BioSci 384)
Undergraduate advisees: 48 majors; ≈12 minors
Graduate Students: Hsui-Jen Wang, Adam Martin
Visiting Scholar: P/J. Kung
OURE fellows: Katie Payne, Hannah Frye



Senior research team leader, Alexis Martin

2010 Activities

- Directed the Missouri S&T cDNA Resource Center –marketed stably transfected cell lines; added 12 clones to the catalog
- Expanded graduate student exchange program with National Taiwan Normal University; 5 visiting fellows welcomed
- Committee: Institutional Biosafety Committee (chair); Radiation Safety Committee. Department committees (Development, Recruitment); Vice-Chair, Department Chair Committee, Strategic Planning Coalition
- GenBank submissions: 12 full length coding sequences of human signal transduction proteins
- Presented 4 “Science Spotlights” at S&T Open Houses

Roger F. Brown, Ph.D.

Professor Emeritus
Chancellor's Professor
Director, Missouri S&T Animal Research Facility
Director, Biomaterials Laboratory

Research Interests

Biomaterials for soft tissue repair

Porous bioactive glass scaffolds for in vitro engineering of new bone tissue

Bioabsorbable composite materials for bone fracture fixation

Neutron-activatable glass microspheres for radiotherapeutic applications

2012 Publications

Modglin, V.C., Brown, R.F., Fu, Q., Rahaman, M.N., Jung, S.B. and Day D.E. *In Vitro* Performance Of 13-93 Bioactive Glass Fiber And Trabecular Scaffolds With MLO-A5 Osteogenic Cells, *Journal of Biomedical Materials Research* 100A:2593–2601, 2012.

Modglin, V.C. Brown, R.F., Jung, S.B. and Day, D.E., Cytotoxicity Assessment Of Modified Bioactive Glasses With MLO-A5 Osteogenic Cells *In Vitro, Journal of Materials Science: Materials in Medicine* (in press).

Fu, H., Rahaman, M.N., Brown, R.F. and Day, D.E., Evaluation of bone regeneration in implants compsed of hollow HA microspheres loaded with transforming growth factor beta1 in a rat calvarial defect model, Acta Biomater., in press, 2013.

Modglin, V.C. and Brown, R.F., Performance Of Surface Immobilized RGDC 13-93 Bioactive Glass Fiber Rafts and Scaffolds With MLO-A5 Osteogenic Cells *In Vitro,* (submitted) *Journal of Biomaterials Applications*.

2012 Teaching

SP12: Human Anatomy and Physiology Lab II (BioSci 247)

FS12: Human Anatomy and Physiology Lab I (BioSci 245)

FS12: Biomaterials I / Biomaterials II (BioSci 340/BioSci 440) – guest presentation

Graduate students:

Mr. Yinan Lin, MS degree, graduated August 2012
Mr. Richard Watters, MS degree candidate (in progress)

2012 Funding

Center for Bone and Tissue Repair and Regeneration, 'Microcirculatory Response of Skin Wounds to Borate Glass Nanofibers,' PI, 1/01/12-12/31/12, $34,000.

2012 Activities

Member of Center for Bone and Tissue Repair and Regeneration (CBTRR), which began January 2008 with a mission to develop advanced biomaterials and biosensors for repair of traumatized bones and tissue.

Ronald L. Frank, Ph.D.

Associate Professor

Laboratory of Plant Molecular Genetics

Research Interests

Identification of gene families and other functional sequences using computer algorithms

Evolution and expression of gene families in plants

Structure and expression of phenylalanine ammonia-lyase gene family in soybean

Education

Houghton College, Houghton, NY, B.S. General Biology, 1978

The Ohio State University, Columbus, OH, M.Sc., Genetics, 1981

The Ohio State University, Columbus, OH, Ph.D., Genetics, 1985

USDA Agricultural Research Service, Beltsville, Postdoctoral Fellow, 1985-88

2012 Publications

Lee L, Leopold JL, Frank RL. 2012. Exhaustive RT-RICO algorithm for mining association rules in protein secondary structure. *Proceedings of the IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB) 2012*, 260-266.

Lee L, Leopold JL, Frank RL. 2012. Protein secondary structure prediction using BLAST and exhaustive RT-RICO, the search for optimal segment length and threshold. *Proceedings of the IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB) 2012*, 35-42.

2012 Presentations

Lee L, Leopold JL, Frank RL. 2012. Exhaustive RT-RICO algorithm for mining association rules in protein secondary structure. IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB), San Diego, CA.

Lee L, Leopold JL, Frank RL. 2012. Protein secondary structure prediction using BLAST and exhaustive RT-RICO, the search for optimal segment length and threshold. IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB), San Diego, CA.

2012 Teaching

WS12: General Genetics (BioSci 231)

WS12: Genomics (BioSci 301)

FS12: Molecular Genetics (BioSci 331)

FS12: Evolution (BioSci 235)

Undergraduate advisees: 31 majors

Undergraduate researchers: Kristin Kelly (BIO 390)

Graduate Students: Gena Robertson M.S., Lisa Snoderly-Foster M.S., Satya Achanta Ph.D. (ChemE), Lisa Guntly Ph.D. (CompSci)

Chen Hou, Ph.D.

Assistant Professor

Laboratory of Animal Physiology

Research Interests

Metabolic basis of aging; Energetic basis of animal growth and reproduction; Mammalian respiratory physiology; Eusocial insects

2012 Publications

J. Shik, **C. Hou (Co-first author)**, A. Key, M. Kaspari, and J.F. Gillooly. 2012. Toward a general life history model of the superorganism: predicting the survival, growth, and reproduction of ant societies. *Biology Letters* . doi: 10.1098/rsbl.2012.0463.

J. Gillooly, A. Hayward, and **C. Hou**, G. Burleigh. 2012. Explaining differences in the lifespan and replicative capacity of cells: a general model and comparative analysis of vertebrates *Proc. Royal Society B* . **279**: 3976-3980

T.G. Bromage, R. Hogg, R.S. Lacruz, and **C. Hou** . 2012 Primate enamel evinces long period biological timing and regulation of life history. *Journal of Theoretical Biolgy* . **305**: 131-144

M. Mayo, P. Pfeifer, and **C. Hou**. 2012. Reverse engineering the robustness of mammalian lung. *Reverse Engineering*, ed. A.C. Telea. InTech Publisher, Boston, P243-262.

2012 Invited Speeches

Hou, C., Metabolic Scaling Theory: From the Colonial Life of Social Insects to the Mammalian Pulmonary System. Dept. of Biological Sciences, MST, Rolla, Missouri, March, 2012.

Hou, C., Energy tradeoffs between growth and longevity. Gordon Research Conference: Metabolic Basis of Ecology; Biddeford, Maine, July, 2012.

Hou, C., Effects of caloric restriction on health maintenance and aging: Insight from metabolic theory. International Symposium on Biomathematics and Ecology Education and Research; St. Louis, Missouri, November, 2012.

Hou, C., How food restriction extends lifespan. Target Meeting Aging Online Symposium; November, 2012.

2012 Teaching

SP12: Human Anatomy and Physiology II (Bio246)
SU12: Evolution (Bio235)

2012 Advising

Undergraduate advisees: 10 majors; Undergraduate researchers: Ian King, Matthew Hayes, and Michael Jennings; Graduate advisee: Lihong Jiao

2012 Activities

Reviewer of peer-reviewed international journals: *Oikos*; *Ecology*; and *Functional Ecology*.

Yue-wern Huang, Ph.D.

Professor

Director, Laboratory of Bionanotechnology and Molecular Toxicology

Research Interests

Nanomaterial toxicity in the aspect: how physiochemical properties of nanoparticles contribute to molecular toxicity mechanisms

Using nanomaterials and cell-penetrating peptides (CPPs) to deliver biologically active molecules into the cell

Pollutants and environmental health

2012 Publications

2012. Ji-Sing Liou, Betty Revon Liu, Adam Martin, Yue-Wern Huang, Huey-Jenn Chiang, and Han-Jung Lee. Protein transduction in human cells is enhanced by cell-penetrating peptides fused with an endosomolytic HA2 sequence. Peptides 37:273-284. (Y. H. and H. L. are corresponding authors.)

2012 Presentations

Invited Speeches

2012, August 7. US EPA. Cytotoxicity of Transition Metal Oxide Nanoparticles Depends on Certain Physicochemical Properties. Research Triangle Park, NC, USA.

2012, March 19, 2012. NIBIB/NIH, Laboratory of Molecular Imaging and Nanomedicine. Presentation title: Nanodelivery Depends on Types of Cell-penetrating Peptides and Cargos. Bethesda, MD, USA.

Conference Presentations

2012, Nov. 4-6. The 1st Annual Meeting of Sustainable Nanotechnology Organization. Yue-Wern Huang, Betty Revon Liu, Han-Jung Lee. Routes of Cellular Uptake of Nano-sized Materials Depend on Compositions of Cell-Penetrating Peptides. Arlington, VA, USA.

2012, April 21-24. Annual Meeting of the Federation of American Societies For Experimental Biology. Yue-wern Huang, A. G. Martin, H-J. Wang, P-K. Chao, A. L. Martin, E. K. Shannon, R. A. Reichard, M-H. Chan, Robert S. Aronstam. Biphenols block calcium entry in response to activation of the M3 muscarinic receptor. San Diego, CA, USA.

2012, April 21-24. Annual Meeting of the Federation of American Societies For Experimental Biology. Yue-wern Huang, Charles C. Chusuei, Shravan Mallavarapu, Robert S. Aronstam. Mechanisms of action of cytotoxicity of Transition metal oxide nanoparticles in human lung cells. San Diego, CA, USA.

2012 Pending Proposals

2014. Bioactive Materials for Traumatic Battlefield Injuries. PI: Mohamed N. Rahaman; Co-PIs (at S&T): Richard K. Brow; Delbert E. Day; Yue-Wern Huang; Ming C. Leu; Chang-Soo Kim. Plus UMKC, MU, PCRMC, Indiana U., Mo-Sci Corp. DOD/USAMRMC.

2013 – 2014. Characterization of Twenty Nanomaterials. EPA National Center for Computational Toxicology. PI: Yue-Wern Huang.

2013 – 2018. Mechanisms of Cardiopulmonary Toxicity Depend On Well-defined Metal Oxide Nanoparticles. Multiple PIs: Yue-Wern Huang, Lung Chi Chen & Terry Gordon (NYU), Da-ren Chen (Wash. U.) NIH R01. (Pending)

2013 – 2018. Engineering Materials and Devices for Tissue Regeneration. NSF Integrative Graduate Education and Research Traineeship Program (IGERT). PI: Mohamed N. Rahaman; Co-PIs: Yue-Wern Huang, Dick Brow, Chang-Soo Kim, Ming Lu, and Yinfa Ma. (Pending)

2012 Teaching

SS12: Toxicology (BioSci 370/470); Issues in Public Health (BIO201); Techniques in Appl & Env Bio (BioSci 475); Special Problems (BioSci 300)

Undergraduate advisees: 15 bio majors

Graduate Students: Chi-heng Wu

2012 Activities

- Reviewer of peer-reviewed international journals: Biomaterials, Langmuir; Advanced Materials Letters; Cell Biology and Toxicology; Toxicology; Journal of Applied Toxicology; Journal of Membrane Biology (BioMed Central); Journal of Agricultural and Food Chemistry
- S& T Institutional Animal Care and Use Committee Chair
- Departmental Graduate Program Chair
- Coordinator of the student exchange program with National Taiwan Normal University.
- Sabbatical leave to NIH (September – December 2012)

Melanie R. Mormile, Ph.D.

Professor

Environmental Microbiology Laboratory

Research Interests

Microbial populations in hypersaline environments

Bio-energy production by halophilic/halotolerant bacteria

Retrieval of enzymes for industrial use from extremophilic bacteria

Members of Laboratory

Daniel Roush-Master's Thesis Candidate

Elise Kittrell-Master's Thesis Candidate (co-advised with Dr. Joel Burken)

Varun Paul-Ph.D. Student (co-advised with Dr. David Wronkiewicz)

Tiffany Edwards-Undergraduate Researcher, OURE

Danielle Insall-Undergraduate Researcher

Erica McFarland-Undergraduate Researcher, OURE

Sarah Rommelfanger-Undergraduate Researcher

2012 Publications

Begemann M.B., M.R. Mormile, O.C. Sitton, J.D. Wall, and D.A. Elias. A streamlined strategy for biohydrogen production with *Halanaerobium hydrogeniformans*, an alkaliphilic bacterium. Frontiers in Microbiology **3**:93. doi: 10.3389/fmicb.2012.00093

2012 Patent

Dwayne A. Elias, Melanie R. Mormile, Matthew B. Begemann, and Judy D. Wall. "Fossil Fuel-Free Process of Lignocellulosic Pretreatment with Biological Hydrogen Production", U.S. Patent No. US 8,034,592 B2, Date of Patent: Oct. 11th.

2012 Invited Presentations

Biohydrogen Production from Cellulosic Material by an Halophilic Bacterium. Department of Earth and Atmospheric Sciences and the Department of Biology, Central Michigan University, Mount Pleasant, Michigan, March 22. (*National Level*)

Are There Martians in Australia? American Society for Microbiology, Michigan Branch Meeting, Central Michigan University, Mount Pleasant, Michigan, March 24. (*National Level*)

2012 Abstracted Presentations

Paul, V., D. Wronkiewicz, and M.R. Mormile. Sulfate Reducing Bacteria and Their Potential Role in CO2 Sequestration. (Platform) Missouri Branch Meeting of ASM. March 30-31, St. Joseph, MO. *Varun was awarded third place recognition for his presentation. (Regional level).*

2012 Teaching

SP12: Bio Sci 221, Microbiology, co-taught with David Westenberg

SP12: Bio Sci 301, Special Topics, Microbial Metabolism, co-taught with David Westenberg

SP12: Bio Sci 402, Problems in Applied and Environmental Microbiology

SP12: Bio Sci 421, Advanced Microbial Metabolism, co-taught with David Westenberg

FS12: Bio Sci 102, Introduction to Biological Sciences

FS12: Bio Sci 221, Microbiology

FS12: Bio Sci 351, Introduction to Environmental Microbiology
FS12: Bio Sci 451, Environmental Microbiology

2012 Honors

Outstanding Professor Award presented by the Eta Kappa Chapter of Chi Omega

2012 Activities

- Academic Editor for PLoS ONE
- Member of the Editorial Boards for Applied and Environmental Microbiology; Environmental Technology; Agricultural, Food and Analytical Bacteriology; Frontiers in MicroBio Technology; Frontiers in Extreme Microbiology
- Served as peer-reviewer for the following journals: BMC Microbiology; Environmental Science and Technology; Extremophiles; International Biodeterioration & Biodegradation; and Life, an Open Access Journal
- Served as peer-reviewer for the following grant agencies: American Chemical Society Petroleum Research Fund
- Program Session Organized and Convened: Environmental Microbiology-Bioremediation and Biodegradation. *Society for Industrial Microbiology and Biotechnology Annual Meeting and Exhibition*, August 12-15, Washington, D.C.
- Program Session Organized and Convened: Environmental Microbiology-Biohydrogen Production. *Society for Industrial Microbiology and Biotechnology Annual Meeting and Exhibition*, August 12-15, Washington, D.C.
- Actively served on the following national committees: The American Society for Microbiology's Committee on the Status of Women in Microbiology of the Public and Scientific Affairs Board; The EMD Millipore Alice C. Evans Award Selection Committee; the Industrial Microbiology and Biotechnology Annual Meeting Program Committee
- Actively served on the following University of Missouri System-wide committee: Symposium Planning Committee, *Frontiers in Metagenomics*, May 7-8, 2012, Columbia, Missouri
- Actively served on the following Missouri University of Science and Technology' committees: MSM-UMR Alumni Association Awards Committee; and Campus Promotion and Tenure
- Academic Faculty Advisor for the Mars Rover Design Team
- Academic Faculty Advisor for Helix, the Undergraduate Student Organization of the Department of Biological Sciences
- Parliamentarian for the Faculty Senate of Missouri University of Science and Technology

Dev Niyogi, Ph.D.

Associate Professor

Director, Laboratory of Freshwater Ecology

Research Interests

Freshwater ecology, aquatic biogeochemistry, microbial ecology of streams and lakes

2012 Publications

Greenwood, M.J., J.S. Harding, D.K. Niyogi, and A.R. McIntosh. 2012. Improving the effectiveness of riparian management for aquatic invertebrates in a degraded agricultural landscape: stream size and land-use legacies. *Journal of Applied Ecology*. 49:213-222.

2012 Teaching

SP12: Ecology (Bio 251)
SP12: Biodiversity (Bio 113)
SP12: Ecology of large Felidae (Bio 300)
SU12: Field Ecology (Bio 201)
SU12: Field class in freshwater ecology (through University of Colorado)
FS12: Freshwater Ecology (Bio 354)
FS12: Ecology (Bio 251)
Graduate research advisees: 1
Visiting scholars from NTNU: 1
Undergraduate research advisees: 5

2012 Activities

At Missouri S&T, I am continuing my research on ecosystem processes in streams, and the use of molecular tools to describe microbial communities of streams. One main focus is on the effects of stream drying on communities of microbes, algae, and animals. One graduate student and several undergrads have been helping with these studies. I also have hosted several visiting scholars from National Taiwan Normal University, who have conducted research on the effects on aquatic fungi and leaf decomposition. I am also continuing my research collaboration with colleagues at the University of Canterbury in Christchurch, New Zealand. My main research focus there is the effects of active and abandoned coal mines on streams. My teaching has focused on several introductory and advanced ecology classes. In 2012 I received a Faculty Teaching Award.

Katie Shannon, Ph.D.

Associate Teaching Professor , Department of Biological Sciences

Director, Cytokinesis Laboratory

Director, Cellular Imaging Facility

Research Interests

Regulation of actomyosin ring assembly and contraction

Cytokinesis is the physical separation of cells, accomplished by contraction of a ring containing actin and the molecular motor myosin. Regulation of cytokinesis is essential to ensure that cell division occurs between chromosomes segregated by mitosis. If cytokinesis fails, aneuploidy results, leading to cell death or tumoriogenesis. The current focus is on a protein essential for cytokinesis in the budding yeast *Saccharomyces cerevisiae* called IQG1. This protein interacts with many other proteins, including actin, a small GTPase, and formins, a class of actin nucleating proteins. Regulation of these interactions during the cell cycle is an area of active research.

2012 Publications

Shannon, K.B. (2012) IQGAP family members in yeast, *Dictyostelium*, and mammalian cells. *International Journal of Cell Biology* Focus Issue on Cytoskeletal Proteins vol. 2012, Article ID 894817, 14 pages, 2012. doi:10.1155/2012/894817

2012 Presentations

Miller, D. and Shannon, K.B. (2012) Phosphorylation of Iqg1 by Cyclin Dependent Kinase (CDK), Cdc28, Temporally Regulates Actin Ring Formation, Dec. 16, 2012, American Society for Cell Biology Annual Meeting, San Francisco, CA

C-H. Huang, M. Ponzer, Y-C. Yu, M. Choudhry, **K. B. Shannon** (2012) Interaction of Iqg1 with formins in budding yeast cytokinesis, Dec. 16, 2012, American Society for Cell Biology Annual Meeting, San Francisco, CA

2012 Professional Development

Biology Scholar Research Residency: The Scholarship of Teaching and Learning**-** American Society for Microbiology, 2012-2013

2012 Grants

Educational mini-grant from Vice Provost for Academic Affairs, 2012 (P.I.) "Design and Implementation of a Study to Determine if a Cell Model Project Attains Desired Learning Outcomes," $1,410

2012 Teaching

WS12: Cellular Biology (Bio211), BioDesign (Bio375), co-taught with Dr. Westenberg

FS12: Senior Seminar (Bio310), Cancer Cell Biology (Bio335/435), Techniques in Applied and Environmental Biology (Bio475)

2012 Advising

OURE students: Brandon Drennen, Mary Ponzer, Avery Joseph

Masters student: Daniel Miller

Twenty Undergraduate Advisees

2012 Activities

- iGEM student synthetic biology team, advised, supervised project
- Reviewer, Molecular Biology of the Cell
- Advisory Board member, Women in Science and Engineering (WISE)
- Advisory Board member, Student Design and Experiential Learning Center (SDELC)

Matthew S. Thimgan, Ph.D.

Assistant Professor
Laboratory of Genetic & Behavioral Sleep Research

Research Interests

Genes and metabolic pathways that regulate both the sleep and wake cycles
Pathways that mitigate the negative consequences of sleep deprivation, with a focus on lipid metabolism pathways
Salivary biomarkers of sleep deprivation

Teaching

SS2012: ME 261: Lead project for Biology applications for Mechanical Engineering
Bio 401: Special Topics in Sleep and Endocrinology
FS 2012: Bio 244: Anatomy & Physiology I
Bio 390: Undergraduate research topics

Undergraduate researchers: Carlos Rivera, Dillon Barton, Thomas Congdon, Sahitya Injamuri, Rachel Glenn, Candace Miller, Anna Luce, Thomas Hilderbrand, Stephanie Voertman, Nick Trapani (Eng Mgmt), Pasha Palangour (Comp Sci)

Publications

Donlea J, Leahy A, **Thimgan MS**, Suzuki Y, Hughson BN, Sokolowski MB, Shaw PJ (2012). Foraging alters resilience/vulnerability to sleep disruption and starvation in *Drosophila*. Proc Natl Acad Sci U S A. 2012 Feb 14;109(7):2613-8.

Presentations

Rivera, Carlos*, Natalie Kress, Laura Gottschalk, Paul Shaw, and **Matthew S. Thimgan**. "Disruption of a Lipid Metabolism Gene Results in Decreased Sleep and Longevity" Midwest *Drosophila* Conference (2012).

David J. Westenberg, Ph.D.

Associate Professor
Chair, Pre-Medicine Advisory Committee

USA Science and Engineering Festival

Research Interests

Antibacterial materials, rhizosphere microbiology. legume symbiosis, quorum sensing

Research Lab Members: Aaron Carson, Matt Coates, Brieanna Kroeger, Michael Lockett, Megan Ottomeyer, Keara Pringle, Matt Threadgill, Jesse Townshend, Natalie Updyke

Abstracts

Westenberg, D.J. and Shannon, K. 2012 The Positive Impact of Synthetic Biology in the Biology Curriculum. 14th Annual Danforth Center Fall Symposium: Exploration in Synthetic and Systems Biology, St. Louis, MO.

Westenberg, D.J. 2012. ASM's K-12 Outreach: Connecting and Raising Awareness. ASM Conference on Undergraduate Education. San Mateo, CA

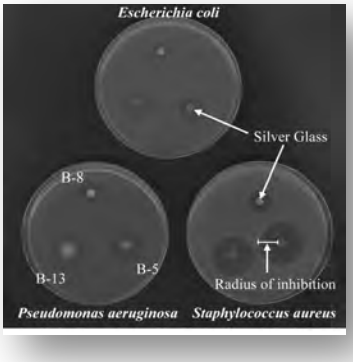
Invited Presentations:

Synthetic Biology Explained: Benefits, Risks, Ethics. Missouri Food Safety and Food Defense Task Force, Missouri Department of Health and Senior Services. Jefferson City, MO February 9, 2012

Teaching

SP12: Microbiology (BioSci 221); Microbiology Lab (BioSci 222); Communication Workshop for Pre-Health Professions (Pre-Med 310), Biological Design and Innovation (BioSci 375), Advanced Microbial Metabolism (BioSci 421)

FS12: Microbiology Lab (BioSci 222), General Genetics (BioSci 231), Microbial Genetics (BioSci 301/401)



Extramural Funding

Missouri Dept. of Higher Ed. Grant, $217,581.32 Science Ed. & Quantitative Literacy: An Inquiry-based Approach

2012 Activities

Co-Advisor for the Missouri S&T iGEM team

Advisor for Scrubs, the Missouri S&T Pre-Health student organization

Summer SEQL Workshop for K-12 teachers

Chair of the ASM Committee on K-12 Education

Hosted an information booth for the NSTA National Conference

Represented ASM and developed hands-on activities for the USA Science and Engineering Festival.

Interview for MicrobeWorld
http://www.microbeworld.org/index.php?option=com_content&view=article&id=1203

Convened a session on The ASM Presents: Evolution and the Extremes for the NABT National Conference

Member of the Missouri S&T Performing Arts Series, Service Learning Advisory and Athletics Advisory Committees

Numerous presentations to visiting students such as SHPE, MITE, Upward Bound and various school groups.

2011 Awards, Honors

Outstanding Teaching Award, Missouri S&T

Faculty Service Award, Missouri S&T

NRHH Faculty/Staff of the Month, local and regional selection, Honorary membership

Aaron Carson, Matt Coates, Matt Threadgill, Jesse Townshend and Natalie Updyke earned S&T OURE awards

Terry Wilson, M.S.
Associate Teaching Professor
Assistant Affiliate Director, PLTW Biomedical

2012 Teaching

SP12: Biodiversity (Bio113)
SP12: Biodiversity lab (Bio 114, 4 sections)
SP12: Cellular Biology Lab (Bio 212, 2 sections)
FS12: Principles of Biology lecture (Bio 111)
FS12: General Biology Lab (Bio 112, 3 sections)
FS12: Cellular Biology Lab (Bio 212, 3 sections)

2012 Activities

- PRO advisor for first year students
- Hosted Project Lead the Way summer training institute for secondary science teachers

Awards

- Missouri University of Science and Technology Outstanding Teaching Award, 2012

Project Lead the Way Training – 2012

8 sessions
74 teachers
Session I: PBS - 13
Session I: HBS - 10
Session I: BI - 7
Session II: MI -13
Session II: HBS - 10
Session III: PBS - 10
Session III: BI - 5
Session III: MI - 6

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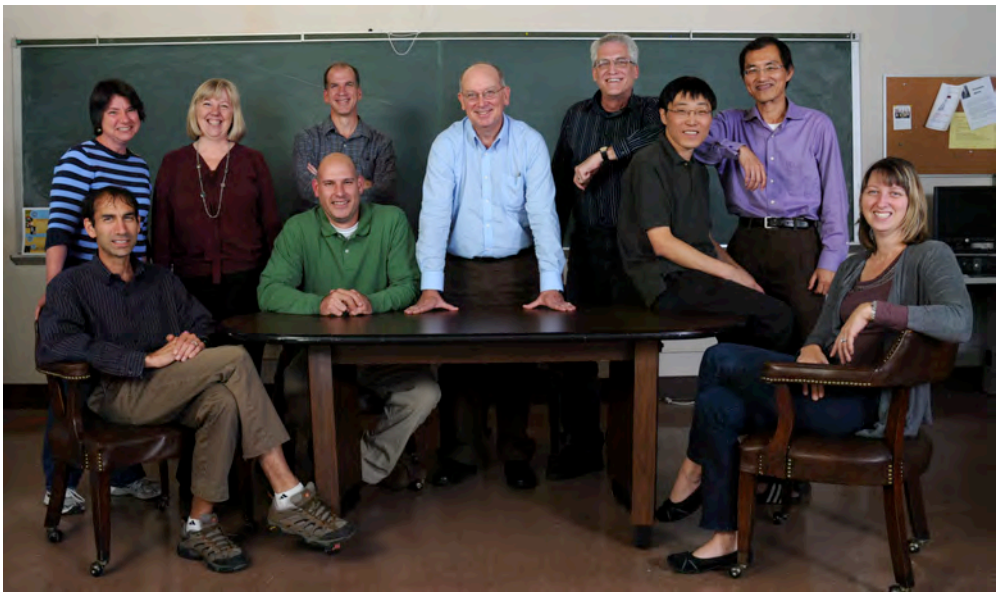
Faculty Publications

2012 Annual Report



BioSci Faculty (*l-r*):
Melanie Mormile (standing),
Dev Niyogi,
Terry Wilson,
Matt Thimgan (seated),
David Westenberg,
Robert Aronstam,
Ronald Frank,
Chen Hou,
Yue-wern Huang,
Katie Shannon,

Research Articles:

Begemann M.B., Mormile, M.R., Sitton, O.C., Wall,J.D. and Elias, D.A., A streamlined strategy for biohydrogen production with *Halanaerobium hydrogeniformans*, an alkaliphilic bacterium. *Frontiers in Microbiology* 3:93. doi: 10.3389/fmicb.2012.00093, 2012

Bromage, T.G., Hogg, R., Lacruz, R.S., and Hou, C., Primate enamel evinces long period biological timing and regulation of life history. *Journal of Theoretical Biology*_. 305: 131-144, 2012.

Donlea, J., Leahy, A., Thimgan, M.S., Suzuki ,Y., Hughson B.N., Sokolowski M.B., Shaw P.J., Foraging alters resilience/vulnerability to sleep disruption and starvation in *Drosophila*. *Proc Natl Acad Sci USA*. 2012 Feb 14;109(7):2613-8, 2012.

Gillooly, J., Hayward, A., and Hou, C., Burleigh, G., Explaining differences in the lifespan and replicative capacity of cells: a general model and comparative analysis of vertebrates *Proc. Royal Society B* . 279: 3976-3980, 2012.

Greenwood, M.J., Harding, J.S. Niyogi, D.K. and McIntosh, A.R., Improving the effectiveness of riparian management for aquatic invertebrates in a degraded agricultural landscape: stream size and land-use legacies. *Journal of Applied Ecology*. 49:213-222, 2012.

Lee L, Leopold JL, Frank RL., 2012, Protein secondary structure prediction using BLAST and exhaustive RT-RICO, the search for optimal segment length and threshold. *Proceedings of the IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB) 2012*, 35-42, 2012.

Lee, L., Leopold, J.L., Frank, R.L., 2012. Exhaustive RT-RICO algorithm for mining association rules in protein secondary structure. *Proceedings of the IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB) 2012*, 260-266, 2012.

Liou, J.-S., Liu, B.R., Martin, A.L, Huang, Y.-w., Chiang, H.-J., and Lee, H.-J., Protein transduction in human cells is enhanced by cell-penetrating peptides fused with an endosomolytic HA2 sequence. *Peptides* 37:273-284, 2012.

Mayo, M., Pfeifer, P., and Hou, C., Reverse engineering the robustness of mammalian lung. *Reverse Engineering*, ed. A.C. Telea. InTech Publisher, Boston, P243-262, 2012.

Modglin, V.C., Brown, R.F., Fu, Q., Rahaman, M.N., Jung, S.B. and Day D.E. *In Vitro* Performance Of 13-93 Bioactive Glass Fiber And Trabecular Scaffolds With MLO-A5 Osteogenic Cells, *Journal of Biomedical Materials Research* 100A:2593–2601, 2012.

Shannon, K.B., IQGAP family members in yeast, *Dictyostelium*, and mammalian cells. *International Journal of Cell Biology* Focus Issue on Cytoskeletal Proteins vol. 2012, Article ID 894817, doi:10.1155/2012/894817, 2012.

Shik, J., Hou, C., Key, A., Kaspari, M., and Gillooly, J.F., Toward a general life history model of the superorganism: predicting the survival, growth, and reproduction of ant societies. *Biology Letters* . doi: 10.1098/rsbl.2012.0463, 2012.

Presentations at Professional Meetings:

Aronstam, R.A., K.Z. Williams, H.L. Chambers, R.A. Reichard, E.K. Shannon, H.-J. Wang, A.G. Martin, and A.L. Martin, Orphan G protein coupled receptors: signaling pathways, Annual Meeting, American Society for Neurochemistry, Baltimore, MD, 2012.

Huang, C.-H., M. Ponzer, Y-C. Yu, M. Choudhry, K. B. Shannon (2012) Interaction of Iqg1 with formins in budding yeast cytokinesis, Dec. 16, 2012, American Society for Cell Biology Annual Meeting, San Francisco, CA

Huang, Y.-w., A. G. Martin, H-J. Wang, P-K. Chao, A. L. Martin, E. K. Shannon, R. A. Reichard, M-H. Chan, Robert S. Aronstam, Biphenols block calcium entry in response to activation of the M3 muscarinic receptor. Annual Meeting of the Federation of American Societies For Experimental Biology San Diego, CA, USA, April 21-24, 2012.

Huang, Y.-w., Charles C. Chusuei, Shravan Mallavarapu, Robert S. Aronstam, Mechanisms of action of cytotoxicity of Transition metal oxide nanoparticles in human lung cells, Annual Meeting of the Federation of American Societies For Experimental Biology San Diego, CA, USA, April 21-24, 2012.

Huang, Yue-wern, Betty Revon Liu, Han-Jung Lee, Routes of Cellular Uptake of Nano-sized Materials Depend on Compositions of Cell-Penetrating Peptides. The 1st Annual Meeting of Sustainable Nanotechnology Organization, Arlington, VA, USA, Nov. 4-6, 2012.

Lee L., Leopold J.L., Frank R.L., Protein secondary structure prediction using BLAST and exhaustive RT-RICO, the search for optimal segment length and threshold. IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB), San Diego, CA, 2012.

Miller, D. and Shannon, K.B., Phosphorylation of Iqg1 by Cyclin Dependent Kinase (CDK), Cdc28, Temporally Regulates Actin Ring Formation, American Society for Cell Biology Annual Meeting, San Francisco, CA, Dec. 16, 2012

Paul, V., D. Wronkiewicz, and M.R. Mormile, Sulfate Reducing Bacteria and Their Potential Role in CO2 Sequestration. (Platform) Missouri Branch Meeting of ASM. St. Joseph, MO, March 30-31, 2012.

Rivera, C., Kress, N., Gottschalk, L., Shaw, P., and Thimgan, M.S., "Disruption of a Lipid Metabolism Gene Results in Decreased Sleep and Longevity" Midwest *Drosophila* Conference, 2012.

Shannon, E.K., A.L. Martin, V.A. Kaighin, A.G.. Martin and R.S. Aronstam, Transcriptional regulation mediated by muscarinic acetylcholine receptors with native and constitutively active phenotypes, Annual Meeting, American Society for Neurochemistry, Baltimore, MD, 2012.

Westenberg, D.J. 2012, ASM's K-12 Outreach: Connecting and Raising Awareness. ASM Conference on Undergraduate Education. San Mateo, CA

Westenberg, D.J. and Shannon, K., 2012 The Positive Impact of Synthetic Biology in the Biology Curriculum. 14th Annual Danforth Center Fall Symposium: Exploration in Synthetic and Systems Biology, St. Louis, MO.

Invited talks, Seminars

Hou, C., Effects of caloric restriction on health maintenance and aging: Insight from metabolic theory. International Symposium on Biomathematics and Ecology Education and Research; St. Louis, Missouri, November, 2012.

Hou, C., Energy tradeoffs between growth and longevity. Gordon Research Conference: Metabolic Basis of Ecology; Biddeford, Maine, July, 2012.

Hou, C., How food restriction extends lifespan. Target Meeting Aging Online Symposium; November, 2012.

Hou, C., Metabolic Scaling Theory: From the Colonial Life of Social Insects to the Mammalian Pulmonary System. Dept. of Biological Sciences, MST, Rolla, Missouri, March, 2012.

Huang, Y.-w., Cytotoxicity of Transition Metal Oxide Nanoparticles Depends on Certain Physicochemical Properties. US EPA, Research Triangle Park, NC, USA, August 7, 2012.

Huang, Y.-w., Nanodelivery Depends on Types of Cell-penetrating Peptides and Cargos, NIBIB/NIH, Laboratory of Molecular Imaging and Nanomedicine. Presentation title:. Bethesda, MD, USA, March 19, 2012.

Mormile, M. Are There Martians in Australia? American Society for Microbiology, Michigan Branch Meeting, Central Michigan University, Mount Pleasant, Michigan, March 24, 2012.

Mormile, M., Biohydrogen Production from Cellulosic Material by an Halophilic Bacterium. Department of Earth and Atmospheric Sciences and the Department of Biology, Central Michigan University, Mount Pleasant, Michigan, March 22, 2012.

Westenberg, D.J., Synthetic Biology Explained: Benefits, Risks, Ethics. Missouri Food Safety and Food Defense Task Force, Missouri Department of Health and Senior Services. Jefferson City, MO February 9, 2012.

Patent

Dwayne A. Elias, Melanie R. Mormile, Matthew B. Begemann, and Judy D. Wall. "Fossil Fuel-Free Process of Lignocellulosic Pretreatment with Biological Hydrogen Production", U.S. Patent No. US 8,034,592 B2, Date of Patent: Oct. 11th.

BioSci office staff (*l-r*);
Ms. Jessica Pelc
Senior Secretary
Mr. Adam Martin
cDNA Manager, Lecturer
Ms. Connie Behrick
Department Administrator
Ms. Hsiu-Jen Wang
Senior Laboratory Tchnician
Ms. Vicky Rowden,
cDNA Center Business Manager,

Extramural Income – Grants, Contract, BioTech Sales

2012 Annual Report

AY12 Summary- Sponsored Programs Activity 7/1/2011 - 6/30/2012

NAME	DIRECT COST	NET INDIRECT	TOTAL COSTS	SPONSOR NAME	PROJECT NAME
Aronstam, Robert S	$212,332	$0	$212,332	cDNA Resource Center	Biotech sales - clones, cells
Brown, Roger F	$7,959	$3,781	$11,740	US Army	Bone and tissue repair
Mormile, Melanie R	$304	$157	$461	Mo Dept Nat Resources	Monitoring bacteria in water
Westenberg, David J	$22,951		$22,951	US Dept of Ed	Science education
Westenberg, David J	$32,993	$888	$33,881	US Dept. Ed	Graduate Education
	$276,539	**$4,826**	**$281,365**		

Funds for research in the department come from grants and contracts from external agencies and from Biotech sales (cDNA Reesaource Centger). Expenditures of these funds for **Academic Year 2012** are listed above.

Dr. Ronald Frank discusses his research with students at the Open Lab meeting sponsored by Helix, October 2012.

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Seminar Program
2012 Annual Report

Seminar directors: Dr. David Westenberg (spring)
Dr. Melanie Mormile (Fall)

Date	Date	Institution	Topic
Jan.30	Dr. Zhaozheng Yin	Missouri S&T	Surveillance under Microscopes: Tracking Cells, Particles and Molecules in Time-Lapse Microscopy Images for Biological Discovery
Feb. 6	Dr. Yongxing Liu	Missouri S&T	Center for Bone and Tissue Repair and Regeneration
Feb. 13	Glenn Morrison	Missouri S&T	Reducing population exposure through passive control of air pollution in buildings
Feb. 20	Dr. Gayla R Olbricht	Missouri S&T	Statistical Challenges for DNA Methylation Profiling
Feb. 27	Dr. Katie Shannon	Missouri S&T	Regulation of Iqg1 protein-protein interactions in budding yeast cytokinesis
Mar. 5	Dr. Chen Hou	Missouri S&T	Metabolic Scaling Theory: From the Colonial Life of Social Insects to the Mammalian Pulmonary System
Mar.19	Dr. Steven Mumm	Washington Univeristy in St. Louis	Genetic Bone Diseases Caused by Mutations in the RANK Signaling Pathway
Apr 2	Dr. Jack Kennell	U. Missouri – St. Louis	Fungal Mitochondrial Genomics
Apr 9	Gary Stacey	University of Missouri Columbia	Building a functional genomics platform for soybean: the leading (legal) crop in Missouri
Apr. 16	Steven Daniel	Eastern Illinois University	Kidney Stones and the Microbial Handling of Oxalate by Commercial Probiotic Bacteria
Apr. 23	Yinan Lin	Missouri S&T	Bioactive Glass Microfiber Constructs for Wound Healing and Bone Tissue Engineering

Date	Date	Institution	Topic
Aug. 27	Mannie Liscum	University of Missouri Columbia	Title: Protein Ubiquitination, You Just Can't Escape It
Sept. 10	Dr. Guoyan Zhao	Washington Univeristy in St. Louis	Metagenomics, Next Generation Sequencing and Virus Discovery
Sept .17	Dr. Jack Schultz	University of Missouri-Columbia	Eavesdropping on plants
Sept. 24	Dr. Chi-Ren Shyu	University of Missouri-Columbia	Searching in Complex Information Haystacks for Discoveries in Biology and Medicine
Oct. 1	Dr. Kyoungtae Kim	Missouri State University	Implication of Dynamin-like Protein Vps1 in Endocytic and Recycling traffics
Oct.8	Dr. John Walker	University of Missouri-Columbia	Signaling Networks Controlling Abscission
Oct.15	Dr. Himadri Pakrasi	Washington Univeristy in St. Louis	A Day and a Night in the Life of a Unicellular Diazotrophic Cyanobacterium
Oct 22.	Dr. Anna Oller	University of Central Missouri	*Staphylococcus*: Longevity and community acquisition of MRSA
Nov. 5	Dr. Gerald Hazelbauer	University of Missouri-Columbia	Bacterial Chemotaxis: A paradigm for molecular understanding of bacterial signaling
Nov 12	Sarah C R Eligin	Washington Univeristy in St. L	Bringing Research in Genomics into the Undergraduate Curriculum: The Genomics Education Partnership

Contents

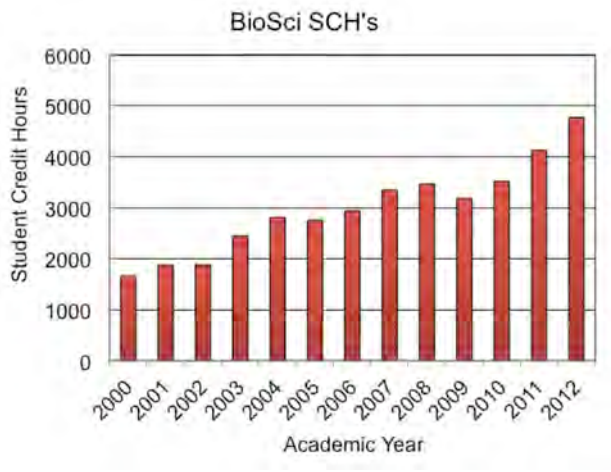
Undergraduate Education
2012 Annual Report

Missouri S&T's thriving **Biological Sciences** community included 226 undergraduate majors in 2012 (4th week fall semester enrollment reports), a 3.2% increase from 2009. **Drs. Dev Niyogi** and **Katie Shannon** chaired the Undergraduate Education Committee in 2012.

Some of our May 2012 graduates

2012 Highlights

- record number of student credit hours (>4800)
- record number of majors (226 vs. 181 in FS2010)
- 81% of graduating seniors participated in research
- service learning courses engaged in by all seniors
- 77 BioSci students were named to the Provost's Academic Scholars List for the SP 2012 semester
- 1 BioSci students graduated with perfect 4.0 grade point averages: **Lisa Snoderly-Foster**
- 36 BioSci majors graduated in 2012; 22 graduated with honors: 5 summa cum laude, 8 magna cum laude, 8 cum laude
- 20 students were awarded OURE scholarships to perform research in the BioSci department (vs. 11 in 2010)



Courses Offered
Spring 2012

- Bio 110 General Biology
- Bio 112 General Biology Lab
- Bio 113 Biodiversity
- Bio 114 Biodiversity Lab
- Bio 150 Biotechnology in Film
- Bio 201 Issues in Public Health
- Bio 211 Cell Biology
- Bio 212 Cell Biology Lab
- Bio 218 Plant Biology
- Bio 221 Microbiology
- Bio 222 Microbiology Lab
- Bio 231 Genetics
- Bio 241 Human Anatomy & Physiology I
- Bio 246 Human Anatomy & Physiology lab
- Bio 251 Ecology
- Bio 300 Special Problem
- Bio 301 Genomics
- Bio 341 Tissue Engineering 1
- Bio 370 Toxicology
- Bio 383 Pharmacology
- Bio 388 Bio Medical Problems
- Bio 390 Undergraduate Research

Some of our December 2012 graduates

Contents

Fall 2012

- Bio 102 Intro to Biological Sciences
- Bio 110 General Biology
- Bio 111 Principles of Biology
- Bio 112 General Biology Lab
- Bio 151 Intro to Environmental Sciences
- Bio 211 Cell Biology
- Bio 212 Cell Biology Lab
- Bio 221 Microbiology
- Bio 222 Microbiology Lab
- Bio 231 General Genetics
- Bio 235 Evolution
- Bio 241 Human Anatomy & Physiology II
- Bio 246 Human Anatomy & Physiology lab
- Bio 251 Ecology
- Bio 300 Special Problems
- Bio 301 Nanobiotechnology
- Bio 301 Microbial Genetics
- Bio 310 Seminar
- Bio 321 Pathogenic Microbiology
- Bio 331 Molecular Genetics
- Bio 332 Molecular Genetics Lab
- Bio 335 Cancer Cell Biology
- Bio 340 Biomaterials I
- Bio 354 Freshwater Ecology
- Bio 390 Undergrad Res

BioSci Graduates 2012

May 2012

Undergraduates
Kelsey Auer
Mydah Choudhry
Thomas Deason
Elizabeth Rusinko
Lisa Snoderly-Foster
Lara Applegate
Brandon Boies
Hannah Chambers
Kristi Curtis
Cathryn Heil
Habiba Inusah
David Kavish
Megan Koerner
Brian Mahan
Alexis Martin
Jamila Mcnair
Daniel Miller
Gabriel Olivo-Bonnelly
Kassie Orborne
Megan Ottomeyer
Rhett Reichard
Shalyn Selby
Erica Shannon
Stephen Slaughter
Nicole Vossmeyer
Sarah Williams

December 2012

Undergraduates
Michael Spauto
Alicia Whitbeck
Heather Branstetter
Charles Dewsnup
Christopher Elliot
Thomas Hilderbrand
Christie Koch
Tyler Robinson
Elizabeth Studt
Stephanie Voertman

Bio-Star Awards

BioStar award winners for AY12 were announced in April. These awards recognize outstanding achievements by BioSci students. A faculty committee selected the winners; the winners received a certificate and flash drive.

Graduating Senior	**Erica Shannon**
Graduate Teaching Assistant	**Karen Schilli**
First year Student	**Thomas Congdon**
Graduate Student Research	**Karen Schilli**
Undergraduate Research	**Kristin Kelly**
Service	**Kristin Kelly**
Leadership	**Megan Ottomeyer**
First Year Transfer Student	**Rachel Glenn**

Some of our buff 2012 BioStar award winners: Thomas Congdon, Rachel Glenn, Megan Ottomeyer, Erica Shannon, and Karen Schilli.

Contents

S&T Undergraduate Research Day

BioSci students participated in the **Annual Undergraduate Research Conference** (April 2012).

BioSci Award winners included:

Kristin Kelly - 3rd place Sciences - Oral Presentation
Erica Shannon and Amanda Foster - 1st place Social Sciences Oral Presentation.
Tavia Hall - 1st place - Research Proposal Poster
David Pohlman - 2nd place - Research Proposal Poster
Heather Branstetter - 3rd place - Research Proposal Poster

Some of our student winners at the 2012 S&T Undergraduate Research Day: Kristin Kelly, Erica Shannon, Tavia Hall, and David Pohlman

Senior Heather Branstetter presenting her posters at Undergraduate Research Day.

Graduating BioSci students and their families were honored at reception in December.

BioSci Students in Dev Niyogi' s Field Ecology Class.

Contents

Graduate Education

2012 Annual Report

The Department instituted a M.S. degree in Environmental and Applied Biology in 2002, and graduated its first students in 2004. Many of our graduates enter doctoral training programs at institutions across the nation, most of the others are employed in the medical and biotech industries.

Drs. Yue-wern Huang and **Melanie Mormile** chaired the department's Graduate Studies Committee in 2012. Options for instituting doctoral level training in biology on the Rolla campus are still being explored.

Three thesis students earned their degree in Environmental and Applied Biology.

2012 Graduate Students
(* non-thesis)

Olutosin Ajakaiye *
Yinan Lin
Gena Robertson
Chi-Heng Wu
Karen Schilli*
Richard Watters
Jio Lihong
Daniel Roush
Kele Thrailkill
Daniel Miller
Megan Ottomeyer
Lisa Snoderly-Foster

2012 graduate students: (clockwise from upper left); Megan Ottomeyer, Yinan Lin, Lisa Snoderly-Foster, Richard Watters, Chi-heng Wu, Olutosin Ajakaiye, Karen Schilli, and Daniel Miller

2012 Thesis defenses

Student	Thesis Title	Advisor
Chi-Heng Wu	Physiochemical Characteristics contributing to the Cytotoxicity of Transition Metal Oxides	Yue-wern Huang
Yinan Lin	"In Vivo Evaluation of Microfibrous Bioactive Borea Glasses for Use in Wound Healing	Roger Brown
Gena Robertson	Analysis of a Wound-Induced Gene Family in Glycine Max	Ronald Frank

cDNA Resource Center

Annual Report 2012

cDNA Center Staff (*l-r*):
Adam Martin, M.S., Manager and Vanessa Kaighin, Sr. Lab Technician analyzing clones

The Missouri S&T cDNA Resource Center provides full-length cDNA clones encoding human signal transduction proteins to the international research community. www.cDNA.org

The **Center** provides clones of human proteins that are:

- Full-length
- Sequence verified
- Expression verified by coupled in vitro transcription/ translation assays
- Propagated in a versatile mammalian expression vector
- Free of extraneous 3' and 5' untranslated regions
- Available in wild-type, epitope-tagged and useful mutant forms (e.g., constitutively-active, dominant negative, PTX-resistant)
- Shipped by courier delivery within 24 hours of order

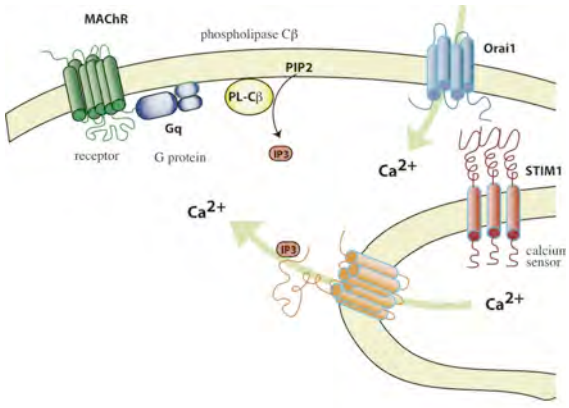
In 2012, proceeds from the Center were used to support 1) faculty research accounts; 2) faculty travel; 3) the NTNU student exchange program; 4) research in the Laboratory of Neurobiology; 5) the departmental seminar program; and 6) departmental operations.

2011 Highlights

- sales surpassed $2 million since 2005, including over $212,000 in Fy2012. (down from $240,000 in the previous year)
- Six special projects (custom syntheses) completed
- introduced 14 new clones to the collection
- submitted 12 wild-type sequences to NCBI, including
- employed/trained 4 student technicians
- supported research rotations in basic molecular biology and DNA sequencing for the campus

New clones – 2012

RGS20 v2 3xHA
RALA 3xHA
RAlB 3xHA
GPR97
DIRAS2 wt
DIRAS3 wt
DIRAS2 2xMYC-tag
DIRAS3 2xMYC-tag
RIG 2xMYC-tag
DIRAS2 3xHA-tag
DIRAS3 3xHA-tag
RIG 3xHA-tag
MAS1 wt
MRGPRD wt



www.cdna.org

Senior Seminar Service Learning Class

2012 Annual Report

Biological Sciences Department incorporates a service-learning practicum as part of its required senior capstone course.

Students work in groups to propose, develop, complete, and present service-learning projects that are related to the biological sciences. There are multiple objectives of the service learning activity: 1) to address a need in the community that is broadly related to core concerns of a biology curriculum, 2) to develop students' skills in organizing group endeavors and formalizing, justifying, proposing and presenting their ideas (in oral and written form); 3) to enhance students' sense of community responsibility and accountability; and 4) to provide students with opportunities to participate in activities that will enhance their employability and academic maturity. Our corporate partners emphasize the importance of team dynamics in the workplace.

The nature of our students' service learning projects is diverse and impressive. Students provided Thanksgiving meals to Russell House, held a graduate school informational seminar, provided information on healthy eating, led a faculty pedometer challenge (alas, Chemistry department nosed out the BioSci department), and provided hands-on science demonstrations in local schools. Photos of some of the projects are posted on the BioSci Facebook page ("Missouri S&T Biology").

S&T students with their booth at the Annual Linking Hearts Adoption Event sponsored by The Community Partnership at Lions Club Park (*l-r*): Hannah Barber, Carlos Rivera and Tiffany Edwards.

Student Projects 2012

- **Cardio for the Cure** – An on-campus dance event to raise money and awareness for Be the Match
- **Fall Walking Challenge** – Faculty teams competed using pedometers to measure weekly steps taken
- **Science Presentations** - In class demonstrations for 5th graders at Newberg
- **Project Linking Hearts** – Students held booth with "plinko" game for children at adoption promoting event
- **Project Giving Thanks** – Fundraising and canned food drive to provide Thanksgiving meals to Russell House
- **Promoting Exercise in the Classroom** – Activities researched and presented to teachers at Wyman Elementary
- **Your Nutrition, Your Health** – Research and campus presentation on healthy eating choices
- **Grad School Informational** – Campus panel of professors and graduate students to provide information about pursing an advanced degree
- **Bear River Ranch** – built and donated canine agility course activities to local summer camp
- **Sex Education** – Booth at Havener Center to promote STD testing and safe sex
- **Science Demonstrations** – Hands on activities to Rolla area homeschoolers, St. James, Cuba, and Newberg high schools

Dr. Katie Shannon has directed the department's service learning course for the last 3 years. In recognition of her efforts, Dr. Shannon received the **2012 Faculty Service Learning Award.**

S&T students Amanda Foster, Chris Elliott, Christine Woods and Erica McFarland show off their dog agility course constructed at the Bear River Ranch.

Helix

2012 Annual Report

Helix: Missouri S&T's Life Sciences Club.

Helix strives to promote camaraderie among students studying Biological Sciences and related fields by participating in community service andsocial activities

Open Lab Fall 2012

2012 Officers:

President: Shelby Emmett
Vice President: Chelsea Ehret
Secretary: Stephanie Voertmann
Treasurer/Webmaster: Kyle Williams
Off-Campus Events Coordinator: Thomas Congdon
Open Lab Coordinator: Sarah Rommelfanger
Historian: Grace Bay

Pumpkin Carving Social Fall 2012

Celebration of Nation Fall 2012

Helix Faculty Advisors: Dr. David Westenberg & Dr. Melanie Mormile

2012-2013 Activities:

- Helix Trip to St. Joe Missouri for the regional ASM conference
- Freshman Welcome: Float trip
- Ice-cream social
- Celebration of Nations Booth, Representing U.S. as a chapter of the American Society of Microbiology
- Open lab to introduce students to research opportunities within Schrenk
- S'mores and Scheduling (to aid underclassmen in registering for classes)
- Pumpkin Carving Social
- Volunteering with the Humane Society
- Adopt-A-Family
- Graduate School Informational Night

iGEM
2012 Annual Report

The Missouri S&T International Genetically Engineered Machine (iGEM) Team performs research in synthetic biology to support the mission of the iGEM Foundation, which is dedicated to research and education as well as the advancement of open collaboration in the field of synthetic biology. The team participates in the annual iGEM competition in which student teams compete to design and assemble biologically engineered organisms using advanced genetic components and technologies. The Missouri S&T iGEM Team seeks to engineer synthetic biological systems to help advance the Registry of Standard Biological Parts, to promote interdisciplinary collaboration for the advancement of science and engineering, to increase awareness of iGEM and the field of synthetic biology, and to represent Missouri S&T nationally and internationally.

Website: http://igem.mst.edu

Highlights

- Won a Bronze Award at the 2012 Americas East iGEM Competition
- Drastic increase in interdisciplinary recruitment and member involvement
- "Exploring Synthetic Biology" educational event
- Speak UP Speak OUT ethical discussion of synthetic biology
- Successful implementation of a student-design and student-taught Lab Training Program
- Developed four committees to promote team participation

Project

There are a plethora of enzymes that occur in the natural world which perform reactions that could be immensely useful to humans. Unfortunately, the efficiency of some of these reactions may render their applications unrealistic. The 2012 Missouri S&T iGEM team sought to engineer a method by which multiple enzymes could be anchored to the outer surface of *Escherichia coli*, a construct which would allow synthetic biologists to exercise more control over multi-enzymatic processes and increase their efficiency. Applications could include, but are not limited to, plastics degradation and tuberculosis treatment.

The construct is an adapted version of the *Clostridium thermocellum* cellulosome, a multi-enzyme complex associated with the cell surface which aids in the introduction of insoluble substrates into the cell. The cellulosome scaffolding protein produced by *C. thermocellum* has been shown to significantly increase the efficiency of cellulose degradation. The protein can be reduced in size and adapted for the cell surface of *E. coli*. Different cohesion sites on the new cell surface display protein can also be introduced to allow for attachment of desired enzymes. Future applications would include producing a collection of distinct versions of the scaffolding protein for unique arrangements and concentrations of enzymes, enabling construction of an extra-cellular assembly line for a variety of multi-enzymatic reactions. This would lay the foundation for making previously infeasible applications of reactions possible through increased efficiency.

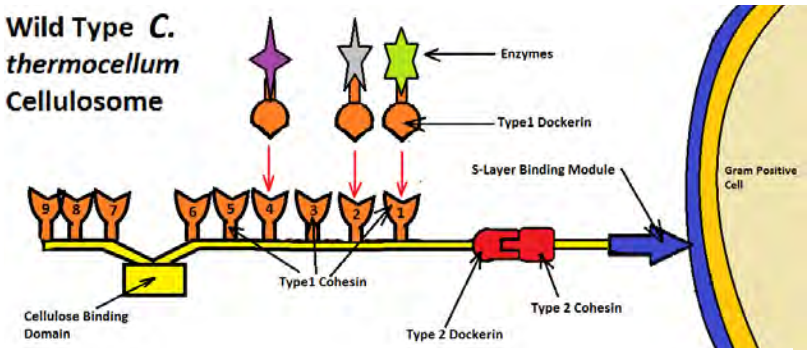


Figure 1 - *Diagram of the cellulosome as it appears in C. thermocellum*

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Activities and Achievements:

- Won a Bronze Award at the 2012 Americas East Regional iGEM Jamboree
- Developed and organized "Exploring Synthetic Biology," a large educational event which increased campus awareness of synthetic biology and iGEM
- Assisted in a Speak UP Speak OUT ethical discussion about synthetic biology between students of a variety of majors
- Selected to present the 2011MS&T iGEM project, "Microbial Glucose Sensor," during Engineers Week at the Saint Louis Science Center
- Recruited students from multiple disciplines, leading to a dramatic increase in team members
- Successfully implemented an extensive Lab Training Program for new members: the Lab Training Program was designed and taught by senior members of the iGEM Team with nominal assistance from faculty advisors
- Established four committees to increase member participation and to train potential future iGEM leaders: Internal Affairs Committee, Public Relations Committee, Fundraising Committee, and Web Committee

Team Members

Amanda Foster – President
David Pohlman – Vice President
April Pummil – PR Officer
Blythe Ferriere – Treasurer
Erica McFarland – Secretary
Chester Gregg – Webmaster
Alie Abele – Lab Manager
Beth Wilkins – Safety Liason
Thomas Congdon
Brice Curtin
Mitchell Duncan
Chelsea Ehret
Hannah Frye
Scott Hack
Lou Harmon
Nick Jentsch
Avery Joseph
Catherine Kinchen
Emily Mulaua
Levi Palmer
Gavin Pringle
Emily Puleo
Dana Roederer
Sarah Rommelfanger
Tim Schieffer
Nick Staufenbiel
Jesse Townsend

Advisors

Dr. Dave Westenberg
Dr. Katie Shannon

Sponsors

Missouri S&T University of Science & Technology

Department of Biological Sciences
Department of Chemical and Biochemical Engineering
Department of Chemistry
Student Council
Student Design and Experiential Learning Center

MidSci
Fotodyne Incorporated
ExxonMobil

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Phi Sigma

2012 Annual Report

Phi Sigma: Missouri S&T's Biological Sciences Honors Society

New Phi Sigma T-shirts

Phi Sigma induction ceremony awarding Candace Miller the Outstanding Freshman Scholarship Award

2012-2013 officers:

President: Brandon Drennen
Vice President: Katherine Bey
Secretary: Jihee Choi
Treasurer: Carolyn Harper

Faculty Advisor: Dr. Ronald Frank

2012 Spring Semester Activities:

- First ever Pasta Lunch raised over $100 for Outstanding Freshman Scholarship
- Penny Wars raised over $100 for outstanding freshman scholarship, Dr. Mormile wore a hula skirt, Dr. Aronstam brought in baked goods
- Candace Miller was the recipient of the Outstanding Freshman Scholarship of $750
- Inducted over 20 new members
- Volunteered for Miner Phone-a-thon in April
- Volunteered at Tri-County Humane Society

2012 Fall Semester Activities:

- Raised over $160 at the Phi Sigma Pasta Lunch for the Outstanding Freshman Scholarship
- Raised over $100 at the Phi Sigma Penny Wars for the Outstanding Freshman Scholarship: Dr. Matthew Thimgan dressed as fairy for a day and Prof. Terry Wilson brought in baked goods for the students.
- Aided other biological science clubs in helping to increase biology awareness
- Participated with Helix and Scrubs in the Adopt-a-Family program in December

Scrubs - HOSA Affiliate
Pre-Health Organization

Scrubs mission is to increase awareness and understanding of career opportunities available in all health fields, and to help prepare S&T students to apply for those positions.

What Happened in 2012?

- Affiliated nationally with Health Occupation Students of America – First college in Missouri
- 10 guest speakers spoke at biweekly meetings
- Practice MCAT tests and MCAT study groups
- Took a tour of Mizzou's Medical and Veterinary School
- Social Events: Cardinals Trip and 'Welcome Back' BBQ

Left: 'Welcome Back' Fall BBQ funded by Scrubs fed 75 people.
Right: Attendance at one of our biweekly meetings in Schrenk.

Visit us!
Facebook Page: Search Missouri S&T Scrubs

Or on the Web:
http://web.mst.edu/~scrubs/

2011-2012 Scrubs Officers
President: Kristin Kelly
Vice President: Shalyn Selby
Secretary: Clayton Buback
Treasurer: Nicci Vossmeyer
Public Relations Officer: Alex Willis
Hospital Relations Officer: Aaron Carson
Correspondence Officer: Mydah Choudhry
Advisor: Dr. Westenberg

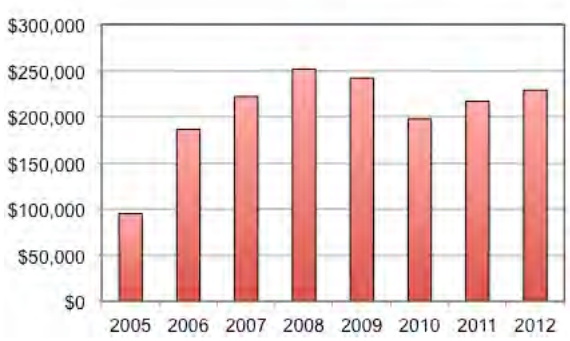
2012-2013 Scrubs Officers
President: Alex Willis
Vice President: Aaron Carson
Secretary: Clayton Buback
Treasurer: Megan Schuller
Public Relations Officer: Taylor B./Lauren M.
Hospital Relations Officer: Jaime Phelps
Correspondence Officer: Krizza Castro
Community Relations Officer: Kelsey Hunt
StuCo Rep: Donnie Rashon
Advisor: Dr. Westenberg

Donors

2012 Annual Report

BioSci Partners 2012

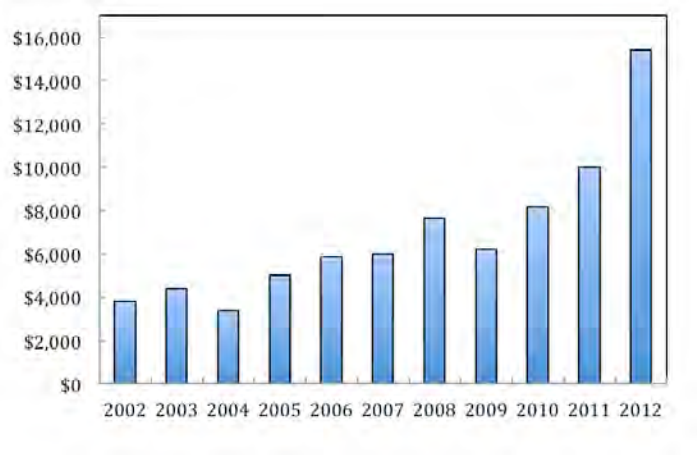
We are pleased to recognize those who generously supported the department in 2012. Donations to the department jumped 54%. The consistent support we receive from our alumni and friends provides the means to strengthen our academic community and support innovation in both teaching and research.



Value of BioSci endowment funds at the end of the fiscal years 2005-2012. The Gale-Hufham, Heilbrunn and Summers funds provide student scholarships; our other two funds support faculty and student research.

Contributions are welcome at any time and can be made on the S&T web site (givingtomst.missouri.edu) (be sure to designate Biological Sciences as the recipient fund). The cadre of BioSci alumni continues to grow, although half have graduated in the last 10 years, reflecting our recent consistent growth.

The S&T Phonathon was held in April. The BioSci participation was 12%, well above the university average. We are delighted to announce that **Dr. George Karr** ("the only dentist to graduate from Missouri S&T"; Life Sciences '92) has established a Charitable Gift Annuity to provide scholarships for S&T Pre-Dental student.



Finally, **TroutBusters of Missouri** funded two scholarships for S&T Ecology students, Sierra Comer and Chelsea Ehret (gift recorded in 2013).

We appreciate all you do to support the department and its students and hope you will continue to be able to do so. We welcome your feedback on any of our activities or plans, and invite you to visit when you are in Rolla.

Donations of $1000 and above

Robert S. Aronstam
F. Fredrick Keilhorn
Joseph A Safron
Baxter International

Donations of $500 to $999

Dr. Laurie Behm
Dr. James and Rebecca Flechtl
Mark Statler

Donations of $100 to $499

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We apologize for any omissions or errors; please correct us, and stay in touch

Donations up to $99

Peggy Sue & David Borok
Dr. Kathleen B Bottroff

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