2010
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 Center	www.cdna.org
BioSci Donations	givingtomst.missouri.edu
iGEM Team wiki	web.mst.edu/~igem

Department of Biological Sciences

Chair's Summary - 2010

Robert S. Aronstam

Department Update

The S&T BioSci community strives to provide a supportive, collegial, challenging and rewarding environment for its faculty, students and staff. We had a lot to deal with in 2010, but we did a very good job in preserving the quality of our program, as well as our unique approach, in a time of extremely limited resources. Good things continued to happen.

Faculty: We celebrated the promotion of **Dr. Melanie Mormile** to the academic rank of Professor of Biological Sciences. Dr. Mormile returned from an AY10 research sabbatical at the University of Missouri – Columbia with a patent and two new grants in tow.
On a less happy note, **Dr. Anne Maglia**, associate professor of biological sciences, resigned to assume the position of Program Director for Advanced Biological Informatics at the National Science Foundation. We celebrate this honor, but will sorely miss Dr. Maglia's creativity, enthusiasm and expertise. A search committee has been formed to fill this open position.

Students. Degrees were awarded to 23 undergraduate and 5 graduate students at our 2010 May and December commencement ceremonies. This brings the number of BioSci graduates to 493 since the department was formed in 1978. Prior to 1978, biology at S&T existed as the Life Sciences section of the Chemistry Department; from 1978 through 1998, we were known as the Department of Life Sciences. More than 50% of all biology majors (255) have graduated since 2000, reflecting the strong recent growth of the department.

More than 45 new (first year and transfer) students matriculated in BioSci for the fall 2010 semester. The BioSci community now includes 181 undergraduates (compared to 161 last year; FS10 4th week enrollment report). In terms of enrollment, we are now the 7th largest department on campus.

Facilities. It was close, but we finished the renovation of our three teaching laboratories in Schrenk Hall (G7, 111, and 313) before the beginning of the fall semester. These renovations were funded by the Caring for Missourians initiative that was designed to increase training of students entering the health professions in Missouri. The new labs have a more flexible layout that supports group projects and interactions. To make maximum use of our physical space, we designated G-9 as a common histology laboratory, reserved G-7 for use of the iGEM student design team, and expanded **Dr. Niyogi's** Laboratory of Freshwater Ecology by incorporating Schrenk Hall room 210.

Department and University Finances. The economic downturn has not been helpful, but we remain in better shape than many similar universities. State funding was reduced by 5% in Academic Year 2011, and we have submitted budget figures incorporating a 10% reduction in AY2012. However, only 30% of our budget comes from the state, so this translates to a decrease of about $100,000. A hiring freeze was implemented last year. And at one point S&T had 37 unfilled faculty lines (≈11% of the total). BioSci has 1.5 unfilled faculty positions, which is a big problem for our small department. We are down to 8 tenured/tenure track faculty, but fortunately, a faculty search is presently underway.

Meanwhile, our program continues its steady growth. The number of biology applicants has increased by 20% in each of the last two years (see accompanying chart). One big challenge is to continue to offer research opportunities for all of our students. The expansion of our cell engineering-research design team (iGEM) has helped in the latter regard. Historically, over 80% of our undergraduates participate in research.

Project Lead the Way. We had a busy summer hosting seven training sessions for master high school teachers involved in the Project Lead The Way – Biomedical Sciences curriculum. This 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 are exploring ways to offer academic credit to both the students and teachers in this remarkable program.

Research. Faculty research publications are listed elsewhere in this newsletter. One faculty member, **Dr. Melanie Mormile**, began a research leave in Columbia, Missouri. Four visiting scholars from Taiwan National Normal University spent part of 2010 in our department; four others will join us later in the spring semester 2011. Clones sales from the cDNA Resource Center were $193,336 in CY10, and have totaled $1.7 million since 2005. The sequences of 70 nuclear receptors, including 13 novel splice variants, were submitted to GenBank and made available to the scientific community.

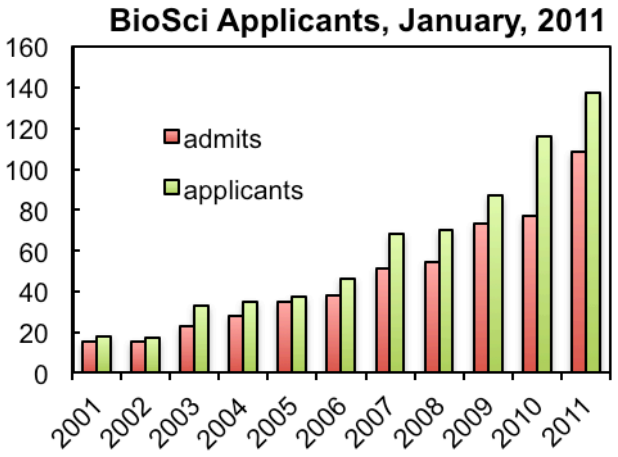
Department of Biological Sciences
Mission Statement

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

Student Affairs: The student organizations (Helix, Scrubs, and Phi Sigma) associated with the BioSci Department had very active years, including invited speakers, service projects, and field trips. The department hosted a homecoming picnic, two graduation receptions, and a holiday party. Our weekly student newsletter (BioConnection) completed its fourth year of publication. Our iGEM cellular design team competed in their third national event at MIT, and was awarded a bronze medal for submission of a novel genetic construct to the iGEM library.



Strategic Plan. The faculty further refined the departmental Strategic Plan at our annual planning retreat. Our 5 year (2010-2014) rolling plan embodies our best strategy for realizing our mission to "promote **learning** and **discovery** in the biological sciences while functioning as an inclusive academic community that is supportive, collegial, challenging and rewarding…" Despite our diverse backgrounds, approaches and interests, there was remarkable agreement with regard to our most pressing needs. Among these are: 1) adoption of a continuous curriculum improvement plan; 2) development of an advising handbook; 3) engaging >90% of our students in lifelong learning activities; 4) growing the BioSci academic community to encompass 200 undergraduate students; 5) formalizing graduate training policies; 6) assessing implementation of an interdisciplinary Ph.D. training program; 7) funding faculty development and research accounts; 8) updating departmental protocols for supporting the career development of new faculty members; and 9) improving our research infrastructure through establishment of core facilities.

I am pleased to report to you. 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

Contents

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 Staff: Adam Martin, M.S. (Senior Research Associate); Vanessa Kaighin (Research Technician); Student Research Assistants: Sarah Sutterer, Joshua Erickson, Erica Shannon, Alexis Martin, Rhett Reichard,

2010 Publications

Wang H-J, T-H Tang, AC Growcock, J O'Hara, A. Martin, Y-w Huang, and RS Aronstam, ZnO Nanoparticle Inhibition Muscarinic Receptor Ligand Binding and Activation of Store-operated calcium entry, *Toxicology In Vitro* 24: 1953-1961, 2010.

Liu BR, J-F Li, S-W Lu, H-J Lee, Y-w Huang*, KB Shannon, and RS Aronstam, Cellular internalization of quantum dots noncovalently conjugated with arginine-rich cell-penetrating peptides. *Journal of Nanoscience and Nanotechnology* 10: 6534-6543, 2010.

Huang, Y-w, C-H Wu, and RS Aronstam, Toxicity of transition metal oxide nanoparticles: Recent insights from *in vitro* studies, *Materials* 3(10) 4842-4859, 2010.

2010 Presentations

Huang, Y-w, C-C Huang, Y Xu, and RS Aronstam, Metal oxides influence cellular homeostasis via multiple interconnected signaling pathways, Society for Toxicology, 2010.

Aronstam, RS, H-J Wang, AC Growcock, J O'Hara, T-H Tang, A Martin, and Y-w Huang, Nanoparticle disruption of muscarinic receptor mediated signal transduction, American Society for Neurochemistry, 2010.

Wang H-J, T-H Tang, AC Growcock, J O'Hara, A Martin, Y-w Huang and RS Aronstam, ZnO nanoparticles alter muscarinic receptor ligand binding and activation of SOCE, Society for Toxicology, 2010.

2010 Teaching

SP10: Pharmacology (BioSci 301); Cellular Biology (BioSci 211)

SS10: Cellular Biology (BioSci 211)

FS10: Cellular Biology (BioSci 211)

Undergraduate advisees: 47 majors; 15 minors

Graduate Student: Hsui-Jen Wang

Visiting Scholars: Tso-Hao Tang, Chiung-Tan Chang

OURE fellows: Joshua Erickson, Erica Shannon, Alexis Martin, Rhett Reichard, Megan Koerner

2010 Activities

- Directed the Missouri S&T cDNA Resource Center – established nuclear receptor collection; marketed stably transfected cell lines
- Expanded graduate student exchange program with National Taiwan Normal University; 4 visiting fellows welcomed
- Project Lead The Way – Affiliate Directors Meeting in Washington (11/09)
- Committee: Institutional Biosafety Committee (chair); Radiation Safety Committee; Department committees (Development, Recruitment; Seminar series organizer)
- Nuclear receptor GenBank submissions: 70 full length coding sequences

Roger F. Brown, Ph.D.

Professor

Director, Missouri S&T Animal Research Facility

Director, Biomaterials Laboratory

Research Interests

Biomaterials for bone repair and therapeutic applications

Development of bioactive glass coatings on titanium implants for enhanced bonding at implant site

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

Education

Colorado State University, Ft. Collins, B.S. Zoology, 1964

Colorado State University, Ft. Collins, Ph.D., Physiology, 1968

University of Pittsburgh School of Medicine, Pittsburgh, Postdoctoral training, 1968-71

2010 Publications

Fu Q, MN Rahaman, BS Bal, and RF Brown, Preparation and in vitro evaluation of bioactive glass (13-93) scaffolds with oriented microstructures for repair and regeneration of load-bearing bones. *Journal of Biomedical Material Research* 93A: 1380–1390, 2010.

Fu Q, MN Rahaman, BS Bal, K Kuroki, and RF Brown, In vivo evaluation of 13-93 bioactive glass scaffolds with trabecular and oriented microstructures in a subcutaneous rat implantation model. *Journal of Biomedical Material Research* 95A: 235–244, 2010.

Fu Q, MN Rahaman. BS Bal. LF Bonewald, K Kuroki, and RF Brown. Silicate, borosilicate, and borate bioactive glass scaffolds with controllable degradation rates for bone tissue engineering applications, II: In vitro and in vivo biological evaluation. *Journal of Biomedical Material Research* 95A: 172–179, 2010.

Jung SB, DE Day, and RF Brown, Comparison of self-bonded, three dimensional bioactive glass fiber scaffolds after in-vivo implantation. *Advances in Bioceramics and Biotechnologies*, Edited by R. Narayan and J. McKittrick. *Ceramic Transactions* 218: 115-132, 2010.

2010 Teaching

SS10: Human Physiology (BioSci 242)

SS10: Tissue Engineering I / Tissue Engineering II (BioSci 341/BioSci 441)

FS10: Human Anatomy (BioSci 241)

FS10: Biomaterials I / Biomaterials II (BioSci 340/BioSci 440)

Mentoring of Mr. Yinan Lin, MS degree candidate

2010 Extramural Funding

'Periodontal Engineering by Growth Factor Release from Hollow HA Microspheres,' National Institute of Arthritis and Musculoskeletal and Skin Diseases R-15 grant, Co-PI (with Dr. M. Rahaman (PI), Missouri S&T Ceramic Engr.), 8/06/08-7/31/11, $250,000.

'Consortium for Bone and Tissue Repair and Regeneration,' U.S. Army Med Res and Materiel Command, Investigator (with J. David Eick (PI), Univ. of Missouri-Kansas City), 9/26/08 – 10/25/10, $850,000.

2010 Activities

Active 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

2010 Publications

Kandoth C, F Ercal, and RL Frank, A framework for automated enrichment of functionally significant inverted repeats in whole genomes. *BMC Bioinformatics* 11(Suppl 6): S20, 2010.

Lee L, C Kandoth, JL Leopold, and RL Frank, Protein secondary structure prediction using parallelized rule induction from coverings. *International Journal of Medicine and Medical Science* 1(2): 99-105, 2010.

Lee L, JL Leopold, C Kandoth, and RL Frank, Protein secondary structure prediction using RT-RICO: a rule-based approach. *Open Bioinformatics Journal* 4: 17-30, 2010.

2010 Presentations

Kandoth C, F Ercal, and RL Frank, Fast automated identification of functionally significant inverted repeats in whole genomes. Mid-South Computational Biology and Bioinformatics Society Conference, Jonesboro, AR, 2010.

2010 Teaching

WS10: General Genetics (BioSci 231)

WS10: Genomics (BioSci 301)

FS10: Molecular Genetics (BioSci 331)

FS10: Evolution (BioSci 235)

Undergraduate advisees: 39 majors

Undergraduate researchers: Karen Shilli (OURE), Kristin Kelly, Gena Robertson

Graduate Students: Cyriac Kandoth, Ph.D. 2010, Computer Science

Yue-wern Huang, Ph.D.

Associate Professor

Director, Laboratory of 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

2010 Publications

Huang, Y-w, C-H Wu, and RS Aronstam, Toxicity of transition metal oxide nanoparticles: Recent insights from *in vitro* studies, *Materials* 3(10) 4842-4859, 2010.

Xu Y, BR Liu, H-J Lee, KB Shannon, JG. Winiarz, T-C Wang and Y-w Huang, Nona-arginine facilitates delivery of quantum dots into cells via multiple pathways. *Journal of Biomedicine and Biotechnology* 2010, Article ID 948543, 11 pages. 2010.

Liu BR, Y-w Huang, H-J Chiang, and H-J Lee, Cell-penetrating peptide-functionalized quantum dots for intracellular delivery. *Journal of Nanoscience and Nanotechnology* 10: 7897-7905, 2010.

Wang H-J, T-H Tang, AC Growcock, J O'Hara, A. Martin, Y-w Huang, and RS Aronstam, ZnO Nanoparticle Inhibition Muscarinic Receptor Ligand Binding and Activation of Store-operated calcium entry, *Toxicology In Vitro* 24: 1953-1961, 2010.

Liu BR, J-F Li, S-W Lu, H-J Lee, Y-w Huang*, KB Shannon, and RS Aronstam, Cellular internalization of quantum dots noncovalently conjugated with arginine-rich cell-penetrating peptides. *Journal of Nanoscience and Nanotechnology* 10: 6534-6543, 2010.

Huang C-C, Y Xu, JT Briggler, M McKee, P Nam, and Y-w Huang, Heavy metals, hematology, plasma chemistry, and parasites in adult hellbenders (*Cryptobranchus alleganienses*). *Environmental Toxicology and Chemistry* 29(5): 1132-1137, 2010.

2010 Presentations

Invited Speeches

June 1. Tzu Chi University Department of Pharmacology and Toxicology. Presentation title: Cytotoxicity of Transitional Metal Oxide Nanoparticles in the 4th Period of the Periodic Table. Hualien, Taiwan.

May 24. National Taiwan University College of Public Health. Presentation title: Metal Oxides Influence Cellular Homeostasis via Multiple Interconnected Signaling Pathways. Taipei, Taiwan.

Poster Presentations

Huang Y-w and H-J Lee, Transducible HA2-R9 fusogenic peptide enhances internalization and intracellular trafficking of quantum dots. BIT 1st Annual World Congress of Nanomedicine. Beijing, China.

Huang, Y-w, C-C Huang, Y Xu, and RS Aronstam, Metal oxides influence cellular homeostasis via multiple interconnected signaling pathways, Society for Toxicology, 2010.

Wang H-J, T-H Tang, AC Growcock, J O'Hara, A Martin, Y-w Huang and RS Aronstam, ZnO nanoparticles alter muscarinic receptor ligand binding and activation of SOCE, Society for Toxicology, 2010.

Aronstam, RS, H-J Wang, AC Growcock, J O'Hara, T-H Tang, A Martin, and Y-w Huang, Nanoparticle disruption of muscarinic receptor mediated signal transduction, American Society for Neurochemistry, 2010.

2010 Teaching

SS10: Toxicology (BioSci 370/401); Techniques in Appl & Env Bio (BioSci 475)

FS10: Ecology (BioSci 251); Nanobiotechnology (BioSci301); Techniques in Appl & Env Bio (BioSci 475)

Undergraduate advisees: 15 majors

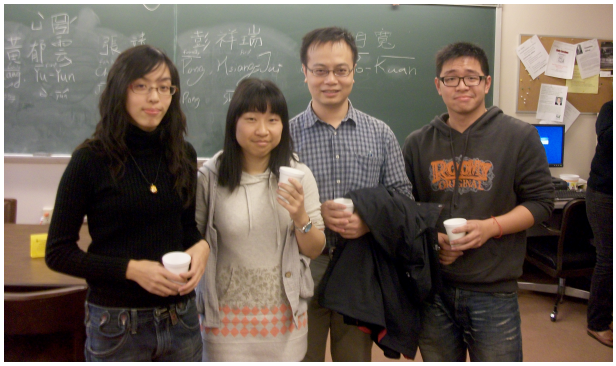
Graduate Students: Chi-heng Wu; Ninu Madria

2010 Extramural Funding

2009-2011. Using Quantum Dots and Protein Transduction Domains to Analyze Cargo Dissociation, Uptake, and Localization in Live Cells. PI: Yue-wern Huang. Co-PI: Jeffrey Winiarz & Katie Shannon. National Institutes of Biomedical Imaging and Bioengineering. R15EB009530.

2010 Activities

- Reviewer of peer-reviewed international journals: 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
- Animal Care and Use Committee Chair
- Graduate Program Chair
- Coordinator of the student exchange program with National Taiwan Normal University. Four visiting graduate students came to study for a period of six months in 2010. Another four students will arrive in January 2011.



Visiting scholars from National Taiwan Normal University
January 2011

Contents

Melanie R. Mormile, Ph.D.

Professor

Director, Environmental Microbiology Laboratory

Research Interests

Microbial populations in hypersaline environments

Bio-energy production by halophilic/halotolerant bacteria

2010 Publications

Tiquia, S.M., and M.R. Mormile. Extremophiles – A source of innovation for industrial and environmental applications. Environmental Technology, **31:** 823.

2010 Invited Editor

Sonia M. Tiquia – Lead Editor, Melanie R. Mormile – Guest Editor, Environmental Technology, Special Issue: Extremophiles-A source of innovation for industrial and environmental applications, Parts I & II. Volume 31, Numbers 8-10.

2010 Grants and Contracts Obtained

Gary Stacey and Melanie R. Mormile. Metagenomics use at a former coal mining environment to bio-prospect for enzymes with applications to sustainable energy. Mizzou Advantage.

Melanie R. Mormile, Joel G. Burken, and John Schumacher. Development and Verification of a Rapid Method for Determining Escherichia coli in Recreational Water in Missouri – Phase 1. Missouri Dept. Natural Resources.

Joel G. Burken, Jianmin Wang, and Melanie R. Mormile. Economics of Waste to Energy Anaerobic Digestion in Missouri. Missouri Department of Natural Resources.

2010 Option Agreements

Fossil Fuel-Free Process of Lignocellulosic Pretreatment with Biological Hydrogen Production, U.S. Patent Application No. 12/635,328 with Sage Agricultural LLC of Columbia, Missouri, February 2nd.

Fossil Fuel-Free Process of Lignocellulosic Pretreatment with Biological Hydrogen Production, U.S. Patent Application No. 12/635,328 with Sage AG Sustainable Energy and Biofuels LLC of Columbia, Missouri, August 12th.

2010 Presentations

How to Translate Your Research into a Science Museum Exhibit. 110th General Meeting of the American Society for Microbiology. San Diego, California, May 23-27. (*National level*)

Mining Genomic Data for Extremophilic Enzymes. 60th Meeting of the Society for Industrial Microbiology. San Francisco, California, August 1-5. *(National Level)*

Benefits of Using Extremophilic Microorganisms for Bio-Fuel Production. 60th Meeting of the Society for Industrial Microbiology. San Francisco, California, August 1-5. *(National Level)*

Metagenomic Study of Rumen Protozoan Glycosyl Hydrolases. Department of Biological Sciences Seminar Series, Missouri University of Science and Technology. Rolla, Missouri, August 30. (*Departmental level*)

Metagenomics Use at a Former Coal Mining Environment to Bio-Prospect for Enzymes with Applications to Sustainable Energy. Research and Development Advisory Board Meeting, University of Missouri. Columbia, Missouri, September 10. (*University of Missouri System level*)

Are There Martians in Australia? Science Seminar Series 2010-2011, Co-sponsored by The Saint Louis Zoo and The Academy of Science – St. Louis. St. Louis, Missouri, October 6. (*Regional Level*)

2010 Teaching

FS10: Bio Sci 102, Introduction to Biological Sciences

FS10: Bio Sci 221, Microbiology

FS10: Bio Sci 451, Environmental Microbiology

2010 Activities

- Served as Councilor for the Missouri Branch of the American Society for Microbiology
- Member of the Editorial Boards for Applied and Environmental Microbiology; Environmental Technology; and Agricultural, Food and Analytical Bacteriology
- Review member for the National Science Foundation's Graduate Research Fellowship Program (GRFP), Arlington, Virginia
- Served as peer-reviewer for the following journals: Biotechnology and Bioengineering, BMC Microbiology, Environmental Microbiology and Environmental Microbiology Reports, GSA Today, and International Journal of Systematic and Evolutionary Microbiology
- Interviewed by David Shiga that resulted in an article in New Scientist Magazine: http://www.newscientist.com/article/dn18709-microbes-thrive-in-harsh-marslike-lakes.html
- Interviewed by Anuradha Herath that resulted in an article in Astrobiology Magazine: http://www.astrobio.net/exclusive/3378/microbial-life-in-mars-analog-lakes

Dev Niyogi, Ph.D.

Associate Professor

Director, Laboratory of Freshwater Ecology

Research Interests

Freshwater ecology, aquatic biogeochemistry, microbial ecology of streams

2010 Publications

Greig HS, DK Niyogi, KL Hogsden, PG Jellyman, and JS Harding, Heavy metals: confounding factors in the response of New Zealand freshwater fish assemblages to natural and anthropogenic acidity. *Science of the Total Environment* 48:3240-3250, 2010.

Niyogi DK, JM Bandeff, C Selman, and DE Menke, Nutrient flux, uptake, and transformation in a spring-fed stream in the Missouri Ozarks, USA *Aquatic Sciences* 72: 203-212, 2010.

2010 Presentations

Niyogi DK, CY Hu, and JS Harding, Fungal communities in streams affected by mine drainage: responses to multiple stressors and nutrient subsidies. North American Benthological Society and American Society of Limnology and Oceanography, joint Annual Meeting, Sante Fe, 2010.

Selman, C, DK Niyogi, and MW Fitch, Dominant processes that affect the nutrient retention in small Missouri-Ozarks streams. North American Benthological Society and American Society of Limnology and Oceanography, joint Annual Meeting, Sante Fe, 2010.

Greenwood MJ, AR McIntosh, JS Harding, KE McHugh, and DK Niyogi, Direct and indirect effects of riparian management on aquatic invertebrate communities in a degraded agricultural landscape. North American Benthological Society and American Society of Limnology and Oceanography, joint Annual Meeting, Sante Fe, 2010.

2010 Teaching

SS10: Ecology (Bio251)

FS10: Freshwater Ecology (Bio354)

FS10: Behavioral Ecology (Bio300)

Su10: Field class in freshwater ecology (Colorado)

Undergraduate research advisees: 6

2010 Extramural Funding

Missouri Water Resources Research Center, "Fungal Diversity and Functioning in Streams Affected by Climate Change," $21,000, PI - 100% effort, (*pending*).

2010 Activities

At Missouri S&T, I am continuing my research on nutrient dynamics in streams, and the use of molecular tools to describe microbial communities of streams. Two graduate students and several undergrads have been helping with these studies. I also had a visiting scholar from National Taiwan Normal University, Chia-Yi Hu, conduct research on the effects of drying stress on stream fungi. 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.

Katie Shannon, Ph.D.

Assistant Professor , Department of Biological Sciences
Director, Cytokinesis Laboratory
Director, Cellular Imaging Facility

Research Interests

Temporal regulation of cytokinesis. Cytokinesis is the physical separation of cells. 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 signaling pathway in the budding yeast *Saccharomyces cerevisiae* called the mitotic exit network (MEN). This pathway regulates exit from mitosis and may also control the timing of cytokinesis, temporally linking these two processes.

Mechanism of nanoparticle uptake and transport in cells.

2010 Publications

Xu Y, BR Liu, H-J Lee, KB Shannon, JG. Winiarz, T-C Wang and Y-w Huang, Nona-arginine facilitates delivery of quantum dots into cells via multiple pathways. *Journal of Biomedicine and Biotechnology* 2010, Article ID 948543, 11 pages. 2010

Liu BR, J-F Li, S-W Lu, H-J Lee, Y-w Huang*, KB Shannon, and RS Aronstam, Cellular internalization of quantum dots noncovalently conjugated with arginine-rich cell-penetrating peptides. *Journal of Nanoscience and Nanotechnology* 10: 6534-6543, 2010

2010 Presentations

Stockstill K, J Park, R Wille, and K Shannon. Analysis of Hof1 PEST domain phosphorylation and cytokinesis in budding yeast. Annual Meeting of the American Society for Cell Biology, Philadelphia, PA, 2010.

Shannon K, Regulation of budding yeast protein-protein interactions important for cytokinesis. 50th Annual Meeting of the American Society for Cell Biology, Philadelphia, PA, 2010.

Shannon K, Using Budding Yeast To Study The Regulation Of Cytokinesis, Nov. 19, 2010, University of Northern Iowa, Cedar Falls, IA

2010 Teaching

FS10: Senior Seminar (Bio310)

FS10; Cancer Cell Biology (Bio301/401)

2010 Advising

Graduate Student: Katherine Stockstill will graduate May 2010

OURE students: Rachel Wille and Grace Bay

Fifteen Undergraduate Advisees

2010 Extramural Funding

NIH R15, 2009 (co-P.I., 25%) "Quantum Dots and Protein Transduction Domains as a Biomolecule Delivery Vehicle" $225,750 over two years

2010 Activities

- iGEM student synthetic biology team, advised, supervised project, attended Jamboree at MIT in November
- Reviewer, Molecular Biology of the Cell
- Advisory Board member, Women in Science and Engineering (WISE)

David J. Westenberg, Ph.D.

Associate Professor

Chair, Pre-Medicine Advisory Committee

Research Interests

Rhizosphere microbiology. phytoremediation, legume symbiosis, quorum sensing, bioenergetics, nitrogen fixation

Research Lab Members: April Rocha, Shannon Franks, Crystal Halloran, Ashley Mueller;
iGEM Team Members: Nichole Hurd, Meghan Ray, Daniel Roush

2010 Presentations

Westenberg DJ and KA Gull, Online with the American Society for Microbiology: Resources and Programs for Educators at all levels., National Association of Biology Teachers annual meeting, Minneapolis, MN, 2010.

Westenberg DJ, convened a session on "Biotechnology", Annual Meeting of the National Association of Biology Teachers, Minneapolis, MN, 2010.

Westenberg DJ, convened a session on the "Benefits of Outreach in Higher Education" for the 2010 General Meeting of the American Society for Microbiology, San Diego, CA, 2010.

Westenberg DJ, Reaching out to K-12 Classrooms. General Meeting of the American Society for Microbiology. San Diego, CA, 2010.

Westenberg DJ, Synthetic Biology: Introducing Students to Independent Research Through the International Genetically Engineered Machines (iGEM) Competition. National Association of Biology Teachers Annual Meeting, Minneapolis, MN, 2010.

Westenberg DJ, The American Society for Microbiology Biology Scholars Program. National Association of Biology Teachers annual meeting, Minneapolis, MN, 2010.

Westenberg DJ, Where the Microbes Are. USA Science and Engineering Festival. Washington, DC, 2010.

2010 Teaching

SP10: Microbiology (BioSci 221); Microbiology Lab (BioSc 222); Communication Workshop for Pre-Health Professions (Pre-Med 310)

FS10: Microbiology Lab (BioSc 222), General Genetics (BioSci 231), Microbial Genetics (BioSc 301)

Graduate Students: April Rocha

OURE recipients: Shannon Franks, Crystal Halloran, Ashley Mueller, Nicole Hurd, Meghan Ray, Daniel Roush

Undergraduate advisees: 20 majors; ≈ 150 Pre-Med students

Current lab members

2010 Extramural Funding

Missouri Dept. of Higher Ed. Grant, Science Ed. & Quantitative Literacy: An Inquiry-based Approach, $$179,636

US Department of Education GAANN, Graduate Education in Alternative Energy, $174,208

2010 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 on genetics and microbiology activities in the classroom

Chair of the American Society for Microbiology Committee on K-12 Education

Chair of the Missouri S&T Public Occasions Committee

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

2010 Awards, Honors

Teaching Award, Missouri S&T

Crystal Halloran and Ashley Muehler earned first place for their poster in the Undergraduate Research Symposium.

Nichole Hurd, Daniel Roush and Megan Ray earned second place for the poster at the UG Research Symposium.

Terry Wilson, M.S.
Teaching Associate

2010 Teaching

SP10: Biodiversity (Bio113)
SP10: Biodiversity lab (Bio 114, 3 sections)
SP10: Cellular Biology Lab (Bio 212)
FS10: Principles of Biology lecture (Bio 111)
FS10: General Biology Lab (Bio 112, 2 sections)
FS10: Cellular Biology Lab (Bio 212, 3 sections)

2010 Activities

- Provided staff support for Project Lead the Way summer training institute
- PRO advisor for first year students
- Attended Project Lead The Way – affiliate directors meeting in Washington, D.C. (October)
- GTA assessment workshops
- Expanding Your Horizons workshop

Project Lead the Way Training - 2010

Contents

2010 Faculty Publications

BioSci Faculty (l-r):
Roger Brown (standing),
Dev Niyogi,
Melanie Mormile,
Dan Oerther,
David Westenberg,
Ronald Frank,
Terry Wilson,
Yue-wern Huang,
Katie Shannon,
Robert Aronstam

Research Articles:

Fu Q, MN Rahaman, BS Bal, and RF Brown, Preparation and in vitro evaluation of bioactive glass (13-93) scaffolds with oriented microstructures for repair and regeneration of load-bearing bones. *Journal of Biomedical Material Research* 93A: 1380–1390, 2010.

Fu Q, MN Rahaman, BS Bal, K Kuroki, and RF Brown, In vivo evaluation of 13-93 bioactive glass scaffolds with trabecular and oriented microstructures in a subcutaneous rat implantation model. *Journal of Biomedical Material Research* 95A: 235–244, 2010.

Fu Q, MN Rahaman. BS Bal. LF Bonewald, K Kuroki, and RF Brown. Silicate, borosilicate, and borate bioactive glass scaffolds with controllable degradation rates for bone tissue engineering applications, II: In vitro and in vivo biological evaluation. *Journal of Biomedical Material Research* 95A: 172–179, 2010.

Greig HS, DK Niyogi, KL Hogsden, PG Jellyman, and JS Harding, Heavy metals: confounding factors in the response of New Zealand freshwater fish assemblages to natural and anthropogenic acidity. *Science of the Total Environment* 48:3240-3250, 2010.

Huang C-C, Y Xu, JT Briggler, M McKee, P Nam, and Y-w Huang, Heavy metals, hematology, plasma chemistry, and parasites in adult hellbenders (*Cryptobranchus alleganienses*). *Environmental Toxicology and Chemistry* 29(5): 1132-1137, 2010.

Huang, Y-w, C-H Wu, and RS Aronstam, Toxicity of transition metal oxide nanoparticles: Recent insights from *in vitro* studies, *Materials* 3(10) 4842-4859, 2010.

Jung SB, DE Day, and RF Brown, Comparison of self-bonded, three dimensional bioactive glass fiber scaffolds after in-vivo implantation. *Advances in Bioceramics and Biotechnologies*, Edited by R. Narayan and J. McKittrick. *Ceramic Transactions* 218: 115-132, 2010.

Kandoth C, F Ercal, and RL Frank, A framework for automated enrichment of functionally significant inverted repeats in whole genomes. *BMC Bioinformatics* 11(Suppl 6): S20, 2010.

Lee L, C Kandoth, JL Leopold, and RL Frank, Protein secondary structure prediction using parallelized rule induction from coverings. *International Journal of Medicine and Medical Science* 1(2): 99-105, 2010.

Lee L, JL Leopold, C Kandoth, and RL Frank, Protein secondary structure prediction using RT-RICO: a rule-based approach. *Open Bioinformatics Journal* 4: 17-30, 2010.

Liu BR, J-F Li, S-W Lu, H-J Lee, Y-w Huang*, KB Shannon, and RS Aronstam, Cellular internalization of quantum dots noncovalently conjugated with arginine-rich cell-penetrating peptides. *Journal of Nanoscience and Nanotechnology* 10: 6534-6543, 2010.

Liu BR, Y-w Huang, H-J Chiang, and H-J Lee, Cell-penetrating peptide-functionalized quantum dots for intracellular delivery. *Journal of Nanoscience and Nanotechnology* 10: 7897-7905, 2010.

Niyogi DK, JM Bandeff, C Selman, and DE Menke, Nutrient flux, uptake, and transformation in a spring-fed stream in the Missouri Ozarks, USA *Aquatic Sciences* 72: 203-212, 2010.

Wang H-J, T-H Tang, AC Growcock, J O'Hara, A. Martin, Y-w Huang, and RS Aronstam, ZnO Nanoparticle Inhibition Muscarinic Receptor Ligand Binding and Activation of Store-operated calcium entry, *Toxicology In Vitro* 24: 1953-1961, 2010.

Xu Y, BR Liu, H-J Lee, KB Shannon, JG. Winiarz, T-C Wang and Y-w Huang, Nona-arginine facilitates delivery of quantum dots into cells via multiple pathways. *Journal of Biomedicine and Biotechnology* 2010, Article ID 948543, 11 pages. 2010.

Presentations at Professional Meetings:

Aronstam, RS, H-J Wang, AC Growcock, J O'Hara, T-H Tang, A Martin, and Y-w Huang, Nanoparticle disruption of muscarinic receptor mediated signal transduction, American Society for Neurochemistry, 2010.

Greenwood MJ, AR McIntosh, JS Harding, KE McHugh, and DK Niyogi, Direct and indirect effects of riparian management on aquatic invertebrate communities in a degraded agricultural landscape. North American Benthological Society and American Society of Limnology and Oceanography, joint Annual Meeting, Sante Fe, 2010.

Huang, Y-w, C-C Huang, Y Xu, and RS Aronstam, Metal oxides influence cellular homeostasis via multiple interconnected signaling pathways, Society for Toxicology, 2010.

Huang Y-w and H-J Lee, Transducible HA2-R9 fusogenic peptide enhances internalization and intracellular trafficking of quantum dots. BIT 1st Annual World Congress of Nanomedicine. Beijing, China.

Kandoth C, F Ercal, and RL Frank, Fast automated identification of functionally significant inverted repeats in whole genomes. Mid-South Computational Biology and Bioinformatics Society Conference, Joneboro, AR, 2010.

Mormile MR, Are there Martians in Australia? Science Seminar Series 2010-2011, Co-sponsored by The Saint Louis Zoo and The Academy of Science – St. Louis. St. Louis, Missouri, 2010.

Mormile MR, Benefits of using extremophilic microorganisms for bio-fuel production. 60th Meeting of the Society for Industrial Microbiology, San Francisco, California, 2010.

Mormile MR, How to translate your research into a science museum exhibit. 110th General Meeting of the American Society for Microbiology, San Diego, California, 2010.

Mormile MR, Metagenomics use at a former coal mining environment to bio-prospect for enzymes with applications to sustainable energy. Research and Development Advisory Board Meeting, University of Missouri. Columbia, Missouri, 2010.

Mormile MR, Mining genomic data for extremophilic enzymes. 60th Meeting of the Society for Industrial Microbiology. San Francisco, California, 2010.

Niyogi DK, CY Hu, and JS Harding, Fungal communities in streams affected by mine drainage: responses to multiple stressors and nutrient subsidies. North American Benthological Society and American Society of Limnology and Oceanography, joint Annual Meeting, Sante Fe, 2010.

Selman, C, DK Niyogi, and MW Fitch, Dominant processes that affect the nutrient retention in small Missouri-Ozarks streams. North American Benthological Society and American Society of Limnology and Oceanography, joint Annual Meeting, Sante Fe, 2010.

Shannon K, Regulation of budding yeast protein-protein interactions important for cytokinesis. 50th Annual Meeting of the American Society for Cell Biology, Philadelphia, PA, 2010.

Shannon K, Using Budding Yeast To Study The Regulation Of Cytokinesis. University of Northern Iowa, Cedar Falls, IA, 2010.

Stockstill K, J Park, R Wille, and K Shannon. Analysis of Hof1 PEST domain phosphorylation and cytokinesis in budding yeast. Annual Meeting of the American Society for Cell Biology, Philadelphia, PA, 2010.

Wang H-J, T-H Tang, AC Growcock, J O'Hara, A Martin, Y-w Huang and RS Aronstam, ZnO nanoparticles alter muscarinic receptor ligand binding and activation of SOCE, Society for Toxicology, 2010.

Westenberg DJ and KA Gull, Online with the American Society for Microbiology: Resources and Programs for Educators at all levels., National Association of Biology Teachers annual meeting, Minneapolis, MN, 2010.

Westenberg DJ, convened a session on "Biotechnology", Annual Meeting of the National Association of Biology Teachers, Minneapolis, MN, 2010.

Westenberg DJ, convened a session on the "Benefits of Outreach in Higher Education" for the 2010 General Meeting of the American Society for Microbiology, San Diego, CA, 2010.

Westenberg DJ, Reaching out to K-12 Classrooms. General Meeting of the American Society for Microbiology. San Diego, CA, 2010.

Westenberg DJ, Synthetic Biology: Introducing Students to Independent Research Through the International Genetically Engineered Machines (iGEM) Competition. National Association of Biology Teachers Annual Meeting, Minneapolis, MN, 2010.

Westenberg DJ, The American Society for Microbiology Biology Scholars Program. National Association of Biology Teachers annual meeting, Minneapolis, MN, 2010.

Westenberg DJ, Where the Microbes Are. USA Science and Engineering Festival. Washington, DC, 2010.

Laboratory dissection, Biodiversity class

BioSci Office staff: Jessica Pelc, Connie Behrick and Vicky Rowden

Extramural Income – Grants, Contract, BioTech Sales

2010 Annual Report

CY09 Summary- Sponsored Programs Activity 1/1/2010 - 12/31/2010

NAME	DIRECT COST	NET INDIRECT	TOTAL COSTS	SPONSOR NAME	PROJECT NAME
Aronstam, Robert S	$193,428	$0	$193,428	S&T cDNA Resource Center	Biotech sales - receptor clones
Brown, Roger F	$21,537	$10,876	$32,414	NIH Natl Inst Of Health	Periodontal engineering
Brown, Roger F	$53,845	$26,332	$80,176	Dept Of Army	Bone and tissue repair
Brown, Roger F	$7,473	$3,290	$10,763	MO Sci Corp	Glass Laser Sintering
Huang, Yue-Wern	$38,574	$0	$38,574	MO Dept of Cons	Hellbender health
Huang, Yue-Wern	$30,628	$15,467	$46,095	NIH Natl Inst Of Health	Novel drug delivery systems
Maglia, Anne Marie	$7,037	$3,448	$10,485	NSF Dirc Bio Sci	Morphology Net: Digital Database
Mormile, Melanie R	$6,225	$1,556	$7,781	MSC Company	Novel Animal Feeds
Shannon, Katie B.	$15,314	$7,734	$23,047	NIH Natl Inst Of Health	Quantum dots/protein cell entry
Westenberg, David J	$14,821	$924	$15,746	MO Dept of Higher Educ	Science education
Westenberg, David J	$1,372	$0	$1,372	US Dept of Educ	Graduate Education
	$390,254	**$69,627**	**$459,881**		

Most of the funds for research in the department come from grants and contracts from external agencies. Expenditures of these funds for the **Calendar Year 2010** are listed above. Funds expended in 2010 from multiple grant funding periods are listed on the same line. Research expenditures derived from biotech sales from the S&T cDNA Resource Center are also listed

Kyle Williams makes cotton candy at BioSci Homecoming picnic

BioSci graduation reception, December 2010

Santa never misses the BioSci Holiday party (December 2010)

Contents

Seminar Program

2010 Annual Report

Seminar Directors: Dr. Robert Aronstam
Dr. Ronald Frank

Date	Date	Institution	Topic
Jan. 25	Dr. Yue-wern Huang	Missouri S&T	"Oxidative Stress, Calcium Homeostasis, and altered Gene Expression in Human Lung Epithelial Cells Exposed to ZnO Nanoparticles"
Feb. 1	Dr. Katie Shannon	Missouri S&T	"Using Budding Yeast to Study the Regulation of Cytokinesis"
Feb. 8	Dr. Robert Aronstam	Missouri S&T	"The Influence of Oxidative Stress on Cellular Responses to Activation of Muscarinic Receptors"
Mar. 16	Sister Shawnee M Daniels-Sykes, SSND	Mount Mary College-Milwaukee	"In Pursuit of Liberty and Justice: from Medical Ethics to Bioethics to Health Care Ethics"
Mar. 22	Dr. Lori Eggert	U. Missouri - Columbia	"Using Molecular Tools in Population and Conservation Ecology"
Apr. 5	Sarah Havens	Missouri S&T	"The Role of Skeletal Development in Body Size Evolution of two American Frogs"
Apr. 12	Adam Martin	Missouri S&T	"Development & Characterization of Constitutively Active Mutant GPCRs"
Apr. 19	Bonnie Beasley	Missouri S&T	"If you can't Love the one that you want, Love one you're With" The Study of Hybridization Among Cave Salamanders"
Apr. 26	Barbara Fears	Missouri S&T	"Correlation Between the Laryngeal Apparatus and Call Structure in the Evolution of the North American Hylids"
May 3	Dr. Stephen Bonasera	U. Nebraska Medical Center	"The Old Mouse in Flames- is Regional Neuroinflammation Involved in Age-Related Functional Loss"

Date	Date	Institution	Topic
Aug. 30	Dr. Melanie Mormile	Missouri S&T	"Metagenomic Study of Rumen Protozoan Glycosyl Hydrolases"
Sept. 13	Dr. Qun Zheng	Washington U. – St. Louis	"A Novel Mechanism of Neuronal Specification Revealed in C. Elegans"
Sept. 20	Dr. Danel Oerther	Missouri S&T	"Applications of Environmental Biotechnology"
Sept. 27	Dr. J. Chris Pires	U. Missouri - Columbia	"Impact of Recent and Ancient Whole Duplications on Eukaryote Diversification"
Oct. 4	Dr. Ming- Huan Chan	U. Missouri - Columbia	"A Novel agent MH101 is Potential for Treatment for Parkinson's Disease in Mouse Model"
Oct. 11	Rachel Willie and the iGEM Team	Missouri S&T	"Summer Internships"
Oct. 18	Dr. Elena Bray Speth	St. Louis U.	"The Sciences of Biology Teaching and Learning"
Oct. 25	Dr. Mary Formanack	Washington U. – St. Louis	"Functional Variations in KATP, the Potassium Channel which Regulates Insulin Secretion"
Nov. 1	Dr. Leong Lee	U. North Carolina-Greensboro	"Rule Visualization of Protein Motif Sequence Data For Secondary Structure Predication"
Nov. 8	Dr. Jason Knouft	St. Louis U.	"Environmental Factor Regulating the Distribution and Diversity of North American Freshwater fishes at Multiple Spatial Scales"
Nov. 15	Dr. Dev Niyogi	Missouri S&T	"Ecosystem Processes in Streams: Service to Humanity and Indicator of Stress"
Nov. 29	Ms. Sharon Wang	Missouri S&T	"Zinc Oxide Nanoparticle Disruption of Store-Operated Entry in a Muscarinic Receptor Signaling Pathway"
Dec. 6	Dr. Allison Miller	U. Missouri - St. Louis	"Evolution of Clonally Propagated Plants under Domestication"

Undergraduate Education

2010 Annual Report

Some of our December 2010 graduates

Missouri S&T's thriving **Biological Sciences** community included 181 undergraduate majors in 2010 (4th week fall semester enrollment reports), a 12% increase from 2009. **Dr. Dev Niyogi** chaired the Undergraduate Education Committee in 2010.

2010 Highlights

- record number of student credit hours
- record number of majors (181 vs. 161, FS2009)
- 75% of graduating seniors participated in research
- service learning courses engaged in by all seniors
- 11 BioSci students graduated with Honors, included one with perfect 4.0 gradepoint average, **Kristen Hinton**
- 68 BioSci students were named to the Provost's Academic Scholars List for the Spring 2010 semester (vs. 51 last year (Fall semester scholars were not announced at the time of publication).
- BioSci students participated in the 6th **Annual Undergraduate Research Conference** (April 2010). BioSci Award winners were:
  - 2nd Place- **Karen Schilli** "Genomic Analysis of the BCA sequence 3 GeneFamily in Glycine Max" Oral presentation.
  - Our students swept the Natural Sciences Poster Session:
  - 3rd Place-**Drew Menke**- "Phosphorus Dynamics in an Ozark Stream And a Hyper-Eutrophic Lake in east Central Missouri"
  - 2nd Place**- Daniel Roush** with Chemical Engineering Students Nichole Hurd and Meghan Ray- "Isolation and Implementation of the Electron Shutting pathway from Geobacter into *Escherichia coli*"
  - 1st Place- **Ashley Muehler and Crystal Halloran**- "Use of Entophytic Bacteria for growth Promotion and Toxicity Resistance in Leachate treated Poplar trees"
- 11 students were awarded OURE scholarships to perform research in the BioSci department

Courses Offered

Spring 2010

- Bio 110 General Biology
- Bio 112 General Biology Lab
- Bio 113 Biodiversity
- Bio 114 Biodiversity Lab
- Bio 150 Biotechnology in Film
- Bio 211 Cell Biology
- Bio 212 Cell Biology Lab
- Bio 221 Microbiology
- Bio 222 Microbiology Lab
- Bio 231 Genetics
- Bio 242 Human Physiology
- Bio 234 Human Physiology Lab
- Bio 251 Ecology
- Bio 300 Special Problem
- Bio 301 Genomics
- Bio 341 Tissue Engineering 1
- Bio 358 Advanced Biodiversity
- Bio 383 Pharmacology
- Bio 388 Bio Medical Problems
- Bio 390 Undergraduate Research

Drew Menke at undergraduate research day (2010)

Contents

Fall 2010

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

May 2010

Undergraduates
Brittany Hood
Brittany Bockhorst
Richard Campos
Benjamin Hale
Kristen Hinton
Forrest Lindsey
Jennifer Luebbering
Drew Menke
Jennifer Qualls
Erin Sind
Brandon Tucker
Kaitlyn Wong
Vivan Anter Rabi Raja Christopher

Graduate Students
Bonnie Beasley
Barbara Fears

December 2010

Undergraduates
Danielle Warchol
Michelle Brosnahan
Nicole Buxton
Crystal Halloran
Teresa MacPhail
Margaret Meyers
Emily Page
Sara Stephans
Rebecca Wentz
Andrew Wessel

Graduate Students
Amanda Watson
Hsui-Jen Wang

May 2010 graduates

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Graduate Education

2010 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 have gone on to doctoral programs at institutions across the nation, most of the others are employed in the medical and biotech industries (see table, below). Drs. Ron Frank and Yue-wern Huang chaired the department's Graduate Studies Committee in 2010.

Four thesis students earned their degree in Environmental and Applied Biology. They are Sarah Havens, Barbara Fears, Bonnie Beasley, Hsiu-Jen Wang.

(clockwise from upper left) Sarah Havens, Barbara Fears, Hsiu-Jen Wang and Bonnie Beasley

Student	Thesis Title	Advisor
Sarah Havens	The Role of Skeletal Development in Body Size Evolution of Two North American Frogs	Dr. Anne Maglia
Bonnie Beasley	Analysis of Eurycea Hybrid Zone in Eastern Missouri	Dr. Anne Maglia
Barbara Fears	Laryngeal Apparatus and Call Structure in North American Hylids	Dr. Anne Maglia
Hsui-Jen Wang	Zinc Oxide Nanoparticle Disruption of Store-Operated Calcium Entry in a Muscarinic Receptor Signaling Pathway	Dr. Robert Aronstam

2010 Graduate Students (* non-thesis)

Yousf Ali Albozidi	Ninu Madria	Katie Stockstill
Yu-Hsiang Chen	Gena Robertson	Kele Thrailkill
Kholoud Ghanem*	April Rocha	Kaitlyn Wong
Pamela Gray*	Daniel Roush	Chi-Heng W
Jesse Holmes	Erin Sind	
Yinan Lin	Stephanie Smith	

2010 Graduate Student Publications

Huang C-C, Y Xu, JT Briggler, M McKee, P Nam, and Y-w Huang, Heavy metals, hematology, plasma chemistry, and parasites in adult hellbenders (*Cryptobranchus alleganienses*). *Environmental Toxicology and Chemistry* 29(5): 1132-1137, 2010.

Huang, Y-w, **C-H Wu**, and RS Aronstam, Toxicity of transition metal oxide nanoparticles: Recent insights from *in vitro* studies, *Materials* 3(10) 4842-4859, 2010.

Wang H-J, T-H Tang, AC Growcock, J O'Hara, A. Martin, Y-w Huang, and RS Aronstam, ZnO Nanoparticle Inhibition Muscarinic Receptor Ligand Binding and Activation of Store-operated calcium entry, *Toxicology In Vitro* 24: 1953-1961, 2010.

Kandoth C, F Ercal, and RL Frank, A framework for automated enrichment of functionally significant inverted repeats in whole genomes. *BMC Bioinformatics* 11(Suppl 6): S20, 2010.

Lee L, C Kandoth, JL Leopold, and RL Frank, Protein secondary structure prediction using parallelized rule induction from coverings. *International Journal of Medicine and Medical Science* 1(2): 99-105, 2010.

Lee L, JL Leopold, **C Kandoth**, and RL Frank, Protein secondary structure prediction using RT-RICO: a rule-based approach. *Open Bioinformatics Journal* 4: 17-30, 2010.

Fu Q, MN Rahaman, BS Bal, and RF Brown, Preparation and in vitro evaluation of bioactive glass (13-93) scaffolds with oriented microstructures for repair and regeneration of load-bearing bones. *Journal of Biomedical Material Research* 93A: 1380–1390, 2010.

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Fu Q, MN Rahaman. BS Bal. LF Bonewald, K Kuroki, and RF Brown. Silicate, borosilicate, and borate bioactive glass scaffolds with controllable degradation rates for bone tissue engineering applications, II: In vitro and in vivo biological evaluation. *Journal of Biomedical Material Research* 95A: 172–179, 2010.

2010 Graduate Student Abstracts/Presentations

Aronstam, R.S., **H-J Wang**, AC Growcock, J O'Hara, T-H Tang, A Martin, and Y-w Huang, Nanoparticle disruption of muscarinic receptor mediated signal transduction, American Society for Neurochemistry, 2010.

Huang, Y-w, C-C Huang, **Y Xu**, and RS Aronstam, Metal oxides influence cellular homeostasis via multiple interconnected signaling pathways, Society for Toxicology, 2010.

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Stockstill K, J Park, R Wille, and K Shannon. Analysis of Hof1 PEST domain phosphorylation and cytokinesis in budding yeast. Annual Meeting of the American Society for Cell Biology, Philadelphia, PA, 2010.

Wang H-J, T-H Tang, AC Growcock, J O'Hara, , A Martin, Y-w Huang and RS Aronstam, ZnO nanoparticles alter muscarinic receptor ligand binding and activation of SOCE, Society for Toxicology, 2010

BioStar Awards

BioStar awards were instituted by the BioSci faculty in 2009 to recognize achievements of our students in several areas. These awards will be made annually at the end of the academic year (May).

BioStar winners in 2010 were:

Graduating Senior:	**Brandon Tucker**
Graduate TA:	**April Rocha**
First Year Student:	**Shelby Emmett**
Graduate Research:	**Katie Stockstill**
Undergraduate Research:	**Crystal Halloran**
Undergraduate Research:	**Ashley Muehler**
Student Service:	**Richard Campos**
Student Leader:	**Karen Schilli**
Transfer Student:	**Heather Branstetter**

2010 **BioStar** winners (*l-r)*: Shelby Emmett, Richard Campos, Ashley Muehler, Crystal Halloran, Karen Schilli, Katie Stockstill, Heather Branstetter, April Rocha, and Brandon Tucker.

Mindy Merenghi and **Amber Kreps** (right) were recently named the fifth and sixth recipient of the **Gale-Hufham Scholarship**. This award, named for the founders of the department of biological sciences, Drs. Nord Gale and James Hufham, is presented annually to an outstanding upperclassman. Ms. Amber Kreps transferred into our department in Fall 2009.; Mindy Merenghi joined our department in Spring 2009.

Previous awards winners were:

2009	**Kristen Hinton**
2008	**Shrea Sticklin**
2007	**Ashley Sheek**
2006	**Wesley Glick**

Shelby Emmett (right) was selected for the Bryant Scholar Program. This program means that Shelby has a reserved seat in medical school, and will not have to take the MCAT exam. Ms. Emmett joined the department in Fall 2009.

Contents

Senior Seminar Service Learning Class

2010 Annual Report

Since 2008, the Biological Sciences Department has included 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 an unmet 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.

Karen Schilli times a participant in the Bike Rodeo at Truman Elementary

The nature of our students' service learning projects is diverse and impressive. Students developed a peer mentoring program for the department, helped the Tri-County Humane Society, put on a bike safety presentation at a local elementary school, started a recycling project at Fort Leonard Wood, and raised money for Heart Disease and cancer patients at PCRMC.

2010 Projects

- Tri-County Humane Society
    - Kitten room improvements
    - Storage shed completion
    - Website and Facebook page creation
- Increasing Celiac disease awareness on campus in conjunction with Chartwell's food services
- Bike Rodeo at Truman Elementary School
- Raising money and awareness of Women's Heart Disease with the Red Dress Project
- Charity 3-on-3 Basketball Tournament to benefit Joy of Caring Foundation
- Creation of a Biological Sciences mentoring program
- Free spay and neuter clinic
- Clean, green Fort Leonard Wood

Veronica Breen and Teresa MacPhail sell hot chocolate at their fundraiser for the Joy of Caring Foundation

Contents

Phi Sigma

2010 Annual Report

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

2010-2011 officers:

President: Joshua Erickson
Vice President: Karen Schilli
Secretary: Jill Wildhaber
Treasurer: Teresa MacPhail/Charles Dewsnup

Faculty Advisor: Dr. Ronald Frank

2011 Spring Semester Activities:

- Assisted in the preparation of land and the construction of a house with Habitat for Humanity
- Solicited applications and held interviews for the Phi Sigma Outstanding Freshman Scholarship
- Inducted new members
- Sponsored a Trivia Night in conjunction with other departmental organizations
- Continued mentoring program for underclassmen

iGEM Team

2010 Annual Report

The international Genetically Engineered Machine (iGEM) competition is an international event in which student teams compete to design and assemble biologically engineered organisms using advanced genetic components and technologies. Our team includes students from many diverse areas including Missouri S&T's Electrical, Chemical, and Biological Engineering department, along with BioSci students.

2010 Highlights:

Team members:

Daniel Roush– President and Webmaster
Nichole Hurd– Vice Presidnet
Erica Shannon– PR Officer
Helen Cardwell– Treasurer
Meghan Ray– Secretary
April Pummel
Amanda Foster
Brice Curtin
Karen Schilli
Josh Erickson
Lou Harmon
Alison Hart
Jarrett Stechschulte
Nick Jentsch
Hamilton Vernon
Amber Kreps
Daniel Miller
Johnny Nyugen
Laura Townzen
Ryan Thomas
Lindsey Schobert
Blythe Ferriere
Andrew Alseth
George Obeldobel
Jesse Townsend

Faculty advisors:

Katie Shannon
Dave Westenberg
David Henthorn
Chang-Soo Kim

2010 Project

A Synthetic Biology Approach to Microbial Fuel Cell Development:

The goal of our project is to manipulate *E. coli,* endowing them with the ability to release electrons in an aerobic environment. We isolated and cloned the outer membrane cytochromes of *Geobacter sulfurreducens* and introduced them into *E. coli* to create a living electrical generator. We targeted omcB, omcE, omcS and omcT as they are the four essential genes used in the electron shuttling pathway in *G. sulfurreducens*. In addition to these four cytochromes we are introducing a C cytochrome materase to allow for proper assembly of the cytochromes in *E. coli*. Our goal is to harness electron export from a biological system and use the current to power an electrical machine.

Beyond the simple exploitation of *G. sulfurreducens* electron shuttling pathway, we made strides in microbial fuel cell technology research. One of our key features was the use of carbon aerogel anodes to dramatically increase the efficiency of electron capture at the anode of a microbial fuel cell.

2010.igem.org/Team:Missouri_Miners

Our Sponsors:

Biological Sciences Department
Chemical & Biological Engineering Department
Materials Research Center
MidSci Scientific
OURE
Energy Research & Development Center

2010 Activities and Achieved Goals

- Earned a bronze medal at iGEM MIT Conference
- Ratified club constitution
- Became a Recognized Campus Organization
- Became a designated student design team
- Recruited team members from other departments
- Obtained our own research space
- Secured additional funding from sponsors

cDNA Resource Center
Annual Report 2010

Adam Martin

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

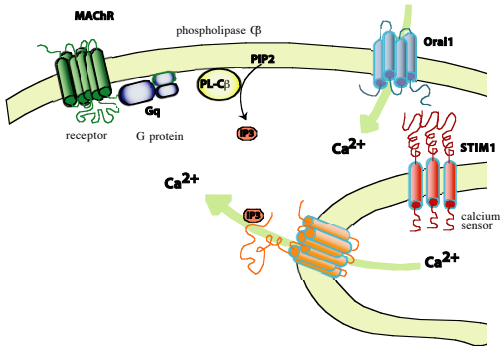
The **Center** provides clones of human proteins that are:

- 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 (Federal Express) within 24 hours of order

Vanessa Kaighin

In 2010, proceeds from the Center were used to support 1) faculty and student research; 2) faculty travel; 3) Taiwanese student exchange program; 4) research in the Laboratory of Neurobiology; 5) departmental seminar program; and 6) other departmental operations and initiatives.

Vicky Rowden



Staff:
Adam Martin, M.S., Manager
Vanessa Kaighin, Sr. Lab Technician
Vicky Rowland, Business Manager
Erica Shannon, Technical Assistant
Joshua Erickson, Technical Assistant
Sarah Sutterer, Technical Assistant
Robert S. Aronstam, Ph.D., Director

Robert Aronstam

www.cdna.org

2010 Highlights

- sales surpassed $1.7 million since 2005, over $193,000 in 2010
- introduced over 70 new clones to the collection
    - submitted 65 wild-type sequences to NCBI, including 72% of all human nuclear receptors and 6 orphan receptors
    - identified 13 novel nuclear receptor variants
- employed/trained 8 student technicians
- supported research rotations in basic molecular biology

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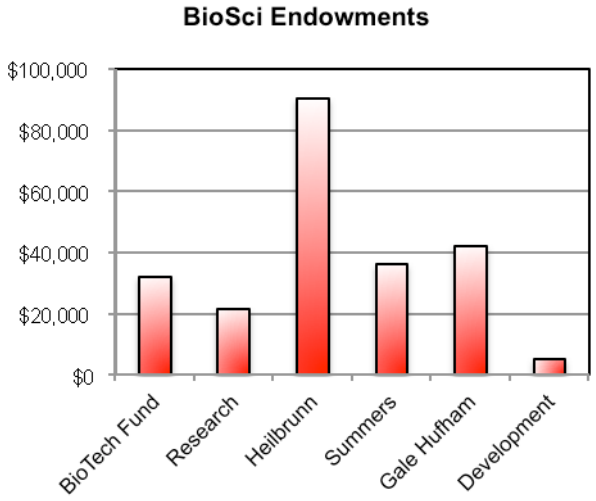
Donors

2010 Annual Report

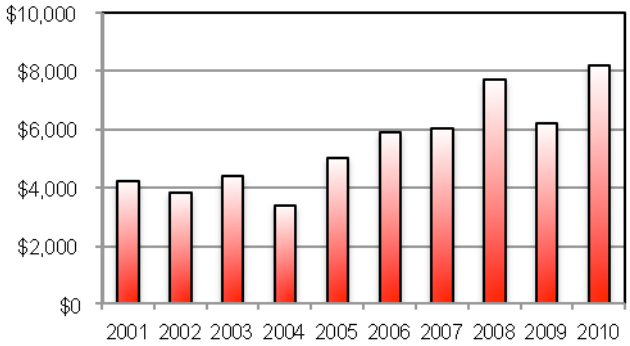
BioSci Partners 2010

We are pleased to acknowledge those who generously supported the department in 2010. 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. A record $20,780 was received in 2010.



Value of BioSci endowment funds at the end of 2010. The Gale-Hufham, Heilbrunn and Summers funds provide student scholarships; the other funds support research.

Contributions are welcome at any time and can be made on the S&T web site (givingtomst.missouri.edu) (Of course, we're sure you'll want to specify Biological Sciences as the recipient fund). We reach about 20% of our alumni during our April Phonathon, and many more by our written solicitation (also in April). While the cadre of BioSci alumni has grown to almost 500, half of our students graduated in the last 10 years and are still in the early phases of their careers.



We appreciate all you have done 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 the department any time you are in Rolla.

Donations to the BioSci department. Excludes donations to specific programs (notably, iGEM) and gifts in kind. Total giving in 2010 was $$20,780.

Donations of $1000 and above

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

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