2009
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 format useful; 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**
MorphologyNet	**www.morphologynet.org**
Amphibian Anatomical Ontology	**www.amphibanat.org**

Department of Biological Sciences

Chair's Summary - 2009

Robert S. Aronstam

The BioSci community at S&T continued to thrive in 2009, celebrating its accomplishments and rallying to meet a variety of challenges. There was, in fact, a lot of good news this year:

Mission Statement: At the beginning of every Academic Year, the BioSci faculty has a retreat at which we review our past performance and current situation, and determine the issues we want to concentrate on in the upcoming year. Amid the tumult and commotion of a busy academic department, it is useful periodically to step back and examine the "bigger picture". This year we spent some time revising our Mission Statement. There was unanimity regarding the twin foci of our mission, **learning** and **discovery.** There was also a remarkable agreement on the importance of how we operate when addressing these tasks. Specifically, the faculty recognized the importance of being an inclusive academic community (faculty, students and staff) that is simultaneously collegial and challenging, and that supports the personal and professional development of all of its members. Exactly how we realize this vision is the focus of present discussion and effort.

Department of Biological Sciences
Mission Statement

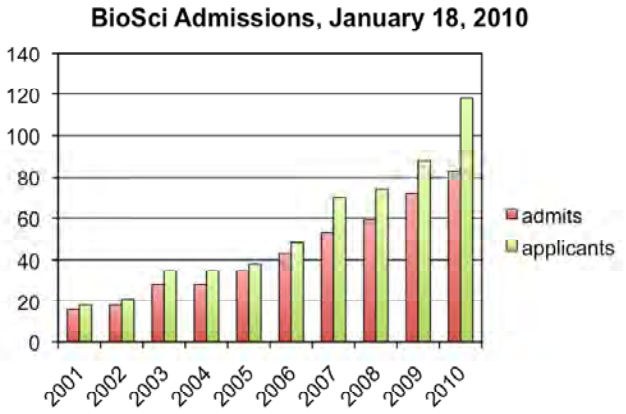
To promote **learning** and **discovery** in the biological sciences while functioning as an inclusive academic community that is supportive, collegial, challenging and rewarding, and that values the personal and professional development of all its members (students, faculty, and staff).

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

Department Growth: We reached new highs in the number of majors, minors, student credit hours, applicants, graduates, and scholarships awarded. We remain one of the fastest growing departments on campus.

Teaching Quality. Four faculty members received academic year 2009 Outstanding Teaching Awards (**Drs. Ron Frank** and **David Westenberg**) or Commendations (**Drs. Anne Maglia** and **Dev Niyogi**) from the campus Committee for Effective Teaching (CET). These awards are based on student evaluation of faculty teaching. (The distinction between an award and a commendation has to do with the number of courses evaluated, not the quality of the instruction). While less than 10% of S&T instructors receive this recognition, generally 30-40% of biology faculty are honored in this manner each year.



Faculty Promotion: **Dr. Dev Niyogi** was promoted to Associate Professor.

Facilities: The BioSci department received a grant of $249,000 through the Caring for Missourians initiative that is designed to increase the entry of students into health care professions. Historically, about a third of our graduates go into a health care field (medical school, dental school, veterinary school, pharmacy, physical therapy, etc.). The Caring for Missourians funds will be used to renovate our 3 primary teaching laboratories and to enhance our technical capabilities through the purchase of analytical equipment

Research. Faculty research publications and presentations are listed elsewhere in this Annual Report. One faculty, **Dr. Melanie Mormile**, began a research leave in Columbia, Missouri. Two visiting scholars from Taiwan National Normal University have spent the last 6 months in our department; three other scholars will join us in the spring 2010 semseter. Clones sales from the cDNA Resource Center exceeded $220,000 in CY09 and $1.5 million since 2005.

Project Lead the Way. We hosted a training session for master high school teachers involved in the Project Lead The Way – Biomedical Sciences curriculum in the summer of 2009. This went exceptionally well, and we are now scheduled for as many as 7 training sessions in 2010. PLTW is a wonderful educational initiative that offers a

creative and rigorous four course secondary biology curriculum. Being State Affiliate leader for the program offers specific advantages to our department and school, including the purchase of additional laboratory equipment, summer employment and training for undergraduate students, and an increased awareness of the unique opportunities for training in biological sciences at Missouri S&T.

Student Affairs: The student organizations (Helix, Scrubs, and Phi Sigma) associated with the BioSci department had very active years, with invited speakers, service projects, and field trips. The department hosted a homecoming picnic, 2 graduation receptions, a holiday party, and lunch with the faculty events. Our weekly student newsletter (BioConnection) completed its third year of publication. Our iGEM cellular design team competed in their 2nd national event at MIT; we now have two teams that will compete in alternate years.

Graduate Program: We graduated 6 Masters students, and our program continues to operate at full capacity. Our graduates are evenly split between PhD programs and employment in biology-related industries. A doctoral level training program in interdisciplinary biology has been proposed.

Challenges:

Department/University Finances. The economic downturn has squeezed us, but we are in better shape than many comparable universities. The University of Missouri and the State of Missouri are conservatively managed. Consequently, Missouri tends to lag the rest of the nation both in going into and coming out of a recession. State funding (and tuition) has been frozen for the last two academic years, and federal stimulus funding has been required to maintain even this level of funding. We anticipate a 5% reduction in state funding for Academic Year 2011 (note, however, that only 30% of our budget comes from the state and is thus subject to this reduction). Insofar as perhaps 75% of university budget is for personnel, a freeze on hiring has been implemented. The university presently has 37 unfilled faculty lines (≈11% of the total). BioSci has 1.5 unfilled faculty positions, a major problem for our relatively small department.

Economic conditions have (paradoxically?) led to a surge in interest in our programs: the number of biology applicants has increased by 20% in each of the last two years (see accompanying chart). We are seeing increased numbers of both reentry students and students attracted by the value of a public university education. One of our biggest challenges 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 (10 years), over 80% of our undergraduates participate in research at some time during their undergraduate training.

Graduate Program: Our plans to institute a doctoral training program in Interdisciplinary Biology have been delayed for a variety of reasons, notably the prevailing economic conditions and the consequent reluctance of the university to introduce new programs.

Growth Challenges: Our growth has placed strain on our resources in a number of areas, notably faculty teaching and advising efforts, student scholarships, and the availability of research training opportunities for undergraduates.

So, the BioSci community at S&T is doing well. The major on-going challenge is to maintain our quality and unique approach while creatively negotiating the financial storms.

I am pleased to report our activities to you. Your comments and suggestions are always welcome. We appreciate your support, ideas and interest, and we look forward to continuing to report our progress and challenges to you. 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

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: Anna Growcock, Heather Lavezzi, Amanda Sutterer, Sarah Sutterer, Caroline Downen, Jennifer O'Hara

2009 Publications

Shi, R.,C.-C. Huang, R.S. Aronstam, N. Ercal, A. Martin and Y-W. Huang, N-acetylcysteine amide decreases oxidative stress but not cell death induced by doxorubicin in H9c2 cardiomyocytes, *BMC Pharmacology* 9:7, 2009; doi:10.1186/1471-2210-9-7

Huang, C.-C., R.S. Aronstam, D.-R. Chen and Y.-W. Huang, Oxidative stress, calcium homeotstasis and altered gene expression in human lung epithelial cells exposed to ZnO nanoparticles, *Toxicology In Vitro*, 2009; doi:10.1016/j.tiv.2009.09.007

2009 Presentations

Huang, C.-C., R.S. Aronstam, D.-R. Chen, Y.-W. Huang, Increased intracellular calcium concentrations in human bronchialepithelial cells exposed to ultrafine zinc oxide particles, Society for Toxicology, 2009.

Wang, H.-J., A. Martin. Y.-W. Huang and R.S. Aronstam, Muscarinic M3 receptor mediated intracellular calcium changes are pH sensitive and dependent, Society for Toxicology, 2009.

2009 Teaching

SS09: Neurobiology (BioSci 301)
FS09: Cellular Biology (BioSci 211)
Undergraduate advisees: 43 majors; 11 minors
Graduate Students: Hsui-Jen Wang, Jennifer O'Hara
Visiting Scholar: Tso-Hao Tang
OURE fellows: Casey Growcock, Barbara Wheelden, Caroline Downen, Jeffrey Nye

2009 Activities

- Directed the Missouri S&T cDNA Resource Center
- Instituted graduate student exchange program with National Taiwan Normal University; 2 visiting fellows welcomed
- Advisees won a prize in the S&T Undergraduate Student Research Day competition
- Attended Project Lead The Way – affiliate directors meeting in Austin, TX (11/09)

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

2009 Publications

Brown, RF, M.N. Rahaman, A. Dwilewizc, W. Huang, D.E. Day, Y. Li, and B. Bal, 'Effect of borate glass composition on its conversion to hydroxyapatite and on the proliferation of MC3T3-E1 cells,' *Journal of Biomedical Materials Research* 88A: 392-400, 2009.

Fu, Q., M.N. Rahaman, B.S., Bal and R.F. Brown, 'Proliferation and function of MC3T3-E1 cells on freeze-cast hydroxyapatite scaffolds with oriented pore architectures', *Journal of Materials Science Materials in Medicine* 20: 1159-1165, 2009.

Fu, Q., M.N. Rahaman, B.S., Bal and R.F. Brown, '*In Vitro* cellular response to hydroxyapatite scaffolds with oriented microstructures', *Materials Sciences Engineering C* 29: 2147-2153, 2009.

2009 Teaching

SS09: Human Physiology (BioSci 242)
SS09: Tissue Engineering I / Tissue Engineering II (BioSci 341/BioSci 441)
FS09: Human Anatomy (BioSci 241)
FS09: Biomaterials I / Biomaterials II (BioSci 340/BioSci 440)

Mentoring of Mr. Vernon Modglin, MS degree recipient

2009 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.), 8/06/08-7/31/10, $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.

2009 Activities

Participated in the 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

Director, 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 training, 1968-71

2009 Publications

Lee L, Leopold JL, Frank RL, Maglia AM. 2009. Protein Secondary Structure Prediction Using Rule Induction from Coverings. *Proceedings of IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology 2009*, 79-86.

2009 Presentations

Lee L, Kandoth C, Leopold JL, Frank RL. 2009. Protein Secondary Structure Prediction Using Parallelized Rule Induction from Coverings. International Conference on Computer, Electrical, and Systems Science, and Engineering, Bangkok, Thailand

Lee L, Leopold JL, Frank RL, Maglia AM. 2009. Protein secondary structure prediction using rule induction from coverings. IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology, Nashville, TN.

2009 Teaching

WS09: General Genetics (BioSci 231)

WS09: Evolution (BioSci 235)

FS09: Molecular Genetics (BioSci 331)

FS09: Evolution (BioSci 235)

Undergraduate advisees: 43 majors

Undergraduate researchers: Sherea Stricklin, Brian Glass, Karen Shilli (OURE)

Graduate Students: Cyriac Kandoth, M.Sc. 2008, Computer Science

Yue-wern Huang, Ph.D.

Associate Professor

Director, Laboratory of Toxicology

Research Interests

- Nanoparticle toxicity in the aspect: how physiochemical properties of nanoparticles contribute to molecular toxicity mechanisms
- Biological responses to endocrine modulators in the environment
- Using quantum dots (QDs) and protein transduction domains (PTDs) to deliver biologically active molecules into the cell

2009 Publications

Weisheng Lin, Yi Xu, Chuan-Chin Huang, Yinfa Ma, Katie B. Shannon, Da-Ren Chen, and Yue-wern Huang. Toxicity of nano- and micro-sized ZnO particles in human lung epithelial cells. *Journal of Nanoparticle Research* 11:25-39, 2009. . DOI: 10.1007/s11051-008-9419-7.

Rong Shi, Chuan-Chin Huang, Robert S. Aronstam, Nuran Ercal, Adam Martin, and Yue-wern Huang. N-acetylcysteine amide decreases oxidative stress but not cell death induced by doxorubicin in H9c2 cardiomyocytes. BMC Pharmacology. DOI: 10.1186/1471-2210-9-7. (15 April 2009) (classified as "Highly accessed"; >1750 references as of by July 2009)

Huang, C.-C., Aronstam, R.S., Chen, D.-R. and Huang, Y.-W., Oxidative stress, calcium homeotstasis and altered gene expression in human lung epithelial cells exposed to ZnO nanoparticles. *Toxicology In Vitro*, 2009.

2009 Presentations

Invited Speeches

Midwest Chinese American Science and Technology Association. Presentation title "A novel system to deliver and monitor biologically active molecules". St. Louis, MO, USA, November, 2009.

National Ilan University. Presentation title: "Nano-sized metal oxides induce oxidative stress and alter calcium homeostasis in human bronchial epithelial cells (BEAS-2B)". Ilan, Taiwan, June, 2009.

New York University Nelson Institute of Environmental Medicine. Presentation title: "Nanotechnology: a doubled edged sword", Tuxedo, New York, USA, May, 2009.

University of Colorado-Denver Department of Biology. Presentation title: "Nanotechnology: a doubled edged sword", Denver, Colorado, USA, March, 2009.

Poster Presentations

49th Annual Meeting of the American Society for Cell Biology. Yue-wern Huang, Han-Jung Lee, Katie Shannon, and Yi Xu. A new cellular delivery system QD/sR9: exploration of the efficiency, uptake mechanism, and intracellular localization. San Diego, CA, USA, 2009.

Annual SETAC Ozark-Prairie Chapter Meeting. Yue-wern Huang. Atrazine exposure and breast cancer incidence in Missouri counties. Gray Summit, MO, USA, 2009.

48th Annual Meeting of the Society of Toxicology. Hsiu-Jen Wang, Adam Martin, Yue-wern Huang, and Robert S. Aronstam. Muscarinic M3-mediated intracellular calcium changes is pH sensitive and dependent. Baltimore, MD, USA, 2009.

48th Annual Meeting of the Society of Toxicology. Chuan-Chin Huang, Robert S. Aronstam, Da-Ren Chen, and Yue-wern Huang. Increased intracellular calcium concentrations in human bronchial epithelial cells exposed to ultrafine ZnO particles. Baltimore, MD, USA, 2009.

2009 Teaching

SS09: Toxicology (BioSci 370/401); Graduate Seminar (BioSci 410); Problems in Appl & Env Bio (BioSci 402)

FS09: Ecology (BioSci 251); Graduate Seiminar (BioSci 410); Techniques in Appl & Env Bio (BioSci 475)

Undergraduate advisees: 10 majors

Graduate Student: Xu, Yi; Huang, Chuan-Chin

2009 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.

2007-2009. Evaluation of Health Conditions, Reproductive Hormones, and Contaminants in Hellbenders (Cryptobranchus alleganiensis): juveniles. PIs: Yue-wern Huang, Jeff Briggler (MDC), and Mike McKee (MDC). Missouri Department of Conservation.

2009 Activities

Lecture to the Science Club of Newburg High School, April, 2009.

Coordinate activities of three visiting students from Taiwan who plan to stay for six months, summer, 2009.

Anne Maglia, Ph.D.

Associate Professor
Director, Laboratory of Herpetology
Director, Bioimaging and Bioinformatics Laboratory

Research Interests:
The evolution of amphibians, including development and anatomical diversity. The development of computational methods for visualizing and analyzing biological data, including 3D visualizations of anatomy and the development of biological ontologies.
Research Staff: Rebecca Shearman, Ph.D. (Postdoctoral Research Associate)

2009 Publications

Luong, H. P., Gauch, S. Wang, Q, and A. M. Maglia. An ontology learning framework using focused crawler and text mining. International Journal on Advances in Life Sciences. 1:99-109, 2009.

Pugener, L.A. and A.M. Maglia. Skeletal development of the vertebral column of the miniature hylid frog *Acris crepitans*, with comments on vertebral anomalies. J. Morphol. 270:52–69, 2009.

Pugener, L.A. and A.M. Maglia. Developmental evolution of the anuran sacro-urostylic complex. SA J Herp. 4:193-209, 2009.

Lee, L., Leopold, J.L., Frank, R. and A.M. Maglia. A computational method for identifying non-independent patterns in protein motif sequence data for secondary structure prediction. *Proc.* IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology. Nashville, TN, 2009.

Kazic, T., Leopold, J.L. and A.M. Maglia. Reasoning over anatomical ontologies. Pp. 185-217 *In*, M. Popescu and D. Xu (eds.), *Data Mining Applications Using Ontologies in Biomedicine* Artech House Publishing, 2009.

2009 Presentations

Havens, S.B. and Maglia, A.M. The Development of *Acris blanchardi* and its Implications. Joint Meetings of Ichthyologists and Herpetologists. Portland, OR.

Fears, B.C. and Maglia, A.M. Evolution of Hyoid Morphology and Call Structure in North American Hylids. Society for Integrative and Comparative Biology. Boston, MA.

Havens, S.B. and Maglia, A.M. Larval developmental patterns in *Acris crepitans blanchardi* (Anura: Hylidae) and their implications. Society for Integrative and Comparative Biology. Boston, MA.

Maglia, A.M. and Pugener, L.A. Developmental Evolution of the Anuran Sacrourostylic Region and its Locomotory Implications. Society for Integrative and Comparative Biology. Boston, MA.

Development of an Ontology of Amphibian Anatomy. Symposium Speaker, Evolution and Ontology Symposium. Joint Meeting of Ichthyologists and Herpetologists. Portland, OR

Developing an Amphibian Anatomical Ontology. Speaker, Evolutionary Biology and Ontologies Workshop. Society for Integrative and Comparative Biology. Boston, MA

2009 Teaching

SS09: Biotechnology in Film (BioSci 150)
SS09: Developmental Biology (BioSci 475)
FS09: Senior Seminar (BioSci 310)

2009 Advising

Undergraduate advisees: 14 majors, 4 minors
Graduate Student: Sarah Havens, Bonnie Beasley, Barbara Fears, John Campbell
OURE Fellow: Janelle Mogdlin; Undergraduate Researcher Assistant: Jennifer Qualls

2009 Extramural Funding

- *MorphologyNet:* A Digital Library of Interactive, 3D Visualizations of Anatomy. National Science Foundation.
- Semi-Automated Construction of an Ontology for Amphibian Morphology. National Science Foundation.

Contents

Melanie R. Mormile, Ph.D.

Associate Professor

Director, Environmental Microbiology Laboratory

Research Interests

Microbial populations in hypersaline environments

Bio-energy production by halophilic/halotolerant bacteria

2009 Publications

K.M. Northcut, M.L. Crow, and M.R. Mormile. Proposal writing from three perspectives: Technical communication, engineering, and science. IEEE International Professional Communication Conference, article number 5208695, 2009.

Mormile, M.R., B-y. Hong, and K.C. Benison. Molecular analysis of the microbial communities of Mars-analog lakes in Western Australia. *Astrobiology*, 9:919-930, 2009.

2009 Symposium Organized and Moderated

Extremophiles-Potential for Industrial Applications. *American Society for Microbiology 109th General Meeting*, May 17-21, Philadelphia, Pennsylvania, Symposium #019, sponsored by Division Q and co-sponsored by Divisions O & N.

2009 Presentations

Invited Seminar Benefits of Using Extremophilic Microorganisms for Bio-Fuel Production. *44th Midwest Regional Meeting of the American Chemical Society*, October 21-24, Iowa City, Iowa.

Abstracted Talks and Poster Presentation: Begemann, M.B., M.R. Mormile, J.D. Wall, and D.A. Elias. Utilizing an Extremophilic Bacterium to Produce Hydrogen Biofuels. (Poster) *Abst. Ann. Meet. Am. Soc. Microbiology*, May 17-21, Philadelphia, PA (Q-148).

2009 Teaching

Bio Sci 110 General Biology, Spring

Bio Sci 452 Astrobiology, Spring

Bio Sci 455 Bioremediation, Fall

2009 Activities

- Served as Councilor for the Missouri Branch of the American Society for Microbiology
- Member of the Editorial Boards for Applied and Environmental Microbiology and Environmental Technology
- Served as peer-reviewer for the following journals: Canadian Journal of Microbiology, FEMS Microbiology Ecology, Geobiology, GSA Today, International Journal of Systematic and Evolutionary Microbiology, and Microbial Ecology
- Served as major advisor for Varun Paul (who successfully completed his thesis).
- Quoted by Michael Reilly, Earth Science Correspondent of Discovery News, regarding paper in *Geology* on how bacteria live for millennia in inclusion within halite deposits, (http://news.discovery.com/earth/oldest-dna-bacteria-discovered.html)

Dev Niyogi, Ph.D.

Associate Professor

Director, Laboratory of Freshwater Ecology

Research Interests

Freshwater ecology, aquatic biogeochemistry, microbial ecology of streams

2009 Publications

Niyogi, D.K., C.A. Cheatham, W.H. Thomson, and J.M. Christiansen. 2009. Litter breakdown and fungal diversity in a stream affected by mine drainage. *Fundamental and Applied Limnology*. 175:39-48, 2009.

Lear, G., Niyogi, D., J. Harding, Y. Dong, and G. Lewis. 2009. Biofilm bacterial community structure in streams affected by acid mine drainage. *Applied and Environmental Microbiology*. 75:3455-3460.

Bray, J.P., P.A. Broady, D.K. Niyogi, and J.S. Harding. 2008. Periphyton communities in New Zealand streams impacted by acid mine drainage. *Marine and Freshwater Research*. 59:1084-1091.

2009 Presentations

Niyogi, D.K. Acid mine drainage runs through it: mining and stream health in New Zealand. American Society of Civil Engineers and Water Environment Foundation, student association meeting, Missouri S&T, 2009.

2009 Teaching

I taught Missouri S&T's Ecology class (Bio 251) in the spring of 2009. I also taught a field class on freshwater ecology in Colorado during the summer. In the fall, I taught a new class, Global Ecology, at Missouri S&T. This advanced ecology course dealt with ecological science at large scales, including global processes and interactions.

2009 Extramural Funding

University of Missouri Research Board, "Fungal Diversity and Functioning in Streams Affected by Climate Change," $39,000, PI - 100% effort, (*pending*).

University of Canterbury (New Zealand) Subcontract for FRST program "Delivering Pathways to Mineral Wealth and Environmental Sustainability," $17,000, PI – 100% effort, 2008-2009.

2009 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. One graduate student and several undergrads have been helping with these studies. I am also continuing my research collaboration with colleagues at the University of Canterbury in Christchurch, New Zealand. My main research focus there was 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

Dr. Shannon's research focuses on the temporal regulation of cytokinesis. Cytokinesis is the physical separation of cells, which is accomplished by the contractile action of actin and myosin filaments. The regulation of this process 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 of the lab 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.

Dr. Shannon is also collaborating with Dr. Huang to investigate the mechanism of nanoparticle uptake and transport in cells.

2009 Publications

Stayton, I., Winiarz, J., Shannon, K., Ma, Y. Study of Uptake and Loss of Silica Nanoparticles in Living Human Lung Epithelial Cells at the Single Cell Level. *Analytical and Bioanalytical Chemistry*. DOI 10.1007/s00216-009-2839-0, 2009.

Park, S., Cable, A.E., Blair, J., Stockstill, K.E., Shannon, K.B. Bub2 Regulation of Cytokinesis and Septation in Budding Yeast. *BMC Cell Biology* 10:43, 2009.

2009 Presentations

Poster, Yue-wern Huang, Han-Jung Lee, Katie Shannon, and Yi Xu. A new cellular delivery system QD/sR9: exploration of the efficiency, uptake mechanism, and intracellular localization. Dec. 5 – 9, 2009, 49th Annual Meeting of the American Society for Cell Biology, San Diego, CA.

Poster, Benjamin Hale, Rachel Wille, Katie Shannon, Is Hof1 a Dbf2 Target? Oct. 3-4, 2009, Midwest Yeast Meeting, Northwestern University, Chicago, IL.

Poster, Jessica Blair, Brittany Hood, Katie Shannon, Dbf2 in Cytokinesis in Budding Yeast, Oct. 3-4, 2009 Midwest Yeast Meeting, Northwestern University, Chicago, IL.

Poster, Katherine Stockstill, Jung Eun Park, Katie Shannon, Analysis of Hof1 PEST Domain Phosphorylation, Oct. 3-4, 2009 Midwest Yeast Meeting, Northwestern University, Chicago, IL.

Talk, Katherine Stockstill and Katie Shannon, Analysis of Hof1 PEST Domain Phosphorylation, Nov. 10, 2009, Central States Microscopy and Microanalysis Society meeting, Missouri S&T, Rolla, MO. Talk was awarded first place for student talk.

Talk, Katie Shannon, Using Budding Yeast To Study The Regulation Of Cytokinesis, Nov. 16, 2009, Birmingham-Southern College, Birmingham, AL

2009 Teaching

BIO211 Cellular Biology, Spring
Co-taught BIO310 Fall
BIO102 Fall

2009 Advising

Graduate Student: Katherine Stockstill began thesis August 2009

OURE students: Brittany Hood and Ben Hale

Fifteen Undergraduate Advisees

2009 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

2009 Activities

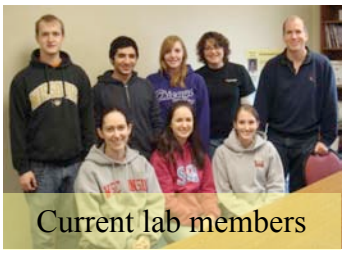
iGEM student synthetic biology team, advised, supervised project

Science Olympiad, supervised student volunteers for Cell Biology competition at regional Olympiad

Reviewer, Molecular Biology of the Cell

David J. Westenberg, Ph.D.

Associate Professor
Director, Laboratory of Microbiology
Chair, Pre-Medicine Advisory Committee


Current lab members


iGEM Team at MIT

Research Interests

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

Research Lab Members: Karissa Braaten, April Rocha, Kristen Hinton, Richard Campos, Crystal Halloran, Ashley Mueller, **iGEM Team Members**: Nichole Hurd, Meghan Ray, Daniel Roush

2009 Presentations

Carlile, C., Halloran, C., Westenberg, D.J., Burken, J.G., Newman L. and van der Lelie, D. Endophytoic bacteria for toxicity resistance and growth promotion in leachate treatment. International Phytotechnologies Conference, 2009.

Westenberg, D.J. Microbial Literacy and the ASM Biology Scholars Program. Missouri Branch of the American Society for Microbiology, 2009.

Westenberg, D.J. 2009. Getting to the Root of the Problem: The Role of Symbiotic Bacteria in Rhizoremediation. Missouri University of Science and Technology. Rolla, MO, February 16, 2009.

Westenberg, D.J. 2009. Bacterial Communication in Symbiosis and Rhizoremediation, Department of Genetics and Biochemistry, Clemson University, Clemson, SC. January 30, 2009.

2009 Teaching

SP09: Microbiology (BioSci 221), Microbiology Lab (BioSc 222), Communication Workshop for Pre-Health Professions (Pre-Med 310)

FS09: General Genetics (BioSci 231), Pathogenic Microbiology (BioSc 321)

Graduate Students: Karissa Braaten, April Rocha

OURE fellows: Kristen Hinton, Richard Campos, Crystal Halloran, Ashley Mueller, Nicole Hurd, Meghan Ray, Daniel Rousch

Undergraduate advisees: 20 majors; Approximately 150 Pre-Meds

2009 Extramural Funding

Missouri Dept. of Higher Education Grant, $177,967 Science Education & Quantitative Literacy: An Inquiry-based Approach (25%).

US Department of Education GAANN, $174,208 Graduate Education in Alternative Energy (5%)

2009 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

Member 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 Advisory Committee

2009 Awards, Honors

Biological Sciences Faculty Member of the Year, Missouri S&T Phi Sigma

Outstanding Teaching Award, Missouri S&T

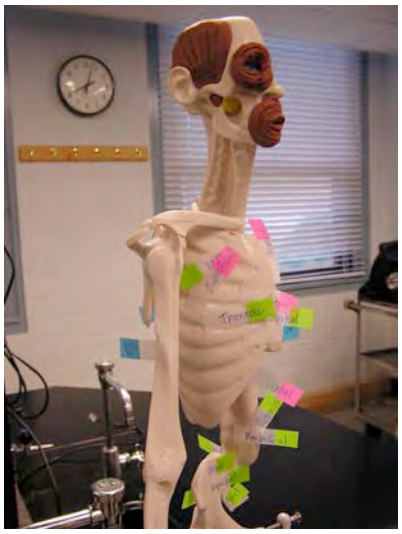
Terry Wilson, M.S.
Teaching Associate

2009 Teaching

SP09 – Biodiversity (BIO113)
SP09 – Biodiversity lab (BIO 114, 3 sections)
SP09 – Cellular Biology Lab (BIO 212)
FS09– Principles of Biology lecture (BIO 111)
FS09– General Biology Lab (BIO 112, 2 sections)
FS09– Cellular Biology Lab (BIO 212, 2 sections)

2009 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 Austin, TX (11/09)
- GTA assessment workshops
- Expanding Your Horizons workshop



Project Lead the Way Training - 2009

Contents

2009 Faculty Publications

Brown, RF, Rahaman, M.N., Dwilewizc, A., Huang, W., Day, D.E., Li, Y. and Bal, B., 'Effect of borate glass composition on its conversion to hydroxyapatite and on the proliferation of MC3T3-E1 cells,' *Journal of Biomedical Materials Research* 88A: 392-400, 2009.

Fu, Q., Rahaman, M.N., Bal, B.S. and Brown, R.F., '*In Vitro* cellular response to hydroxyapatite scaffolds with oriented microstructures', *Materials Sciences Engineering C* 29: 2147-2153, 2009.

Fu, Q., Rahaman, M.N., Bal, B.S. and Brown, R.F., 'Proliferation and function of MC3T3-E1 cells on freeze-cast hydroxyapatite scaffolds with oriented pore architectures', *Journal of Materials Science Materials in Medicine* 20: 1159-1165, 2009.

Huang, C.-C., Aronstam, R.S., Chen, D.-R. and Huang, Y.-W., Oxidative stress, calcium homeotstasis and altered gene expression in human lung epithelial cells exposed to ZnO nanoparticles. *Toxicology In Vitro*, 2009.

Kazic, T., Leopold, J.L. and Maglia, A.M., Reasoning over anatomical ontologies. Pp. 185-217 *In*, M. Popescu and D. Xu (eds.), *Data Mining Applications Using Ontologies in Biomedicine* Artech House Publishing, 2009.

Lear, G., Niyogi, D., Harding, J., Dong, Y. and Lewis, G., Biofilm bacterial community structure in streams affected by acid mine drainage. *Applied and Environmental Microbiology*. 75:3455-3460, 2009.

Lee, L., Leopold, J.L., Frank, R. and Maglia, A.M., A computational method for identifying non-independent patterns in protein motif sequence data for secondary structure prediction. *Proc. IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology*. Nashville, TN, 2009.

Lin, W., Xu, Y., Huang, C.-C., Ma, Y., Shannon, K.B., Chen, D.-R. and Huang Y.-W., Toxicity of nano- and micro-sized ZnO particles in human lung epithelial cells. *Journal of Nanoparticle Research* 11:25-39. 2009

Luong, H. P., Gauch, S. ,Wang, Q. and Maglia, A.M., An ontology learning framework using focused crawler and text mining. *International Journal on Advances in Life Sciences*. 1:99-109, 2009.

Mormile, M.R., Hong, B.-Y. and Benison, K.C., Molecular analysis of the microbial communities of Mars-analog lakes in Western Australia. *Astrobiology*, 9:919-930.

Niyogi, D.K., Cheatham,C.A., Thomson, W.H. and Christiansen, J.M., Litter breakdown and fungal diversity in a stream affected by mine drainage. *Fundamental and Applied Limnology*. 175:39-48, 2009.

Northcut, K.M., Crow, M.L. and Mormile, M.R., Proposal writing from three perspectives: Technical communication, engineering, and science. *IEEE International Professional Communication Conference*, article # 5208695, 2009.

Park, S., Cable, A.E., Blair, J., Stockstill, K.E., Shannon, K.B., Bub2 Regulation of Cytokinesis and Septation in Budding Yeast. *BMC Cell Biology* 10:43, 2009.

Pugener, L.A. and Maglia, A.M., Developmental evolution of the anuran sacro-urostylic complex. *SA J Herp*. 4:193-209, 2009.

Pugener, L.A. and Maglia, A.M., Skeletal development of the vertebral column of the miniature hylid frog *Acris crepitans*, with comments on vertebral anomalies, *J. Morphol*. 270:52–69, 2009.

Shi, R., Huang, C.-C., Aronstam, R.S., Ercal, N., Martin, A. and Huang Y.-W., N-acetylcysteine amide decreases oxidative stress but not cell death induced by doxorubicin in H9c2 cardiomyocytes. *BMC Pharmacology*. 15 April, 2009.

Stayton, I., Winiarz, J., Shannon, K. and Ma, Y., Study of Uptake and Loss of Silica Nanoparticles in Living Human Lung Epithelial Cells at the Single Cell Level. *Analytical and Bioanalytical Chemistry*, 2009.

Presentations at Professional Meetings:

Begemann, M.B.,Mormile, M.R., Wall, J.D. and Elias, D.A., Utilizing an Extremophilic Bacterium to Produce Hydrogen Biofuels. *Abst. Ann. Meet. Am. Soc. Microbiology*, May 17-21, Philadelphia, PA (Q-148), 2009.

Blair, J., Hood, B. and Shannon, K., Dbf2 in Cytokinesis in Budding Yeast. Midwest Yeast Meeting, Northwestern University, Chicago, IL, 2009.

Cailie Carlile, C., Halloran, C., Westenberg, D.J., Burken, J.G., Newman, L. and van der Lelie, D., Endophytoic bacteria for toxicity resistance and growth promotion in leachate treatment International Phytotechnologies Conference, 2009.

Fears, B.C. and Maglia, A.M., Evolution of Hyoid Morphology and Call Structure in North American Hylids. Society for Integrative and Comparative Biology, Boston, MA, 2009.

Hale, B., Wylie, R. and Shannon, K., Is Hof1 a Dbf2 Target? Midwest Yeast Meeting, Northwestern University, Chicago, IL, 2009.

Havens, S.B. and Maglia, A.M., Larval developmental patterns in *Acris crepitans blanchardi* (Anura: Hylidae) and their implications. Society for Integrative and Comparative Biology, Boston, MA, 2009.

Havens, S.B. and Maglia, A.M., The Development of *Acris blanchardi* and its Implications. Joint Meetings of Ichthyologists and Herpetologists, Portland, OR, 2009.

Huang, C.-C., Aronstam, R.S., Chen, D.R. and Huang, Y.-W., Increased intracellular calcium concentrations in human bronchialepithelial cells exposed to ultrafine zinc oxide particles. Society for Toxicology, 2009.

Huang, Y.-W., A novel system to deliver and monitor biologically active molecules. Midwest Chinese American Science and Technology Association, St. Louis, MO, 2009.

Huang, Y.-W., Atrazine exposure and breast cancer incidence in Missouri counties. Annual SETAC Ozark-Prairie Chapter Meeting, Gray Summit, MO, 2009.

Huang, Y.-W., Lee, H.-J., Shannon, K. and Xu, Y., A new cellular delivery system QD/sR9: exploration of the efficiency, uptake mechanism, and intracellular localization. Annual Meeting of the American Society for Cell Biology, San Diego, CA, 2009.

Lee, L., Kandoth, C., Leopold, J.L. and Frank, R.L., Protein Secondary Structure Prediction Using Parallelized Rule Induction from Coverings. International Conference on Computer, Electrical, and Systems Science, and Engineering, Bangkok, Thailand, 2009.

Lee, L., Leopold, J.L., Frank, R.L. and Maglia, A.M., Protein secondary structure prediction using rule induction from coverings. IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology, Nashville, TN, 2009.

Maglia, A.M. and Pugener, L.A. Developmental evolution of the Anuran Sacrourostylic region and its locomotory implications, Society for Integrative and Comparative Biology, Boston, MA, 2009.

Maglia, A.M., Developing an Amphibian Anatomical Ontology. Speaker, Evolutionary Biology and Ontologies Workshop. Society for Integrative and Comparative Biology, Boston, MA, 2009.

Maglia, A.M., Development of an Ontology of Amphibian Anatomy. Symposium Speaker, Evolution and Ontology Symposium, Joint Meeting of Ichthyologists and Herpetologists, Portland, OR, 2009.

Niyogi, D.K., Acid mine drainage runs through it: mining and stream health in New Zealand. American Society of Civil Engineers and Water Environment Foundation, Missouri S&T, 2009.

Stockstill, K., Park, J.E. and Shannon, K., Analysis of Hof1 PEST Domain Phosphorylation. Midwest Yeast Meeting, Northwestern University, Chicago, IL, 2009

Wang, H.-J., Martin, A., Huang, Y.-W. and Aronstam, R.S, Muscarinic M3 receptor mediated intracellular calcium changes are pH sensitive and dependent. Society for Toxicology, 2009.

Westenberg, D.J., Microbial Literacy and the ASM Biology Scholars Program. Missouri Branch of the American Society for Microbiology, 2009.

Tasty Microbiology lunch.

Extramural Income – Grants, Contract, BioTech Sales

2009 Annual Report

CY09 Summary- Sponsored Programs Activity 1/1/2009 - 12/31/2009

NAME	DIRECT COST	NET INDIRECT	TOTAL COSTS	SPONSOR NAME	PROJECT NAME
Aronstam, Robert S	$225,116	$0	225,116	S&T cDNA Resource Center	Biotech sales - receptor clones
Brown,Roger F	$25,532	$12,894	38,425	NIH Natl Inst Of Health	Periodontal engineering
Brown,Roger F	$39,325	$18,456	57,780	Dept Of Army	Bone and tissue repair
Brown,Roger F	$6,836	$2,968	9,804	MO Sci Corp	Glass Laser Sintering
Huang,Yue-Wern	$32,483	$0	32,483	MO Dept of Cons	Hellbender health
Huang,Yue-Wern	$20,103	$10,152	30,256	NIH Natl Inst Of Health	Novel drug delivery systems
Maglia,Anne Marie	$116,453	$37,764	154,217	NSF Natl Sci Fndtn	Amphibian ontology construction
Maglia,Anne Marie	$14,389	$0	14,389	NSF Natl Sci Fndtn	Amphibian ontology consortium
Maglia,Anne Marie	$54,532	$26,721	81,253	NSF Dirc Bio Sci	Morphology Net: Digital Database
Mormile,Melanie R	$32,204	$7,178	39,381	MSC Company	Novel Animal Feeds
Niyogi,Dev K.	$11,024	$2,866	13,890	Univ Of Canterbury	Environmental ecology
Shannon, Katie	$12,876	$0	12,876	U MO Research Board	Proteins in cytokinesis
Shannon,Katie B.	$10,052	$5,076	15,128	NIH Natl Inst Of Health	Quantum dots/protein cell entry
Westenberg,David J	$630	$31	661	MO Dept of Higher Educ	Science education
Westenberg,David J	$35	$0	35	US Dept of Educ	Graduate Education
Westenberg,David J	$9,479	$545	10,024	MO Dept of Higher Educ	Science education
	$611,066	**$124,650**	**$735,717**		

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 2009** are listed above. Funds expended in 2009 from multiple grant funding periods are listed on separate lines. Research expenditures derived from a competitive grant from the University of Missouri Research Board, as well as income from biotech sales from the S&T cDNA Resource Center are also listed

Seminars

2009 Annual Report

Seminar directors: Dr. Katie Shannon
Dr. Robert S. Aronstam

Date	Speaker	Institution	Topic
Jan. 26	Dr. Justin Fay	Washington Univ. St. Louis	Dissecting the pleiotropic effects of a quantitative trait nucleotide
Feb. 2	Dr. Ram Dixit	Washington Univ. St. Louis	Getting in shape: the cortical microtubule cytoskeleton and plant morphogenesis
Feb. 9	*Maria Potter & Tara Flynn	Missouri S&T	Current and future research projects at Onondaga and Cathedral Caves
Feb. 16	Taylor Hahn	Missouri S&T	Internship in Pediatrics: Childhood obesity
Feb. 23	Dr. Kathryn Miller	Washington Univ.	Actin cytoskeleton using Drosophila as a model
Mar. 2	Dr. Ronald Frank	Missouri S&T	Gene families in Glycine max
Mar. 9	Dr. Dwayne Elias	U. Missouri - Columbia	Utilizing extremophilic bacteria to produce biofuels
Mar. 16	Dr. Wendy Olivas	Univ. Missouri – St. Louis	The end of the road for mRNAs: Regulation of mRNA decay by Puf proteins
Mar. 30	Dr. David Westenberg	Missouri S&T	A funny thing happened on the way to the soybean patch
Apr. 2	Dr. Jonathan Katz	Washington Univ.	Spontaneous symmetry breaking in actin propulsion
Apr. 7	Dr. Jack Jones	U. Missouri - Columbia	An overview of Missouri reservoirs from a landscape perspective
Apr. 13	Dr. Jeffrey Moore	Washington Univ. St. Louis	Positioning the mitotic spindle in a polarized cell: Microtubules, motors and monitors
April 20	*Chuan-Chin Huang	Missouri S&T	Oxidative stress and ZnO nanoparticles
Apr. 21	Dr. Rebecca Shearman	Wesleyan University	Morphological evolution and the lateral somatic frontier
Apr. 27	*Varun Paul	Missouri S&T	Iron-reducing haloalkaliphilic bacteria
May 4	*Vernon Modglin	Missouri S&T	Bioactive glass scaffolds
Sept. 14	Dr. Kevin Dreher	Environmental Protection Agency	Nanotoxicology: An integrated – multidisciplinary strategy to assess health effects of engineered-manufactured materials
Sept. 28	Dr. Change Tan	U. Missouri - Columbia	Controlling Protein Activities with an Intein Switch; Mechanism of Incomplete Cytokinesis
Oct. 5	+Anna Growcock; +Jen Qualls; +Kendall Slaughter	Missouri S&T undergraduates	Summer internships
Oct. 12	Dr. Philip Jen	U. Missouri - Columbia	Adaptive mechanisms underlying the bat biosonar behavior
Oct. 19	Dr. Roger Brown	Missouri S&T	Investigation of bioactive glass for tissue repair
Oct. 26	Dr. David Schultz	U. Missouri - Columbia	How do individual neurons balance plasticity and stability in the nervous system?
Nov. 2	Dr. Paul Nam	Missouri S&T.	Microalgal biotechnology for sustainable energy
Nov. 9	Mr. Justin Thomas	Int. Botanical Tr.	Botany in Action – Field botany education
Nov. 16	Kristen Leach	U. Missouri - Columbia	Wolbachia mediates maize gene expression patterns in response to western corn rootworm feeding
Nov. 30	* Karissa Braaten	Missouri S&T	Antimicrobial activity of the volatile oxidized by-products of biogenic oil
Dec. 7	* Yi Xu	Missouri S&T	Nona-arginine peptides facilitate cellular entry of nanocystals

* Masters degree candidates; + Undergraduate student

Contents

Undergraduate Education

2009 Annual Report

Missouri S&T's thriving **Biological Sciences** community included 161 undergraduate majors in 2009 (4th week fall semester enrollment reports). Dr. Dev Niyogi chaired the Undergraduate Education Committee in 2009.

2009 Highlights

- record number of graduates (54 vs. 23)
- record number of student credit hours
- record number of majors (161 vs. 153, FS2009)
- 75% of graduating seniors participated in research
- service learning courses engaged in by all seniors
- 34 BioSci students graduated with Honors, included 4 with perfect 4.0 gradepoint averages (**Jamie Moline, April Rocha, Courtney Smith** and **Sherea Strickland**)
- 56 BioSci students were named to the Provost's Academic Scholars List for the Spring 2009 semester (vs. 51 last year; Fall semester scholars not yet announced)
- BioSci students participated in the 4th Annual Undergraduate Research Conference (April 9, 2008). BioSci Award winners were:

  3rd Place Oral Presentation – **Katherine Stockstill**, Cytokinesis Defects in Budding Yeast, Research Advisor- Katie Shannon

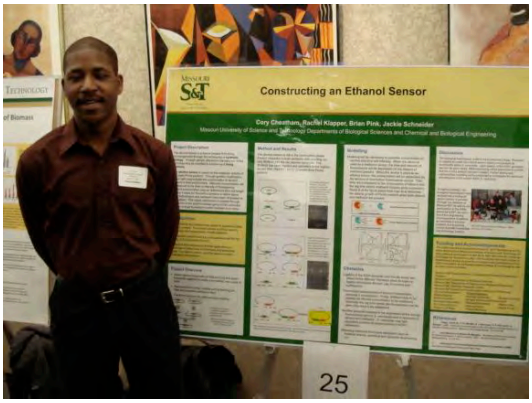
  3rd Place Poster Presentation - **Casey Growcock and Barbara Wheelden,** Nitric Oxide Increases Calcium Oscillations in Response to Muscarinic Receptor Stimulation, Research Advisor- Robert Aronstam
- 11 students were awarded OURE scholarships to perform research in the BioSci department

Some of our May and December 2009 graduates.

Courses Offered

Spring 2009

- Bio 110 General Biology
- Bio 112 General Biology Lab
- Bio 113 Biodiversity
- Bio 114 Biodiversity Lab
- Bio 211 Cell Biology
- Bio 212 Cell Biology Lab
- Bio 221 Microbiology
- Bio 222 Microbiology Lab
- Bio 231 General Genetics
- Bio 235 Evolution
- Bio 242 Human Physiology
- Bio 234 Human Physiology Lab
- Bio 251 Ecology
- Bio 300 Special Problems
- Bio 301 Neurobiology
- Bio 315 Developmental Biology
- Bio 341 Tissue Engineering 1
- Bio 354 Fresh Water Ecology
- Bio 370 Toxicology
- Bio 390 Undergraduate Research



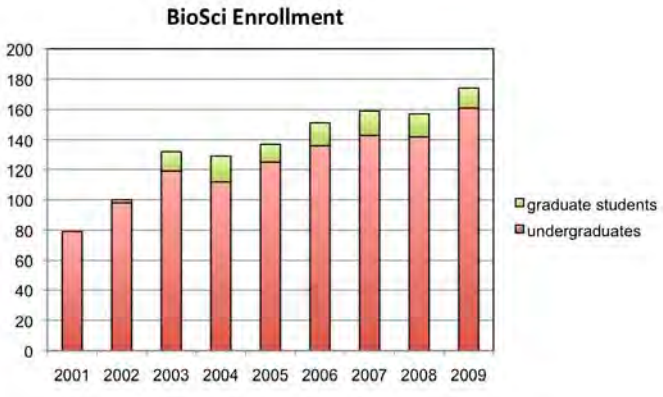
Cory Cheatham at undergraduate research day.

Fall 2009

- Bio 102 Intro to Biological Sciences
- Bio 110 General Biology

Contents

- Bio 111 Principles of Biology
- Bio 112 General Biology Lab
- Bio 201 Special Topics
- Bio 211 Cell Biology
- Bio 212 Cell Biology Lab
- Bio 231 General Genetics
- Bio 235 Evolution
- Bio 241 Human Anatomy
- Bio 251 Ecology
- Bio 300 Special Problems
- Bio 301 Global Ecology
- Bio 301 Cancer Cell Biology
- Bio 310 Seminar
- Bio 321 Pathogenic Microbiology
- Bio 331 Molecular Genetics
- Bio 332 Molecular Genetics Lab
- Bio 340 Biomaterials I
- Bio 390 Undergrad Res



May 2009

Benjamin Bowe BS
Stuart Brune BS
Cory Cheatham BS
Elizabeth Coats BA
Patrick Courtney BS
Lauren Dubbert BS
Taylor Hahn BS
Joseph Karas BS
Daniel Koehler BS
Megan Kreitner BS
Jennifer Kresse BS
Heather Lavezzi BS
Melanie Maassen BS
Jamie Moline BS
Andrew Moss BS
Jennifer O'Hara BS
Elizabeth Politte BA
April Rocha BS
Kyle Runge BS
Shradha Samuel BS
Sarah Schatz BS
Courtney Smith BA
Ryan Steele BS
Benjamin Stephan BS
Katherine Stockstill BS
Sherea Strickland BA

December 2009

Zachary Anderson-Boland BS
Brianne Blue BS
Angie Bulen BS
Isaac Deatheridge BS
Thais Diaz-Figueroa
Kimberly Earl BS
Anthony Gonzalez BS
Dana Gow BA
Casey Anna Growcock BS
Tyler Johnson BA
Amy Kalloch BS
Casey Kotschedoff BA
Daniel Schwent BS
Sparrow Smith BA
Krista Stewart BS
Theresa Tyree BS

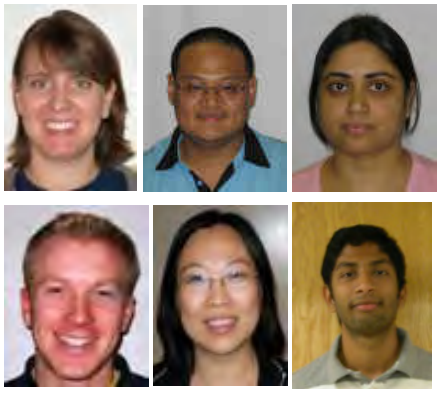
2009 BioSci Graduates

Santa dropped by the departmental holiday party.

December 2009 reception for our graduating seniors.

Graduate Education

2009 Annual Report



The Department instituted a M.S. degree in Environmental and Applied Biology in 2002, and graduated its first students in 2004. Since its inception, the program has been fully subscribed. 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. Melanie Mormile and Ronald Frank chaired the department's Graduate Studies Committee in 2009.

2009 Highlights

- Six thesis students earned their degrees in 2009: (*Right*: Karissa Braaten, Chuan-Chin Huang, Malavika Sinha, Vernon Modglin, Yi Xu, Varun Paul)

Student	Thesis Title	Advisor
Malavika Sinha	Characterization of selected isolates from hypersaline lakes in Western Australia and Victoria, Australia	Dr. Melanie Mormile
Chuan-Chin Huang	Heavy metals, hematology, plasma chemistry and parasites in adult hellbenders (*Cryptobranchus alleganiensis*)	Dr. Yue-wern Huang
Vernon Modglin	In vitro evalulation of bioactive glass scaffolds and modified bioactive glasses with an ostepgenic cell line	Dr. Roger Brown
Varun Paul	Electricity generation and ethanol production using iron-reducing haloalkaliphilic bacteria	Dr. Melanie Mormile
Yi Xu	Nona-arginine peptides facilitate cellular entry of semiconductor nanocrystals: Mechanisms of uptake	Dr. Yue-wern Huang
Karissa Braaten	Antimicrobial activity of the volatile oxidized by-products of biogenic oil	Dr. David Westenberg

2009 Graduate Students (* non-thesis)

Bonnie Beasley	Pamela Gray*	April Rocha
Jesi Blair*	Sarah Havens	Malavika Sinha
Karissa Braaten	Chuan-Chin Huang	Katie Stockstill
John Campbell*	Vernon Modglin	Hsui-Jen Wang
Barbara Fears	Jennifer O'Hara*	Amanda Watson
Kholoud Ghanem*	Varun Paul	Yi Xu

2009 Graduate Student Publications

Lee, L., Leopold, J.L., Frank, R. and Maglia, A.M., A computational method for identifying non-independent patterns in protein motif sequence data for secondary structure prediction. *Proc*. IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology. Nashville, TN, 2009

Park, S., Cable, A.E., **Blair, J., Stockstill, K.E.,** Shannon, K.B., Bub2 Regulation of Cytokinesis and Septation in Budding Yeast. *BMC Cell Biology* 10:43, 2009.

Shi, R., Huang, C.-C., Aronstam, R.S., Ercal, N., Martin, A. and HuangY.-W., N-acetylcysteine amide decreases oxidative stress but not cell death induced by doxorubicin in H9c2 cardiomyocytes. BMC Pharmacology. 15 April, 2009.

2009 Graduate Student Abstracts/Presentations

Blair, J., Hood, B. and Shannon, K., Dbf2 in Cytokinesis in Budding Yeast, Midwest Yeast Meeting, Northwestern University, Chicago, IL, 2009.

Fears, B.C. and Maglia, A.M. Evolution of Hyoid Morphology and Call Structure in North American Hylids. Society for Integrative and Comparative Biology. Boston, MA, 2009.

Havens, S.B. and Maglia, A.M. Larval developmental patterns in *Acris crepitans blanchardi* (Anura: Hylidae) and their implications. Society for Integrative and Comparative Biology. Boston, MA, 2009.

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Huang, Y.-W., Lee, H.-J., Shannon, K. and **Xu, Y.,** A new cellular delivery system QD/sR9: exploration of the efficiency, uptake mechanism, and intracellular localization. Annual Meeting of the American Society for Cell Biology, San Diego, CA, 2009.

Lee, L., Kandoth, C., Leopold, J.L., Frank, R.L., Protein Secondary Structure Prediction Using Parallelized Rule Induction from Coverings. International Conference on Computer, Electrical, and Systems Science, and Engineering, Bangkok, Thailand, 2009.

Lee, L., Leopold, J.L., Frank, R.L. and Maglia, A.M. Protein secondary structure prediction using rule induction from coverings. IEEE Symposium on Computational Intelligence in Bioinformatics and Computational Biology, Nashville, TN, 2009.

Stockstill, K., Park, J.E. and Shannon, K., Analysis of Hof1 PEST Domain Phosphorylation, Midwest Yeast Meeting, Northwestern University, Chicago, IL., 2009

Wang, H.-J., Martin, A., Huang, Y.-W. and R.S. Aronstam, R.S, Muscarinic M3 receptor mediated intracellular calcium changes are pH sensitive and dependent, Society for Toxicology, 2009.

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).

Inaugural BioStar winners were:

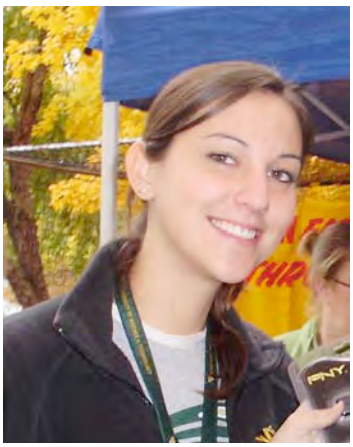
Graduating Senior:	**Taylor Hahn**
Graduate TA:	**Karissa Braaten**
First Year Student:	**Erica Shannon**
Undergraduate Research:	**Katie Stockstill**
Graduate Research:	**Chuan-Chin Huang**
Student Service:	**Krista Stewart**
Student Leader:	**Richard Campos**
Transfer Student:	**Ashley Muehler**

2009 **BioStar** winners (*l-r)*: Taylor Hahn, Karissa Braaten, Erica Shannon, Chuan-Chin Huang, Katie Stockstill, Krista Stewart, Richard Campos, and Ashley Muehler

Kristen Hinton was recently named the fourth 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. Hinton is from Cape Girardeau, and joined the department in 2006. Ms. Hinton has maintained a perfect 4.0 GPA at S&T.

Previous awards winners were:

2006	**Wesley Glick**
2007	**Ashley Sheek**
2008	**Sherea Stricklin**



Karen Schilli received the 2009 **Margaret Summers Scholarship in Pre-Medicine**. This award is made annually to an S&T student in the pre-med program. Ms. Schilli, a senior in the BioSci department, transferred to S&T from the University of Missouri - Columbia in January 2008.

Service Learning Classes

2009 Annual Report

Since 2008, the Biological Sciences Department has included a service-learning practicum as part of the 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. This is not something we have done particularly well in BioSci; our time-honored model is to provide a lot of information, have the students go away to study this information, and then to assess how much information they are able to retain. The small team, service learning paradigm devised by Dr. Maglia cannot be performed in this kind of isolation.

Nicole Buxton, Anna Growcock and Thais Diaz-Figeuroa discuss brushing with a St. Pat's elementary class.

The nature of our students' service learning projects is diverse and, frankly, impressive. Students have redesigned the website for the Russell House shelter, designed modules for elementary school science classes, raised awareness of health issues, repaired trails in the Mark Twain National Forest, restored a Missouri cave, supported humane society operations, designed tutoring and mentoring opportunities for first year students, etc., etc. Over 25 service learning projects have been carried out in the last 2 years.

"Biology is inherently a service-related major," said Dr. Anne Maglia, Associate Professor of Biological Sciences and co-instructor of the course. "Most of our graduates go on to careers in healthcare, the environment, or biomedical research. As a department, we felt it was important to engage all of our students in service activities to encourage them to be proactive leaders in society and difference makers in the community."

2009 Projects

- Tri-County Humane Society
- Onondaga Cave Clean-Up
- Truman Elementary Fitness Club
- Dental Module for Elementary Classes
- Eye Can See a Cure
- Making Healthy Choices
- Phelps County Animal Welfare League

Dr. Anne Maglia was recently honored with the 2nd Annual Faculty Service Learning Award from S&T for introducing service learning into the BioSci curriculum

Adam Martin

Vanessa Kaighin

Robert Aronstam

Vicky Rowden

cDNA Resource Center

2009 Annual Report

Staff:

Adam Martin, M.S., Manager
Vanessa Kaighin, Technician
Heather Lavezzi, Technical Assistant
Amanda Sutterer, Technical Assistant
Sarah Sutterer, Technical Assistant
Vicky Rowland, Business Manager

Robert S. Aronstam, Ph.D., Director

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

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

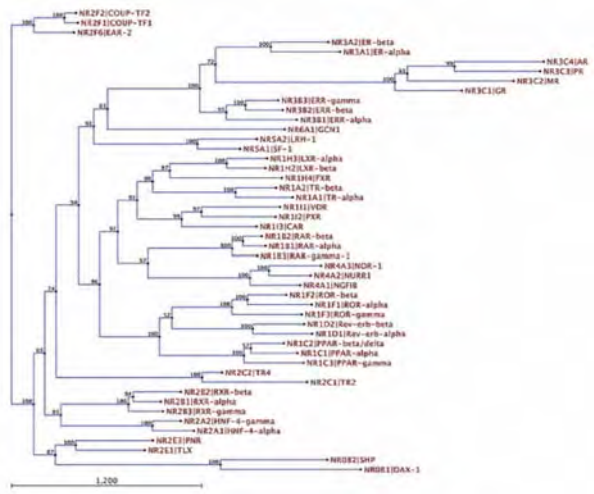
- Full-length
- Sequence verified
- Expression verified by coupled in vitro transcription/ translation assays
- Propagated in a versatile mammalian expression vector
- Free of extraneous 3' and 5' untranslated regions
- Available in wild-type, epitope-tagged and useful mutant forms (e.g., constitutively-active,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

In 2009, 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.

www.cdn.org

2009 Highlights

- sales surpassed $1.5 million since 2005
- introduced 15 new clones
- employed/trained 3 student technicians
- supported research rotations in basic molecular biology
- began development of a comprehensive collection of nuclear receptors in collaboration with NURSA (*right*); 21 clones completed



Nuclear receptor families includes receptors for thyroid hormone, vitamin D, estrogen, progesterone, androgen, and other steroid hormones.

iGEM Team

2009 Annual Report

The international Genetically Engineered Machine competition iGEM 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.

2009 Highlights:

Team members:

Drew Menke - President
Nicole Hurd – Vice-President
Daniel Rousch – Webmaster
Meghan Ray – Secretary
Erica Shannon – Public Relations
Helen Cardwell – Treasurer
Ryan Thomas
Ben Heiman
Brianna Kneib
Kevin Myer
Patrick Martin

Faculty advisors:

Katie Shannon
Dave Westenberg
David Henthorn
Change-Soo Kim

2009 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. This project utilizes geobacter's cytochromes that make extracellular electron transfer possible. OmcB, OmcE, OmcS, and MacA are our target genes, since their proteins are the major electron smugglers out of the cell. By isolating and placing these cytochromes into bricks, we hope to harness the ability to produce electricity in biological systems.

The optimization of electron shuffle within bacteria to external surfaces such as anodes is one of the primary goals of our project. *Geobacter sulfurreducens* is the bacteria of choice due to its ability to efficiently export electrons. *E. coli* is the "skeleton" bacteria for our project because its genome already contains many of the key proteins in the desired pathway. Extracellular pilin, MacA, and many other cytochromes that *E. coli* does not have will be isolated from *Geobacter sulfurreducens* and then introduced into *E. coli* to create the most optimal pathway for generating electromotive force in a microbial fuel cell apparatus.

A handful of problems have surfaced already in our project this year. Two involve plasmid engineering and one derives from *Geobacter's* anaerobic respiration instead of *E. coli's* aerobic respiration. Also, the role of *Geobacter's* pili in extracellular electron transfer is not clearly understood, and this could create a problem insofar as *E. coli* does not have such a pilus. Nevertheless, our team will strive harder than an emf on the internal resistivity of a toroid.

web.mst.edu/~igem

Our Sponsors:

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

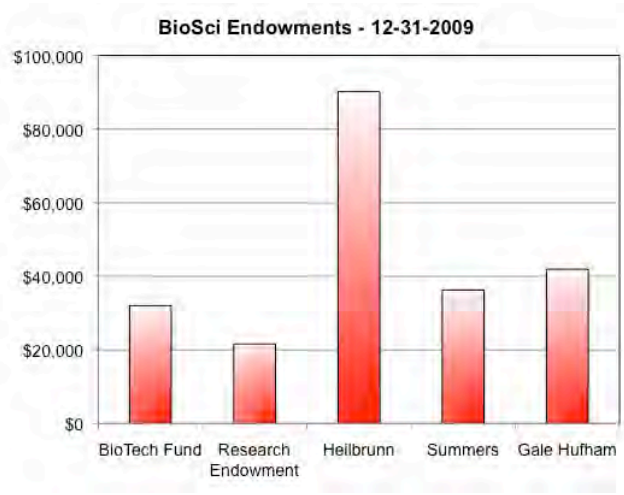
2009 Activities and Goals

- iGEM Fall Conference at MIT
- Ratify club constitution
- Become a Recognized Campus Organization
- Become a designated student design team
- Recruit team members from other departments
- Get our own research space
- Secure additional funding from sponsors

BioSci Partners 2009

We are pleased to acknowledge those who generously supported the department in 2009 through donations designated for research, teaching and scholarship programs. 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.

Contributions are welcome at any time and can be made using 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 only reach about 20% of our alumni during our April Phonathon, although many more of you respond to our written solicitation (also in April). While the cadre of BioSci alumni has grown to over 430, half of our students graduated in the last 10 years and are still in the early phases of their careers.



Value of BioSci endowment funds at the end of 2009. The Gale-Hufham, Heilbrunn and Summers funds provide student scholarships; the other funds support research.

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

We appreciate all you have done to support the department and its students and hope you will continue to be able to do so. As always, 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 up to $100

Mark David Algaier
Laurie L. Behm
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Rachel Lee Carter
Raymond Joseph Cologna
John Gerald Cooley
Betsy Marie Dampier
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Donations over $100

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