

**2013  
Annual Report  
Department of Biological Sciences**

**Missouri University of Science & Technology**



**Table of Contents**

<b>2013 Annual Report – Chair’s Summary</b>	<b>3</b>
<b>BioSci Strategic Plan</b>	<b>7</b>
<b>Faculty Reports</b>	
<b>Robert Aronstam</b>	<b>9</b>
<b>Ronald Frank</b>	<b>11</b>
<b>Chen Hou</b>	<b>12</b>
<b>Yue-wern Huang</b>	<b>13</b>
<b>Melanie Mormile</b>	<b>16</b>
<b>Dev Niyogi</b>	<b>19</b>
<b>Katie Shannon</b>	<b>20</b>
<b>Matthew Thimgan</b>	<b>22</b>
<b>David Westenberg</b>	<b>24</b>
<b>Terry Wilson</b>	<b>26</b>

<b>Department Operations</b>	
<b>Faculty Scientific Communications</b>	<b>27</b>
<b>Extramural Research Funding</b>	<b>32</b>
<b>Seminar Program</b>	<b>32</b>
<b>Undergraduate Studies</b>	<b>34</b>
<b>Field Courses</b>	<b>37</b>
<b>Graduate Program</b>	<b>39</b>
<b>S&amp;T cDNA Resource Center</b>	<b>40</b>
<b>Service Learning Classes</b>	<b>41</b>
<b>Helix</b>	<b>42</b>
<b>iGEM</b>	<b>44</b>
<b>Phi Sigma</b>	<b>45</b>
<b>Scrubs</b>	<b>46</b>
<b>2013 Donors</b>	<b>47</b>



**Useful BioSci Links**

Department	<a href="http://biosci.mst.edu">biosci.mst.edu</a>
Missouri S&T	<a href="http://www.mst.edu">www.mst.edu</a>
cDNA Resource Center	<a href="http://www.cdna.org">www.cdna.org</a>
BioSci Donations	<a href="http://giving.mst.edu">giving.mst.edu</a>
BS&T Biology FaceBook	<a href="#">Missouri S&amp;T Biology</a>

■ Note: This Annual Report is prepared to improve communications with the S&T Biological Sciences community. 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.



## Department of Biological Sciences

### Chair's Summary - 2013

Robert S. Aronstam



### Department Update

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

### Faculty

Several BioSci faculty members were honored with awards this year. **Dr. Ronald Frank** received a Governor's Award for Excellence in Teaching, **Dr. Dev Niyogi** receive a Faculty Teaching Excellence Award, and **Dr. David**



Teaching award recipients, Drs. Frank, Niyogi and Westenberg, and Ms. Wilson.



Dr. Ann West

**Westenberg** and **Ms. Terry Wilson** earned CERTI (Center for Educational Research and Teaching Innovation) awards based on student evaluations. **Dr. Ann West**, Adjunct Lecturer, received a CERTI teaching commendation. **Dr. Melanie Mormile** and colleagues received their second US Patent related to the development of biofuels, while **Dr. Roger Brown** and colleagues received a patent for the development of glass scaffolds that support tissue regeneration.

**eFellow awards** to support the redesign of BioSci courses were obtained by **Drs. Katie Shannon** and **David Westenberg** and **Ms. Terry Wilson**.

**Strategic Plan:** Over the past 18 months, scores of S&T faculty, staff, students and administrators have been working on a strategic plan to guide our efforts over the next seven years. For the first time, system funding has been tied to the implementation of the plan. S&T's plan focused on maximizing the return on investment for our key constituencies (students, employers, donors, and funding agencies). Our strategy statement is: **"Missouri S&T will provide by 2020 a top return on investment among public research universities to students, employers, research partners and donors through extraordinary access to renowned expertise, services and experiential learning opportunities."** The plan is complex and comprehensive, involving 30 levers (groups of actions) and 188 specific actions, 115 of which are scheduled to begin in the first year. The BioSci department's strategic plan was revised and expanded in response to the S&T initiative (see following Section).

S&T's plan was very well received by the Board of Curators, and all three of Year 1 initiatives were fully funded (\$3.2 million + \$1.26 million S&T match). These include:

- Hiring 100 faculty members over the next 7 years (33 initially). Some positions will involve cluster hires.
- Improving our teaching laboratories (\$500,000)

The BioSci was awarded a new tenure track faculty position. Drs. Huang and Shannon are heading up a search committee, and we expect to invite candidate to campus in March. We would like to hire a scientist with expertise in Synthetic Biology.

**Alumni and Development. Dr. Robert L Phillips, Jr.** was awarded a Professional Degree at the May 2013 graduation ceremony. **Dr. Phillips**, vice president for research and policy with the American Board of Family Medicine, earned a bachelor of science from Missouri S&T in 1990. Dr. Phillips was appointed by the U.S. Secretary of Health and Human Services to serve on a federal committee to redesignate medically underserved areas, and served as vice chair of the U.S. Council on Graduate Medical Education. Dr. Phillips completed family medicine residency at the University of Missouri-Columbia, and is a member of the Institute of Medicine of the National Academies of Science.



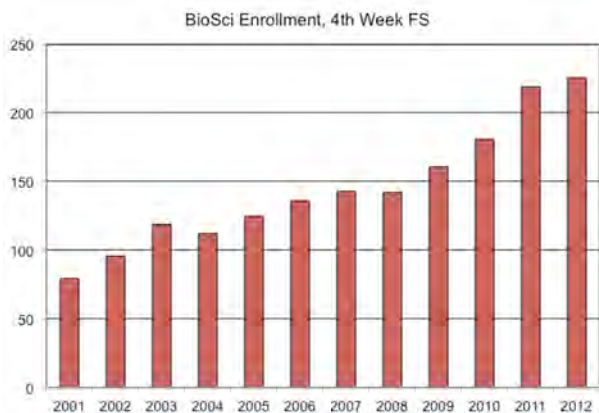
The department continues to receive strong support from its alumni and friends; the fraction of graduates supporting the department has increased in each of the last six years. Gifts to the BioSci department increased to record \$16,385 (see Donors Section). **Dr. George Karr** made a legacy gift to fund a Pre-Dental Scholarship. The consistent support we receive from our alumni and friends is critical for the development of the department, and we are grateful for your gifts and advice.



Dr. Karlynn Sievers of Casper, Wyoming returned to Rolla with her family to receive the Distinguished Young Alumni Award. Sievers, a physician and clinical assistant professor at the University of Wyoming, earned a bachelor degree in both English and life sciences from S&T in 1996.



Dr. Paul Stricker (B.S., '92), returned to campus last fall to lecture in Anatomy and Physiology. Dr. Stricker, a member of the American Academy of Pediatrics' Council and past president of the American Medical Society for Sports Medicine, practices medicine at the Scripps Clinic In San Diego, CA.

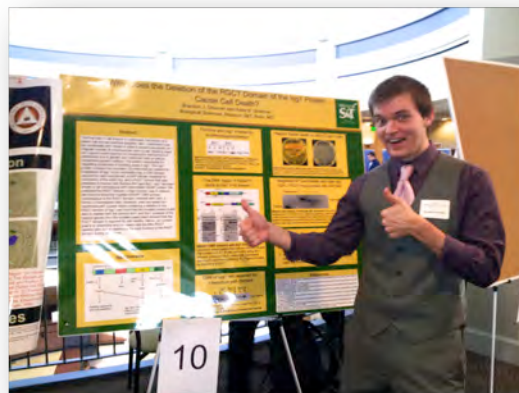
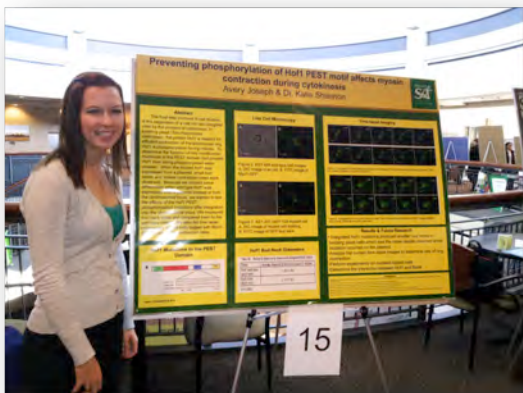


**Students:**

Degrees were awarded to 49 undergraduates and 4 graduate students at our May and December 2013 commencement ceremonies (compared to 36 in 2012). This brings the number of BioSci graduates to 600 since the department was formed in 1978. Our entering class of first year students was among the highest in history, and preliminary enrollment data indicate that fall 2014 enrollment of first year students will set a new record.

The BioSci department continues to enjoy steady increases in undergraduate enrollment. The official fall semester 4<sup>th</sup> week enrollment was 222 students. In terms of enrollment, we are now the 6<sup>th</sup> largest department on campus.

BioStar awards winners included **Shelby Emmett** and **Alex Willis** (Student Leaders), **Amanda Foster** (Senior), **Katie Payne** (Undergraduate Research) and **Lisa Snoderly-Foster** (Graduate Teaching Assistant). **Erica McFarland** was the year's Gale Hufham Scholarship winner, and **Sierra Comer** and **Chelsea Ehret** were awarded the first Troutbuster Scholarship.



Avery Joseph and Brandon Drennan present at the 2013 S&T Undergraduate Research Day

**Project Lead the Way.** We hosted 8 training sessions for 70 master high school teachers involved in the Project Lead The Way – Biomedical Sciences curriculum. For the first time we offered training session in Medical Detectives/Science & Technology for middle school teachers. Under the direction of **Ms. Terry Wilson**, these sessions went exceptionally well, and we took full advantage of the opportunity to inform our guests about the unique training programs in biological sciences at Missouri S&T. We now offer academic credit to students in this remarkable program; we expect to be able to offer graduate credit for teachers this summer.



Dr. Matthew Thimgan discusses his sleep research with students at the fall semester Open Laboratory.

Research support is one of our greatest priorities. While faculty members actively pursue extramural funding opportunities, we are exploring ways to develop additional sources of support. Accordingly, three years ago the department established faculty research accounts funded with income from 1) summer session tuition, 2) grant overhead incentives, 3) donations, 4) biotech sales, 5) research endowment income, and 6) PLTW course credits. In 2013 the amount of distributed money increased to >\$62,000. This is an innovative approach that we seek to expand.

**Research.** In 2013 BioSci faculty members published 17 (vs. 12 in 2012) peer reviewed research publications, 4 book chapters (vs. 0), presented 25 (vs. 12) papers at national and international meetings, and were invited to give 16 (vs. 9) talks in various professional venues. Clones sales from the cDNA Resource Center have totaled over \$2.1 million since FY2005. At the annual **S&T Undergraduate Research Day** in April, 2013, five of the nine awards in the sciences went to BioSci students.

■ BioSci Research Laboratories and Directors

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

**Student Affairs:** Student organizations (Helix, Scrubs, iGEM and Phi Sigma) associated with the BioSci department had very active years, with invited speakers, service projects, and field trips (see accompanying reports). The department hosted faculty-student teas, two graduation receptions, and a holiday party. The student organizations hosted an end-of-term reception. Our weekly student newsletter (BioConnection) completed its seventh year of publication. The revamped departmental FaceBook page (“[Missouri S&T Biology](#)”) provides an interesting snapshot of departmental activities.

**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

I am pleased to provide you with this report. The BioSci department had a very, very good year in 2013. 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



Helix students wrapping presents for families in the Adopt-A-Family program.



iGEM students host a beginning of the semester social event.



BioSci students volunteer in the Expand Your Horizons program to encourage 7<sup>th</sup> and 8<sup>th</sup> grade students to explore careers in the sciences,

## Department of Biological Sciences

### BioSci Strategic Plan - 2013

#### Departmental Strategic Plan:

The departmental strategic plan was updated in response to the major campus planning initiative. The faculty reaffirmed its mission statement (see box) and adopted an aggressive Strategy statement.

Our plan envisions a great deal of growth in the department. This reflects the breadth of the field of biological study and the popularity of the discipline among undergraduate students. This growth will entail taking market share from other institutions. The competitive advantage we feel we have is our emphasis on an **Academic Community** that is supportive, collegial, challenging and rewarding, and that values the personal and professional development of all its members. Our community is characterized by close interactions of students with passionate faculty, and engagement in experiential and service learning and research,

#### Theme 1. Increase number of students

**Action 1.1** - Work with admissions, student recruiters, faculty interviews, high school counselors, PLTW teachers: build relationships

**Action 1.2** – Establish a nursing school articulation

**Action 1.3** – Utilize Project Lead The Way as recruitment tool

**Actions 1.4** - Reduce the S:F ratio to 17:1

#### Theme 2. Involve all students in experiential learning

**Action 2.1** Encourage student participation in research OUREs, REUs, summer internships. Support Open Lab program.

**Action 2.2** - Provide scholarships or awards to recognize student leadership (4 BioSci-related student clubs; BioStar awards)

**Action - 2.3** Require Biological Sciences students to take Bio 310, a Service Learning course

**Action - 2.4** Employ students as TA's lab assistants, graders, recruiters

**Action - 2.5** Expand field course options

#### Theme 3. Increase Research Productivity

**Action 3.1** - Encourage students participation in OUREs, REUs, internships

**Action 3.2** – Establish doctoral training in life sciences

**Action 3.2** – Promote interdisciplinary Bio research initiatives

**Action 3.3** – Offer internal peer review of colleague proposals

**Action 3.4** – Reward proposal submission

**Action 3.5** – Provide travel funds to attend regional and national meetings

**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).

#### Strategy Statement:

To become the school of choice for 450 biology majors by 2020 by offering outstanding learning and research opportunities and career preparation in an inclusive and interactive academic community.

#### Strategic Plan Themes:

1. Increase number of students
2. Involve all students in experiential learning
3. Increase research productivity
4. Improve instructional methodology

**Action 3.6** – Expand faculty research accounts (now \$6,200/FTE) biotech income, alumni support, summer teaching, PLTW profit

**Action 3.7** – Recruit additional faculty

**Action 3.8** – Establish field research station (?)

**Action 3.9** – Reward publication (\$500/article)

**Action 3.10** – Improve infrastructure: lab space; analytical equipment, etc.; establish core analytical and imaging facilities

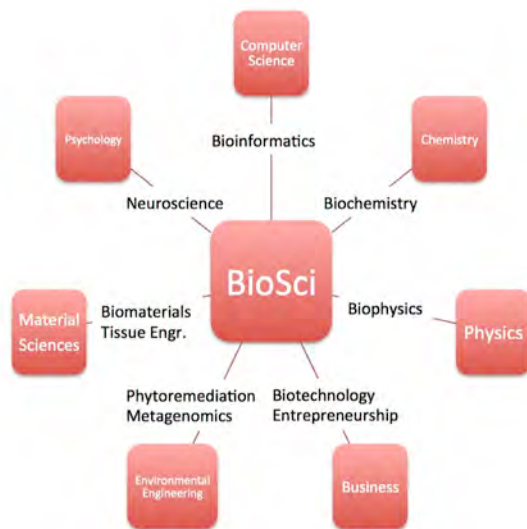
### Theme 3. Improve teaching methodology

**Action 4.1** Increase lab space; update lab equipment

**Action 4.2** Encourage continuing professional development: CERTI (participation and presentation), eFellows grants, Provost grants, Biology Scholars, publication in education journals

**Action 4.3** Continue faculty meetings to discuss instructional alignment, adoption of concept inventories, and assessment techniques

**Action 4.4** Assess the BioSci curriculum for alignment with the Vision and Change guidelines; apply for Vision and Change certification.



Biology is applied and interdisciplinary in nature. Interactions with multiple S&T units could form the basis for doctoral training in the Life Sciences at S&

### BioSci Best-In-Class (BIC) performance

S&T will be the top school of choice for Biology majors based on:

- 1) superior engagement of students in a dynamic, challenging and rewarding academic community
- 2) student satisfaction
- 3) student success





**Robert S. Aronstam, Ph.D.**

**Professor and Chair, Department of Biological Sciences**

**Director, Laboratory of Neurobiology**

**Director, Missouri S&T cDNA Resource Center**

### **Research Interests**

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

**Research Group:** Adam Martin, M.S. (Senior Research Associate); Vanessa Kaighin (Research Technician); Hsiu-Jen Wang (graduate student); Undergraduate Researchers: Hannah Frye, Katherine Brinker, Anne Safron, Jeremy Whilhoite, Abe Steurer.

### **2013 Publications**

Chusuei, C.C., C.-H. Wu, S. Mallararapu, J.G. Winnarz, J.-S. Moon, R.S. Aronstam and Y.-W. Huang, Cytotoxicity in the age of nano: cell toxicity reflects certain physiochemical properties of fourth period of metal oxide nanoparticles, *Chemico-Biological Interactions*, 205(2) 319-326, 2013.

Liu, B.R., S.-Y. Lo, C.-C. Liu, C.-L. Chyan, Y.-W. Huang, R.S. Aronstam and H.-Jung Lee, Endocytic Trafficking of Nanoparticles Delivered by Cell-penetrating Peptides Comprised of Nona-arginine and a Penetration Accelerating Sequence, *PLOS One*, June 26 8(6):e67100. DOI:10.1371/journal.pone.0067100, 2013.

Liu, B.R., S.-Y. Lo, Y.-W. Huang, R.S. Aronstam and H.-Jung Lee, Intracellular Delivery of Nanoparticles and DNAs by IR9 Cell-penetrating Peptides, *PLOS One*, May 28;8(5):e64205. doi: 10.1371/journal.pone.0064205, 2013.

Liu, B.R., Winiarz, J.G., Moon J.-S., Lo, S.-Y., Huang, Y.-W., Aronstam, R.S., and Lee, H.-J., Synthesis, characterization and applications of carboxylated and polyethylene-glycolated bifunctionalized InP/ZnS quantum dots in cellular internalization by cell-penetrating peptides, *Colloids and Surfaces B: Biointerfaces* 111C:162-170, doi: 10.1016/j.colsurfb.2013.05.038, 2013.

Tang, T.-H., C.-T Chang, H.-J. Wang, J. Erickson, R.A. Reichard, A.G. Martin, E.C. Shannon, Y.-W. Huang, and R.S. Aronstam, Influence of *tert*-butyl hydroperoxide on muscarinic signaling pathways and store-operated calcium entry, *J. Biomed. Sciences*, 20(1):48. DOI:10.1186/1423-0127-20-48, 2013.

Wang, H.-J., A.G. Martin, P.-K.Chao, R.A. Reichard, A.L. Martin, Y.-W. Huang, M.-H. Chan and R.S. Aronstam, Honokiol blocks store operated calcium entry in CHO cells expressing the M3 muscarinic receptor, DOI: 10.1186/1423-0127-20-11, *J. Biomed. Sciences*, 20:11, doi: 10.1186/1423-0127-20-11, 2013.

### **2013 Presentations**

Frye, H.E., H.-J. Wang, Y.-W. Huang, A.L. Martin and R.S. Aronstam, M2 muscarinic receptor signaling through phospholipase C mediated by a modified  $G\alpha_q$  protein, Annual meeting, American So Cell Biology, New Orleans, 2013.

Huang, Y.-W., F.Y.S. Hou, C.-M. Hsu, C.-J. Hsiao and R.S. Aronstam, Mechanisms of toxicity and types of cell death induced by nanoscale particles, Annual meeting, American Society for Cell Biology, New Orleans, LA, 2013.

Martin, A.L., H.L. Chambers, K.Z. Williams and R. AS Aronstam, Constitutive activity of orphan G protein coupled receptors, Constitutive Activity of Orphan G Protein Coupled Receptors, 4<sup>th</sup> GPCR Colloquium, American Societyfor Pharmacology & Experimental Therapeutics, Boston, MA, April, 2013.

Shannon, E.K., A.L. Martin, H.-J. Wang and R.S. Aronstam, M2 muscarinic receptor control of gene expression signaling mediated by  $G\alpha_s$ , Annual meeting, American Society for Cell Biology, New Orleans, LA, 2013.

Yue-Wern Huang, Y.-W., C. Chusuei, C.-H. Wu, S. Mallavarapu, J.G. Winiarz and R.S. Aronstam, Cytotoxicity of Fourth Period Transition Metal Oxide Nanoparticles Depends on Certain Physicochemical Properties. TechConnect World Conference Washington, DC. May 12-16, 2013.

Yue-Wern Huang, Y.-W., C. Chusuei, C.-H. Wu, S. Mallavarapu, J.G. Winiarz and R.S. Aronstam, Cell viability and apoptosis induced by transition metal oxide nanoparticles depend on surface charge, available surface binding site, and ion dissolution, , March 10-14. 52nd Annual Meeting of the Society of Toxicology, San Antonio, TX, 2013.

### 2013 Teaching

SP13: Neurobiology (BioSci 382)

Su13 Cellular Biology (BioSci 211)

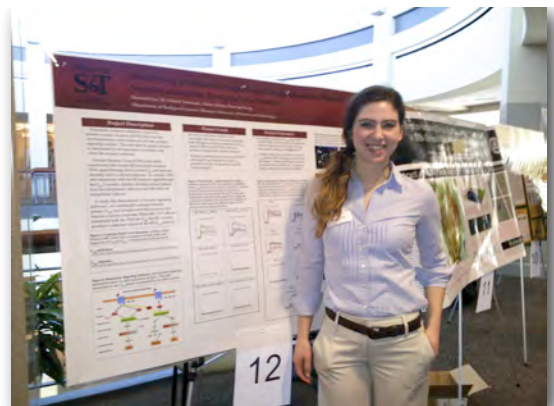
FS13: Cellular Biology (BioSci 211)

Undergraduate advisees: 65 majors; ≈17 minors

Graduate Students: Hsui-Jen Wang, Adam Martin

### 2013 Activities

- Directed the Missouri S&T cDNA Resource Center –marketed stably-transfected cell lines
- Directed research of 4 OURE grantees: Katherine Brinker, Hannah Frye. Katie Payne and Anne Safron. Hannah Frye won 3<sup>rd</sup> place award for presentation at the Undergraduate Student Research Day in April
- Committee: Institutional Biosafety Committee (chair); Radiation Safety Committee.; Course Renumbering; Department committees (Development, Recruitment); Chair, Strategic Planning Coalition; Search committee for Director of Institutional Research
- Chair, Department Chair Committee
- Presented 4 “Science Spotlights” at S&T Open Houses



Hannah Frye presenting her research at the Undergraduate Student Research Day in April



**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

**2013 Presentations**

Frank RL. 2013. Effective teaching: Tips from award winning faculty. Focus on Teaching and Technology Conference. St. Louis, MO.

Frank RL. 2013. Annotation and analysis of gene families in Glycine max using DNA Subway. Plant and Animal Genome Conference XXI. San Diego, CA

**2013 Teaching**

WS13: General Genetics (BioSci 231)  
WS13: Genomics (BioSci 301)  
FS13: Molecular Genetics (BioSci 331)  
FS13: Evolution (BioSci 235)  
Undergraduate advisees: 31 majors  
Undergraduate researchers: Alie Abele (BIO 390), Ryan Holzum (BIO 390)  
Graduate Students: Lisa Snoderly-Foster M.S.

**Award**

Missouri Governor's Award for Excellence in Education



Dr. Frank with talks with students interested in genomic research at the Helix-sponsored Open Lab.



**Chen Hou, Ph.D.**

**Assistant Professor**  
**Laboratory of Animal Physiology**

### **Research Interests**

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

### **2013 Publication**

**C. Hou.** 2013. The energy trade-off between growth and longevity. *Mechanisms of Ageing and Development* 134:373-380.

### **2013 Invited Speech**

Hou, C., Energy tradeoffs between metabolism, growth, and longevity: from insects to mammals. Colloquium seminar, Albert Einstein School of Medicine, New York, November, 2013.

### **2013 Teaching**

SP13: Human Anatomy and Physiology II (Bio246)  
SU13: Evolution (Bio235)

### **2013 Pending Proposal**

Simons Investigator in the Mathematical Modelling of Living Systems

### **2013 Advising**

Undergraduate advisees: 10 majors;  
Undergraduate researchers: Matthew Hayes, Lindsay Koerperich, Kathryn Koerperich, Caitlin Wilkes, Azriel Domingo, Julie Petru, Mary Puleo, and Michael Jennings;  
Graduate advisee: Lihong Jiao and Kaushalya Amunugama

### **2013 Activities**

Reviewer of peer-reviewed international journals: *Proc. Natl. Acad. Sci. U.S.A.* and *Journal of Sea Research*.  
Served on Kendra Bolt's PH.D. Thesis Defense Committee at Albert Einstein School of Medicine, NYC, New York.



**Yue-wern Huang, Ph.D.**

**Professor**

**Director, Laboratory of Bionanotechnology and Molecular Toxicology**

### **Research Interests**

- Nanomaterial toxicity in the aspect: how physiochemical properties of nanoparticles contribute to molecular toxicity mechanisms
- Using nanomaterials and cell-penetrating peptides (CPPs) to deliver biologically active molecules into the cell for biomedical applications
- Pollutants and environmental health

### **2013 Publications**

- Chusuei, C.C., C.-H. Wu, S. Mallarapu, J.G. Winnarz, J.-S. Moon, R.S. Aronstam and Y.-W. Huang, Cytotoxicity in the age of nano: cell toxicity reflects certain physiochemical properties of fourth period of metal oxide nanoparticles, *Chemico-Biological Interactions*, 205(2) 319-326, 2013.
- Liu, B.R., S.-Y. Lo, C.-C. Liu, C.-L. Chyan, Y.-W. Huang, R.S. Aronstam and H.-Jung Lee, Endocytic Trafficking of Nanoparticles Delivered by Cell-penetrating Peptides Comprised of Nona-arginine and a Penetration Accelerating Sequence, *PLOS One*, June 26 8(6):e67100. DOI:10.1371/journal.pone.0067100, 2013.
- Liu, B.R., S.-Y. Lo, Y.-W. Huang, R.S. Aronstam and H.-Jung Lee, Intracellular Delivery of Nanoparticles and DNAs by IR9 Cell-penetrating Peptides, *PLOS One*, May 28;8(5):e64205. doi: 10.1371/journal.pone.0064205, 2013.
- Liu, B.R., Winiarz, J.G., Moon J.-S., Lo, S.-Y., Huang, Y.-W., Aronstam, R.S., and Lee, H.-J., Synthesis, characterization and applications of carboxylated and polyethylene-glycolated bifunctionalized InP/ZnS quantum dots in cellular internalization by cell-penetrating peptides, *Colloids and Surfaces B: Biointerfaces* 111C:162-170, doi: 10.1016/j.colsurfb.2013.05.038, 2013.
- Tang, T.-H., C.-T Chang, H.-J. Wang, J. Erickson, R.A. Reichard, A.G. Martin, E.C. Shannon, Y.-W. Huang, and R.S. Aronstam, Influence of *tert*-butyl hydroperoxide on muscarinic signaling pathways and store-operated calcium entry, *J. Biomed. Sciences*, 20(1):48. DOI:10.1186/1423-0127-20-48, 2013.
- Wang, H.-J., A.G. Martin, P.-K.Chao, R.A. Reichard, A.L. Martin, Y.-W. Huang, M.-H. Chan and R.S. Aronstam, Honokiol blocks store operated calcium entry in CHO cells expressing the M3 muscarinic receptor, DOI: 10.1186/1423-0127-20-11, *J. Biomed. Sciences*, 20:11, doi: 10.1186/1423-0127-20-11, 2013.
- Liou, J.-S, B.R. Liu, Y.-H. Che, Y.W. Huang and H.-J. Lee, Delivery of nucleic acids, proteins, and nanoparticles by arginine-rich cell-penetrating peptides in rotifers. *Marine Biotechnology* doi:10.1007/s10126-013-9509-0, 2013.
- Liu, B.R., Y.-W. Huang, H.-J. Chiang and H.-J. Lee, Mechanistic studies of intracellular delivery of proteins by arginine-rich cell-penetrating peptides in cyanobacteria, *BMC Microbiology* 13:57, 2013. doi:10.1186/1471-2180-13-57. (Highly accessed)
- Liu, B.R, H.-J. Chiang, Y.-W. Huang, M.-H. Chan, H.-H. Chen and H.-J. Lee, Cellular internalization of quantum dots mediated by cell-penetrating peptides. *Pharmaceutical Nanotechnology* 1(2): 151-161, 2013.
- Madria, N., N. Nair, A. Vadapali, Y.-W. Huang, S. Jones and V. P. Reddy, Ionic liquid electrolytes for lithium batteries: Synthesis, electrochemical, and cytotoxicity studies. *J. Power Sources* 234:277-284, 2013.
- Liu, B.R., Y.-W. Huang, H.-J. Chiang and H.-J. Lee, Primary effectors of transmembrane delivery of arginine-rich cell-penetrating peptides *Advanced Studies in Biology* 5(1):11-25, 2013.

### 2013 Book Chapters

- Huang, Y.W., H.-J. Lee, B. R. Liu and C.-H. Wu. Chapter 23: Cellular Internalization of Quantum Dots. In *Cellular and Subcellular Nanotechnology: Methods and Protocols*. Weissig, V.; Elbayoumi, T.; Olsen, M. (eds.): Humana press, New York, pp. 249-259, 2013.
- Liu, B.R., M.-H. Chan, H.-H. Chen S.-Y. Lo, Y.-W, Huang and H.-J. Lee, Chapter 3: Effects of Surface Charge and Particle Size of Cell-penetrating Peptide/Nanoparticle Complexes on Cellular Internalization. In *Cell Membrane: Molecular Structure, Physicochemical Properties and Interactions with the Environment*, L. Mandraccia and G. Slavin (eds.); Nova Science Publisher, Hauppauge, New York, pp. 43-57, 2013.
- Liu, B.R., M.-H. Chan, H.-H. Chen, Y.-W. Huang and H.-J. Lee, Chapter XX: Protein Transduction in Human Cells Mediated by Arginine-rich Cell-penetrating Peptides in Mixed Covalent and Noncovalent Manners. In *Cell Membrane: Molecular Structure, Physicochemical Properties and Interactions with the Environment*, L. Mandraccia and G. Slavin (eds.); Nova Science Publisher, Hauppauge, New York, 2013.

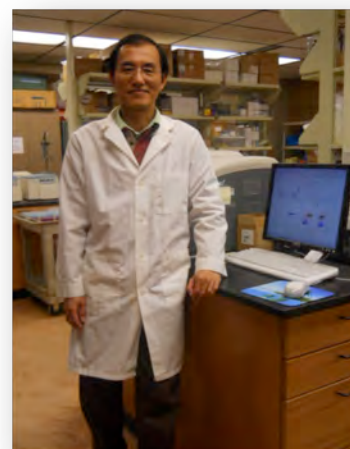
### 2013 Presentations

#### *Invited Speeches*

- Academia Sinica Institute of Atomic and Molecular Science. Cytotoxicity is a Function of Multiple Physical and Chemical Properties of Nanomaterials: Implications for Design of Safer Nanomaterials. Taipei, Taiwan, July 4, 2013.

#### *Conference Presentations*

- Fry, H.E., H-J. Wang, Y-W. Huang, A. L. Martin, and R. S. Aronstam, M2 muscarinic receptor signaling through phospholipase C mediated by a modified Gαq protein, 53rd Annual Meeting of the American Society for Cell Biology, New Orleans, LA, USA, December, 2013.
- Huang, Y-W. , F-Y. S. Hou, C-M. Hsu, C-J. Hsiao, and R. S. Aronstam, Mechanisms of toxicity and types of cell death induced by nanoscale particles. 53rd Annual Meeting of the American Society for Cell Biology, New Orleans, LA, USA, December, 2013.
- Huang, Y.-W., C.C. Chusuei, C.-H. Wu, S. Mallavarapu, J.G. Winiarz and R.S. Aronstam, Cytotoxicity of Fourth Period Transition Metal Oxide Nanoparticles Depends on Certain Physicochemical Properties, TechConnect World Conference, Washington, DC, USA, May, 2013.
- Huang, Y.-W., C.C. Chusuei, Chi-Heng Wu, S. Mallavarapu, J.G. Winiarz and R.S. Aronstam, Oxidative stress, cell viability and types of cell death induced by transition metal oxide nanoparticles depend on surface charge, available surface binding site, and ion dissolution, 52nd Annual Meeting of the Society of Toxicology, San Antonio, TX, USA, March, 2013.



### 2013 Pending Proposals

- 2014 – 2016. Novel Platform to Control Cellular Gene Expression. PI: Yue-Wern Huang (80%); Co-PI: Jeffrey Winiarz (20%). NIH R21. \$343,125. In revision.
- 2014-2018. New Synthetic Biomaterials with Osteoinductive-like Properties for Bone Regeneration. PI: Mohamed N. Rahaman; Co-PI: Yue-Wern Huang. NSF. \$455,461.
- 2015-2018. Reduction of the BMP2 dose required for bone regeneration through the use of a new intrinsically osteoinductive hydroxyapatite carrier. PI: Mohamed N. Rahaman; Co-PI: Yue-Wern Huang. NIH R21. \$365,015.
- 2014 – 2016. Tradeoffs between Metabolism, Growth, and Health Maintenance. PI: Chen Hou (80%); Co-PI: Yue-Wern Huang (20%). NIH R21. \$250,000. In revision.

### 2013 Teaching

- SS13: Toxicology (Bio Sci 370/470); Issues in Public Health (Bio Sci 271); Techniques in Appl & Env Bio (Bio Sci 475)
- FS13: Ecology (Bio Sci 251); Nanobiotechnology (Bio Sci 301)
- Undergraduate advisees: 20 bio majors
- Graduate Students: Larry M. Tolliver

### 2013 Activities

- Reviewer of peer-reviewed international journals: Biomaterials, Langmuir; Advanced Materials Letters; Cell Biology and Toxicology; Toxicology; Journal of Applied Toxicology; Journal of Membrane Biology (BioMed Central); Journal of Agricultural and Food Chemistry
- Reviewer, the 2014 SOT annual conference nanotoxicology platform/poster proposals
- Chair, S& T Institutional Animal Care and Use Committee
- Chair, Departmental Graduate Program
- Chair, Faculty Search Committee
- Coordinator, departmental scholar exchange program with National Taiwan Normal University.





**Melanie R. Mormile, Ph.D.**

**Professor**

**Environmental Microbiology Laboratory**

### **Research Interests**

Microbial populations in hypersaline environments

Bio-energy production by halophilic/halotolerant bacteria

Retrieval of enzymes for industrial use from extremophilic bacteria

### **2013 Active Members of Laboratory**

Tiffany Edwards-Master's Thesis Candidate

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

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

Dylan Courtney-Undergraduate Student in Chemical Engineering, OURE Fellow

Olivia Flemming-Undergraduate Student in Biological Sciences

Ethan Hamilton-Undergraduate Student in Biological Sciences

Sarah Rommelfanger-Undergraduate Student in Biological Sciences

Christine Wood-Undergraduate Student in Biological Sciences

Jenn Parks-Technician

Hoda Bakhshizadeh-Volunteer

Yi Cui-Volunteer

### **2013 Completed Master's Thesis**

Daniel Roush (2011-2013) successfully defended his thesis July 17, 2013. Thesis title: Production of 1,3-propanediol from glycerol under haloalkaline conditions by the organism, *Halanaerobium hydrogeniformans*)

### **2013 Publications**

Paul, V.G., S.D. Minter, B.L. Treu, and M.R. Mormile. Ability of a haloalkaliphilic bacterium isolated from Soap Lake, Washington, to generate electricity at pH 11.0 and 7% salinity. *Environmental Technology*, DOI: 10.1080/09593330.2013.858186.

### **2013 Invited Editor**

Sonia M. Tiquia-Arashiro – Lead Editor, Melanie R. Mormile – Guest Editor, *Environmental Technology* Special Issue: Sustainable technologies: Bioenergy and biofuel from biowaste and biomass. Volume 34, Issues 13-14.

Editorial for Issue: Tiquia-Arashiro, S.M., and M.R. Mormile. Sustainable technologies: Bioenergy and biofuel from biowaste and biomass. *Environmental Technology*, **34**: 1637-1638.

### **2013 Participation In Workshop**

Biological Hydrogen Production Workshop. National Renewable Energy Laboratory, Golden, Colorado, sponsored by the U.S. Department of Energy (DOE), Energy Efficiency and Renewable Energy (EERE), Fuel Cell Technologies Office (FCTO) (September 24-25). Link to Workshop Summary Report:

[http://www1.eere.energy.gov/hydrogenandfuelcells/wkshp\\_bio\\_h2\\_production.html](http://www1.eere.energy.gov/hydrogenandfuelcells/wkshp_bio_h2_production.html)



### 2013 Invited Presentations

It Came From Soap Lake: Industrially Relevant Metabolic Activities of a Haloalkaliphilic Bacterium. Department of Biology, Missouri State University, Springfield, Missouri, March 8. (*Regional Level*)

Going from microbial ecology to genome data and back again: Studies on a haloalkaliphilic bacterium isolated from Soap Lake, Washington State. Halophiles 2013. University of Connecticut, Storrs, Connecticut, June 23-27. (*International Level*)

### 2013 Conferences Organized And Moderated

Halophiles 2013. June 23-27, University of Connecticut, Storrs, Connecticut. Served on the International Organizing Committee. (*International level*)

### 2013 Program Sessions Organized And Convened

Environmental Microbiology-Bioremediation and Biodegradation. *Society for Industrial Microbiology and Biotechnology Annual Meeting and Exhibition*, August 11-15, San Diego, California.

### 2013 Abstracted Presentations

Edwards, T., and M.R. Mormile. pH Dependent Antibiotic Resistance of an Alkaliphilic Halotolerant Bacterium from Soap Lake, Washington. (Platform) Missouri Branch Meeting of ASM. March 22-23, Columbia, MO. *Tiffany was an undergraduate at the time.* (*Regional level*).

Paul, V., D. Wronkiewicz, and M.R. Mormile. Biogeochemical Cycling and Microbial Diversity in the Microbialites of Storr's Lake, Bahamas. (Platform) Missouri Branch Meeting of ASM. March 22-23, Columbia, MO. *Varun won third place recognition for his presentation.* (*Regional level*).

Roush, D., M.R. Mormile, D. Elias, and O. Sitton. Production of 1,3-Propanediol from Glycerol Under Haloalkaline Conditions. (Platform) Missouri Branch Meeting of ASM. March 22-23, Columbia, MO. *Daniel won second place recognition for his presentation.* (*Regional level*).

Roush, D., M.R. Mormile, D. Elias, and O. Sitton. Production of 1,3-Propanediol from Glycerol Under Haloalkaline Conditions. (Platform) *Ann. Meet. Am. Soc. Microbiology*, May 18-21, Denver, Colorado. *Daniel's abstract was selected for an oral presentation. He presented during the "Life lessons from biofuels research and bioremediation" symposium. He received a Student Travel Grant. His presentation was also selected for a press release.* (*National level*)

Kitrell, E.F., J.G. Burken, M.R. Mormile, and M. Fitch. Potential acid mine drainage treatment utilizing acidophilic sulfate reducing bacteria in an upflow bioreactor. (Poster) *Abst. Ann. Meet. Am. Soc. Microbiology*, May 18-21, Denver, Colorado (Q-337). (*National Level*)

Paul, V., D. Wronkiewicz, M.R. Mormile, and J.S. Foster. Microbialites in the hypersaline, light-limiting waters of Storr's Lake, Bahamas. (Poster) *Abst. Ann. Meet. Am. Soc. Microbiology*, May 18-21, Denver, Colorado (N-743). (*National Level*)

### 2013 Teaching

SP13: Bio Sci 358, Advanced Biodiversity—took 9 students to San Salvador Island, Bahamas as part of this course

SP13: Bio Sci 301, Special Topics, Introduction to Astrobiology

SP13: Bio Sci 452, Astrobiology

FS13: Bio Sci 102, Introduction to Biological Sciences

FS13: Bio Sci 221, Microbiology

FS13: Bio Sci 455, Bioremediation

### 2013 Activities

- Academic Editor for PLoS ONE

- Member of the Editorial Boards for: Applied and Environmental Microbiology; Environmental Technology; Agricultural, Food and Analytical Bacteriology; Frontiers in MicroBio Technology; Frontiers in Extreme Microbiology
- Served as peer-reviewer for the following journals: Antonie van Leeuwenhoek Journal of Microbiology; Astrobiology; International Society of Microbial Ecology (ISME) Journal
- Review member for the National Science Foundation's Graduate Research Fellowship Program (GRFP), Arlington, Virginia (January 8-11)
- Actively served on the following national committees: The American Society for Microbiology's Committee on the Status of Women in Microbiology of the Public and Scientific Affairs Board; The EMD Millipore Alice C. Evans Award Selection Committee; the Industrial Microbiology and Biotechnology Annual Meeting Program Committee
- Actively served on the following international committee: Subcommittee on the Taxonomy of the *Halomonadaceae* of the International Committee on Systematics of Prokaryotes
- Actively served on the following Missouri University of Science and Technology' committees: MSM-UMR Alumni Association Awards Committee; Campus Promotion and Tenure; Best-in-Class Selection Committee; Library Director Search Committee; Non-tenure Track Promotion; Rules, Procedures & Agenda; Missouri S&T's Woman of the Year Selection Committee
- Academic Faculty Advisor for the Mars Rover Design Team
- Academic Faculty Advisor for Helix, the Undergraduate Student Organization of the Department of Biological Sciences
- Parliamentarian (January-May) for the Faculty Senate of Missouri University of Science and Technology
- Secretary (June-December) for the Faculty Senate of Missouri University of Science and Technology



**Dev Niyogi, Ph.D.**

**Associate Professor**

**Director, Laboratory of Freshwater Ecology**

### **Research Interests**

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

### **2013 Publications**

Niyogi, D.K., J.S. Harding, and K.S. Simon. 2013. Organic matter breakdown as a measure of stream health in New Zealand streams affected by acid mine drainage. *Ecological Indicators*. 24:510-517.

### **2013 Teaching**

SP13: Biodiversity (Bio 113)

SP13: Global Ecology (Bio 364)

SU13: Field Ecology (Bio 201)

SU13: Field class in freshwater ecology (through University of Colorado)

FS13: Freshwater Ecology (Bio 354)

FS13: Introduction to Environmental Science (Bio 151)

Graduate research advisees: 2

Visiting scholars from NTNU: 1

Undergraduate research advisees: 6

### **2013 Activities**

At Missouri S&T, I am continuing my research on ecosystem processes in streams, and the use of molecular tools to describe microbial communities of streams. One main focus is on the effects of stream drying on communities of microbes, algae, and animals. One graduate student and several undergrads have been helping with these studies. I also have hosted several visiting scholars from National Taiwan Normal University, who have conducted research on the effects on aquatic fungi and leaf decomposition. I am also collaborating with local scientists and conservationists with the Mill Creek Watershed Coalition and their efforts to study and conserve a unique watershed near Rolla. A new graduate student and several undergraduate students are conducting research related to water quality and conservation of fishes in the watershed. My teaching has focused on several introductory and advanced ecology classes.

Dr. Niyogi's Fresh Water Ecology class at the Little Prairie Conservation Area, September 2013.





**Katie Shannon, Ph.D.**

**Associate Teaching Professor , Department of Biological Sciences**

**Director, Cytokinesis Laboratory**

**Director, Cellular Imaging Facility**

### **Research Interests**

#### **Regulation of actomyosin ring assembly and contraction**

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

#### **2013 Publications**

Stockstill, K.E., Park, J., Wille, R., Bay, G., Joseph, A. and **Shannon, K.B.** (2013) Mutation of Hof1 PEST domain phosphorylation sites leads to retention of Hof1 at the bud neck and a decrease in the rate of myosin contraction. *Cell Biology International* Article first published online : 29 JAN 2013, DOI: 10.1002/cbin.10042

#### **2013 Presentations**

**Shannon, K.** (2013) How do cells know when it's time to divide? Regulation of cytokinesis in budding yeast, March 1, Invited Seminar Speaker of the Biology Department, Missouri State University

**Miller, D.** and Shannon, K.B. (2013) Phosphorylation of Iqg1 by Cyclin Dependent Kinase (CDK), Cdc28, Temporally Regulates Actin Ring Formation. Poster. Sept. 28, Midwest Yeast Meeting, Northwestern University, Evanston IL

**Nelson, K.** and Shannon, K.B. (2013) Does a Hof1 Mutation that Prevents Phosphorylation in the PEST Domain Affect Both Haploid and Diploid Yeast Cells? Poster. Sept. 28, Midwest Yeast Meeting, Northwestern University, Evanston IL

**Crossen, K.** and Shannon, K.B. (2013) Do Mutations that Affect IQG1 Phosphorylation Change the Dynamics of an Actin Probe? Poster. Sept. 28, Midwest Yeast Meeting, Northwestern University, Evanston IL

**Shannon, K.** (2013) Design and Implementation of a Study to Determine if a Cell Model Project Attains Desired Learning Outcomes, Presentation at the Teaching and Learning Technology Conference, March 14-15, Missouri S&T, Rolla, MO

**Shannon, K.** (2013) Building Models to Understand Cell Function, Microbrew Presentation, American Society for Microbiology Conference for Undergraduate Educators, May 16-19, Englewood, CO

#### **2013 Grants**

eFellows Program, Tier 2, Missouri S&T Provost office and Educational Technology 2013 (P.I.) "Design of a "Flipped" Cell Biology Course", \$2,000

#### **2013 Teaching**

WS13: Cellular Biology (Bio211), BioDesign (Bio375), co-taught with Dr. Westenberg, Developmental Biology (Bio315), and Problems in Applied and Environmental Biology (Bio402)

FS13: Senior Seminar (Bio310), Cancer Cell Biology (Bio335/435), Cellular Biology (Bio211)

## 2013 Advising

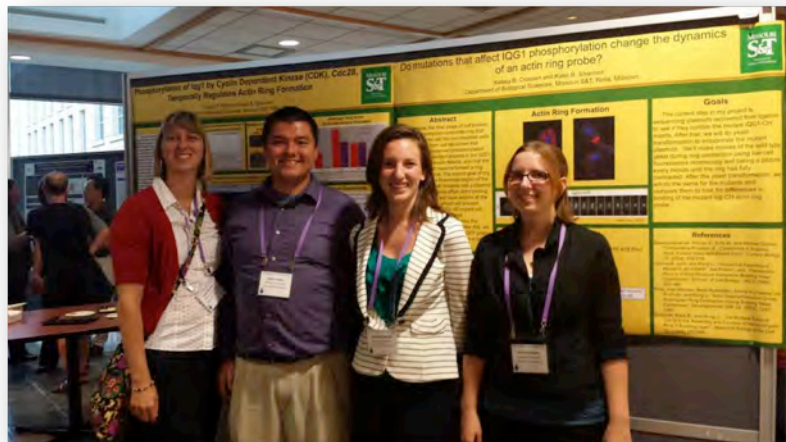
OURE students: Brandon Drennen, Katie Nelson, Kelsey Crossen

Masters student: Daniel Miller

Twenty Undergraduate Advisees

## 2013 Activities

- Co-advisor, iGEM student synthetic biology team, supervised project
- Reviewer, PLOS One
- Advisory Board member, Women in Science and Engineering (WISE)
- Advisory Board member, Student Design and Experiential Learning Center (SDELC)
- Panelist, Campus One Book event, “Ethics in Research”
- Judge, Social Sciences Poster Session, Undergraduate Research Conference
- Member, Center for Educational Research and Teaching Innovation (CERTI) committee
- Member, Discipline Specific Curriculum Committee
- Volunteer, Summer Solutions Camp, Women in Science and Engineering Program for 9-10<sup>th</sup> grade girls
- Volunteer, It’s a Girl Thing Camp, Women in Science and Engineering Program for 7-8<sup>th</sup> grade girls



Dr. Shannon with students at the Midwest Yeast Meeting in Chicago.



**Matthew S. Thimgan, Ph.D.**

**Assistant Professor**  
**Laboratory of Genetic & Behavioral Sleep Research**

### **Research Interests**

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

### **Publications**

**Matthew S. Thimgan**, Laura Gottschalk, Cristina Toedebusch, Jennifer McLeland, Allan Rechtschaffen, Marcia Gilliland-Roberts, Stephen P. Duntley, and Paul J. Shaw. (2013) Cross-translational studies in Human and *Drosophila* identify markers of sleep loss. *PLoS ONE* 8(4):e61016.

**Matthew S. Thimgan** and Karen D. Schilli. (2013) The role of metabolic genes in sleep regulation. In Medhi Tafti, Paul J. Shaw, and Michael Thorpy (Eds.) *Genetics of Sleep and Sleep Disorders*. (pp. 91-103). Cambridge: Cambridge University Press.

### **Invited presentations**

American Professional Sleep Societies national meeting, Baltimore, MD  
“Genetics of Sleep in Animals and Humans”  
Basics of Sleep postgraduate course

Saint Louis University, Department of Biology  
“Detection and Prevention of Sleepiness”

University of Missouri, Kansas City, Department of Biology  
“Detection and Prevention of the Consequences of Sleep Deprivation”

### **International presentations**

Intl. Conf. on Image Processing, IEEE, Sydney, Australia  
“Tracking fast-moving, tiny flies by adaptive LBP feature and cascaded data association.”  
Mingzhong Li, Zhaozheng Yin, Matthew Thimgan, Ruwen Qin

Proceedings of the American Society for Engineering Management International  
“Managing Sleep Deprived Workers”  
N. Khalafi\*, S. Murray, and M. Thimgan

### **National Presentations**

**Poster presentation**, American Professional Sleep Societies, Baltimore, MD  
“Mathematical analysis of sleep and wake transitions in *Drosophila melanogaster*”  
Matthew S. Thimgan, Sahitya Injamuri, V.A. Samaranayake, Gayla Olbricht

Mary Kay O'Connor Process Safety Center International Symposium, College Station, TX  
"Countermeasures to Improve Workers' Performance and Reduce Errors Due to  
Inadequate Sleep and Fatigue"  
N. Khalafi\*, S. Murray, and M. Thimgan

### **Regional presentations**

**Poster Presentation**, Midwest *Drosophila* Conference, Allerton, IL  
"Mathematical modeling of sleep and wake in *Drosophila melanogaster*"  
Sahitya Injamuri\*, Gayla Olbricht, V.A. Samaranayake, Matthew S. Thimgan

**Poster Presentation**, Midwest *Drosophila* Conference, Allerton, IL  
"Differential impact of short sleep in a lipid metabolism mutant"  
Carlos Rivera\*, Thomas Hilderbrand\*, Chen Hou and Matthew S. Thimgan

### **Awards**

UM Interdisciplinary Grant (Co-PI)  
"Insomnia and Obesity: Translational Studies of Metabolism and Genes in *Drosophila melanogaster* and Humans"

University of Missouri Research Board (PI)  
"Regulation of sleep by lipid metabolic enzymes"

### **Invention Disclosure**

Matthew S. Thimgan and Laura Musselman, "Self-contained, independent water source to promote *Drosophila* health and reproduction"

### **Teaching**

SS2013: ME 261: Led project for Biology applications for Mechanical Engineering

Bio 401: Special Topics in Sleep and Endocrinology

Bio 390: Undergraduate research topics

Bio 201: Sleep: Function and Dysfunction

FS 2013: Bio 244: Anatomy & Physiology I

Bio 390: Undergraduate research topics

Thesis Committee – Neda Khalafi (Engineering Management)

Thesis Committee - Stephanie Berhorst (Statistics)

Graduate researchers: Carlos Rivera

Undergraduate researchers: Dillon Barton, Thomas Congdon, Sahitya Injamuri, Rachel Glenn, Candace Miller, Anna Luce, Pasha Palangour (Comp Sci), Kaleb Bassett, Chantal Chambers, Danielle Meyer, Jack Colaric, Timmy Kenny, Elizabeth Theoren, Julie Nguyen

### **Other activities**

UM Research Board Grant Reviewer

Abstract reviewer SLEEP Meeting 2013

Improved Faculty Orientation 2014 Committee



David J. Westenberg, Ph.D.

Associate Professor,  
Chair, Pre-Medicine Advisory  
Committee



### Research Interests

Antibacterial materials, rhizosphere microbiology. legume symbiosis, quorum sensing

**Research Lab Members:** Megan Ottomeyer (MS, SP 2013), Aaron Carson, Matt Coates, Matt Threadgill, Natalie Updyke, Justin Lovelady, Brianna Kroeger, Cera Thomason, Serena Austin, Kent Lin, John Plihal, Jeremiah Herbert, Adrian Black, Isaac Bader, Jesse Townsend, Ashley Peters, Alex Evans, Courtney Filer, Carol Baker, Sarah Moeller, Colton Daniel, Brian Haslag

### Abstracts

Ottomeyer, M.E. and Westenberg, D.J. 2013. Broad Spectrum Antibacterial Properties of Metal-Ion Doped Borate Glass for Medical Applications. General Meeting of the American Society for Microbiology, Denver, CO.

Westenberg, D.J. 2013. ASM’s K-12 Outreach: Connecting the Past and Present with the Future of Microbiology. ASM Conference on Undergraduate Education. Denver, CO.

Ottomeyer, M.E. and Westenberg, D.J. 2013. Broad Spectrum Antibacterial Properties of Metal-Ion Doped Borate Glass for Medical Applications. Annual Meeting of the Missouri Branch of the American Society for Microbiology, Columbia, MO.

### Presentations:

“Broad spectrum antibacterial properties of metal-ion doped borate bioactive glasses for clinical applications”  
Feng Chia University, Taichung, Taiwan, July 3, 2013

“Evaluation of Glass and Polymers as Delivery Agents for Antibacterials” China Medical University, Taichung, Taiwan, July 9, 2013

“Broad spectrum antibacterial properties of metal-ion doped borate bioactive glasses for clinical applications”  
Providence University, Taichung, Taiwan, July 10, 2013

Flipping your lab to increase student engagement. ASM Conference on Undergraduate Education, Denver, CO  
May 16 – 19, 2013

Integrated Math and Science Education Through Science Education and Quantitative Literacy (SEQL). NSTA National Conference. San Antonio, TX, April 13, 2013.

### Teaching

SP13: Microbiology (BioSci 221); Microbiology Lab (BioSci 222); Communication Workshop for Pre-Health Professions (Pre-Med 310), Biological Design and Innovation (BioSci 375)

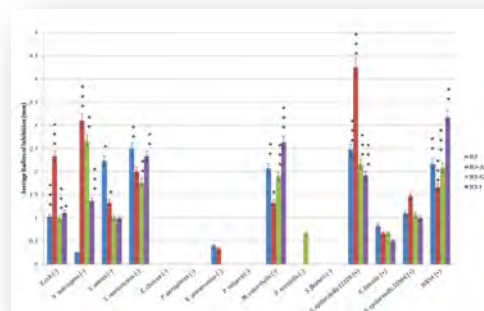
FS13: Microbiology Lab (BioSci 222), General Genetics (BioSci 231), Pathogenic Microbiology (BioSci 321)

### Extramural Funding

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

### 2013 Activities

Faculty Athletics Representative  
Chair of the ASM Committee on K-12 Education





Chair, Missouri S&T Pre-Medicine Advisory Committee  
Advisor for Scrubs, the Missouri S&T Pre-Health student organization  
Co-Advisor for the Missouri S&T iGEM team  
Summer SEQL Workshop for K-12 teachers  
Convened a session on The ASM and the CDC, Partners in Safety at the 2013 NABT National Conference  
Convened a session on The ASM and the NASA at the 2013 NSTA National Conference  
Member of the Missouri S&T Performing Arts Series, Conflict of Interest, Service Learning Advisory and Athletics Advisory Committees  
Numerous presentations to visiting students such as SHPE, MITE, and various school groups.

**2013 Awards, Honors**

Justin Lovelady, Brianna Kroeger, Cera Thomason, Serena Austin, John Plihal, Jeremiah Herbert, Adrian Black, Alex Evans, Courtney Filer, Carol Baker, Sarah Moeller and Colton Daniel earned S&T OURE awards





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

### **2013 Teaching**

- SP13: Biodiversity (Bio113)
- SP13: Biodiversity lab (Bio 114, 3 sections)
- SP13: Cellular Biology Lab (Bio 212, 3 sections)
- FS13: Principles of Biology lecture (Bio 111)
- FS13: General Biology Lab (Bio 112, 3 sections)
- FS13: Cellular Biology Lab (Bio 212, 3 sections)

### **2013 Activities**

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

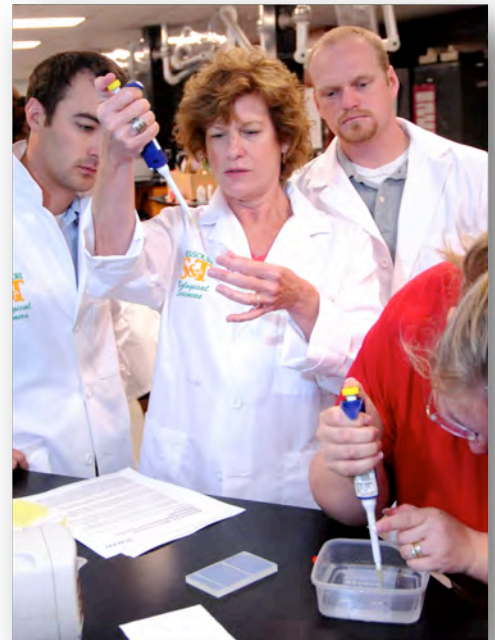
### **Awards**

- Missouri University of Science and Technology Outstanding Teaching Award, 2013
- Provost's eFellows Course Redesign Grant for Cellular Biology Lab



### **Project Lead the Way Training – 2013**

- 8 sessions
- 79 teachers
- Session I: PBS - 19
- Session I: HBS - 13
- Session I: BI - 2
- Session II: MI -10
- Session II: BI - 8
- Session II: HBS - 9
- Session III: PBS - 11
- Session III: MDST - 7



**Faculty Scientific Communications  
2013 Annual Report**



**BioSci Faculty and Staff**  
*standing:* Melanie Mormile, Katie Shannon, Jule Willyard, Chen Hou, Jessica Pelc, Yue-Wern Huang. *seated:* Matt Thimgan, Ron Frank, Robert Aronstam, Terry Wilson, David Westenberg. (*missing:* Dev Niyogi)

**Research Articles:**

- Chusuei, C.C., C.-H. Wu, S. Mallarapu, J.G. Winnarz, J.-S. Moon, R.S. Aronstam and Y.-W. Huang, Cytotoxicity in the age of nano: cell toxicity reflects certain physiochemical properties of fourth period of metal oxide nanoparticles, *Chemico-Biological Interactions*, 205(2) 319-326, 2013.
- Hou, C., The energy trade-off between growth and longevity, *Mechanisms of Ageing and Development* 134:373-380, 2013.
- Liou, J.-S, B.R. Liu, Y.-H. Che, Y.W. Huang and H.-J. Lee, Delivery of nucleic acids, proteins, and nanoparticles by arginine-rich cell-penetrating peptides in rotifers. *Marine Biotechnology* doi:10.1007/s10126-013-9509-0, 2013.
- Liu, B.R, H.-J. Chiang, Y.-W. Huang, M.-H. Chan, H.-H. Chen and H.-J. Lee, Cellular internalization of quantum dots mediated by cell-penetrating peptides. *Pharmaceutical Nanotechnology* 1(2): 151-161, 2013.
- Liu, B.R., S.-Y. Lo, C.-C. Liu, C.-L. Chyan, Y.-W. Huang, R.S. Aronstam and H.-Jung Lee, Endocytic Trafficking of Nanoparticles Delivered by Cell-penetrating Peptides Comprised of Nona-arginine and a Penetration Accelerating Sequence, *PLOS One*, June 26 8(6):e67100. DOI:10.1371/journal.pone.0067100, 2013.
- Liu, B.R., S.-Y. Lo, Y.-W. Huang, R.S. Aronstam and H.-Jung Lee, Intracellular Delivery of Nanoparticles and DNAs by IR9 Cell-penetrating Peptides, *PLOS One*, May 28;8(5):e64205. doi: 10.1371/journal.pone.0064205, 2013.
- Liu, B.R., Winiarz, J.G., Moon J.-S, Lo, S.-Y., Huang, Y.-W., Aronstam, R.S., and Lee, H.-J., Synthesis, characterization and applications of carboxylated and polyethylene-glycolated bifunctionalized InP/ZnS quantum dots in cellular internalization by cell-penetrating peptides, *Colloids and Surfaces B: Biointerfaces* 111C:162-170, doi: 10.1016/j.colsurfb.2013.05.038, 2013.

- Liu, B.R., Y.-W. Huang, H.-J. Chiang and H.-J. Lee, Mechanistic studies of intracellular delivery of proteins by arginine-rich cell-penetrating peptides in cyanobacteria, *BMC Microbiology* 13:57, 2013. doi:10.1186/1471-2180-13-57. (Highly accessed)
- Liu, B.R., Y.-W. Huang, H.-J. Chiang and H.-J. Lee, Primary effectors of transmembrane delivery of arginine-rich cell-penetrating peptides *Advanced Studies in Biology* 5(1):11-25, 2013.
- Thimman, M.S., L. Gottschalk, C. Toedebusch, J. McLeland, A. Rechtschaffen, M. Gilliland-Roberts, S.P. Duntley and P.J. Shaw, Cross-translational studies in Human and Drosophila identify markers of sleep loss. *PLoS ONE* 8(4):e61016, 2013.
- Madria, N., N. Nair, A. Vadapali, Y.-W. Huang, S. Jones and V. P. Reddy, Ionic liquid electrolytes for lithium batteries: Synthesis, electrochemical, and cytotoxicity studies. *J. Power Sources* 234:277-284, 2013.
- Modglin, V.C., and R.F. Brown, Performance of surface immobilized RGDC 13-93 bioactive glass fiber rafts and scaffolds with MLO-A5 osteogenic cells, *J. Mater. Sci. Res.* 2(4):53, 2013.
- Modglin, V.C., R.F. Brown, S.B. Jung and D.E. Day, Cytotoxicity assessment of modified bioactive glasses with MLO-A5 osteogenic cells in vitro, *J. Mater. Sci. Mater. Med.* 24(5):1191-1199, doi: 10.1007/s10856-013-4875-8, 2013.
- Niyogi, D.K., J.S. Harding, and K.S. Simon, Organic matter breakdown as a measure of stream health in New Zealand streams affected by acid mine drainage. *Ecological Indicators.* 24:510-517, 2013.
- Stockstill, K.E., J. Park, R. Wille, G. Bay, A. Joseph and Shannon, K.B., Mutation of Hof1 PEST domain phosphorylation sites leads to retention of Hof1 at the bud neck and a decrease in the rate of myosin contraction, *Cell Biology International* Article first published online : 29 JAN 2013, DOI: 10.1002/cbin.10042, 2013.
- Tang, T.-H., C.-T Chang, H.-J. Wang, J. Erickson, R.A. Reichard, A.G. Martin, E.C. Shannon, Y.-W. Huang, and R.S. Aronstam, Influence of *tert*-butyl hydroperoxide on muscarinic signaling pathways and store-operated calcium entry, *J. Biomed. Sciences*, 20(1):48. DOI:10.1186/1423-0127-20-48, 2013.
- Wang, H.-J., A.G. Martin, P.-K.Chao, R.A. Reichard, A.L. Martin, Y.-W. Huang, M.-H. Chan and R.S. Aronstam, Honokiol blocks store operated calcium entry in CHO cells expressing the M3 muscarinic receptor, DOI: 10.1186/1423-0127-20-11, *J. Biomed. Sciences*, 20:11, doi: 10.1186/1423-0127-20-11, 2013.

### Book Chapters

- Huang, Y.W., H.-J. Lee, B. R. Liu and C.-H. Wu. Chapter 23: Cellular Internalization of Quantum Dots. In *Cellular and Subcellular Nanotechnology: Methods and Protocols*. Weissig, V.; Elbayoumi, T.; Olsen, M. (eds.): Humana press, New York, pp. 249-259, 2013.
- Liu, B.R., M.-H. Chan, H.-H. Chen S.-Y. Lo, Y.-W. Huang and H.-J. Lee, Chapter 3: Effects of Surface Charge and Particle Size of Cell-penetrating Peptide/Nanoparticle Complexes on Cellular Internalization. In *Cell Membrane: Molecular Structure, Physicochemical Properties and Interactions with the Environment*, L. Mandraccia and G. Slavin (eds.); Nova Science Publisher, Hauppauge, New York, pp. 43-57, 2013.
- Liu, B.R., M.-H. Chan, H.-H. Chen, Y.-W. Huang and H.-J. Lee, Chapter XX: Protein Transduction in Human Cells Mediated by Arginine-rich Cell-penetrating Peptides in Mixed Covalent and Noncovalent Manners. In *Cell Membrane: Molecular Structure, Physicochemical Properties and Interactions with the Environment*, L. Mandraccia and G. Slavin (eds.); Nova Science Publisher, Hauppauge, New York, 2013.



Santa stopped by to harass Bienna Kroeger at our annual holiday party.

Thimgan, M.S. and K.D. Schilli, The role of metabolic genes in sleep regulation, In Medhi Tafti, Paul J. Shaw, and Michael Thorpy (Eds.) *Genetics of Sleep and Sleep Disorders*. (pp. 91-103). Cambridge: Cambridge University Press, 2013.

### **Invited Talks, Seminars**

#### *Invited Speeches*

Frank, R.L., Effective teaching: Tips from award winning faculty. Focus on Teaching and Technology Conference, St. Louis, MO, 2013..

Hou, C., Energy tradeoffs between metabolism, growth, and longevity: from insects to mammals, Colloquium seminar, Albert Einstein School of Medicine, New York, November, 2013.

Huang, Y.-W., Academia Sinica Institute of Atomic and Molecular Science. Cytotoxicity is a Function of Multiple Physical and Chemical Properties of Nanomaterials: Implications for Design of Safer Nanomaterials. Taipei, Taiwan, July 4, 2013.

Mormile, M., Going from microbial ecology to genome data and back again: Studies on a haloalkaliphilic bacterium isolated from Soap Lake, Washington State. Halophiles 2013. University of Connecticut, Storrs, Connecticut, June 23-27, 2013.

Mormile, M., It Came From Soap Lake: Industrially Relevant Metabolic Activities of a Haloalkaliphilic Bacterium. Department of Biology, Missouri State University, Springfield, Missouri, March 8, 2013.

Shannon, K., Building Models to Understand Cell Function, Microbrew Presentation, American Society for Microbiology Conference for Undergraduate Educators, Englewood, CO, May 16-19, 2013.

Shannon, K., Design and Implementation of a Study to Determine if a Cell Model Project Attains Desired Learning Outcomes, Presentation at the Teaching and Learning Technology Conference, Missouri S&T, Rolla, MO, March 14-15, 2013.

Shannon, K., How do cells know when it's time to divide? Regulation of cytokinesis in budding yeast, March 1, Invited Seminar Speaker of the Biology Department, Missouri State University, 2013.

Thimgan, M.S., Detection and Prevention of Sleepiness, Saint Louis University, Department of Biology, 2013.

Thimgan, M.S., Detection and Prevention of the Consequences of Sleep Deprivation, University of Missouri, Kansas City, Department of Biology, 2013.

Thimgan, M.S., Genetics of Sleep in Animals and Humans, American Professional Sleep Societies national meeting, Basics of Sleep postgraduate course, Baltimore, MD, 2013

Westenberg, D.J., Broad spectrum antibacterial properties of metal-ion doped borate bioactive glasses for clinical applications, Feng Chia University, Taichung, Taiwan, July 3, 2013.

Westenberg, D.J., Broad spectrum antibacterial properties of metal-ion doped borate bioactive glasses for clinical applications, Providence University, Taichung, Taiwan, July 10, 2013

Westenberg, D.J., Evaluation of Glass and Polymers as Delivery Agents for Antibacterials, China Medical University, Taichung, Taiwan, July 9, 2013

Westenberg, D.J., Flipping your lab to increase student engagement, ASM Conference on Undergraduate Education, Denver, CO May 16 – 19, 2013



Dr. Thimgan discusses his research with students at the October 2013 Open Lab hosted by Helix.

Westenberg, D.J., Integrated Math and Science Education Through Science Education and Quantitative Literacy (SEQL), NSTA National Conference. San Antonio, TX, April 13, 2013.

#### *Editorial*

Tiquia-Arashiro, S.M., and M.R. Mormile., Sustainable technologies: Bioenergy and biofuel from biowaste and biomass. *Environmental Technology*, **34**: 1637-1638, 2013.

#### *Conference Presentations/Abstracts*

Crossen, K. and K.B. Shannon, Do Mutations that Affect IQG1 Phosphorylation Change the Dynamics of an Actin Probe? Midwest Yeast Meeting, Northwestern University, Evanston IL, Sept. 28, 2013.

Edwards, T., and M.R. Mormile, pH Dependent Antibiotic Resistance of an Alkaliphilic Halotolerant Bacterium from Soap Lake, Washington, (Platform) Missouri Branch Meeting of ASM. Columbia, MO, March 22-23, 2013.

Frank R.L., Annotation and analysis of gene families in Glycine max using DNA Subway, Plant and Animal Genome Conference XXI. San Diego, CA, 2013.

Fry, H.E., H-J. Wang, Y-W. Huang, A. L. Martin, and R. S. Aronstam, M2 muscarinic receptor signaling through phospholipase C mediated by a modified G $\alpha$ q protein, 53rd Annual Meeting of the American Society for Cell Biology, New Orleans, LA, USA, December, 2013.

Huang, Y-W., F-Y. S. Hou, C-M. Hsu, C-J. Hsiao, and R. S. Aronstam, Mechanisms of toxicity and types of cell death induced by nanoscale particles. 53rd Annual Meeting of the American Society for Cell Biology, New Orleans, LA, USA, December, 2013.

Huang, Y.-W., C.C. Chusuei, C.-H. Wu, S. Mallavarapu, J.G. Winiarz and R.S. Aronstam, Cytotoxicity of Fourth Period Transition Metal Oxide Nanoparticles Depends on Certain Physicochemical Properties, TechConnect World Conference, Washington, DC, USA, May, 2013.

Huang, Y.-W., C.C. Chusuei, Chi-Heng Wu, S. Mallavarapu, J.G. Winiarz and R.S. Aronstam, Oxidative stress, cell viability and types of cell death induced by transition metal oxide nanoparticles depend on surface charge, available surface binding site, and ion dissolution, 52nd Annual Meeting of the Society of Toxicology, San Antonio, TX, USA, March, 2013.

Injamuri, S., G. Olbricht, V.A. Samaranayake and M.S. Thimgan, Mathematical modeling of sleep and wake in *Drosophila melanogaster*, Midwest *Drosophila* Conference, Allerton, IL, 2013.

Khalafi, N., S. Murray and M. Thimgan, Countermeasures to improve workers' performance and reduce errors due to inadequate and fatigue, Mary Kay O'Connor Process Safety Center International Symposium, College Station, TX, 2013.

Kitrell, E.F., J.G. Burken, M.R. Mormile, and M. Fitch, Potential acid mine drainage treatment utilizing acidophilic sulfate reducing bacteria in an upflow bioreactor, *Abst. Ann. Meet. Am. Soc. Microbiology*, May 18-21, Denver, Colorado (Q-337), May 18-21, 2013.

Li, M., Z. Yin, M.S. Thimgan and R. Qin, Tracking fast-moving, tiny flies by adaptive LBP feature and cascaded data association, Intl. Conf. on Image Processing, IEEE, Sydney, Australia, 2013.

Martin, A.L., H.L. Chambers, K.Z. Williams and R. AS Aronstam, Constitutive activity of orphan G protein coupled receptors, Constitutive Activity of Orphan G Protein Coupled Receptors, 4<sup>th</sup> GPCR Colloquium, American Society for Pharmacology & Experimental Therapeutics, Boston, MA, April, 2013.

Miller, D. and K.B Shannon, Phosphorylation of Iqg1 by Cyclin Dependent Kinase (CDK), Cdc28, Temporally Regulates Actin Ring Formation, Midwest Yeast Meeting, Northwestern University, Evanston IL, Sept. 28, 2013.

N. Khalafi, S. Murray, and M. Thimgan, Managing Sleep Deprived Workers, Proceedings of the American Society for Engineering Management International, 2013.

- Nelson, K. and K.B. Shannon, Does a Hof1 Mutation that Prevents Phosphorylation in the PEST Domain Affect Both Haploid and Diploid Yeast Cells?, Midwest Yeast Meeting, Northwestern University, Evanston IL, Sept. 28, 2013.
- Ottomeyer, M.E. and D.J. Westenberg, Broad Spectrum Antibacterial Properties of Metal-Ion Doped Borate Glass for Medical Applications, General Meeting of the American Society for Microbiology, Denver, CO, 2013.
- Ottomeyer, M.E. and Westenberg, D.J., Broad Spectrum Antibacterial Properties of Metal-Ion Doped Borate Glass for Medical Applications, Annual Meeting of the Missouri Branch of the American Society for Microbiology, Columbia, MO, 2013.
- Paul, V., D. Wronkiewicz, and M.R. Mormile, Biogeochemical Cycling and Microbial Diversity in the Microbialites of Storr's Lake, Bahamas, (Platform) Missouri Branch Meeting of ASM. Columbia, MO, March 22-23, 2013.
- Paul, V., D. Wronkiewicz, M.R. Mormile, and J.S. Foster, Microbialites in the hypersaline, light-limiting waters of Storr's Lake, Bahamas, *Abst. Ann. Meet. Am. Soc. Microbiology*, Denver, Colorado (N-743) May 18-21, 2013.
- Rivera, C., T. Hilderbrand, C. Hou and M.S. Thimgan, Differential impact of short sleep in a lipid metabolism mutant, Midwest *Drosophila* Conference, Allerton, IL, 2013.
- Roush, D., M.R. Mormile, D. Elias, and O. Sitton, Production of 1,3-Propanediol from Glycerol Under Haloalkaline Conditions, (Platform) Missouri Branch Meeting of ASM. Columbia, MO, March 22-23, 2013.
- Roush, D., M.R. Mormile, D. Elias, and O. Sitton, Production of 1,3-Propanediol from Glycerol Under Haloalkaline Conditions, (Platform) *Ann. Meet. Am. Soc. Microbiology*, Denver, Colorado, May 18-21, 2013 .
- Shannon, E.K., A.L. Martin, H.-J. Wang and R.S. Aronstam, M2 muscarinic receptor control of gene expression signaling mediated by  $G\alpha_s$ , Annual meeting, American Society for Cell Biology, New Orleans, LA, 2013.
- Thimgan, M.S., S. Injamuri, V.A. Samaranayake and G. Olbricht, Mathematical analysis of sleep and wake transitions in *Drosophila melanogaster*, American Professional Sleep Societies, Baltimore, MD, 2013.
- Westenberg, D.J., ASM's K-12 Outreach: Connecting the Past and Present with the Future of Microbiology. ASM Conference on Undergraduate Education, Denver, CO, 2013.



Dr. Aronstam greets students and their families at the December 2013 graduation reception.

**Extramural Income – Grants, Contract, BioTech Sales**  
**2013 Annual Report**

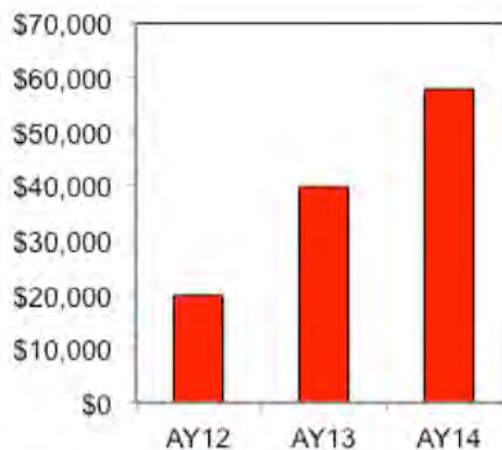
**AY13 Summary- Sponsored Programs Activity 7/1/2011 - 6/30/2012**

NAME	DIRECT COST	NET INDIRECT	TOTAL COSTS	SPONSOR NAME	PROJECT NAME
Aronstam, Robert	\$143,844	\$0	\$143,844	cDNA Resource Center	Biotech sales - clones, cells
Niyogi, Dev	\$22,764	\$5,919	\$28,683	Mill Creek Watershed	Stream ecology
Niyogi, Dev	\$294	\$254	\$448	Aquatech Engineering	Pond water quality study
Westenberg, D.J.	\$10,194	\$1,101	\$11,295	MO Dept Education	Science education
Westenberg, D.J.	\$32,993	\$4,068	\$37,061	Dow Chemical	Contamination Study
	<b>\$210,089</b>	<b>\$11,342</b>	<b>\$221,331</b>		

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

**Faculty Research Accounts**  
**Intramural research Funding**

In response to the challenging extramural funding situation (primarily reflecting lingering effects of the recession and reduced government spending), the faculty of the BioSci department has aggressively sought alternate means to fund faculty and student research. Our goal is to supplement extramural funding with enough money to keep all laboratories continuously active. We wish to develop sufficient additional sources of revenue to provide research accounts of \$10,000 per faculty member each year. Accordingly, three years ago we established Faculty Research Accounts. Funding has been obtained from biotech sales, alumni donations, PLTW credits, summer school tuition, and grant overhead return. This program is flourishing, and is a major factor in the increased faculty research productivity documented in this report. This year a total of \$62,000 was available for distribution (see graph).



Faculty Research Account funding. This program was initiated in AY12



**Seminar Program**  
**2013 Annual Report**

**Seminar director:** Dr. Melanie Mormile (Spring)  
 Dr. Dev Niyogi (Fall)



<b>Date</b>	<b>Speaker</b>	<b>Institution</b>	<b>Topic</b>
Jan. 28	Dr. Pamela Ryan	Truman State University	Mathematical Biology at Truman State Uniniversity
Feb 4	Dr. Guantam Dantas	Washington University	Genetic Reservoirs of Antibiotic Resistance in Environmental & Human Microbiota
Feb 11	Dr. Paul Stricker	Youth Sports Medicine Specialist	Environmental Stresses in Young Athletes
Feb 18	Dr. Mostafa Elshaed	Oklahoma State University	Genome of the anaerobic fungus Orpinomyces sp. C1A reveals the unique evolutionary history of a remarkable plant biomass degrader.
Mar. 4	Dr. Donald H. Burke Agüero	University of Missouri-Columbia	Suppressing HIV with RNA aptamers
Mar. 11	Dr. Ranier Glaser	University of Missouri-Columbia	Arenes and Heteroarenes in the Universe: Identification, Astronomical Localities and Chemical Mechanisms of Formation
Mar. 18	Dr. Thad Stanton	US Dept of Agriculture	Bugs, Drugs, and the Intestinal Ecosystem (Embracing Inner Selves- the Swine Intestinal Microbiome)
Apr. 1	Dr. William Folk	University of Missouri-Columbia	Ethnomedical Studies of Lessertia frutescens (Sutherlandia, Unwelw, cancer bush) – a South African phytotherapy
Apr. 15	Dr. Frank Schmidt	University of Missouri-Columbia	Building the RNA World, Piece by Piece
Apr. 22	Megan Ottomeyer	M.S. Degree Candidate	Broad-Spectrum Antibacterial Properties of Metal-Ion Doped Borate Bioactive Glasses for Clinical Applications
Apr. 29	Dr. Kelly Bender	Southern Illinois University	The Geomicrobiology of a Sulfate-Reducing Bioreactor Treating Coal Generated Acid Mine Drainage

<b>Date</b>	<b>Speaker</b>	<b>Institution</b>	<b>Topic</b>
Sept. 9	Dr. Daniel Oerther	Missouri S&T	Microbiology of the human gut and the obesity epidemic
Sept. 16	Dr. Edward Heist	Southern Illinois University	Preserving the Evolutionary Legacy of Endangered Pallid Sturgeon in Altered Big-River Ecosystems
Sept. 23	Dr. Craig Paukert	University of Missouri-Columbia	More than the Mississippi and Missouri: Conservation and Management of Other Large River Fishes in the Midwest
Sept. 30	Dr. Jason Knouft	Saint Louis University	Climate Change and Freshwater Biodiversity
Oct. 7	Dr. Suzanne Femmer	US Geological Survey	Nutrient criteria and algal communities in Ozark streams
Oct. 17	Dr. John R. Jones	University of Missouri-Columbia	Regional patterns and natural variability in Missouri reservoirs
Oct. 21	Dr. Ann Allert	US Geological Survey	Effects of Mining-Derived Metals on Stream Invertebrate Communities in Several Mining Districts of Central USA
Oct. 28	Dr. Joel G. Burken	Missouri S&T	Mother Nature as Witness and Engineer: What's That Worth?
Nov. 4	Dr. Mark Fitch	Missouri S&T	Passive removal of toxic metals from mine-impacted water
Nov. 11	Dr. Jeffrey T. Briggler	University of Missouri	The Hellbender – A Journey in Saving a Declining Ozark Highland Salaman
Nov. 14	Dr. John Havel	Missouri State University	Biological invasions: the roles of dispersal and invasibility

## Undergraduate Education 2013 Annual Report

Missouri S&T's thriving **Biological Sciences** community included 222 undergraduate majors in 2013 (4<sup>th</sup> week fall semester enrollment reports), a 56% increase over the last 5 years. **Dr. Katie Shannon** chaired the Undergraduate Education Committee in 2013.

### 2013 Highlights

- record number of student credit hours ( $\approx 4,900$ )
- Service learning courses engaged in by all seniors
- 78 BioSci students were named to the Provost's Academic Scholars List for the fall 2013 semester
- 49 BioSci majors graduated in 2013 (vs. 36 in 2010); 27 graduated with honors: 12 summa cum laude, 14 magna cum laude, 1 cum laude
- 19 students were awarded OURE scholarships to perform research in the BioSci department (vs. 11 in 2010)



Some of our May 2013 graduates

### Courses Offered

#### Spring 2013

- Bio 110 General Biology
- Bio 112 General Biology Lab
- Bio 113 Biodiversity
- Bio 114 Biodiversity Lab
- Bio 150 Biotechnology in Film
- Bio 201 Sleep and Behavior
- Bio 211 Cell Biology
- Bio 212 Cell Biology Lab
- Bio 221 Microbiology
- Bio 222 Microbiology Lab
- Bio 231 General Genetics
- Bio 241 Human Anatomy & Physiology II
- Bio 246 Human Anatomy & Physiology lab
- Bio 251 Ecology
- Bio 271 Issues in Public Health
- Bio 300 Special Problem
- Bio 301 Introduction to Astrobiology
- Bio 315 Developmental Biology
- Bio 334 Genomics
- Bio 358 Advanced Biodiversity
- Bio 364 Global Ecology
- Bio 375 Biological Design and Innovation I
- Bio 382 Neurobiology

- Bio 388 Biomedical Problems
- Bio 390 Undergraduate Research



Some of our December 2013 graduates

### Summer 2013

- Bio 211 Cell Biology
- Bio 235 Evolution
- Bio 201 Field Ecology
- Bio 201 Cave biology
- Bio 235 Evolution
- Bio 375 Biological Design and Innovation I
- 

### Fall 2013

- Bio 102 Intro to Biological Sciences
- Bio 110 General Biology
- Bio 111 Principles of Biology
- Bio 112 General Biology Lab
- Bio 151 Intro to Environmental Sciences
- Bio 211 Cell Biology
- Bio 212 Cell Biology Lab
- Bio 221 Microbiology
- Bio 222 Microbiology Lab
- Bio 231 General Genetics
- Bio 235 Evolution
- Bio 241 Human Anatomy & Physiology I
- Bio 246 Human Anatomy & Physiology lab
- Bio 251 Ecology
- Bio 300 Special Problems
- Bio 301 Nanobiotechnology
- Bio 310 Seminar
- Bio 321 Pathogenic Microbiology
- Bio 328 Nutrition
- Bio 331 Molecular Genetics
- Bio 332 Molecular Genetics Lab
- Bio 335 Cancer Cell Biology
- Bio 354 Freshwater Ecology
- Bio 390 Undergrad Research

### Bio-Star Awards

BioStar award winners for AY13 were announced in April. These awards recognize outstanding achievements by BioSci students. A faculty committee selected the winners; the winners received a certificate and flash drive.

Graduating Senior	<b>Amanda Foster</b>
Graduate Teaching Assistant	<b>Lisa Snoderly-Foster</b>
Graduate Student Research	<b>Daniel Rousch</b>
Undergraduate Research	<b>Katie Payne</b>
Leadership	<b>Shelby Emmett and Alex Willis</b>

### BioSci Graduates 2013

#### May 2013

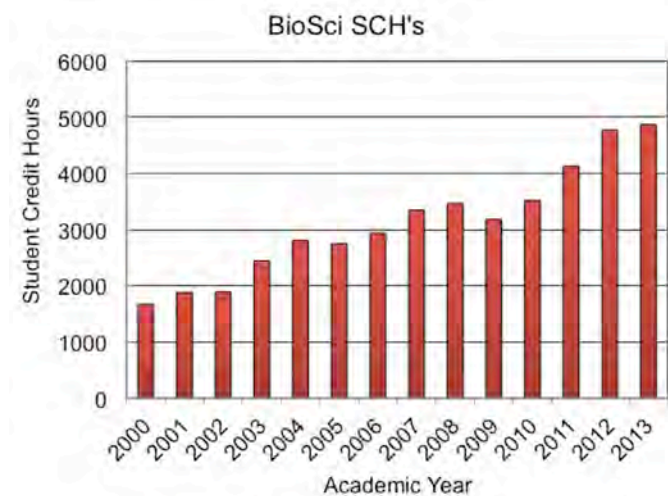
##### Undergraduates

Molli Marie Barnhart  
Grace Ann Bay  
Brittany Mechelle Brand  
Andrew Cole Bromet  
Matthew Allen Burkett  
Aaron Scott Carson  
Matthew Tyler Coates  
Kevin Jay Creighton  
Tiffany Charlynn Edwards  
Shelby Terrill Emmett  
Amanda Kate Foster  
Annamaria Danielle Gaitan  
Peter McSpaden Haw  
Katelyn LeAnn Heil  
Avery Bryn Joseph  
Kristin Marie Kelly  
Saidah Aisha Kindell  
Ian Mitchel King  
Hope Christine Kirby  
Erica Dacy McFarland  
Crystal Leighann Meeks  
Mave Ailene Miller  
Anna Leigh Neubert  
Jessica Earlene Oxley  
Hailee Brooke Parks  
Carlos Eduardo Rivera  
Charlene Heide Ruwwe  
Lindsey Caitlin Schobert  
Lisa Cristine Simone  
Larry Michael Tolliver  
Natalie Jean Updyke  
Alex Brian Willis, Jr.  
Christine Louis Wood

#### December 2013

##### Undergraduates

Hannah Lee Barber  
Krizzia DeVeronese Castro  
Chantal Danielle Chambers  
Andrew Lawrence Glover  
Kyesha Krishel Hall  
Matthew Brian Hayes  
Kelsey Paige Hunt  
Michael Ray Jennings, Jr.  
Andrew Calvin Jones  
Brianna Diane Kroeger  
Alexandria Elizabeth Lore  
Andrew Thomas Lott  
Kyle Matthew Rich  
Sarah Rochelle Rommelfanger  
Ashley Renee Shockley  
Charles Caleb Stephens



## S&T Undergraduate Research Day

BioSci students participated in the **Annual Undergraduate Research Conference** (April 2013).

BioSci students receiving awards included:

Katie Payne – 2<sup>nd</sup> place Sciences - Oral Presentation

Hannah Frye 3<sup>rd</sup> place, Sciences - Poster Presentation.

Tiffany Edwards 3<sup>rd</sup> place - Research Proposal Poster

Annamaria Gaitan – 1<sup>st</sup> place - Research Proposal Poster

**Erica McFarland** was the year's Gale Hufham Scholarship winner.

**Sierra Comer** and **Chelsea Ehret** were awarded the first Troutbuster Scholarship.



BioSci students Chelsea Ehret and Morgan Kleeschulte interact with students and community members at the 2013 Earth Day celebration.



Katlyn Meier and Jamie Phelps were named Bryant Scholars and will attend the University of Missouri Medical School upon graduation.



Dr. Aronstam takes a pie in the face as part of a student fund raising effort. Now first year student Jordan Powell will probably never graduate from S&T.



S&T alumnus Dr. Paul Stricker returned to campus to lecture in Anatomy and Physiology and to meet with S&T students in *Scrubs*, pre-med student organization.

## Field Courses

### 2013 Annual Report

BioSci has been offering an increasing number of field courses and incorporating field exercises in their regular courses.



Field Ecology, May 2013



Cave Biology class led by Onadaga Cave State Park naturalist (And S&T graduate), Maria Potter, May 2013.



Dr. David Westeburg leads his Microbiology class on a tour of the Rolla water treatment plant.



Amanda Lowe leads Field Ecology class, May 2013



Field Ecology, May 2013



Ecology field trip to Prairie Lake Conservation Area in St. James, September 2013.

Field courses (one week in May):  
Cave Biology  
Ozark Vegetation  
Field Ecology

The **Advanced BioDiversity** class led by Dr. Melanie Mormile, traveled to San Salvador Island, the Bahamas, from May 27 to June 4. While on the island, the class studied the diversity of organisms in environments that included sand dunes, tidal pools, salt lakes, mangrove stands, and coral reefs. The students had the opportunity to snorkel and explore the diversity at the coral reefs. They also discovered great diversity in the fish, birds, reptiles, invertebrates, and plants associated with the island. In addition, they saw first hand how humans pact this diversity. For more information, see the "[Missouri S&T San Salvador 2013](#)" page on FaceBook.



The students enjoyed collecting samples and data at Storr's Lake.



Everyone was interested in the Sally Light Foot Crabs that were seen along the paved road.



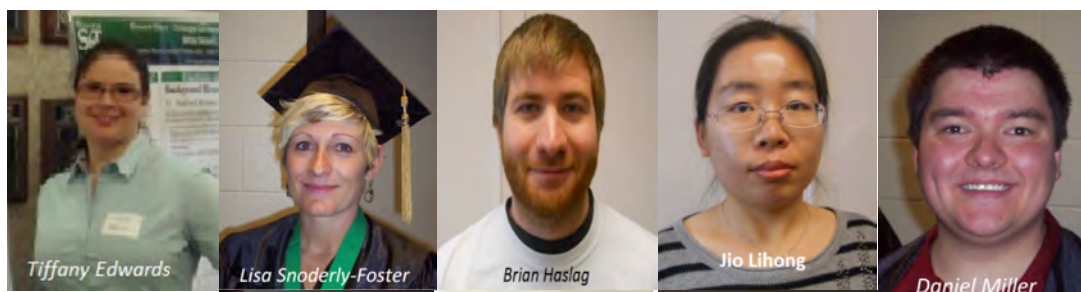
Not only did the students explore modern diversity, they were also able to fossilized coral reef beds (and enjoy beautiful scenery).

**Graduate Education  
2013 Annual Report**

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

**Drs. Yue-wern Huang** chaired the department’s Graduate Studies Committee in 2013. Options for instituting doctoral level training in biology on the Rolla campus continue to be explored and are incorporated in our strategic plan.

Three thesis students earned an MS degree in Environmental and Applied Biology.



**2013 Graduate Students**

(\* non-thesis)

- Tiffany Edwards
- Lisa Snoderly-Foster
- Brian Haslag
- Jio Lihong
- Daniel Miller
- Megan Ottomyer
- Carlos Rivera
- Daniel Roush
- Karen Schilli\*
- Gregory Travis Thompson
- Kele Thraikill
- Larry Tolliver
- Richard Watters



**2013 Thesis defenses**

<b>Student</b>	<b>Thesis Title</b>	<b>Advisor</b>
Megan Ottomeyer	Broad Spectrum Antibacterial Properties of Metal Ion Doped Borate Bioactive Glasses for Clinical Applications	David Westenberg
Kele Thraikill	Wetting-Drying Cycles and the Fungal Communities on Leaf Litter in Streams	Dev Niyogi
Daniel Roush	Production of 1,3-propanediol from Glycerol Under Haloalkaline Conditions by Halanaerobium Hydrogeniformans	Melanie Mormile

**cDNA Resource Center  
Annual Report 2013**

The Missouri S&T cDNA Resource Center provides full-length cDNA clones encoding human signal transduction proteins to the international research community. [www.cdna.org](http://www.cdna.org)

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

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



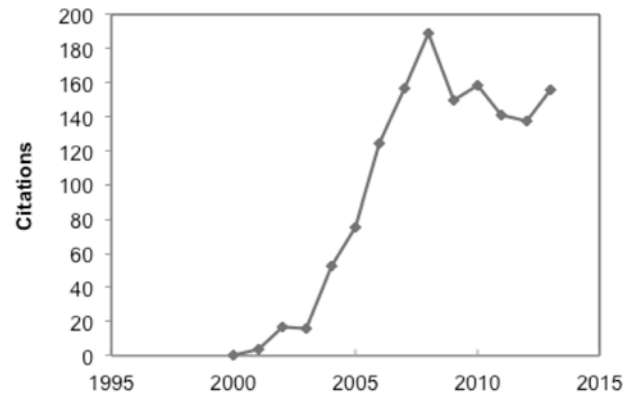
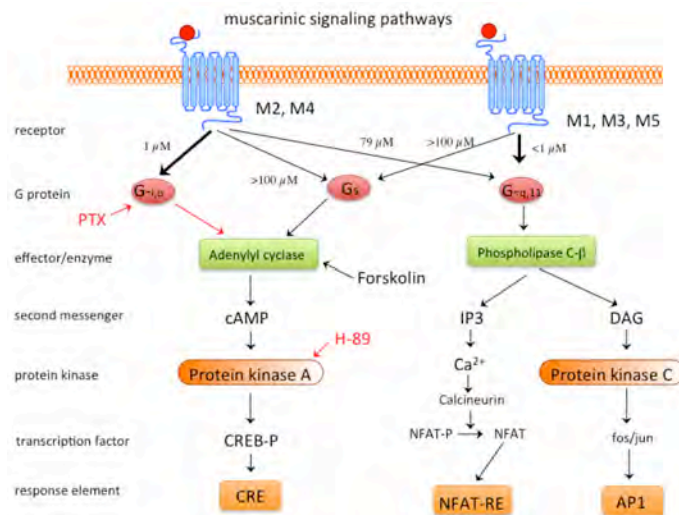
**cDNA Center Staff:**  
Adam Martin, M.S., Manager  
Vanessa Kaighin, Research Specialist  
Derrick Callahan, Student intern  
Robert Aronstam, PhD, director

In 2013, proceeds from the Center were used to support 1) faculty research accounts; 2) faculty and student travel to scientific conferences; 3) the NTNU student exchange program; 4) research in the Laboratory of Neurobiology; 5) the departmental seminar program; and 6) departmental operations.

**2013 Highlights**

- sales surpassed \$2.1 million since establishment at S&T in AY05
- five special projects (custom syntheses) were completed
- employed/trained 4 student technicians
- supported research rotations in basic molecular biology and DNA sequencing for the campus
- initiated a project to labeled G protein coupled receptors with fluorescent proteins
- citations to the “cDNA Resource Center” in scientific publications (PubMed database) has now exceeded 1,500, including 156 in 2013.

[www.cdna.org](http://www.cdna.org)



Citations to the cDNA Resource Center in the scientific literature.

Receptor and G Proteins are provided by the Center in support of signal transduction research by scientists throughout the world.



## Senior Seminar Service Learning Class

### 2013 Annual Report

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

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

The nature of our students' service learning projects is diverse and impressive. Students provided presentations at public schools in Rolla, St. James, and Success, raised funds for a variety of worthy causes including Juvenile Diabetes, Breast Cancer, and Leukemia, provided information to S&T students on nutrition and white nose syndrome in bats, and sent shoes to Africa. Photos of some of the projects are posted on the BioSci Facebook page ("[Missouri S&T Biology](#)").



S&T students visited Success School District to present to 6<sup>th</sup>-8<sup>th</sup> graders about exercise and nutrition. Admissions provided S&T shirts for the students.

### Student Projects 2013

- **Success for a Healthy Future** – Gave a presentation on exercise and nutrition to 6<sup>th</sup> – 8<sup>th</sup> graders in the Success School District
- **Scaring for a Cure** – Assisted with a Haunted Maze to raise money for Juvenile Diabetes Foundation
- **Smile Big** – Presented on Oral Health to 4<sup>th</sup> graders at Mark Twain Elementary in Rolla
- **Paint it Pink** – Helped organize a color run 5K to raise money and awareness of breast cancer
- **Hygiene and You** – Visited Boys and Girls town in St. James to provide donations and information on personal hygiene
- **White Nose Syndrome** – Gave presentation at S&T dorm on a disease threatening bats in Missouri
- **Sole Hope** – Hosted shoe making parties to combat parasites of the feet and provide employment for women in Africa
- **Cotton Candy for the Cure** – Sold cotton candy at S&T Festival of Nations as a fundraiser for a Leukemia patient
- **The Importance of Nutrition** – Provided healthy snacks and nutrition information to S&T students at Havener
- **Flu Fighters** – Demonstrated flu prevention strategies at Rolla Middle School

**Dr. Katie Shannon** has directed the department's service learning course for the last 4 years. In recognition of her efforts, Dr. Shannon received the **2012 Faculty Service Learning Award**.

S&T students Tara Voyles, Taylor Buescher, Brianna Kroeger, Jeremiah Herbert and Toni Knar pose with donated denim for making shoes.



**Helix**  
**2013 Annual Report**

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

Helix strives to provide a sense of companionship for students studying Biological Sciences and other related fields. We encourage participation in service and social events.



Zoo Trip

**2013 Activities:**

- Helix Trip to Columbia, MO for the regional ASM conference
- Trip to St. Louis Zoo
- Ice-cream social
- Welcome Back Float Trip
- Open lab to introduce students to research opportunities within Schrenk
- S'mores and Scheduling (to aid underclassmen in registering for classes)
- Volunteering with the Humane Society
- Adopt-A-Family
- Assisting Senior Projects



ASM  
Conference



Adopt-A-Family

Humane Society



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

**2013 Officers:**

- President:** Sahitya Injamuri
- Vice President:** Candace Miller
- Secretary:** Thomas Congdon
- Treasurer:** Alex Craig
- Off-Campus Events Coordinator:** Tara Voyles
- Open Lab Coordinator:** Jacqueline Wolf
- Historian:** Connor Hines
- Webmaster:** Jeremiah Herbert
- Student Council Representative:** Justin Cole



S'mores and  
Scheduling

# iGEM 2013 Annual Report

## Missouri S&T International Genetically Engineered Machines Team



The Missouri S&T iGEM team is a synthetic biology research and design team affiliated with the iGEM Foundation, which is dedicated to research and education as well as the advancement of open collaboration in the field of synthetic biology. The team participates in the iGEM yearly competition between teams across the Americas and the world.

The Missouri S&T iGEM team seeks to...

- Engineer synthetic biological systems to help advance the iGEM Registry of Standard Biological Parts and the field of synthetic biology
- Increase awareness of iGEM and synthetic biology
- Provide experiential research opportunities to undergraduate students

### 2013 Highlights

Implementation of an online Lab Training Program for new members

- Increased membership and team member involvement
- Several large scale public relations educational events
  - Exploring Synthetic Biology in Spring 2013
  - The Science behind *The Immortal Life of Henrietta Lacks* in Fall 2013, in collaboration with the S&T English and Technical Communication Department
  - Speak Up Speak Out in Fall 2013, in collaboration with Leadership and Cultural Programs
- Successful Fundraising in the forms of Soup Fundraisers and a Henna Fundraiser
- Development of a newsletter for alumni, corporate sponsors, and interested individuals



### Project & Competition

The S&T iGEM team decided not to attend the 2014 Jamboree competition and instead used 2013 as a year for team development and new member training. For the 2014 competition, the team is working on a project using cyanobacteria to filter out harmful pollutants such as nitric oxide from coal flus and convert them into cost-effective fertilizer.

### 2013 Officers

Sarah Rommelfanger – President  
Emily Puleo – Vice President  
Hannah Frye – Public Relations Officer  
Beth Wilkins – Treasurer

Jordan Sanders – Secretary  
Emilio Navarro – Webmaster  
Alie Abele – Lab Manager  
Levi Palmer – Safety Liaison and Social Chair

Websites: <http://igem.mst.edu/> and <http://sdelc.orgsync.com/org/igem/home>

## Phi Sigma Biological Sciences Honor Society

### 2013 Annual Report

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



#### 2013-2014 officers:

**President:** Nikki Gomez

**Vice President:** Toni Knar

**Treasurer:** Kirstin Bier

**Faculty Advisor:** Dr. Ronald Frank

#### 2013 Spring Semester Activities:

- Pasta Lunch raised money for the Outstanding Freshman Scholarship
- Penny Wars raised money for the Outstanding Freshman Scholarship
- Inducted new members
- Volunteered for Miner Phone-A-Thon in April
- Adopted a stretch of highway down 10th Street from the Quad to the Rolla High School

#### 2013 Fall Semester Activities:

- Cleaned for Adopt-A-Highway on multiple occasions
- Held a Halloween Social to help members to get to know each other
- Helped promote the panel discussion and ethics/research presentation on Henrietta Lacks
- Awarded Victoria Grill the Outstanding Freshman Scholarship
- Started the process to update the Chapter Constitution
- Updated and have a working model for the Points System
- Participated in Waynesville High School's 1<sup>st</sup> Annual STEM Expo
- Switched over to OrgSync for the keeping of files, forms, and records
- Started holding meetings that fall on different dates and times to accommodate more members



## Scrubs

### HOSA – Student Organization

#### 2013 Annual Report

- Heard from many exciting speakers, including KCUMB, a cardiologist, a panel of S&T students accepted into professional school, the director of PCRMC's ER, and others
- Hosted many social events, including a welcome back BBQ in August
- Participated in a Tour of the Body Cadaver Lab Tour at Logan College of Chiropractic
- Hosted a Patient-Based Learning Session with Mizzou Med student leaders
- Toured UMKC's medical and pharmacy schools
- Competed in our first ever HOSA Missouri State Competition and took home 9 gold medals!



Hearing from Dr. Moore, a St. Louis cardiologist



Lauren, Kelsey and Alex at the HOSA State Competition

#### Where We're Headed in 2014:

- Continuing to hear from great speaker at our meetings
- Another Cadaver Lab Tour, UMKC visit, and other trips
- MCAT study groups and prep
- Service-based learning and volunteering projects
- Strengthening partnerships with PCRMC, Student Health, AHEC and others

#### Visit Us!

Facebook Page:  
[Missouri S&T Scrubs](#)

Scrubs-HOSA's mission is to increase awareness and understanding of career opportunities available in all health fields and to help prepare S&T students to apply for those positions.

#### Spring 2013 Scrubs Officers

**President:** Alex Willis

**Vice President:** Aaron Carson

**Secretary:** Clayton Buback

**Treasurer:** Megan Schuller

**Public Relations Officer:** Lauren Moore

**Hospital Relations Officer:** Jamie Phelps

**Correspondence Officer:** Krizzia Castro

**Community Relations Officer:** Kelsey Hunt

**StuCo Rep:** Donnie Roshan

**Advisor:** Dr. Westenberg



Spring Semester Officers

#### Fall 2013 Scrubs Officers

**President:** Kelsey Hunt

**Vice President:** Lauren Moore

**Secretary:** Clayton Buback

**Treasurer:** Zach Woolsey

**Public Relations Officer:** Kiran Patel

**Hospital Relations Officer:** Donny Roshan

**Correspondence Officer:** Jamie Phelps

**Community Relations Officer:** Anne Safron

**StuCo Rep:** Justin Cole

**Advisor:** Dr. Westenberg



Cadaver Lab Tour

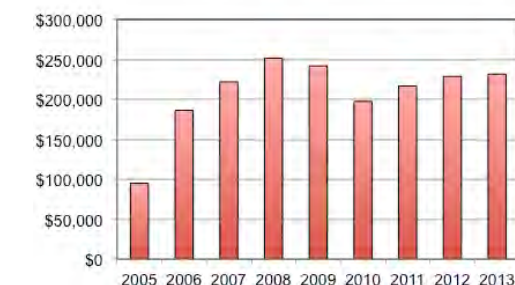
## Donors

### 2013 Annual Report

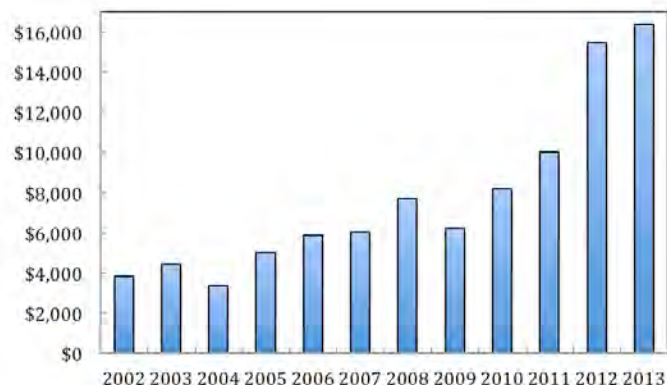
#### BioSci Partners 2013

We are pleased to recognize those who generously supported the department in 2013. Donations to the department increase to a record \$16,385. 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 on the S&T web site ([givingtomst.missouri.edu](http://givingtomst.missouri.edu)) (be sure to designate Biological Sciences as the recipient fund). The cadre of BioSci alumni continues to grow, although half have graduated in the last 10 years, reflecting our recent growth.



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



Donations to the BioSci department in the indicated calendar year.

Finally, **TroutBusters of Missouri** renewed their funding of scholarships for S&T Ecology students.

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

#### Donations of \$1000 and above

Amedica  
Robert and Joan Aronstam  
Baxter International Foundation  
Dr. Melanie Mormile  
Joseph A. Safron  
Dr. Stacy Lynd Story  
Troutbusters of Missouri

#### Donations \$500 - \$999

Dr. James Francis Fiechtl  
Rebecca May Fiechtl  
Midwest Science (MIDSCI)

#### Donations \$100 to \$499

Michael C. Abernathy  
Michelle R. Brosnahan  
Ann M. Caudill  
Betsy Marie Dampier  
Dr. Brian Edward Haggard

Amy Marie Johnston  
Anthony Kaczmarek  
Julie Kaczmarek  
Christiane Kay Korba  
Anthony C Korba  
Helen P. Law  
Dr. Paula M. Lutz  
Leonard J. Lutz  
Michael W. McMenus  
Monsanto Fund  
Leslie Wayne Moody  
Brad Allen Rucker  
Marcie Lanette Rucker  
Dr. Paul Stricker

#### Donations < \$100

Dr. Kathleen B. Bottroff D.O.  
Rachel Lee Carter  
John Gerald Cooley  
Gerald Alan Griffith

Taylor A. Hahn  
Dr. George W. Karr  
Jonathan Kwantes  
Lisa Lindesmith  
Stanley Lindesmith  
Susan Nickols  
Steven C. Peppers  
Richard Alan Schmidt  
Christina Marie Schmidt  
Erica Shannon  
Dr. John Joseph Stansfield  
Dr. Julie Deles Stansfield  
Sara J. Stephens  
Joseph G. Sueme III  
Julie Sellmeyer Townsend  
Matthew F. Vogel