

## Department Update

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## Spring Phonathon

April 15-20 2010

Your chance to update your contact info, share your thoughts and news, talk with current BioSci students, and contribute to the Biological Sciences department.

## Development of a Miniature Species and its Implications

Miniaturization. In the animal realm we think of teacup poodles and tiny Chihuahuas but have we ever thought more about “small” animals? SARAH HAVENS has! In her research at Missouri University of Science and Technology in DR. ANNE MAGLIA'S Herpetology lab she has been researching the developmental patterns of a miniature tree frog species, *Acris Blanchardi* (Blanchard's cricket frog).

*Acris blanchardi* is of interest because it is a species that was once very common but is now showing signs of decline. SARAH discovered that this frog is also found as a miniature. In this case being a miniature means that it is more than just small but shows signs of adaptation for living as a miniature. These adaptations include loss of bone elements in the cranium and morphological novelties. Morphological novelties are unique developments not seen in many species or any other species. *Acris* has a nasal element that is formed by both dermal and endochondral bone which has not been seen in other species.

Miniaturization is also an interesting evolutionary development. We commonly see species grow larger over time when examining the evolutionary record and it is a gradual change. However, miniaturization appears to happen quite quickly and also has happened many times. Miniaturization is believed to be a necessary adaptation that allows a species to live in a previously unused niche, make use of a previously unused food source, reach reproductive maturity quicker, avoid predation or survive in island situations.

SARAH'S research is focused on the development of the tadpole in comparison to two closely related species, *Pseudacris crucifer* and *Hyla lanciformis*. This research began with tadpoles in different developmental stages being cleared and stained. This process clears away muscle and skin making it see through and then stains the bone and cartilage.



Sarah examining her tadpoles using the microscope in the Herpetology lab.

Tadpoles begin as all cartilage and through their development the cartilage ossifies to become bone. The tadpoles are then examined very closely from one stage to another. The results are summed up with detailed descriptions of shape and relative size and timing. Thus far in her research she has found that *Acris* development of the body is similar to that of the other species examined but the cranium develops differently.

# Faculty News

## Faculty Publications, 2009

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## Presentations at Professional Meetings, 2009

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



Dr. Aronstam hangs out with students Karen Schilli, Josh Erickson, and Crystal Halloran at the Schrenk Hall Holiday Party



Dr. Shannon and Ms. Wilson enjoy the food at the Schrenk Hall Holiday Party.



# Department Update

As always, the BioSci community has much to celebrate. Here are some of the highlights since our October newsletter.

**Students:** Degrees were awarded to 16 undergraduates at our December commencement ceremony. With the 24 May graduates, we awarded 40 undergraduate degrees in calendar 2009 – a new record. Fortunately 50 undergraduates (34 first year and 16 transfers) began their studies in biology at S&T In August (another record).

**Facilities:** The BioSci department received a grant of \$249,000 through the Caring for Missourians initiative that is designed to increase the entry of students into health care professions. Historically, about a third of our graduates go into a health care field, (medical school, dental school, veterinary school, pharmacy, physical therapy, etc.). In addition, in 2009, three of our graduates entered an accelerated RN program. The Caring for Missourians funds will be used to renovate our 3 primary teaching laboratories and to enhance our technical capabilities through the purchase of analytical equipment.

**Research:** Faculty research publications are listed elsewhere in this newsletter. One faculty, **DR. MELANIE MORMILE**, began a research leave in Columbia, Missouri. Two visiting scholars from Taiwan National Normal University have spent the last 6 months in our department; three others will join us later in the spring semester. Clones sales from the cDNA Resource Center exceeded \$220,000 in CY09 and \$1.5 million since 2005.

**Department/University Finances:** The economic downturn is squeezing us, but we are in better shape than many similar universities. The University of Missouri and the State of Missouri are conservatively managed, and Missouri tends to lag the rest of the nation both in going into and coming out of a recession. State funding (and tuition) has been frozen for the last two academic years, and federal stimulus funding has been required to maintain even this level of funding. We anticipate a 5% reduction in state funding for Academic Year 2011 (note, however, that only 30% of our budget comes from the state). Insofar as perhaps 75% of our budget is for personnel, a freeze on hiring has been implemented. The university presently has 37 unfilled faculty lines ( $\approx 11\%$  of the total). BioSci has 1.5 unfilled faculty positions, a major problem for our relatively small department. Economic conditions have led to a surge in interest in our programs: the number of biology applicants has increased by 20% in each of the last two years (see accompanying chart). We are seeing increased numbers of both reentry students and students attracted by the value of a public university education. One of our biggest challenges is to continue to offer research opportunities for all of our students. The expansion of our cell engineering-research design team (iGEM) has helped in the latter regard. Historically (10 years), over 80% of our undergraduates participate in research.

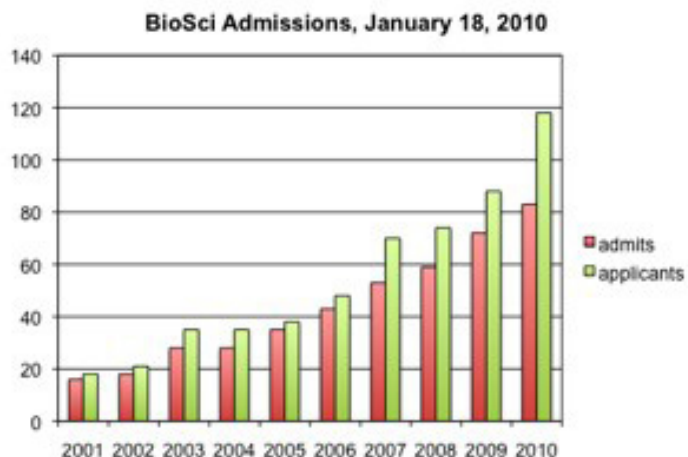
**Project Lead the Way:** We hosted a training session for master high school teachers involved in the Project Lead The Way – Biomedical Sciences curriculum in the summer of 2009. This went exceptionally well, and we are now scheduled for up to 7 training sessions in 2010. In addition to supporting a wonderful initiative that offers a creative and rigorous 4 course secondary biology curriculum, the program offers some specific advantages to our department and school, including the purchase of additional laboratory equipment, summer employment and training for undergraduate students, and an increased awareness of the unique opportunities for training in biological sciences at Missouri S&T. **MS. TERRY WILSON** and I attended the PLTW conference for State Affiliate directors in Austin in November, and we helped Dr. Ralph Flori host a PLTW conference for Missouri high schools interested in adopting the biomedical sciences program in January 2010.

So, the BioSci community at S&T continues to thrive. Our major challenge is to maintain our quality and unique approach while creatively addressing the financial storms. I am pleased to report our activities to you. Your comments and suggestions are always welcome. As always, I invite you to visit the department for a tour and update on our work.

Sincerely,



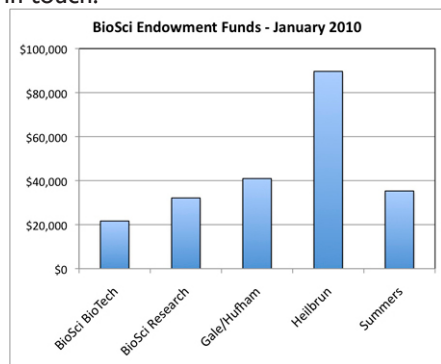
Robert S. Aronstam, Ph.D.  
Professor and Chair, Biological Sciences



## 2009 Research Partners

We are pleased to acknowledge those who generously supported the department in 2009 through donations designated for research, teaching and scholarship programs. Contributions are welcome at any time during the year on the S&T web site ([givingtomst.missouri.edu](http://givingtomst.missouri.edu)) (Of course, we're sure you'll want to specify Biological Sciences as the recipient fund). We can only reach about 20% of our alumni during our April Phonathon, although many more of you respond to our written solicitation (also in April). While the cadre of BioSci alumni has grown to over 430, half of our students graduated in the last 10 years and are still in the early phases of their careers.

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



### Donations up to \$100

Algaier, Mark David  
Behm, Laurie L  
Bennett, Martha A  
Carter, Rachel Lee  
Cologna, Raymond Joseph  
Cooley, John Gerald  
Dampier, Betsy Marie  
Elsenrath, David Anthony  
Griffith, Gerald Alan  
Haas, Michael John  
Humphrey, Maribeth A  
Jacobi, Jennifer L  
Karr, George Winsler  
Kindle, Jason Lynn  
Kwantes, Jonathan Michael  
Lindesmith, Lisa Chon  
Martine, Andrew Ryan  
McCallister, Lynn W  
Michaelsen, Linda J  
Nickols, Susan Marie  
Padgett, Hal Stover  
Padgett, Kerstien Andrea  
Ross, Jeffery Tobias  
Rucker, Marcie Lanette  
Schipper, Lisa Kaye

Schlarman, David E  
Sheek, Ashley Jo  
Stansfield, Julie Deles  
Sueme, Joseph George  
Thompson, Margaret Joan  
Vogel, Matthew F  
Ward, Laura Marie  
Winkeler, Kimberly Ann

### Donations up to \$999

Arredondo, Lachelle Renae  
Baxter International Foundation  
Delaney, Lisa Roberta  
Fiechtl, James Francis  
Haggard, Brian Edward  
Highfill, Gary Rex  
IBM  
Kaczmarek, Julie  
Lutz, Paula M  
McMenus, Michael W  
Phillips, Robert Leroy  
Safron, Joseph  
Shaffer, Jessica A  
Statler, Mark Steven  
Stricker, Paul Robert  
Youth Sports Awareness Enterprise

### Donations > 1,000

Aronstam, Robert Steven

## Senior Seminar Students Conduct Service Learning Projects

In the fall, 30 seniors enrolled in Senior Seminar designed biologically related service projects. The goal was for students to practice group communication and organization skills while giving back to the community. The projects showed a range of student interests: cleaning up Onondaga Cave, assisting with Truman Elementary PE Club, presenting dental health to St. Patrick's Elementary, raising money and awareness for the Foundation for Fighting Blindness, raising awareness about Mental Health on campus, renovating the kitten room at the Tri-county Humane Society, and fundraising for Phelps County Animal Welfare League.



Nicole Buxton watches as Anna Growcock and Thias Diaz-Fueroa demonstrate proper brushing technique for the class using their tooth model.

One successful project was a Dental Day Demonstration for the first grade students at St. Patrick's Elementary School. Students who conducted the project were **ANNA GROWCOCK, THE-RESA TYREE, NICOLE BUXTON**, and **THIAS DIAZ-FIGUEROA**. The purpose was to keep the children up-to-date with proper techniques, how many times to brush and floss, and examples of foods that can damage the teeth. The group wanted to make sure they benefited from the information, but also wanted to make sure kids could do it themselves at home. Visual learning techniques were used, including a giant tooth model, and children volunteered to be teeth so floss could be put between them. The group gave them little games to play that improved their brushing technique and that makes them brush for the correct amount of time.

The presentation was a complete success. The group gave them a quiz at the end and the students answered the majority of the questions correctly. The students especially enjoyed the visual aids that included cavity pictures, rotten apples, and eggshells soaked in soda. These examples not only showed them the importance of flossing and brushing, it also gave them knowledge of bad foods to eat and what happens inside of the mouth. To make sure the demonstration is given frequently, the group assembled a box that included the tooth model, all of the hand-outs, donations, and contacts to the school and Forum Dental office that donated supplies.



# Student Organization News

## iGEM Team Competes at MIT

Each year, MIT hosts a competition for synthetic biology known as the International Genetically Engineered Machines (iGEM) Jamboree where the most innovative teams earn high recognition. Teams begin research with kits containing the necessary DNA parts. They travel to Boston and share what they have created and learned with other students and professors. On October 30th, **MARCUS HAYER, SOO YOUNG SHIN, PATRICK MARTIN, NICOLE HURD, ERICA SHANNON, AMANDA FOSTER, and DR. DAVID WESTENBERG** represented their team at the 2009 iGEM Jamboree. They delivered their Microbial Fuel Cell project as oral and poster presentation. The S&T team gained a lot of experience and knowledge of the synthetic biology field, and were able to network with other researchers. To learn more, go to the iGEM website at <http://2009.igem.org>.



iGEM members Nicole Hurd, Marcus Hayer, Patrick Martin, Amanda Foster, Soo Young Shin, and Erica Shannon put the final touches on their presentation at MIT.

## Scrubs helps with Wellness Fair

Healthy for Life hosted its annual Faculty & Staff Wellness Fair November 19, 2009 at the Havener Center. Scrubs' members volunteered their time to help with the free health screening of all university employees and their family members. The fair focused on preventing diabetes and provided tests that determined blood sugar, blood pressure, cholesterol, and body mass index. Seasonal flu shots were also provided. In addition, the students volunteered their time to help individuals register for a program called Be The Match, the new name for the National Marrow Donor Program (NMDP) Registry. The NMDP exceeded its goal, with forty-five people registered and had their cheeks swabbed to obtain cells for testing.

## Helix Hosts Ice Cream Social



Josh Erickson and Helix president Karen Schilli enjoy some refreshing root beer at the ice cream social.

## December 2009 BioSci Graduates

Sixteen Missouri S&T students received a B.A. or B.S. in Biological Sciences during the Dec. 2009 Missouri S&T Commencement ceremony.



Dr. Westenberg poses with graduates Zak Anderson-Boland, Theresa Tyree, Krista Stewart, Anna Growcock, Thias Diaz-Figueroa, Kimberly Earl, Daniel Schwent, Anthony Gonzalez, Amy Kalloch, Jacob Lister

## Graduate Student News

We had two Graduate Students who received their M.S. in Biological Sciences this December.

**KARISSA BRAATEN'S**- Thesis was on "Antimicrobial Activity Of The Volatile Oxidized By-Products Of Biogenic Oil"

**YI (JENNY) XU'S**-Thesis was on "Nona-arginine Peptides Facilitate Cellular Entry of Semiconductor Nanocrystals: Mechanisms of Uptake"

**KATIE STOCKSTILL'S** Talk at the Fall Central States Microscopy and Microanalysis Society meeting at Missouri S&T on "Analysis of HofI PEST Domain Phosphorylation" won first place for best student talk.

**CHI-HENG (MARTIN) WU** joined the department this Spring semester as a student in **DR. YUE-WERN HUANG'S** lab.



**MISSOURI S&T**  
**Department of Biological Sciences**  
**400 West 11th Street**  
**105 Schrenk Hall**  
**Rolla, MO 65409-1120**

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## Four Faculty Members Recognized for Teaching

Four faculty members received academic year 2009 Outstanding Teaching Awards (**DRS. RON FRANK** and **DAVID WESTENBERG**) or Commendations (**DRS. ANNE MAGLIA** and **DEV NIYOGI**) from the campus Committee for Effective Teaching (CET). These awards are based on student evaluation of faculty teaching. (The distinction between an award and a commendation has to do with the number of courses evaluated, not the quality of the instruction). While less than 10% of S&T instructors receive this recognition, generally 30-40% of biology faculty are honored in this manner each year.



In 2008-2009, Dr. Frank taught General Genetics, Evolution, Molecular Genetics and lab. Dr. Frank has previously won the Outstanding Teaching Award ten times!



In 2008-2009, Dr. Westenberg taught Microbiology, Micro lab, Virology, and General Genetics. Dr. Westenberg has previously won the Outstanding Teaching Award seven times.



In 2008-2009, Dr. Maglia taught Senior Seminar, Bioinformatics, and Biotechnology in Film. Dr. Maglia previously won the Outstanding Teaching Award in 2004.



In 2008-2009, Dr. Niyogi taught Ecology and Freshwater Ecology. Dr. Niyogi was previously Commended in 2007.