



Southwestern University

Biology Professors Receive \$98,928 NSF Grant

Two Southwestern biology professors have received a \$98,928 grant from the National Science Foundation that will enable them to purchase several key pieces of equipment for their teaching and research.

Maria Todd, assistant professor of biology, and Maria Cuevas, associate professor of biology, applied for the grant to help further their research on a membrane protein known as claudin-3.



Maria Todd (right) and Maria Cuevas (left) have received a \$98,928 grant from the National Science Foundation to further their research on a membrane protein known as claudin-3.

The study of claudins is relatively new, since the family of proteins was only discovered a decade ago. Claudins are found in tight junctions, which connect adjacent cells and act as a barrier to the movement of substances between cells.

"Currently, there is little information about the critical roles of each of the 24 different types of human claudin proteins in particular cell types," Todd said. "It's a very exciting field and we're in on the ground floor."

Todd and Cuevas are focusing their research on the function of human claudin-3 in breast cells. By manipulating the cellular levels of claudin-3 protein with small interference RNA (siRNA), they hope to determine its role in critical processes such as cell motility (migration), invasion and signaling.

Todd and a former Southwestern student, Brytanie Piana ('08), conducted claudin-3 siRNA studies in the summer of 2007. Cuevas joined the project in the summer of 2008, along with Rebecca Sheller, an associate professor of biology. Sheller spent her sabbatical last year optimizing the measurement of tight junction strength between breast cells that produced different levels of claudin-3 protein. During her sabbatical this fall, Cuevas will install and optimize the equipment.

The NSF grant will enable Todd and Cuevas to purchase three new pieces of equipment: a benchtop flow cytometer, a cell counter, and a phase-contrast microscope with digital camera and computer. The phase-contrast microscope currently at Southwestern is not equipped with a camera and computer. Todd said the new microscope that can be connected to a computer will enable them to show students real-time changes in the appearance and motility of cells on a computer screen. "It will be a wonderful teaching tool," she said.

The grant was funded through the NSF's Major Research Instrumentation Program, which is designed to provide researchers and students with access to state-of-the-art scientific and engineering equipment. The program is particularly interested in funding instrumentation that will be shared among different research groups. Several other Southwestern faculty members will be able to use the equipment in their research, and students will benefit from having the use of this equipment.

"Entry into Ph.D. programs requires extensive research experience using state-of-the-art equipment," Todd said. "This will make our students much stronger candidates for entry into top graduate schools."

Cuevas has been at Southwestern since 2003 and Todd has been at Southwestern since 2004. The majority of students who have worked with them in their labs have been accepted either into Ph.D. programs or into medical school.

Issue # 17: Fall 2009

CSI Georgetown



Rachel Hoovler, Molly Rice and Kathleen Ayres collect evidence from their crime scene.

A River

Through

Runs

lt...

Ms. Southwick taught the Forensic Biology course for the second time this past summer. The students spent the first two weeks learning how crime scene evidence is analyzed in the laboratory. The final week of the course they collected evidence from a mock crime scene and analyzed everything they found to determine which of the suspects most likely was the guilty party. They enjoyed the course and were interviewed for an article that is on the SU website. You can access the article and photos taken during the collection of evidence portion of the course from the SU homepage (search: CSI Georgetown) or from the Biology Department homepage. (southwestern.edu/newsroom/story.php?id= 1256)



Members of the First Year Seminar Class on the ecology and history of the San Gabriel River canoed to Knight's Spring on Lake Georgetown in late August.

Student Seminars

"You remind me of a mustard plant--Peroxisome genes in Arabidopsis thaliana" by Abbie Ornelas and Violetta Vasquez Thursday, Nov. 12th at Noon in FJS 148–Pizza will be provided!!

"You've Got Snail: Recent invasion of the Everglades by Pomacea insularum."

Matt Trawick, Vanessa Toro and Alexis Kropf recently had the opportunity to conduct field research at the Arthur R. Marshall Loxahatchee National Wildlife Reserve in Florida. While there, they collected data on the oviposition habits and fecundity of an invasive species of South American apple snail, *Pomacea insularum*. After returning to Southwestern, they gave a lunchtime seminar discussing the invasion history of *P. insularum*, the data collected while in Florida. They also contrasted the different levels of involvement of the varying government agencies in combating the spread of this destructive species in Texas and Florida.

Meet Jinelle Sperry ... Postdoctoral Fellow in the Environmental Studies Program and expert snake wrangler!



I am happily joining the Southwestern community and look forward to meeting the current faculty, staff, and students. I grew up in Montana where I gained an appreciation for wildlife and the natural world through hiking and camping in the Bitterroot Valley. I studied Wildlife Biology at the University of Montana and received my B.S. in 1999. I went on to receive my M.S. in Wildlife from Humboldt State University in Northern California in 2004. For my thesis work, I examined the effects of prescribed burning on ground-nesting birds. Through this work I became interested in community ecology and species interactions. In 2004, I began my doctoral research under the direction of Dr. Patrick Weatherhead at the University of Illinois. My dissertation research was focused on the predator/prey interactions between snakes and birds at Fort Hood, Texas. Using surgically implanted radio-transmitters, I was able to follow Texas ratsnakes to determine how their habitat use and activity patterns affect nest predation on the nests of two endangered bird species breeding in central Texas, the black-capped vireo and golden-cheeked warbler. I was also involved in research examining snake thermoregulation across latitudinal gradients and the effects of blood parasites on snake health. After completing my PhD in 2008, I conducted a year of post-doctoral research examining the effects of habitat manipulation on predator/prey interactions at Fort Hood. This fall, I joined Southwestern as a post-doctoral fellow in the Environmental Studies Program. I am currently teaching Biodiversity for the fall semester and will be teaching Wildlife Conservation in the spring. Starting in spring 2010, I will begin capturing snakes to continue my research on snake predator/prey interactions, thermoregulation and parasitic infection. I will also initiate research on the impacts of deer overabundance and associated over-browsing of vegetation on nest survival of birds in central Texas. I hope to recruit student research assistants so please contact me if you are interested in joining me for nest searching and snake wrangling!

BIOSCOPE FOCUS: Scholarly Updates



Maria C. Todd, Shea C. Spruill and Kristen L. Meerbrey. (2009). Small interference RNA-mediated suppression of overexpressed cyclin E protein restores G1/S regulation in NIH-OVCAR-3 ovarian cancer cells. International Journal of Oncology 35 (2): 375-380.

Summary: Our research revealed that approximately 70% of primary ovarian cancers express abnormally elevated levels of the cell cycle protein, cyclin E, in addition to hyperactive low molecular weight forms of cyclin E. Using small interference RNA (siRNA), we were able to substantially reduce the level of the full-length cyclin E protein and eliminate the LMW forms in an ovarian cancer cell line, resulting in the growth arrest of ovarian cancer cells. These findings indicate the therapeutic potential of targeted RNA interference in the treatment of ovarian cancer patients whose tumors overexpress cyclin E protein.

Note about the students: Kristen Meerbrey is currently in her 3rd year of a PhD in cancer/molecular biology at Baylor College of Medicine, Houston, and Shea Spruill is working as a scientist in the chemical industry and planning to apply to PhD programs in molecular immunology in 2010.



Olivia Stanzer, Senior, received a \$400 grant for her apple snail research. Excerpts from her proposal:

Exotic invasive species can be difficult to remove because they often disappear or merge into the landscape. Pomacea insularum, a very large but cryptically brown applesnail, recently established reproductive populations across the Gulf Coast. This applesnail lays incredibly noticeable vibrant pink. egg clutches on emergent vegetation. Each clutch potentially contains thousands of eggs. Cheesman (1958) originally discovered that ovorubin constitutes the chromoprotein within clutches giving them that flashy pink color. Nearly 50 years later, Argentinean biochemist Dr. Marcus Dreon found that ovorubin allows egg clutches of a related applesnail, P. canaliculata, to withstand varying environmental conditions (i.e. oxidative stress from light)... Mitochondrial DNA work, recently genetically distinguished *P. insularum* as a separate, yet close-related species to *P. canaliculata*. Such oxidative protection by ovorubin likely confers a greater chance of egg survival. Though adult snails remain aquatic through most of their lives, females lay clutches on emergent vegetation above aquatic predators including crayfish and snails. Despite their showy color, clutches rarely exhibit predation damage. Besides conferring protection against oxidative stress, speculation exists that ovorubin also makes eggs unpalatable to predators. Although Dreon et al. have investigated ovorubin's chemical properties, no research exists that tests how ovorubin ecologically affects predation susceptibility of the eggs. Management efforts suggest submerging recently laid eggs under water as a means to slow hatching success. However, no one has considered the implications of this strategy. I seek to understand what ecological function ovorubin plays in riparian-aquatic links. I plan to test the influence of this protein on consumption by aquatic predators and hypothesize that the protein chemically deters predators from ingesting food sources that contain ovorubin. I will use a 2x2 factorial design (N=5) consisting of predators (Procambarus clarkii crayfish versus juvenile applesnails) and protein (absence versus presence of ovorubin additive). A 2-way ANOVA will be used to evaluate the differences between the main factors: predators and protein. If more than two protein manipulations occur, then we will use Tukey's multiple comparison tests to compare treatments. These results could help in determining costs and benefits of possible management strategies where invasive P. insularum or P. canaliculata have negatively impacted local environments. By understanding how ovorubin found in clutches affects aquatic predators, management strategies can understand the implications of moving this energy reserve from one environment to the other.

Posters, Presentations and Publications



In July, Ben Pierce presented gave a talk and led discussion at the community salon for the Williamson Museum on "Science and Religion: The Evolution Controversy".

<u>Trawick, M. A.*</u>, A. K. Youens*, S. A. Hensley*, M. A. Barnes* and **R. L. Burks**. May 2009. Stay out of the water: Hatching efficiency and short term survival of an invasive apple snail. Poster Presentation, North American Benthological Society, Grand Rapids, MI.



Kyle, C. H.,* M. K. Trawick,* J. P. McDonough* and R. L. Burks. Accepted June 2009. Population dynamics of an established reproducing population of the invasive apple snail ("Pomacea insularum") in suburban southeast Houston, Texas. Coming out in November issues of Texas Journal of Science



Chemistry major Alexis Ritzer, biology graduate Taylor Jones, and Ben Pierce presented a poster at the Joint Meeting of Ichthyologists and Herpetologists in Portland, OR in July: Ritzer, Taylor A. L., T. A. Jones, and B. A. Pierce. Two-Year Population Survey and Microhabitat Ecology of the Georgetown Salamander *Eurycea naufragia*. Joint Meeting of Ichthyologists and Herpetologists, Portland, OR, July 22-27, 2009.

Dr. Ben Pierce also spent time this summer conducting frog call research and ecological research on the Georgetown salamander.

Burks, R. L. and M. M. Chumchal. July 2009. Who's On First?: How to write, publish and negotiate issues of authorship with undergraduate students. Invited presentation at Vision and Change: Transforming Undergraduate Biology Education conference. American Association for the Advancement of Science, Washington, D.C.

Ben Pierce recently finished another genetics textbook called Genetics Essentials: Concepts and Connections, which will be published by WH Freeman. The book will be out in late October.



In March, Andrew Woodward attended the American Society of Plant Biologists meeting in Austin accompanying undergraduate students whom he mentors at Rice University. The students, Marta Bjornson and James Liu, presented posters examining plant hormone signal transduction and lipid catabolism in *Arabidopsis thaliana*. Bjornson's poster won the undergraduate poster prize.



Burks, R. L. A Kernel of Truth: Microwave popcorn makes it easier to teach basic statistics. The Limnology and Oceanography Bulletin.

What do Biology graduates end up doing?

Elizabeth Williams, 2007

Finally realized education is really my calling and will be teaching High School science in the fall in the Sugarland area. Big thanks to all of the amazing professors I had at SU to help inspire me to continue the cycle of education.

Bret Barrier

I graduated from SU in 1992, from med school at UTHSC San Antonio in 1996 and completed a Mizzou OB/GYN residency in 2000. After a 5 year Air Force payback in San Antonio (Wilford Hall Medical Center), I returned to Mizzou where I have been on faculty for 4 years. I'm the Associate Residency Director, planning on retiring here in many years.



- E. Conrad Lamon III, class of '78 (Manager and President, Statistical Ecology Associates LLC) My research interests focus on aquatic ecosystem models for forecasting water quality, toxicological and ecological endpoints for use in management and decisionmaking. Some of my recent research has focused on nutrient criteria determination in support of the Total Maximum Daily Load (TMDL) process (EPA, USA) through my EPA STAR project, and on similar efforts in Europe associated with the Water Framework Directive (EU). This work has led to international collaborations with the Finnish Environment Institute (SYKE), as well as collaborations with researchers funded through an EPA National Lake Assessment Planning Program (NLAPP) grant (PI: Patricia Sorrano, Michigan State University) and at EPA Region 5 Nutrient Criteria **Development Regional Technical** Advisory Group. Other lines of recent work have included an analysis of climate driven trends in Great Lakes surface elevations, and the effects of land use on the water quality in streams of the Brazilian Amazon.
- Jeanna (Van Pelt) Mascorro graduated from Barry University's school of Podiatric Medicine and Surgery on May 2nd with a degree in Doctor of Podiatric Medicine (DPM) as well as an MBA. She also received her MS in Biomedical Sciences from Barry two years ago! Married to Southwestern Alumni Patric Mascorro, she will be doing a 3 year residency program in Houston.



Jon Morison class of '67 recently spent two weeks in Costa Rica, a birding trip he organized for the Friends of the Bosque. Next year, it's Belize and Tikal in the Peten jungle of Guatemala."



TRI BETA

2009-2010 officers:

President: Jessica Bolton

Treasurer: Janet Del Real

Secretary: Laura Kromann

*10/23 - Applications due

*11/30 - Volunteer hours due

barbecue at noon)

(11:30am)

Vice-President: Dena Leerberg

Volunteer Coordinator: Tammy Warner

*10/25 - San Gabriel Park Cleanup and Barbecue (meet at 9am and carpool to park;

*11/3 - Induction Ceremony and Luncheon

Important dates in Tri Beta this fall:

Pre-Med Coordinator: Carlos Cardena



Southwestern University Animal Behavior Society

Jen Penland President

> Brittany Ford Vice President

Morgan Mingle Secretary

Jade Tinker Treasurer

Stephanie Henderson Publicity

Matt Trawick Minor Coordinator

> Alex Hall Web Master

Advice from a BookWorm: Stay Healthy!





Book recommendation from Ms. Linda Southwick: Gina Kolata, <u>Flu, The Story of the</u> <u>Pandemic of 1918</u> (check it out from the library!) SMArTeams are meeting for the 6th semester at Southwestern, led by Meredith Liebl. Mitchell Elementary 3rd - 5th graders come to SU on Mondays from 5-6 pm to work on their scientific investigations with their SU student mentors. They will be presenting their posters on Monday, November 16, from 5-6pm in Bishops Lounge.





SUMMER HIGHLIGHTS FROM STUDENTS: WHAT DID YOU DO THIS SUMMER?

This summer after being accepted to a Research Experience for Undergraduate Students (REU) at Bradley University, I flew away from the hot Texas heat to the cool Illinois breezes and began my very own research. Well, not just my own. With the guidance of Dr. Nicholas A. Stover, a molecular biologist who focuses on the evolution and biology of genomes, I conducted research on what would be titled "Temperature Adaptations with the Phospholipid Biosynthesis Fusion Gene ART1: AcyI-CoA Reductase/Transferase in *Tetrahymena thermophila*"! Dr. Stover's work lies in the wiki, ciliate.org, a genome database for the ciliate *Tetrahymena thermophila* as well as homologous of the gene in other sequenced genomes (such as *Arabidopsis thaliania*). This accessibility and cross evaluation of the gene allow biologist to formulate primers and predict expression patterns of genes.

Of value to my own experiment, was the "fusion gene", which occurs when two previously separate genes now code one gene; thus one gene codes for one large protein product. For ART1, a fused gene that through an enzyme complex places the C-1 fatty-acyl tail on the glycerol backbone of a phospholipid, we predicted that temperature shock would up-regulate the gene. This is because membrane stability is very important for T. thermophila (a thermophile!) and thus colder/hotter temperature could lead to increased formation of phospholipids. Using temperature shock and recovery as our variables, we attempted to view up-regulated expression of ART1. A procedure of RNA extraction, RT-PCR and gel electrolysis displayed the brightness of a gene's band- pointing to the amount of RNA expression of the gene after treatment. Though our results were inconclusive, I developed a micro-biology and genome database knowledge that will aid in my own liberal arts education- as well as the crucial concepts of developing experiments.

-Vanessa Toro



This past summer I was fortunate enough to obtain a Howard Hughes Medical Institute Research internship at Rice University. This internship lasted for seven weeks and during this time I studied plant genetics and development, more specifically, plant-peroxisomal disorders. During this research opportunity, I worked with Dr. Andrew Woodward, one of Southwestern University's visiting biology professors, and performed molecular and physiological assays on *Arabidopsis thaliana*. I designed and conducted experiments in an effort to map mutations in *A. thaliana* mutants with the use of PCR and mapping markers. In addition, I also characterized lines of mutants based on their sensitivity to auxins, which are essential plant hormones. By the end of the seven weeks I had mapped a mutation in the *chy-1* gene of an *A. thaliana* mutant, characterized many mutants in their response to auxins, and run westerns to determine the absence or presence of peroxisomal-related proteins in certain *A. thaliana* lines.

This internship provided me with invaluable insight into the field of biological research. I learned a great deal about plant-peroxisomal deficiencies, how these deficiencies can be analyzed and how to perform experimental procedures, such as DNA electrophoresis and western blots. I am currently continuing my research under the guidance of Dr. Woodward, here at Southwestern, and am in the process of mapping the *chy-1* gene mutation in Landsberg as well as other experiments. I would like to thank Dr. Woodward for this opportunity and for allowing me to continue my research.

-Violetta C. Vasquez (Sophomore)







Learn something new from BioScope Magnifications: Resveratrol

Molecule: Resveratrol, a phenolic compound found in certain plants and plant products like red wine and chocolate.

Pathway: Regulation of glucose synthesis (gluconeogenesis) in the liver that in turn regulates blood glucose levels.

Organisms: Human (also studied regulating other pathways in yeast, nematode worms, and mice).

Ecosystems: Many!

Resveratrol may lower blood glucose by inhibiting gluconeogenesis



Resveratrol, a small molecule found in red wine and chocolate, promotes the function of the human SIRT1 protein. In the liver, SIRT1 is then better able to inhibit the CRTC2 transcription factor protein that promotes gluconeogenesis, the biosynthesis of glucose. A decrease in glucose production may account for the drop in blood glucose levels observed in patients after resveratrol treatment. Resveratrol is in clinical trials as a treatments for type 2 diabetes. In addition, SIRT1 activators extend lifespan in several organisms and inhibit the formation of certain tumors.

Suggested articles for further reading:

Liu *et al*. (2008) Imai and Keiss (2009) Nemoto *et al*. (2009) Gerhart-Hines *et al*. (2007)

Biology course offerings

AB Animal Behavior program
CM Cellular/Molecular
E Ecology and evolution
L with Lab
№ Nonmajors course
Organismal

<u>Spring 2010</u>

Animal Behavior ^{AB} (Dr. Purdy) Biochemistry I ^{CM,L} (Dr. Loudwig) Biochemistry II ^{CM,L} (Dr. Bruns) Ecology ^{E,L} (Dr. Price)



Endocrinology ^{O,L} (Dr. Cuevas) Human Biology Today ^{NM,L} (Dr. Ard) Introduction to Immunology ^{CM} (Dr. Gonzalez) Methods in Ecology and Evolution (Dr. Pierce) Methods in Molecular and Cell Biology (Dr. Gonzalez) Molecular Mechanisms in Biology ^{CM,L} (Dr. Woodward) Organ Physiology ^{O,L} (Dr. Sheller) Tissue Mechanics ^O (Dr. McLean) Tumor Biology ^{CM,L} (Dr. Todd)

