

# Southwestern University

DEPARTMENT OF BIOLOGY

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<http://www.southwestern.edu/academic/biology/bioscope.html>

# B i o s c o p e



## SU Biology Department Continues Dedication to Undergraduate Research: Come See for Yourself

Five faculty members of the Biology Department and 10 students spent 8 weeks during the summer working as collaborative researchers as part of the Biology Summer Research Program and the MERCK Program that includes projects with both biological and chemical components. The program began with a breakfast that introduced students to the expectations of summer research including dedicated hours, focused literature reviews, attendance at workshops and research meetings and eventually presentations of their research.

Students received a stipend for their participation in the program as well as housing on-campus. More importantly, they experienced first-hand the trials, tribulations, surprises and delights that accompany hands-on research. Besides collaborating closely with an individual faculty member, students also got the opportunity to see the personal and fun side of faculty members during group dinners that often ended with biology-themed games. The back side of this year's t-shirt showcased the fine artwork produced during a game of biology Pictionary, with some images even being drawn with the artist's eyes closed (we'll let you guess which ones!). Several other iterations of popular games surfaced during the summer program. The Program culminated in the Biology Summer Research Banquet where each students presented a poster of their results to date. Many projects will continue into this Fall. The Department of Biology encourages you to visit the posters displayed in the Department and inquire about doing collaborative research.

centrifuge      mutation      Dr. Gonzalez

microscope      Fondren-Jones      duodenum

South-western      pheromones

Brandon Boland	Erica Navaira
Dr. Romi Burks	Fern Nguyen
Jason Burnham	Dr. Ben Pierce
Dr. Maria Cuevas	Kurt Seilheimer
Dr. Martín Gonzalez	Julianne Stafford
Jose Granda	Joan Strandtmann
Jessica Hua	Dr. Max Taub
Chellie Martinez	Abby Youens
Brian Miller	

We're Biologists, what?

# BSRP/MERCK Student Summaries



**Jessica Hua**  
**Pierce Lab**



**Jason Burnham**  
**Gonzalez Lab**

This summer under the BSRP program, we studied salinity tolerance in tadpoles. Several studies have demonstrated that amphibians have a limited tolerance to high levels of salinity. However, despite evidence of salinity fluctuations, there has been little recent work done on the salinity tolerance of amphibians. Our results showed that: (1) Lethal concentrations for *Bufo nebulifer* tadpoles were between 5 and 10 ppt; (2) Salinity tolerance varied among species; (3) Size affected tolerance within species; (4) Growth rate did not differ among tadpoles reared at sublethal levels of salinity; (5) Exposure to sublethal levels of salinity negatively affected survival time at lethal levels of salinity. Overall, this program was one of the most valuable experiences I have had at Southwestern and I highly recommend this experience to any biology major.

Bacterial resistance to antibiotics is becoming an increasingly prevalent issue. In an attempt to add to the body of research about this growing dilemma, this summer I (in partnership with Dr. Martín Gonzalez) did research on *E. coli* under the funding of the Merck Research Program. I looked at the effects of the dipeptide D-AlaGly on the cleavage of the LexA protein, which plays a key role in bacterial resistance to the effects of beta-lactam antibiotics (ampicillin, penicillin, amoxicillin). Preliminary results have shown no modification of LexA cleavage, but this fall I will continue research with Dr. Lynn Guziec in an attempt to synthesize an analog of D-AlaGly that will increase the bactericidal effects of beta-lactam antibiotics. Summer research was a great learning experience and I would recommend it to all persons with a serious interest in science.

**Abby Youens**

**Burks Lab**

**Brandon Boland**

This summer, we explored the life history of the exotic invasive applesnail *Pomacea insularum*. *P. insularum* are native to South America, where they may inhabit slightly different environmental conditions than those in their exotic habitat. To gain insight into *P. insularum*'s invasive success, I specifically looked at effects of different environmental conditions on juvenile growth. Juveniles grew more at higher temperatures. Salinity and high population density had significant negative effects on growth. The presence of fish chemical cue did not significantly affect growth. In addition, I also compiled data for allometric (body-size) relationships and computed regressions. I hope that this data will lead to a paper. Come by Dr. Burks lab and look at the white and green poster!

This was my 2<sup>nd</sup> summer in the BSRP and a continuation of previous research with the exotic invasive applesnails. As part of a large experiment, I investigated the effects of a predator cue, temperature, density, and salt on juvenile applesnail consumption and growth. Previous experiments were only run for 24 hours; this experiment was maintained for 3 weeks so it was an entirely different experience. I found that applesnails assimilated less in the presence of salinity, but more when they occurred with another snail. This is an interesting result because greater assimilation did not result in increased growth. Southwestern provides a great atmosphere for student research. I encourage anyone interested in science to pursue available student research opportunities.



**Erika Navaira - Cuevas Lab**

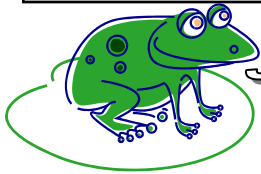
This summer Dr. Cuevas and I investigated the effects 4-OH tamoxifen on an estrogen-receptor negative human cervical cancer cell line. The compound is a metabolite of tamoxifen, a prophylactic prescribed to women likely to develop breast cancer. In different tissue types however, the drug can display different properties. When we compared the effects of 4-OH tamoxifen to 17-*b* estradiol, we saw that both compounds at low concentrations promoted cell proliferation, and at very high concentrations, both promoted cell death via apoptosis. \*The cells killed themselves! What an exciting finding to end the exciting summer! For anyone interested in research in biology, the BSRP is a must.

**Fern Nguyen**  
**Taub Lab**

Under the Merck Research Program this summer in collaboration with Dr. Emily Niemeyer, we have begun to study the effects of nitrogen on antioxidant properties in basil (*Ocimum basilicum L.*). Antioxidants have been associated with various health benefits, including reducing cancer, heart disease, and aging effects as well. High levels of phenolic compounds, the antioxidants found in food, have been found in basil. The focus this summer was to grow the basil under different nitrogen applications, harvest, and store them for analysis at a later date. This fall, we will continue to work on developing an assay to determine the antioxidant activity of the basil extract and develop a method to separate and quantify various phenolic compounds.

## Kurt Seilheimer Cuevas Lab

This summer at the Biology Summer Research Program, we began looking at the effects of Anthrapyrazoles 10 and 11 on the DU-145 human prostate carcinoma. Anthrapyrazoles (APs) are potent cytotoxic agents that intercalate into DNA, causing single-strand breaks, inhibition of DNA synthesis and topoisomerase II. Cell cultures were treated for 1 hour with different concentrations (0.1  $\mu\text{M}$ -20.0  $\mu\text{M}$ ) of AP-10 and AP-11. Cells were allowed to recover for 48 hours in fresh media, and cell viability was determined by MTS assay or trypan blue exclusion assay. The IC50 of AP-10 and AP-11 on the DU-145 carcinoma was determined to be 0.4  $\mu\text{M}$  and 3.2  $\mu\text{M}$ , respectively. Using trypan dye exclusion assay we were able to confirm the cytotoxic effect of AP-10 and AP-11, distinguishing from cell growth inhibition. To determine if cells were able to recover after exposure to AP-10, cells were incubated in the presence of AP-10. After exposure, the media plus or minus 1.0  $\mu\text{M}$  dihydrotestosterone (DHT) or testosterone (T) was replaced daily. Although cells exposed to AP-10 were able to recover, they never attained the cell number observed in cultures that were never exposed to the compound. Furthermore, addition of either DHT or T didn't increase their proliferative rate when compared to either control. Finally, based on DNA gel electrophoresis, apoptosis seems not to be the underlying cellular mechanism of AP-10 and AP-11's cytotoxic effect.



**Jose Grande**  
**Pierce Lab**



**Julianne Stafford**  
**Gonzalez Lab**

During the summer of 2006 during The Biology Summer Research Program, we began to do research on trying to improve the methodology of doing anuran roadside call surveys. These surveys are used to determine population densities of anurans across the US. We examined different factors which may affect the ability to detect these calls. Some of the factors that were looked at were the position of the observer, effects of moonlight, and whether disturbance from the observers affected anuran calls. The research will continue in the fall by focusing on other factors. This research program has been one of the best experiences of my Southwestern career and I encourage others to take this opportunity.

This summer we worked with *E. coli* cells to find the Lon protease recognition sequence in the UmuC tail. UmuC is a protein involved in SOS mutagenesis, an error-prone mechanism of repair, which enables translesion synthesis in prokaryotic cells. Previous research has determined that a sequence of amino acids in the 67 amino acid tail of UmuC targets the protein for degradation by Lon. My research included setting up two approaches to mutate a region in the tail suspected of containing the protease recognition site in order to further narrow down the location of the site.



**Brian Miller - Taub Lab**

The BSRP program allowed me the chance to examine the effects of Global Warming in more detail, specifically the effect of rising CO<sub>2</sub> levels on the protein content of selected staple crops. My experiment over the summer involved a meta-analysis of current and past research that examined changes in protein content at variant levels of CO<sub>2</sub>. Current results from the meta-analysis indicated that there is a significant negative correlation between CO<sub>2</sub> levels and protein content in such important crops as Soybeans and Wheat. I highly enjoyed the BSRP experience at Southwestern over the summer, and plan to continue the research during the fall semester.

Interested in Science Writing?  
**Interested in Science Writing?**

**BioScope** needs student contributors and editors. Contact Dr. Burks!

Need  $\beta\beta\beta$  Info?  $\beta\beta\beta$  is looking for **Biology Students** to be involved in campus activities. Talk to the officers:

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(979) 743-5604  
SU Box 7105

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Vice-President (Fall)  
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### Goals

- 1) To promote biological understanding and appreciation.
- 2) To provide activities and experiences in biology.
- 3) To expose students to numerous avenues in the biological field.



Up to twice a year, Tri-Beta inducts eligible applicants who have completed the introductory Biology course as well as 1 upper-level Biology course, and who have a 3.0 Biology GPA and a 2.5 overall GPA. Students who do not meet these requirements, but who have an interest in Biology are inducted as Associate Members.

Faculty Sponsor: Dr. Cuevas

**MEET THE PROFESSORS  
and LEARN MORE ABOUT  $\beta\beta\beta$   
Wednesday, 9/27 in FJSH 151**

**Look for Fall Membership  
Deadline Announcement –  
Coming SOON!**



Scientists devise yet another way of delaying death.

# Biology Department Launches New Methods Courses!

This Fall saw the appearance of two new courses in the Biology curriculum, Methods in Cellular and Molecular Biology (taught by Dr. Gonzalez) and Methods in Ecology and Evolution (taught by Dr. Taub). These courses replace Molecular Genetics as the traditional class taken by sophomores. Instead of focusing on a specific subject matter, these courses emphasize the skills that students need to read and absorb primary literature papers and to start thinking like a scientist when they approach writing. All Biology faculty will be able to participate in these courses with Drs. Sheller and Burks teaching in the Spring. Each of the courses is a pre-requisite for that area, i.e. you need Methods in CMB for Organ Physiology vs. Methods in EE for Ecology. This allows students to begin taking upper-levels once they have completed the methods course in that area. Methods in EE also requires statistics. The courses meet for 4 hours a week but students can expect to devote considerable out of class time to the writing projects!

## ***BioScope asked Biology faculty “how do you think a Methods course will best equip students for upper-level courses?”***



Dr. Rebecca Sheller

*“I think that students will gain literacy skills that will encourage their enthusiasm for studying biology.”*



Dr. Martín Gonzalez

*“The Methods course is structured to provide students with an understanding of the process of scientific writing, which includes interpretation of the scientific literature, as well as an appreciation for the time and knowledge required in formulating and experimentally addressing a hypothesis.”*



Dr. Max Taub

*“The new methods courses will provide students a foundation in thinking and writing as scientists. This will lead to upper-level biology classes being a richer and more exciting experience for everyone.”*



Dr. Maria Cuevas

*“I believe the new methods courses will provide the students with the skills necessary to critically analyze primary literature papers, helping them to learn more in depth the concepts taught in upper level biology courses.”*



Dr. Ben Pierce

*“I think these new Methods courses will equip students with the tools needed to conduct inquiry-based learning favored by our advanced courses.”*



Dr. Romi Burks

*“The process of science depends on peer-review. Learning what makes a good paper better equips students to contribute more effectively to independent research, and thus broaden their options for upper-levels.”*



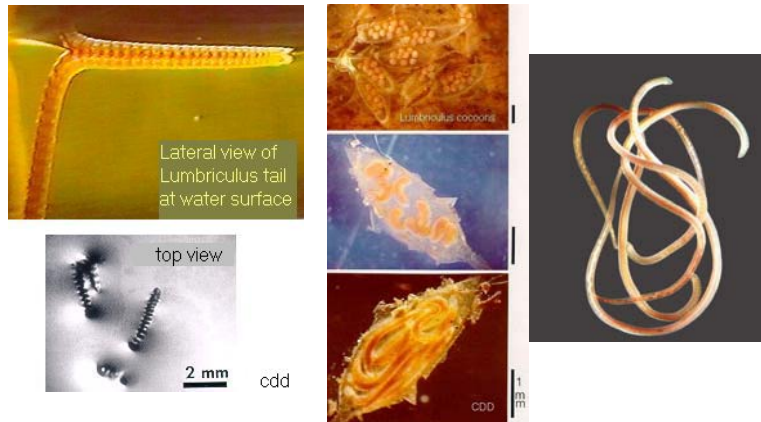


Learn something new  
from  
**BioScope**  
Magnifications:

Look next time for Caffeine and associated pathway as the molecule emphasis

- **SPECIAL ORGANISMAL FOCUS – Research focus for Dr. Veronica Martinez** (see profile pg. 8) *Lumbriculus variegatus* - common or California blackworms

These worms are the most fantastic examples of evolution, development, and giant fiber nervous system escape reflexes found in nature! This species is also on the verge of being sequenced by a collaborative group working through Columbia University and a grant from NSF.



## WORM LIMERICKS

### WORM LIMERICK #1 (circulation / respiration)

Did you know there are worms in the lake  
Whose conditions we just couldn't take?  
With their head in the mud  
Always pumping red blood  
To make sure that they're always awake.

### WORM LIMERICK #2 (feeding and lab culture)

There once were some worms in a tank  
That suddenly got very rank  
Overfed with fish food  
They became very rude  
Refusing to swim, they just sank.

### WORM LIMERICK #3 (reproduction by fragmentation)

As one blackworm once said to another  
I am sure we're both sister and brother  
Now, if parents we're seeking  
Fragmentally speaking  
Our head end's our father AND mother

Most of the interesting info written about Lumbriculus for the scientific and non-scientific audience is found at the website of my scientific "grandfather", Dr. Charlie Drewes at Iowa State University. Charlie was a great scientist and educator. He passed away a year ago this July. I spent one summer collecting worms in the lakes of Iowa and Minnesota - It was the most fun field work, I've ever done! He also wrote a series of fun limericks!  
<http://www.eob.iastate.edu/faculty/DrewesC/htdocs/>

**ECOSYSTEM – Freshwater Shallow lakes – important habitat for many invertebrates. Millions of these lakes exist across the continent.**

### WORM LIMERICK #4 (regeneration of new body segments)

A worm minus its head or its rear  
Would be a certain goner, I fear.  
Unless just for fun  
Regeneration  
Replaced segments lost year after year.

### WORM LIMERICK #5 (helical swimming)

If I were a worm like *Lumbriculus*  
With no feet or no legs, I'd kick you less.  
But I'd crawl and I'd swim  
With a helical spin,  
And that would be really ridiculous.



C. Drewes, 1997

***Congratulations to those students  
that participated in the 7<sup>th</sup> Annual  
SU Undergraduate Research and  
Creative Works Symposium  
(This could be YOU in April '07!)***

**Oral Presentations:**

Matt Barnes  
Brandon Boland  
Ian Bothwell  
Barrett Cromeens  
Manjah Fernandez  
Kristin Meerbrey  
Angela Nordin  
Robert Peña

**Poster Presentations**

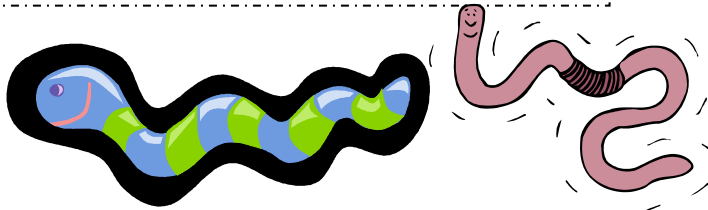
Carolina Boet  
Tracey Einem  
Greg Hagemann  
Sara Huie  
Jay Gupta  
Ryan Ubias  
Sheeba Varughese  
Liz Williams

For Abstracts, please see

[http://www.southwestern.edu/academic/symposia/SU\\_URCWS/SUURCWS\\_2006.pdf](http://www.southwestern.edu/academic/symposia/SU_URCWS/SUURCWS_2006.pdf)



I am currently enjoying my new home in Austin, TX with my fiance, Alfonso, and our two dogs - Jasmine & Tahini. For fun we travel to ultimate frisbee tournaments in the fall with Alfonso's nationals caliber team, Doublewide. In the spring & summer, we spend lots of time outdoors. We also love to cook and try new recipes.



***LATEST NEWS: The Biology  
Department welcomes Dr.  
Veronica Martinez as our new  
Visiting Professor of Biology***

Hello everyone.

I like to describe myself as a developmental neurobiologist. I love studying the nervous system and I think the cellular processes of early development are absolutely AMAZING!

A bit about me....

I received a B.A. in biology and a B.A. in elementary education from the University of St. Thomas in Houston, TX (1996), where I studied *Mysidopsis almyra* with Dr. Ruth Ann Bagnall. Working with Dr. Bagnall was very inspiring in the development of my biological research interests as well as my love of teaching. Following my undergraduate studies, I accepted a position as the science instructor of a small private school in Houston, Annunciation Orthodox School. In 1999, I began my doctoral studies in the laboratory of Dr. Mark J. Zoran at Texas A&M University. My doctoral thesis set a foundation for future investigations of specific mechanisms that mediate this novel form of neural plasticity. Last year, I completed a post-doctoral fellowship at the University of Texas @ Austin in the laboratory of Dr. Bing Zhang. Ultimately, I would like to expand my teaching experiences and look forward to teaching Developmental Biology in the Spring. I also look forward to continuing my investigations of neural plasticity and neurodegeneration over the next few years.





**ANOTHER GREAT ADDITION:  
The Biology Department also  
welcomes Dr. Glennis Julian!**

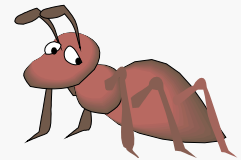


**Teaching:** Evolution and Environmental Science

**Research interests:** Evolution of social behavior, behavioral genetics, social insect ecology and evolution, neuroethology, ecological physiology

**Education:** B.A. Pomona College, 1992; Ph.D. Arizona State University, 1999. Post-docs at University of Arizona and University of Texas, Austin

**For fun:** in my spare time I like (in no particular order) cooking, mountain biking, hiking, knitting, birding, salsa dancing and relaxing with my husband Jason and two cats, Jasper and Blue.



Next Issue: see Magnifications "organism" for more info on Dr. Julian's research interests!



**Advising  
starts  
10/25**

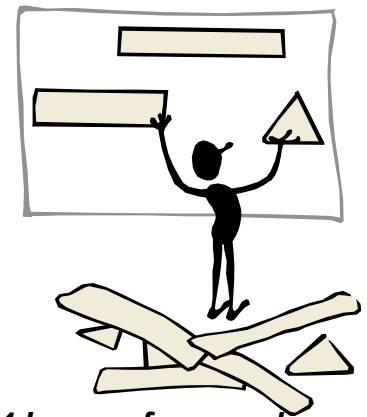
It will soon be time to piece together another schedule. Here is a brief preview of the courses offered for Biology majors.

- 1<sup>st</sup> Year: *Genes and Molecules* – Todd – MWF 10/11 plus lab
- 1<sup>st</sup> Year: *Genetics and Evolution* – Taub MWF 10/11 plus lab

- 2<sup>nd</sup> Year: *Methods in Cellular and Molecular Biology* – Sheller – Tu/Th 8:45 – 10:45 a.m. (pre-reqs 1<sup>st</sup> year sequence)
- 2<sup>nd</sup> Year: *Methods in Ecology and Evolution* – Burks – Tu/Th 8:45 – 10:45 a.m. (pre-reqs Statistics + 1<sup>st</sup> year sequence)

**These courses require Molecular Genetics and the 1<sup>st</sup> year sequence.**

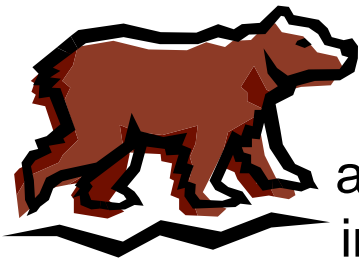
- Developmental Biology* – Martinez – MWF 9 + W or Th Lab
- Endocrinology* – Cuevas – MWF 11 + W Lab – Note that this class requires completion of Organic II
- Genetics* – Pierce – Tu/Th 8:00-9:15 + Tu Lab
- Microbiology* – Gonzalez – Tu/Th 9:30-10:45 + M or Tu Lab
- Biochemistry* – Foote or Bruns – MWF 11 + lab – Note that this class requires completion of Organic II
- Ecology* – Burks – Tu/Th 1:00 – 2:15 + Tu Lab – Note this class requires a weekend field trip



**4 hours of research  
also equals an  
upper-level course  
with a lab**

Students & Faculty interested in submitting announcements, items for focus, profiles or highlights (i.e. Magnifications) to *BioScope* should email Dr. Burks ([burksr@southwestern.edu](mailto:burksr@southwestern.edu)).  
Next Issue: ~January 2007

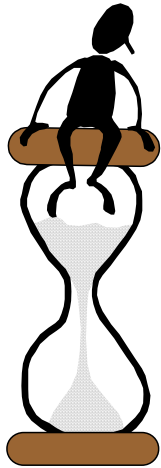
Capstones in Biology can be associated with any of these courses or completed through an independent research project.



Wild or Just Woolly?  
Come see *Grizzly Man*  
as part of Cinematic Saturday  
in the COVE on October 28<sup>th</sup>!



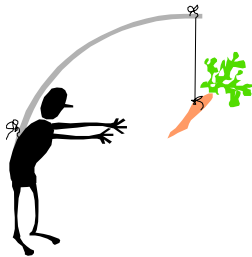
Sponsored by the Animal Behavior Program



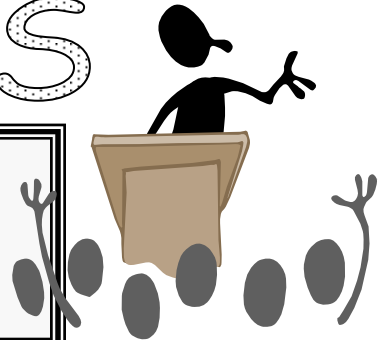
**Interested in Animal Behavior....  
but really don't know what it is about?**

Take some time to explore. AB is an interdisciplinary major that combines the best of both worlds of Psychology and Biology. The Program has just undergone a renewal in faculty and research. In addition, AB will now work with Pre-Vet students. A new Intro course is available for students starting after 1<sup>st</sup> year seminar (TU/TH 9:30-10:45 a.m. 10/31-12/5). It is still a possibility to enroll for this 1 credit course. Talk to Dr. Burks, Program Chair.

# SEMINARS



**All BIO STUDENTS should make  
a very strong effort to attend  
The Biology Seminar Series  
12:00 THURSDAYS in Room 151:**



Sept 14	Dr. Donna Janes	Concordia University	Physiology
Sept 21	Dr. Bob Kane	Baylor University	Biochemistry
Sept 28	Dr. Kemble White	SWCA Consultants	Cave Fauna
Oct 5	Dr. Patricia Beynham	St. Edward's	Microbiology
Oct 26	Dr. John Malone	UT Arlington	Mol. Genetics
Nov 2	Dr. Brody	Baylor College of Medicine	StemCells
Nov 9	Dr. Lisa Mefferet	Rice University	Animal Behavior
Nov 16	Dr. Robin Fuchs-Young	MD Anderson	Hormone signals
Nov 30	MERCK Student Researchers		
Dec 2	MERCK Student Researchers		

**BRING YOUR LUNCH OR ALL BIOLOGY MAJORS ARE INVITED  
TO LUNCH (FREE!) WITH SPEAKERS AFTER TALKS!**

