



University of Vermont, College of Arts and Sciences Department of Biology Newsletter

June 2012



DEPARTMENT OF BIOLOGY [WEBSITE](#)

Dr. Jim Vigoreaux Appointed to Endowed Professorship



Biology Professor and Chair Jim Vigoreaux has been appointed for a five year term as the Breazzano Family Green and Gold Professor in the Department of Biology. With unanimous support from the Selection Committee, Provost Knodell summed it up best when she wrote, "This appointment is a testament to Dr. Vigoreaux's rigorous and productive scholarship, and his commitment and service as mentor, and his outstanding service as a university citizen."

Professor Vigoreaux investigates the function, development and evolution of muscle in arthropods, primarily insects and crustaceans. His research group uses time proven genetic approaches in combination with modern biochemical and biophysical approaches to elucidate the contributions of individual proteins to the structural and functional properties of muscle. One aspect of this work entails an understanding of how the biomechanical properties of proteins and protein assemblies are manifested hierarchically at the cellular and tissue level, and in the organism. This work aims to provide examples of the mechanical behavior of natural (biological) materials that may serve as inspiration in the design of novel materials and functional nanodevices.

Professor Vigoreaux received his PhD in Biochemistry from the University of Oklahoma. After completing a post-doctoral fellowship at MIT, he joined UVM as an Assistant Professor in 1991 and was named department Chair in 2005. Professor Vigoreaux serves as Director of the UVM McNair Scholars Program for undergraduates and of the AGEF Program for graduate students. He holds a joint appointment in the Department of Molecular Physiology & Biophysics at UVM.

Congratulations, Professor Vigoreaux!

The Department of Biology Welcomes Two New Faculty Members



Dr. Alicia Ebert and Family

Dr. Ebert's research focuses on two aspects of zebrafish eye development. The eyes develop from forebrain tissues and must migrate bilaterally to take up their final position. Dr. Ebert is interested in what mechanisms/molecules are involved in maintaining eye tissue cohesion as they undergo elegant movements of morphogenesis and migration. She has discovered a novel role for signaling molecules previously known for their roles in axon guidance, semaphorins and plexins, in tissue cohesion of the developing eye.

The other focus of her research involves fibroblast growth factor (FGF) signaling in patterning the retinal vasculature and maintenance of Retinal Ganglion Cell (RGC) morphogenesis and survival. Loss of FGF8a or inhibition of the FGF receptors (FGFRs) results in embryos with fewer RGCs and small optic nerves. Her group is uncovering a role for FGF signaling in maintenance and survival of RGCs by regulating vascularization of the retina.



Dr. Ingi Agnarsson

Dr. Agnarsson is an evolutionary biologist working on various fronts. His main research applies phylogenetics and population genetics to address evolutionary questions, with a focus on spiders. Current topics include evolution of sociality in spiders, evolutionary biomechanics of spider silk, and a large project on the biogeography of the Caribbean and the role of dispersal in diversification.

Alumnus Michael L. Cunningham's Research in Craniofacial Disorders



Dr. Michael Cunningham

Michael L. Cunningham, MD, PhD, is Chief of the Division of Craniofacial Medicine and Professor of Pediatrics in the Department of Pediatrics at the University of Washington School of Medicine. He is Medical Director of Seattle Children's Craniofacial Center and holds the Jean Renny Endowed Chair in Craniofacial Medicine. He is also adjunct Professor in the Departments of Biological Structures, Oral Biology and Pediatric Dentistry at the University of Washington. Dr. Cunningham is a 1983 UVM Biology Department PhD Graduate.

"The care of a single patient during residency made me realize that I enjoyed helping families work through the difficult time after the birth of a child with complex cleft and craniofacial disorders. After residency, I was given the unique opportunity to train in the longitudinal care of these patients and their families. Encouraged by my mentors, Drs. Ron Lemire and Sterling Clarren, I returned to graduate school to obtain a PhD in Anatomy and Embryology. Now, after this 20-year journey as a physician-scientist, I recognize that it is my patients, their families and my trainees who serve as my teachers. I am dedicated to the advancement of craniofacial research and our unique model of pediatric care for children born with these conditions."

Research Description: [Craniosynostosis Research Program](#)

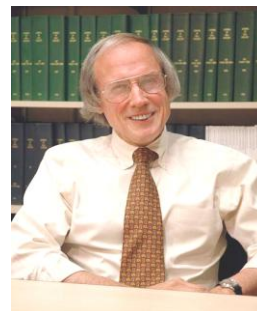
Rachael Manzo, UVM Alumnus, and the Wolfree Program



Wolfree's Program Manager Rachael Manzo (far right)

Dr. Manzo, who was a work study student in the Department of Biology in 2001, has been working for a wonderful non-profit organization in Oregon called Wolfree. They have recently completed a study with 5th graders of an underserved/rural community in Central Oregon on the Oregon Spotted Frog and their dependency on Beaver Ponds for habitat. The Oregon Spotted Frog is close to nomination as an endangered species due to loss of habitat. Wolfree uses a project based learning approach to science education in the field. Wolfree has STEM (Science, Technology, Engineering and Math) based curriculum that connects students to career concepts in this field through outdoor learning. For more information: [Wolfree](#)

Accomplished Graduate Alumni Awardee, Dr. Gary Stein



Dr. Gary Stein

This year the Biology Department's Accomplished Alumni award for Distinguished Career Accomplishments in Science and Science Education goes to Dr. Gary Stein. Dr. Stein will be joining UVM this summer as Professor and Chair of Biochemistry and Co-Director of the Vermont Cancer Center. Dr. Stein joins UVM from the University of Massachusetts Medical School, where he is the Haidak Distinguished Professor of Cell Biology, Co-Director of the UMass Memorial Health Care Cancer Center of Excellence, Chair of the Department of Cell Biology and Founding director of the UMass Human Stem Cell Bank & Registry.

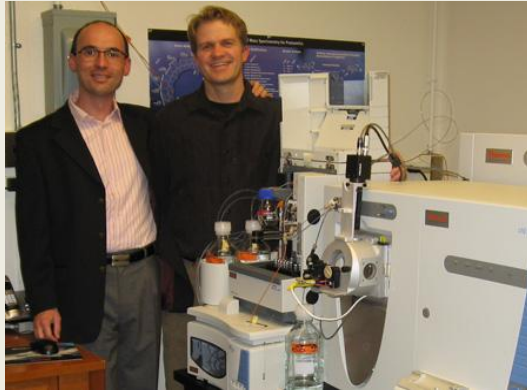
Following graduate training here at UVM in Biology and Physiology and post-graduate training in Pathology, Dr. Stein joined the faculty at the University of Florida College of Medicine where he became Vice-Chair of the Department of Biochemistry. He joined the faculty at the University of Massachusetts Medical School in 1987.

Dr. Stein directs a well-funded research program of scientists and physician investigators who are dedicated to discovering aberrant regulatory mechanisms in cancer cells and developing new dimensions to cancer diagnosis and therapy. Their research program is sponsored by the National Cancer Institute, pharmaceutical companies and by research foundations, and will significantly enhance the Biochemistry's programs in cancer and cell biology.

Dr. Stein has organized and chaired numerous international research conferences and serves on advisory panels for United States and foreign government science policy and granting agencies, scientific advisory boards for biotechnology, pharmaceutical and health care organizations and editorial boards of more than 20 journals. He has been committed to providing mentorship to more than 120 graduate students, postdoctoral students and physician scientists, developing research and science education programs in his institution as well as with universities in Europe, Asia, the Middle East and South America. His research contributions are documented in more than 850 publications.

[READ MORE ABOUT DR. STEIN](#)

The Molecular Basis for Two Novel Blood Group Systems Identified by an International Team of Scientists



Dr. Lionel Arnaud (left) and Dr. Bryan Ballif (right) standing behind the Vermont Genetics Network Mass Spectrometer used to identify the proteins responsible for two novel blood types. Their work was published in the February 2012 issue of Nature Genetics

Most people are aware of their ABO blood type, and many also know if they are Rhesus (Rh) positive or negative. However, very few learn if they are Langereis or Junior positive or negative. This is partly due to the fact that the proteins on red blood cells responsible for these lesser-known blood types have remained a mystery—that is until their recent discovery by an international effort, as described in the February 2012 issue of *Nature Genetics*. Using a mass spectrometer funded by the Vermont Genetics Network, Dr. Bryan Ballif, Associate Professor of Biology at the University of Vermont, analyzed proteins purified by a longtime collaborator, Dr. Lionel Arnaud (French National Institute for Blood Transfusion in Paris, France), thanks to monoclonal antibodies to Langereis and Junior blood antigens developed by Dr. Yoshihiko Tani (Japanese Red Cross Osaka Blood Center, Japan) and Dr. Toru Miyasaki (Japanese Red Cross Hokkaido Blood Center, Japan) respectively. Dr. Ballif identified the proteins to be the transport proteins ABCB6 and ABCG2. After the protein identification, Dr. Arnaud conducted extensive cytological and genetic analyses verifying that these proteins were indeed responsible for the Langereis and Junior blood types. Only 30 proteins have previously been identified as responsible for a basic blood type (or blood group system), *but the count now reaches 32 with ABCB6 and ABCG2!*

While blood transfusion problems due to Langereis and Junior blood types are rare worldwide, several ethnic populations are at risk. For example, more than 50,000 Japanese are thought to be Junior negative and may encounter blood transfusion problems or mother-fetus incompatibility. Thus, health care professionals will now be able to more rapidly and more confidently screen for these novel blood group proteins. This will leave them better prepared to have blood ready when blood transfusions or other tissue donations are required. Stay tuned, Drs. Ballif and Arnaud are continuing their approach and already have another tiger by the tail...

[FORBES ARTICLE](#)

Why do we age?



Why do we age, and why do many animals, including humans live beyond the last age that they can reproduce. This is a problem that has occupied evolutionary biologists since the time of Darwin.

The currently reigning theory is the “grandmother hypothesis” which is the idea that women live past the age of last reproduction because they help raise their grandchildren, and thus indirectly increase their fitness.

This theory works well for humans, but does not explain the observation that there are a large number of animals, both in captivity, and in the wild, that survive well past when they cease to reproduce. Animals known to survive past reproduction range from birds, to fish, and even worms. These lower animals don’t care for their young at all, thus, their post-reproductive survival is particularly puzzling.

In a recent study UVM professor, Charles Goodnight, and Dr. Josh Mitteldorf, a visiting scholar, propose that post reproductive lifespan may be an adaptation that slows and stabilizes population growth when populations are large, and as a result helps to prevent populations from over-shooting their resources. Ultimately, they suggest, post reproductive life span may be an adaptation that helps prevent populations from going extinct. [READ MORE](#)

Josh Mitteldorf, J. and C. Goodnight. 2012. Post-reproductive life span and demographic stability. *Oikos*, doi: 10.1111/j.1600-0706.2012.19995.x

PRESENTATIONS BY FACULTY

Dr. Jim Vigoreaux gave an invited talk at the Drosophila Genetics Annual Research Conference, Chicago, IL (March 7-11, 2012). The title of the talk was “Molecular Evolutionary Analysis of Flightin Reveals a Novel Protein Motif unique to Pancrustacea”. Co-authors included Pedro Alvarez-Ortiz and Felipe Soto Adames.

Dr. Vigoreaux also presented a poster at the 51st Annual Meeting of the American Society for Cell Biology, December 3-7, 2011 in Denver, CO. The title of the presentation was “Structural characterization of thick filaments from *Drosophila* flight muscles”, co authored with L.R. Nyland, J. Budzik and T. Ruiz.

RECENT FACULTY PUBLICATIONS

Saison C, Helias V, **Ballif BA**, Peyrard T, Puy H, Miyazaki T, Perrot S, Vayssier-Taussat M, Waldner M, Le Pennec PY, Cartron JP, Arnaud L. Null alleles of ABCG2 encoding the breast cancer resistance protein define the new blood group system Junior. *Nature Genetics*. 2012 Jan 15;44(2):174-7.

Helias V, Saison C, **Ballif BA**, Peyrard T, Takahashi J, Takahashi H, Tanaka M, Deybach JC, Puy H, Le Gall M, Sureau C, Pham BN, Le Pennec PY, Tani Y, Cartron JP, Arnaud L. ABCB6 is dispensable for erythropoiesis and specifies the new blood group system Langereis. *Nature Genetics*. 2012 Jan 15;44(2):170-3.

Wallis JM, Borg ZD, Daly AB, Deng B, **Ballif BA**, Allen GB, Jaworski DM, Weiss DJ. Comparative Assessment of Detergent-Based Protocols for Mouse Lung De-Cellularization and Re-Cellularization. *Tissue Engineering Part C Methods*. 2012 Jan 26

Caldwell GB, Howe AK, Nickl CK, Dostmann WR, **Ballif BA**, Deming PB. Direct modulation of the protein kinase A catalytic subunit α by growth factor receptor tyrosine kinases. *Journal of Cellular Biochemistry*. 2012 Jan;113(1):39-48.

Nakashima, K., Eddy, M. C., Katsukawa, H., **Delay, E.R.**, & Ninomiya, Y. (2012). Behavioral responses to glutamate receptor agonists and antagonists implicate the involvement of brain-expressed mGluR4 and mGluR1 in taste transduction for umami in mice. *Physiology & Behavior*, 105, 709–719.

Goodnight, C. J. 2012. Defining the Individual. In: From Groups to Individuals; Frédéric Bouchard and Philippe Huneman eds. In Press, MIT Press.

Mitteldorf, J, C. **J. Goodnight**, 2012 Post-Reproductive Life Span and Demographic Stability, In Press Oikos

Liu, Q, P. Chen, K. He, **C. W. Kilpatrick**, S-Y. Liu, F. Yu, and X. Jiang. 2012 Phylogeographic study of *Apodemus ilex* (Rodentia: Muridae) in southwestern China. *PLoS ONE*, 7(2):e31453.

Lodh, N., **Stevens L.**, Kerans B. 2012. The parasite that causes whirling disease, *Myxobolus cerebralis*, is genetically variable within and across spatial scales. *Journal of Eukaryotic Microbiology* 59. In Press.

Müller; A., Christine Klöppel; Megan Smith-Valentine; **Judith Van Houten**; Martin Simon. (2012) Selective and programmed cleavage of GPI-anchored proteins from the surface membrane by phospholipase C. *BBA* 1818: 117-124.

Chakravorty, S. Wadja, M. and **Vigoreaux, J. O.** (2012) Analysis of mating song in *Drosophila* muscle mutants. (Invited chapter) In *Methods*, 56: 87-94. Benian, G. and Bernsteins, S., editors. Elsevier Journals Publishing.

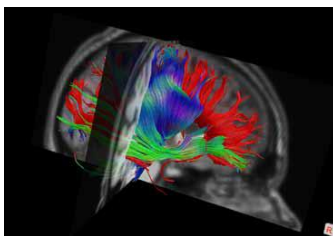


Photo by Stephan Boas

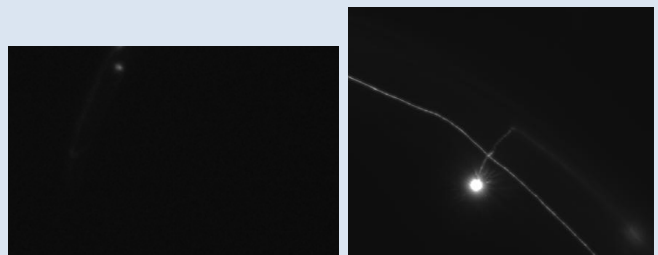
Visiting Scholar Karen Hinkle Receives Grant to Study Mechanisms of Neuronal Migration



Dr. Karen Hinkle is a visiting scholar at UVM and an Associate Professor of Biology at Norwich University. Since September 2011 Karen has been spending Independent Study Leave in Dr. Bryan Ballif's laboratory in the UVM Department of Biology where her work is focused on investigating the functional role of novel phosphotyrosine residues in Src-family tyrosine kinases; Dr. Ballif previously identified these sites through a large-scale phosphoproteomic study. In addition to biochemical studies as part of Dr. Ballif's current NSF grant, Dr. Hinkle is using the nematode *C. elegans* to test the functional consequences of these phosphorylation sites on neuronal migration. By inserting transgenes carrying wildtype or phosphorylation site mutants of the Src family kinase Fyn, Dr. Hinkle is examining their capacity to rescue the mechanosensory neuronal migration defects in Src mutant worms.

Dr. Hinkle was recently awarded a Vermont Genetics Network Project Grant for 2012-2013 to establish this system in her own lab at Norwich University and for the continuation of this exciting collaboration with Dr. Ballif and their collaborator Peter Juo at Tufts Medical School. The team expects to generate precious preliminary data for a future NSF proposal.

Below are images of fluorescent mechanosensory neurons in a whole worm (left) and at higher magnification (right). Specific neurons in the Src mutants are mispositioned and take more of a wandering path compared to the 90° turns seen at right. A new imaging facility in Marsh Life Science will enable these scientists to readily observe and measure neurons.



Recent Grad of the University of San Carlos, Guatemala, Visits the Dept of Biology



Lucia Herrera (right) showing another student a Chagas disease vector

This spring Lucía Herrera, a recent graduate of the University of San Carlos, Guatemala, visited the department to work with Professors Dr. Jim Vigoreaux and Dr. Lori Stevens. If you know these two faculty members, you might be surprised that they are co-advising a student. Stevens works on Chagas disease and population genetics, while Vigoreaux's research is on insect flight muscle.

Their common thread is that the Chagas disease parasite is transmitted by an insect vector, so naturally, Lucia investigated the hypothesis that infection with the parasite affects the insect vector's flight muscle.

Lucia's two-month visit to our Biology Department was funded by a very prestigious fellowship through the Inter-American Network of Academies of Sciences. The network promotes science and technology for development, prosperity and equity in the Americas, and provides independent policy advice to governments on key scientific, technological and health challenges. The visit allowed Lucia to acquire technical skills and to plan and facilitate further, long-term scientific collaboration.

It appears Lucia's travels are just starting, this fall she starts graduate study at the European Molecular Biology Laboratory in Heidelberg Germany.



***Triatoma dimidiata*, the major Chagas disease vector in Central America**

2012 Graduate Teaching Assistants of the Year Awards

This year two graduate students, Suraj Cherian and Nicholas de la Rua, have been named "Outstanding Teaching Assistants of the Year."



In the words of Dr. Rona Delay "Suraj Cherian is the kind of TA you dream about having for your course, always on time, prepared and extremely helpful. In class, the students really enjoyed working with Suraj. He was extremely patient and would explain or demonstrate just what the student needed to do. The students raved about him!"



Nick is a graduate student in Dr. Lori Stevens lab, and was a GTA for her BCOR 011 course in Fall 2010. He also has mentored three undergraduate researchers on independent projects related to his own research. Dr. Stevens said that "Nick is a pleasure because his commitment, enthusiasm and excitement about teaching are contagious and certainly deserving of recognition."

"When Nick started graduate school he was a bit daunted about teaching but he quickly became acclimated to the responsibilities for his weekly lab sessions and was well on his way. He usually had a story to relate to me about the week's lab sections and was determined to convey his passion for science and research to his students. Having published a couple of papers on his own undergraduate research, he was well aware of the challenges of scientific writing and dedicated himself to helping his students become better writers. Having gone through multiple drafts on his own papers, he was determined to have his students appreciate the benefits of multiple drafts and was always more than willing to nurture their skills in writing lab reports."

Congratulations to Suraj and Nick!

Grad Student Allison Neal in New Zealand



Graduate student Alli Neal spent the summer collecting snails on the mudflats of the Otago Peninsula in New Zealand. She received an NSF East Asia and the Pacific Summer Institute grant to work with Dr. Robert Poulin at the University of Otago and to study a portion of the life cycle of a trematode (parasitic flatworm) that uses these snails as an intermediate host. The parasite emerges from these snails and forms cysts on hard surfaces, and Alli's task was to determine which hard surfaces, if any, they prefer.

Through a combination of fieldwork and experiments in the laboratory, she determined that the parasite has a preference for forming cysts on the shells of a number of different snail species, and that they seem to prefer shells that already have cysts. This aggregation behavior might increase the number of mates available to them once they reach their definitive bird host. For more details about the results of this research, check out the publication, coming soon to the Journal of Parasitology!

RECENT GRADUATE STUDENT PUBLICATIONS

Chakravorty S., Wajda MP and Vigoreaux JO, Courtship song analysis of *Drosophila* muscle mutants. *Methods*. 2012, 56(1):87-94.

Lodh, N., Stevens, L., Kerans, B., 2011. Prevalence of *Myxobolus cerebralis* Infections Among Genetic Lineages of *Tubifex tubifex* at Three Locations in the Madison River, Montana. *Journal of Parasitology* 97, 531-534.

Lodh, N., Kerans, B., Stevens, L., 2012. The parasite that causes whirling disease, *Myxobolus cerebralis*, is genetically variable within and across spatial scales. *Journal of Eukaryotic Microbiology* 59 (1), 80-87.

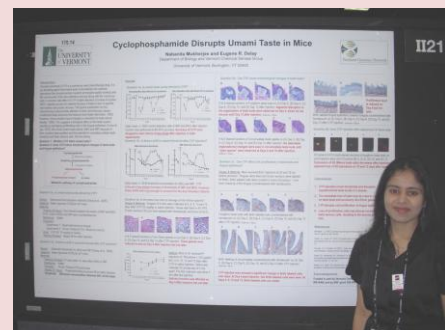
Neal, A. T. and R. Poulin. 2012. Substratum preference of *Philophthalmus* sp. cercariae for cyst formation under natural and experimental conditions. *Journal of Parasitology* 98: in press.

Allyson Degrassi, Receives Honorable Mention



Allyson (Ally) Degrassi, a first year PhD graduate student in Dr. Nick Gotelli's lab, received an Honorable Mention for the 2012 National Science Foundation's (NSF) Graduate Research Fellowship Program (GRFP). The purpose of the NSF-GRFP is to help ensure the vitality and diversity of scientific and engineering research while providing three years of financial support for graduate students and their associated university. Ally is focusing her research efforts on the effects of foundation species on rodent ecology, behavior, and population dynamics in eastern hemlock (*Tsuga canadensis*) forests. She is looking forward to begin her first field season at Harvard Forest's experimental Hemlock Forest removal plots this summer. Although she was not awarded financial support, she is grateful that her project was recognized and she will apply again next year!

Nabanita Mukherjee Awarded the Ronald Suiter Prize



Nabanita Mukherjee was granted a Ronald Suiter Prize to help fund her poster presentation, "Cyclophosphamide disrupts umami taste in mice" at the Society for Neuroscience Conference in Washington, DC, November 12-16, 2011

GRADUATES 2012



Congratulations to the following graduate students who completed their degrees!

Heather Axen, PhD – Interactions between Hybridization and Eusociality in a Fire Ant Hybrid Zone.
Advisor: Dr. Sara Helms Cahan

Mujeeburahiman Cheerathodi, PhD – Identification and Quantification of Embryonic CrkL-SH3 Binding Proteins: Implications for Reelin Signaling and the Quantification of Protein Isoforms Using Bottom-Up Proteomics.
Advisor: Dr. Bryan Ballif

Laura Farrell, PhD – Northeastern Mesomammals: Landscape Use and Detection.
Advisor: Dr. William Kilpatrick

Edmund Hart, PhD – The Impacts of Climate Change on Ecological and Evolutionary Processes.
Advisor: Dr. Nicholas Gotelli

Nilanjan Lodh, PhD – The Ecology, Population Genetic Structure and Spatial Genetic Variability of the Stream Dwelling Worm *Tubifex tubifex* and *Myxobolus Cerebralis*, the Causative Agent of Whirling Disease in Salmonid Fishes.
Advisor: Dr. Lori Stevens

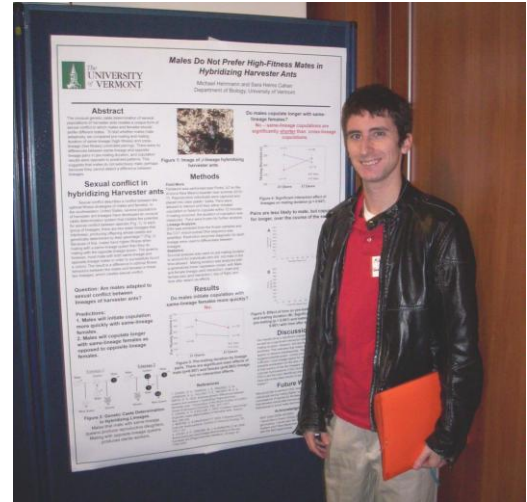
Sukanya Lodh, PhD – Characterization of PWA and PWB Proteins in Paramecium.
Advisor: Dr. Judith Van Houten

Renee Petipas, MS – Underground in Gated Communities: The Effects of Termites and Ungulate Herbivores on Plant Mycorrhizal Associations.
Advisor: Dr. Alison Brody

Madhurima Saha, PhD – Identification and Characterization of Novel RSK-dependant 14-3-3 Interactions.
Advisor: Dr. Bryan Ballif

Tatyana Svinkina, MS – Target of Rapamycin (TOR) and Glycogen Synthase Kinase 3 (GSK3) in Ciliate *Paramecium Tetraurelia*.
Advisor: Dr. Judith Van Houten

Grad Student Michael Herrmann Travels to London



This winter Michael Herrmann traveled to London for the Animal Behavior Winter Meetings to present his poster entitled “Sexual conflict arising in cross-lineage mating in hybridizing harvester ants”. He received funding from a Ronald Suiter Grant, as well as a mini grant. The meeting focused on “Wrong” mate selection, and its implications in animal behavior. The meeting was held at the London Zoo on December 1 and 2.

GRAD STUDENT POSTER PRESENTATIONS

Samya Chakravorty and Pedro Alvarez Ortiz presented posters at the Drosophila Genetics Annual Research Conference in Chicago, IL (March 7-11, 2012).



Chakravorty S, Foelber V, Tanner BC, and Vigoreaux J. “Requirement of the flightin amino terminal sequence for flight and species-specific courtship song in *Drosophila melanogaster*.”



Alvarez-Ortiz P, Ballif BA, Guillemette S, Humphrey R, and Vigoreaux J. “Expression and Function of Glutactin in *Drosophila* Larvae and Adults”

2012 Recipients of APLE Funding

The College of Arts & Sciences announced its Fall 2012 recipients of the Academic Programs for Learning and Engagement (APLE) awards. Awards are made on a competitive basis to grant proposals submitted by undergraduate students and evaluated by a committee of College faculty. Students work with a faculty research advisor to design a research project that the student then writes up as a mini-grant proposal. The following students working with Biology Department faculty were among the recipients of the 2012 funding. Congratulations!



Jen Grauer is a Zoology and Environmental Science double major, and has spent her time at UVM immersing herself in scientific research. She began in her sophomore year as a volunteer working with Dr. Joe Schall, studying the genetics of lizard malaria. Jen was selected as a McNair scholar in her junior year, and transitioned to social insect biology to conduct a year-long independent research project combining field ecology, genetics and GIS mapping to determine the habitat requirements of two species of ant and their interspecific hybrids. Jen received an APLE award in Fall 2011 for this work, which allowed her to travel to Arizona, New Mexico and Texas to see these species in their native habitat. She presented a research poster on this work at the UVM Student Research conference this past April, entitled "Ecological Niche Modeling of *Pogonomyrmex* Harvester Ant Lineages." For her senior McNair project, she will be broadening her horizons yet further, studying mammal behavior and ecology with Dr. Jed Murdoch in the Rubenstein School of Environment and Natural Resources.

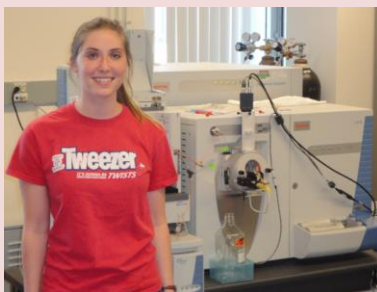


Genesis Tejada worked on a project examining genetic variability of a fish parasite introduced to the USA from Europe to assess single vs multiple introductions. The parasite, *Myxobolus cerebralis*, causes whirling disease in salmonid fishes, including the endangered Yellowstone cutthroat trout and the popular sport fish rainbow trout. Knowing if there is a multiple genetic strain of the parasite or just a single genetic variant will help develop strategies for controlling the disease. She is working with Professor Lori Stevens in Biology and in collaboration with graduate student Nikos Fytillis and Professor Donna Rizzo in Engineering at UVM and Professor Billie Kerans at Montana State University.

Additional APLE Awardees

Joseph Allario and Kelci Lanthier worked with Dr. Jim Vigoreaux, Department of Biology
 Nicholas Thompson and Collin Love worked with Dr. Bryan Ballif, Department of Biology
 Shannon Prior worked with Dr. Alison Brody, Department of Biology
 Reynaldo Pena Jr worked with Dr. Lori Stevens, Department of Biology
 Caleb Liberman worked with Dr. Katarina Zvarova, Department of Surgery
 Megan Lind worked with Dr. Joseph Schall

Undergraduate Kate Schlosser Working in the Ballif Lab



Kate Schlosser

Undergraduate Kate Schlosser, working in the lab of [Dr. Bryan Ballif](#), was part of an international team of scientists who recently published their work in *Vox Sanguinis*, the international journal of transfusion medicine¹. Kate used a mass spectrometer funded by the [Vermont Genetics Network](#) to map a specific antibody-recognizing region of the water channel Aquaporin 1, a protein that is found on red blood cells and is responsible for the [Colton blood group system](#). This work facilitated the efforts of collaborator, Dr. Lionel Arnaud, and his team at the French National Institute for Blood Transfusion, in the identification of only the sixth individual in the world found to be completely deficient in Aquaporin 1. The work not only helped characterize the special blood transfusion requirements and pregnancy challenges for this rare individual, but also contributes to our understanding of a complex and still poorly understood blood group system.

[ABSTRACT](#)

STUDENT HONORS AWARDS 2012

Each year the Department of Biology recognizes and awards undergraduates who have made outstanding contributions to research. Dr. Jim Vigoreaux, Chair of the Biology Department, presented the awards

Congratulations to all!



Amy Glen, Caleb Liberman, Margaux McConn, Ashleigh Allaire, Amanda Northrup and Dr. Jim Vigoreaux

Ashleigh R. Allaire

Received the George Perkins Marsh Award in Ecology/Evolution

Ashleigh has recently started volunteering in Dr. Jon Boyson's immunology lab. The main focus of study in this lab are semi-invariant NKT cells; a lymphocyte subset that has been found to be important in tumor immunology, autoimmunity, and infectious disease. Activated NKT cells produce cytokines begins the downstream activation of both innate and adaptive immune cells such as NK cells, macrophages, dendritic cells and B cells. The project that Ashleigh will begin working on involves cloning and studying the expression of mouse SLAM family genes in order to investigate their role in NKT cell proliferation and function. She will be using a variety of molecular biology skills and immunology skills such as flow cytometry.

Amy K. Glen

Received the Joan M. Herbers Award in Biology

Amy's favorite areas of biology are ecology, evolution, and genetics; she is especially interested in areas where those three things overlap. She is not very picky, however, and really does enjoy all aspects of biology and, more generally, admire the style of thinking all biology inspires and requires.

Caleb S. Liberman

Received the Bernd Heinrich Award In Physiology or Evolution

The title of his thesis is: The Effects of Traumatic Brain Injury on Bladder Function. Mentor: Dr. Katarina Zvarova.

ABSTRACT

Traumatic brain injury (TBI) is a threat to proper neurological function in all individuals and can result in symptoms such as incontinence or overactivity, problems that can severely decrease an individual's quality of life. Unfortunately, the mechanisms behind this injury-induced bladder dysfunction are not well known, and so there are a limited number of effective treatments for afflicted individuals. This study seeks to characterize the relationship between brain injury and the associated bladder dysfunction (incidence and type) via the continuous monitoring of systemic and intravesical pressures simultaneously, both before and after FP-TBI is induced. Data will be collected wirelessly using a radiotelemetric implant device. We aim to validate the accuracy of the wireless device using conventional cystometry for diagnostic efficacy in experimental settings, and describe changes in urodynamic and hemodynamic parameters during the sequence of events that occurs within 24 hours post injury to observe the physiological effects of TBI on bladder function. It is believed that experimentally-induced TBI will cause disruption of the CNS, resulting in increased intermicturition intervals and voiding volume, as well as changes in blood pressure and heart rate. The result of this study demonstrated successful injury-induced bladder dysfunction; with 57.1% of animals developing transient incontinence and 85.7% experiencing increased intravesical pressure. Further, we successfully observed and characterized the urodynamic sequence of events immediately after injury. This principal study of mechanical and physiological changes in the bladder is a crucial step towards more fully understanding injury induced bladder dysfunction in the hopes of providing more effective treatments in the future.

Margaux M. McConn
Received the Paul A. Moody Award in Biology

The title of her thesis is: Competition between thick filament proteins, MyBP-C and flightin, for myosin binding in *Drosophila* transgenic lines. Mentor: Dr. Jim Vigoreaux.

ABSTRACT

Mutations in cardiac myosin binding protein C (cMyBP-C) have been linked to Familial Hypertrophic Cardiomyopathy in humans. The molecular interactions by which cMyBP-C fulfills its role in proper muscle contraction are still relatively unknown. This research investigates the possibility that thick filament proteins, flightin and cMyBP-C, are functional homologs. Specifically this study will examine if endogenous flightin and transgenic human cMyBP-C compete for myosin binding when co-expressed in the flight muscles of *Drosophila melanogaster*. According to flight characteristic tests such as flight index and wing beat frequency, the presence of cMyBP-C partially restores flight but does not fully rescue flight capabilities in the absence of flightin. Using protein quantification of fluorescently stained polyacrylamide gels we determined that the presence or absence of flightin does not appear to significantly alter cMyBP-C expression in two independent transgenic lines. The flightin to myosin heavy chain ratio (~1:1.3 to 1:2) is also not affected by the presence of cMyBP-C, which was found to be expressed at a much lower ratio to myosin (~1:12 to 1:15) than flightin. However, these results were not found to be statistically significant. Quantification of flightin using mass spectrometry with synthetic, heavy isotope labeled peptides are consistent with gel analysis showing that the presence of cMyBP-C does not result in lower flightin expression. In contrast, mass spectrometry quantification of cMyBP-C showed increased expression in the presence of flightin. However, statistical significance of these results could not be concluded due to an insufficient sample size. The results of this study suggest several conclusions: (i) cMyBP-C is incorporated into the myofibril; (ii) cMyBP-C cannot fully rescue for the absence of flightin but can partially compensate flightin function; and (iii) cMyBP-C may be binding to unoccupied myosin binding sites, actin or other thick filament proteins. Further data needs to be collected to accurately compare the accuracy of protein quantification via gel electrophoresis and fluorescent dyes versus mass spectrometry with AQUA peptides.

Amanda C. Northrop
Received the Kurt Milton Pickett Award

The title of her thesis is: Does Working behavior control differential development rates in parental and hybrid harvester ant lineages? Mentor: Dr. Sara Helms Cahan.

ABSTRACT

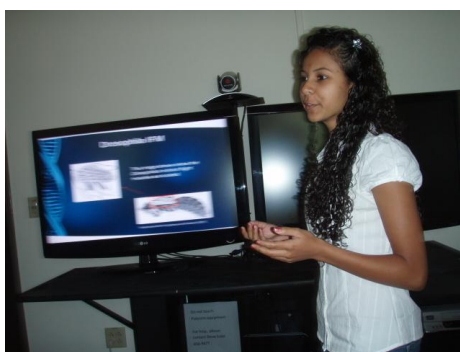
The success of ant colonies is largely determined by colony size, which is positively influenced by the rapid development of offspring. In *Pogonomyrmex* harvester ants, interspecific hybrid offspring develop more rapidly than one of their parent species, *P. rugosus*, which could be caused by intrinsically faster development or by enhanced larval care provided to the offspring by hybrid workers. In this study, I conducted a cross-fostering experiment to test which of these factors drives differences in developmental rates between the "J1" hybrid lineage and *P. rugosus* harvester ants. J1 larvae raised by J1 workers developed more rapidly than those raised by *P. rugosus* workers; however, there was no difference in development time of *P. rugosus* larvae, regardless of worker type. The *P. rugosus* larvae developed at a rate more similar to that of the J1 larvae raised by *P. rugosus* workers than to J1 larvae raised by J1 workers. The results of my study indicate a gene by environment influence on larval developmental rates, with J1 larvae displaying plasticity in developmental rates depending on host worker identity while *P. rugosus* larvae display rigidity in developmental rates regardless of the type of caregiver. My data show that the developmental rate of offspring of *Pogonomyrmex* harvester ants is not influenced by a single factor, but is determined by a complex interaction of genotype and worker behavior.

Photos by Nabil Nasseri



High School students from Puerto Rico Participate in Summer Research

Five pre-college students from Puerto Rico participated in the 2011 summer research internship program hosted by the Department of Biology and the EPSCoR Streams project. The five students, Nicolle Rosa, Jennifer Patritti, Melinda Vargas, Melanie Cruz, and Valerie Mejia, are participants in the Ana G. Mendez University System (AGMUS) Institute for Mathematics, a year round Saturday research academy. A brief description of the student projects follows:



Nicolle Rosa (pictured) used RNA in situ hybridization and RT-PCR to investigate the phylogenetic distribution and expression of flightin, a myosin-binding muscle protein. Her work uncovered broad patterns of tissue expression in the grasshopper (*Locusta migratoria*) and the water flea (*Daphnia pulex*) that contrast sharply with the flight muscle-specific expression found in the fruit fly *Drosophila*. These studies have important implications for understanding the evolutionary history of flightin and insect flight, and the phylogenetic relationships of insects and crustaceans.

The project was supervised by Pedro Alvarez, a graduate student in the Vigoreaux laboratory. Ms. Rosa received the award for Best Poster Presentation under the Pre-College category at the annual AGMUS Research Symposium held in San Juan, PR in September 2011.

Melinda Vargas Melinda Vargas studied phosphoregulatory mechanisms of Collapsin Response Mediator Proteins which govern the migration of neurons during development.

Melanie Cruz participated in research with mice to study the role of specific taste receptors in generating the perception of the tastes of L-glutamate (umami) and sucrose (sweet). Under certain conditions, normal mice often confuse the taste of sucrose with L-glutamate. Melanie tested normal mice and genetically altered mice with behavioral methods. This experiment was designed to see if the genetically altered mice, which were missing one of the taste receptors for L-glutamate, would also have difficulty distinguishing between sucrose and L-glutamate. Her results suggested that the genetically altered mice did not confuse the tastes of these substances like the normal mice. These data indicate that this receptor is important for distinguishing between these basic tastes. Melanie also was able to observe and participate in other projects that were studying the effects of chemotherapy drugs on the taste system. All of these studies are important for understanding how our taste system detects and encodes information about foods, and can give us a better understanding of what happens when the taste system is malfunctioning. A diminished capacity for tasting food can lead to poor nutritional intake and malnutrition, which can lead to a poorer prognosis and diminished quality of life for a number of clinical populations (diabetes, cancer).

Jennifer Patritti and **Valerie Mejia** participated in the EPSCoR Streams project whose goal is to address pollution issues along the Lake Champlain watershed.

FIRST ANNUAL “ART OF BIOLOGY” IMAGE CONTEST WINNERS

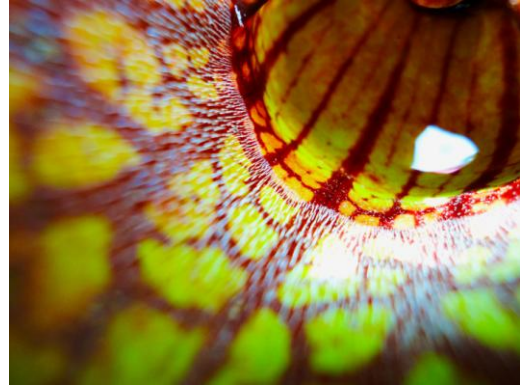
These photos were taken by Graduate and Undergraduate students in the Department of Biology. Images are of original research conducted by the student and related to research in the Biology Department. Selected images are displayed in the Marsh Life Science Building. Notification of the next Image Contest will be sent via email in January. Enjoy!

Grand Prize Winners: Nabil Nasseri (Graduate Student) and Rachel Brooks (Undergraduate Student)

Special Recognition Awardees: Allison Neal, Laura Farrell, Stefan Boas and Nabanita Mukherjee



This is an adult male African elephant (*Loxodonta africana*). This picture was taken during Nabil Nasseri's research investigating elephant behavior after they interacted with a suite of putative natural chemical compounds. Nabil was looking for “negative”/defensive behaviors. This picture is of a defensive posture where the head is held high and the ears extended out. Photo taken by Nabil Nasseri, Biology Department Graduate Student, in Dr. Alison Brody's lab. This photo was taken in Northeast



The patterned leaves of the Northern Pitcher Plant (*Sarracenia purpurea*) trap insects in their cup shaped leaves. These rain filled pockets contain an entire micro-ecosystem consisting of many endemic species that break down the captured prey. This miniature aquatic ecosystem provides a unique opportunity to study how natural systems respond to environmental changes. Developing monitoring techniques can allow for the prediction and prevention of these changes in this, and possibly other, systems. This image is just a small window into the complex interactions between this plant and its environment. Photo taken by Rachel Brooks (2011 Graduate), in Petersham, MA during her research project with Dr. Nicholas Gotelli and Dr. Bryan Ballif.



Western fence lizard, *Sceloporus occidentalis*, the host of the lizard malaria parasite *Plasmodium mexicanum*. This host-parasite system has been studied by Dr. Joseph Schall and his students for over 30 years. Research topics include virulence, transmission, phylogenetics, life history traits, and parasite sex ratios. This research has contributed to a greater understanding of ecology and evolution, particularly for malaria parasites. Photo by Allison Neal, a Graduate Student in Dr. Joseph Schall's lab.



TRI BETA is the National Honor Society for students who major in Biology. The society has a three-part mission: stimulation of scholarship, dissemination of scientific knowledge, and promotion of biological research. It is primarily designed for undergraduates, with the goal of recognizing students with outstanding scholarly achievement in the life sciences and actively promoting undergraduate participation in research.

PROMOTED MEMBERS: Christopher Cason

NEW MEMBERS: Sienna Weinstein, Cailyn Toomey, Jen Grauer, Caroline Kirkpatrick, Zachary Evans, Michaela Cornbrooks, Megan Hess, Harrison Keyes, Samantha O'Dwyer

WE ARE PROUD TO RECOGNIZE OUR GRADUATING SENIORS!

Kelsey Haist, Chelsea Manning, Rhys Niedecker, Luke Soelch, Megan Gibeley, Rob Rudy, Caroline Kirkpatrick, Harrison Keyes

For information on Tri Beta go to: [TRIBETA](http://tribeta.org)



Alumni Update – The UVM Connection

Check out the online connection to communicate with classmates from the past:

<http://www.alumni.uvm.edu/>

Donations Made to the Department of Biology in 2012

The Department of Biology would like to thank the generous contributions made by the following. Your donations are very much appreciated!

Ms. Wendy Sara Rosenblum
Mrs. Carol Leavitt Levine

Thank you all very much!

Yes! I am pleased to support the UVM Department of Biology and its commitment to excellence in education and research!

We are grateful for your contribution to the Biology Department of any amount

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