DEPARTMENT OF BIOLOGY
WILLIAMS COLLEGE
WILLIAMSTOWN, MASSACHUSETTS 01267

Thompson Biology Laboratory
(413) 597-3315
(413) 597-3495 fax

2011-2012 Colloquium Schedule

September 16, 2011: Reports by students who have been doing summer research off campus

September 23, 2011 (co-sponsored with Neuroscience): Larry Zipursky, Ph.D. UCLA, HHMI
"Cell Recognition, Molecular Specificity and Constructing Neural Circuits"
The Dscam1 gene of Drosophila encodes a large family of cell recognition molecules essential for the development of neural circuits in Drosophila. Alternative splicing generates some 38,016 different cell surface proteins, comprising 19,008 different amino sequences extending out from the cell membrane tethered to the cell by one of two alternative transmembrane domains. Each different Dscam1 protein, or isoform, shows exquisite recognition specificity. Each isoform selectively recognizes the same isoform on opposing membranes and thereby contributes to patterning neural circuits. I will briefly review what we know about how neural circuits are constructed from studies in both vertebrate and invertebrate model systems. I will then discuss both biochemical and genetic studies demonstrating that Dscam1 isoforms regulate neural circuit assembly in an entirely unexpected way.

September 30, 2011: Dr. Warren Abrahamson, Bucknell University
"Host Plants, Herbivores, & Natural Enemies: A Medley of Questions and Approaches"
Biologists have long sought an answer to the question, "What determines species diversity?" Recent findings suggest that "species may beget species," that is, that the diversity of species may drive species formation within other interacting species. My lab group has examined this question from the perspective of how species differentiation at one trophic level may facilitate the differentiation of species at another trophic level. Using the three-trophic-level interactions among goldenrod host plants, gall-inducing insect herbivores, and natural enemies of the herbivores as a model system, we have gained numerous insights into the impacts of herbivores on their host plants, the evolution of host-plant defense (via resistance and tolerance) against herbivores, the evolution of insect traits, adult insect oviposition preference and offspring performance, host-race formation & the sequential speciation and radiation of interacting species. My presentation will highlight a medley of related questions; our approaches to answer these questions; and our findings. My goals are to share insights into the ecological and evolutionary consequences of plant-animal interactions and the values of utilizing a variety of field and experimental approaches.

October 07, 2011: Mountain Day

October 14, 2011: Thesis Talks

October 21, 2011: Thesis Talks

October 28, 2011 (1960s Scholar lecture): Dr. Pam Silver, Harvard Medical School
"Designing Biological Systems for Health and Sustainability"
Biology presents us with an array of design principles. From studies of both simple and more complex systems, we understand some of the fundamentals of how Nature works. We are interested in using the foundations of biology to engineer cells in a logical and predictable way to perform certain functions. By necessity, the predictable engineering of biology requires knowledge of quantitative behavior of individual cells and communities and the ability to construct reliable models. By building and analyzing synthetic systems, we learn more about the fundamentals of biological design as well as engineer useful living devices with myriad applications. For example, we are interested in building cells that can perform specific tasks, such as counting mitotic divisions and remembering past events thus acting as a biological computer. Moreover, we design cells with predictable biological properties that serve as cell-based sensors, factories for generating useful commodities and improved centers for carbon fixation. In doing so, we have made new findings about how cells interact with and impact on their environment.

November 4, 2011 (BIMO Class of 1960s Scholar lecture): Dr. Gokhan Hotamisligil, Harvard School of Public Health
"Treasure hunting in fat to treat the plague of metabolic diseases"

November 11, 2011: Dr. Zhen Yan, Univeristy of Virginia
"Molecular and signaling mechanisms of skeletal muscle adaptation"
Skeletal muscle exhibits superb plasticity in response to changes in functional demands. Chronic increases of skeletal muscle contractile activity, such as endurance exercise, lead to a variety of physiological and biochemical adaptations in skeletal muscle, including mitochondrial biogenesis, angiogenesis, and fiber type transformation. These adaptive changes are the basis for the improvement of physical performance and other health benefits. This lecture focuses on recent findings on genetically engineered animal models designed to elucidate the mechanisms and functions of various signal transduction pathways and gene expression programs in exercise-induced skeletal muscle adaptations.

November 18, 2011: Dr. Jerry Yin, University of Wisconsin, Madison
"Memory, sleep, sick flies and fiesty badgers--Really??"
My lab works on higher order neuronal function/dysfunction. The cAMP/PKA/dCREB2 signaling pathway is a conserved cassette used in many contexts, including memory formation. Recent work shows that it is dysfunctional in fly models of neurodegeneration, and suggest that it is a fundamental cellular thermostat to coordinate inter- and intracellular homeostasis.

December 2, 2011: Biology Class of 1960s Scholars Reunion

Winter Study Science Communication Series

January 9, 2012 (Wege Auditorium at 7pm): A panel discussion on careers in science writing and scientific illustration featuring Maywa Montenegro, Sacha Vignieri and Janet Iwasa. Maywa Montenegro '02 rose from intern to editor of SEED magazine after getting a masters in science writing from MIT; Sacha Vignieri is an editor of Science; and Janet Iwasa '99, who earned a PhD from UCSF and post-doc'ed at Harvard and is now a Lecturer in Science Illustration at Harvard.

January 17, 2012 (Wege Auditorium at 7pm): As part of our Science Communication series, Dr. Richard Besser, '81, ABC News' senior health and medical editor, will be on campus.

January 19, 2012 (Wege Auditorium at 7pm): Screening of Flock of Dodos (film on evolution vs. creationism) – this is a hilarious movie with the message that scientists should do a better job in communicating science.

January 24, 2012 (Wege Auditorium at 7pm): Screening of Sizzle (another funny film – this one on global warming). That will be followed by skyped Q&A with writer/director of these two movies, Randy Olson.

February 17, 2012: Winter Carnival

February 24, 2012: Dr. Kerry Woods, Bennington College
"Imagined Forests: Preconceptions and Realities of Old-Growth"
Long-standing models of late-successional forest communities are based on surprisingly sparse evidence. I use unusually long-term data-sets to assess hypotheses about predictability and stability in these slow systems and to explore the importance of historical contingency. Community assembly processes in old-growth forests may be simpler than we thought, but perhaps less esthetically pleasing.

March 9, 2012: Dr. Margaret Rubega, University of Connecticut
"Feeding mechanics in birds: we know less than you think"
Birds display an astonishing diversity of beak shapes, and feed in every kind of habitat. The apparent match of beak shape to feeding style leads to compelling stories about how mouth parts have adapted to food type in birds, but surprisingly few of these stories have actually been tested. Testing ideas about how birds feed has important implications for our understanding of what they eat, where they eat it, and whether environmental degradation will limit their ability to eat it successfully. We use techniques from biomechanics to field ecology to uncover all the links in the chain between morphology and feeding ecology in birds, and find over and over again that the truth is more surprising and interested that our best guess was.

April 6, 2012: Dr. Wendy Garrett, Harvard School of Public Health
"Disease-associated and beneficial gut microbiota in colitis and colorectal cancer"
Numerous studies of the microbiota that are found throughout the human body are underway with the goal of unraveling the role of microbes in both human health and disease. Inflammatory bowel disease (IBD) is an ideal setting for such studies as disruption of homeostasis between the host immune system and the intestinal microbiota is now a well-accepted contributor to IBD pathogenesis. Using experimental colitis models, we are investigating microbes that may instigate chronic inflammation as well as putative beneficial microbes whose reduced presence may impact not only host response to the microbiota but also the behavior of the endogenous microbiota. Chronic inflammation in the intestine is not only the central pathophysiologic mechanism of IBD but also a key contributor to colorectal cancer. Ongoing work on the colorectal microbiome using experimental models and human tumors will be discussed. Collectively, our studies support the utility of wedding culture-independent and culture-dependent studies with mouse models for defining how the gut microbiota works in concert with the mucosal immune system to shape disease susceptibility for IBD and colorectal cancer.

April 11, 2012: Public Health Lecture with Dr. Miriam Cremer
"Cervical Cancer Prevention in Rural El Salvador"
Basic Health International (BHI) is a women's health nonprofit organization with a mission to eradicate cervical cancer in Latin America and the Caribbean. BHI utilizes its expertise in women's health to provide clinical training, research and public policy guidance in the field of cervical cancer screening and treatment, particularly for women in low-resource settings. BHI believes training in-country physicians and other healthcare professionals to provide gynecological care in rural areas is the only way to help develop sustainable programs.
Dr. Miriam Cremer is the President and Founder of Basic Health International. Dr. Cremer will provide an overview of her organization, discussing the basics of cervical cancer, including its burden on developing countries such as El Salvador. Additionally, Dr. Cremer will highlight the work BHI conducts to address this burden, including training health promoters and in-country physicians in affordable, safe screening and treatment methods for cervical cancer such as VIA (visual inspection with acetic acid) and cryotherapy. Finally, Dr. Cremer will explain how the programs being conducted by BHI can and are being replicated in other countries.

April 13, 2012 (1960 Scholar Lecture): Dr. Jerry Wilkinson, University of Maryland
"Sexual selection, genomic conflict and reproductive isolation in stalk-eyed flies"
Sex chromosome meiotic drive is a form of genomic conflict in which one of the two sex chromosomes passes disproportionately often into sperm produced by carrier males. Such selfish genetic behavior should result in an arms race between genes on the sex chromosomes for either driving or suppressing transmission bias. One prediction of this process is that interbreeding between historically isolated populations would be expected to uncover cryptic drive because coevolved suppressing factors are expected to be absent. Furthermore, to the extent that sex chromosome drive affects spermatogenesis, male hybrid sterility may occur and, therefore, create reproductive isolation. In this talk I describe studies on *Teleopsis dalmanni*, a sexually dimorphic stalk-eyed fly found in Southeast Asia, which test these predictions. I also

present evidence to assess the degree to which reproductive isolation occurs after mating but prior to fertilization as a consequence of sexual selection. Generation of backcrosses between hybrid females and males from three different closely related populations reveals that sterility segregates in simple ratios and that cryptic drive is common and can produce either extremely female-biased or male-biased progeny sex ratios. Sexual selection operates on multiple traits in this system and interacts with drive in surprising ways in these unusual flies.

April 20, 2012: Dr. Rachel Brewster, University of Maryland Baltimore County
"Getting the brain into shape: mechanisms of neural tube morphogenesis"
Research in the Brewster laboratory centers on the general question of how the neural tube, the precursor of the central nervous system, is formed during embryonic development. We use the zebrafish as a model system as it is a vertebrate that provides many advantages for performing embryonic manipulations, imaging of live embryos and carrying out forward and reverse genetics.Through the study of a mutant called *linguini* in which the microtubule network is disrupted, we have found that stabilization of the microtubule network is essential for proper neural convergence, an early and conserved stage of neural tube formation. Our efforts in developing tools for analyzing microtubule dynamics in live embryos and investigating the role of Microtubule Associated Protein 1b (MAP1b) and the ligand/receptor pair RGMa and Neogenin will be discussed.

April 27, 2012 (BIMO Class of 1960s Scholar lecture): Dr. Leonard Guarente
"Sirtuins, Aging & Disease"

May 4, 2012: Honors Poster Session, TBL lobby from 1:00 - 2:30