

Chair: Joseph Koonce

Cell and Developmental Biology

- Radhika Atit***: Origin and development of dermis in the skin
- Morris Burke***: Molecular mechanisms of actomyosin motility
- Arnold Caplan***: Use of stem cells to regenerate tissues
- Chris Cullis***: Plant genomes and crop improvement
- S. Haynesworth***: Mesenchyme stem cells and adipocyte cell fate
- Jennifer Liang***: Neural development and regulation of circadian rhythm
- Charles Rozek***: Genetics of flies

Transgenic mouse embryo with expression in the belly side of the mouse: Courtesy of Dr. Atit. Genetic tools in the mouse embryo are used to permanently mark cells on the belly side and follow their fates during embryonic development.

Rozek

Fluorescent Zebrafish larva: Courtesy of Dr. Liang. Zebrafish that lack the Cyclops gene are born with only one eye. Embryos with this missing gene also have the pineal organ that controls circadian rhythm is misplaced in the brain. This allows for the study of how secreting signaling molecules affect the development of embryos

Liang

Caplan

Haynesworth

Cullis

Neurobiology and Robotics

Neurobiology and Neuromechanical Systems

- Hillel Chiel***: Soft tissue biomechanics, neural modeling, and soft robots
- Darin Croft***: Mammalian paleontology, evolution, and community
- Dmitri Kourennyi***: Electrophysiology; ion channels; retinal physiology
- Kristan Lukas***: Effects of designed environments on animal behavior
- Roy Ritzmann***: Locomotion in insect through complex terrain
- Peter Thomas***: Mathematical biology, computational neuroscience
- Mark Willis***: Olfactory orientation and flight behavior
- Debra Wood***: Rhythmic behaviors and analysis, neural network

Chiel

A single frame of video taken at 500 frames per second as a cockroach climbs a plastic barrier: Courtesy of Dr. Ritzmann

Lukas

Flight track of a *Manduca sexta* male as he tracks a pheromone plume upwind to its source (wind is blowing from right to left): Pictures Courtesy of Dr. Willis.

Wood

With a combination of high-speed video analysis and electrophysiology one can begin to understand how insects deal with barriers to forward locomotion.

Ritzmann

Moths use odor to navigate flights to find flowers or pheromones to for mating. By tracking flight muscles and patters, computer simulations can be created.

Neurophysiology



The Department of Biology provides training for both undergraduate and graduate students. The strongest areas of training in the program are in Animal Behavior, Biochemistry, Cell and Developmental Biology, Computational Biology, Ecology and Evolutionary Biology, Genetics, Molecular Biology, Neurobiology, Physiology, and Plant Biotechnology. In addition, the Department is closely affiliated with other divisions such as the School of Medicine and the Case School of Engineering at Case Western Reserve University. Cooperative programs outside of Case including the **Cleveland Museum of Natural History**, **Cleveland Metroparks Zoo**, and **Holden Arboretum** allow for students to have a variety of resources at hand. Research in the department is primarily conducted in one of three focus areas: **Cell and Developmental Biology**, **Neurobiology and Neuromechanical Systems**, or **Plant Dynamics and Disturbance Ecology**. This focus framework allows faculty to build on common research interests. Mentored teaching and research programs with faculty and students foster a strong educational environment in the Department.

Highlights in Student Achievements and Publications

Graduate Student Publications, Honors, and Awards

- Mu, L. and **Ritzman, R. E.** (2005) "Kinematics and motor activity during tethered walking and turning in the cockroach, *Blaberus discoidalis*". *J Comp Physiol A*. 191:1054
- Graham AC, Kis DL, Andrusis ED. Differential distribution of exosome subunits at the nuclear lamina and in cytoplasmic foci. *Mol Biol Cell*. 2006 Mar; 17(3):1399-409
- 2005. Noche, R.R. and **Liang, J.O.** (10th EPBR Congress, September 2005, Poster Frankfurt/Main, Germany) Role of exo-rhodopsin signaling in the regulation of pineal gene expression
- Jennifer Tally: 2006- Using simulations to understand simple rules for odor tracking. Oral presentation. International Symposium for Biologically-inspired Design and Engineering, Atlanta, Georgia
- 2006- Odor tracking based on simple rules: using simulations to understand animal behavior. Oral presentation. East Coast Never Net, Woods Hole, MA.
- Sarah Carrino and Ramil Noche. Phi Beta Kappa grant for student research competition. Noche: "Light Sensing Role of Exo-Rhodopsin in the Developing Zebrafish Pineal Organ", Case Western Reserve University (US \$500), June 2006
- Psujek, S., Ames, J., and Beer, R.D. (2006). Connection and coordination: The interplay between architecture and dynamics in evolved model pattern generators. *Neural Computation*, 18(3): 729-747.
- Sutton, G.P. and **Chiel, H.J.** 2006. Dynamics of multifunctional in *Aplysia*. *Soc. Neurosci. Abstr.*
- Chesteck, C.A., Samsukha, P., Tabib-Azar, M., Harrison, R.R., **Chiel, H.J.** and Garverick, S. L. (in press) *Microcontroller-based wireless recording unit for neurodynamic studies in saltwater*, *IEEE Sensors Journal*

Summer Program in Undergraduate Research (SPUR) Student Publications

- Zhu J, Beamish J.A., Tang C., Marchant K.K., Marchant R.E. (2006). *Extracellular matrix-like cell-adhesive hydrogels from RGD-containing poly(ethylene glycol) diacrylate*. *Macromolecules* 39: 1305-1307.
- Tang C., Mee Ja S., Bohnet S., Rehman A., Taishi P., Krueger J.M. (2005). *Interleukin-1 & #946; induces CREB-binding protein (CBP) mRNA in brain and the sequencing of rat CBP*. *Molecular Brain Research* 137:213-222.

Elena Hoellein

Sheryl Petersen

Jennifer Tally

Tom Neeson

Thu Tran

Sarah Kyker

Danielle Mackay

Ramil Noche

*Indicates Research Mentoring Faculty
Italics indicates adjunct faculty

Plant Dynamics and Disturbance Ecology

Burke

Drewa

Keiper

Koonce

McCall

Pilla

Smemo

Snyder

Swanson

Rhizosphere and plant ecology
Plant ecology and role of disturbance
Insect biology and ecology
Great lakes land/water interactions
Pollution ecology, sediments, and modeling
Boundary crossing problems, statistics
Soil biogeochemistry
Effects of environmental variation
Global Change, wetland ecology

Researcher collecting samples off the shore of Lake Erie: Pictures courtesy of Dr. Koonce

Data collected from water and samples are used to make a GIS database and models that will regulate the management of Lake Erie fisheries. The database provides documentation of river tributaries, including the geo-data, as well as evidence for linking land-change and non-point pollution to coastal fish habitat productivity

Teaching Emeriti

Teaching and Emeriti Faculty

Bader

DiIulio

Drushel

Haywood

Locci

Rosenberg

Rushforth

Westin

Zull

Aquatic Biology, K-12 outreach
Cell biology and microbiology
Anatomy, physiology, robotics, executive officer
Systems biology, GOB chemistry
Biology lab, ecology
Herpetology, human physiology and anatomy
Former chair of the Biology Department
Introductory biology, physiology
Human learning and brain in education