



MCDB News

Molecular, Cellular, and Developmental Biology
University of Michigan

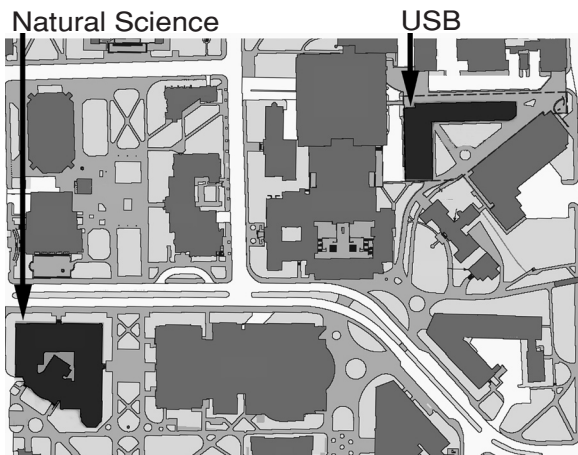
Fall 2006

A NEW BUILDING FOR MCDB LAB CLASSES

A highlight of the past year was the opening of the Undergraduate Science Building (USB), the new home for MCDB laboratory courses in cell biology, microbiology, animal physiology, genetics, developmental biology, neurobiology and endocrinology. It has fantastic facilities, and I encourage you to walk through it next time you visit Ann Arbor. The USB is located about two blocks from our current home in the Kraus Natural Science building (see map). However, I also have to report on a major disappointment. After two years of intensive planning for a new building next to the USB to house MCDB research labs, it was decided to defer construction of this building until the state economy improves.



The entry courtyard of the USB.



EDUCATION AND RESEARCH IN MCDB

The Biology major we offer jointly with the Department of Ecology and Evolutionary Biology continues to thrive, and our more specialized majors have exploded in popularity. The Cell and Molecular Biology major now has nearly 250 concentrators, and two new majors we initiated in 2005-06 (Neuroscience and Microbiology) have a combined total of over 150 concentrators.

Our undergraduate and graduate students are doing exciting research as evidenced

by the theses titles listed on pages 6 and 7. Faculty research continues to thrive with one of this year's highlights being a cover article in *Science* by Eran Pichersky where his work on the volatile compounds found in plants is described. Also, Bob Denver's work on the role of the hormone leptin in frog development is of great interest and is featured on page 2. In this issue, there are also articles describing recent honors received by Dan Klionsky and Janine Maddock for their outstanding work as educators.



The neurobiology lab in the USB.

Should you have an opportunity to visit to Ann Arbor, I would be delighted to share more about what is happening in the Department of MCDB.

Cordially,
Richard I. Hume, Ph.D.
Arthur F Thurnau Professor and Chair

DANIEL KLIONSKY RECEIVES HHMI TEACHING GRANT

Professor Daniel J. Klionsky has been awarded a \$1.5 million grant by the Howard Hughes Medical Institute to advance his pioneering methods of teaching basic biology. Klionsky is widely known for his “active learning” approach to introductory biology at the University of Michigan.

Stressing problem solving and collaboration with other people, Klionsky replaces the traditional textbook and lectures with

lecture notes that are to be read before each class, gives daily quizzes, has group discussions and two-way interactions with his students. Klionsky emphasizes the individual, encouraging students to learn science their own way.

Klionsky is the Abram Sager Collegiate Professor of Life Sciences, and professor of Molecular, Cellular & Developmental Biology and of Biological Chemistry.



Daniel Klionsky

SCIENCE SPOTLIGHT WITH BOB DENVER

As a graduate student at the University of California at Berkeley, Bob Denver became fascinated with a phenomenon that has intrigued biologists for centuries, tadpole metamorphosis. Metamorphosis is controlled by thyroid hormone, which plays critical roles in animal development, including in humans. Thyroid hormone deficiency in the human fetus leads to severe mental retardation (cretinism). Denver’s group studies how the brain controls thyroid hormone production and, consequently, how the hormone exerts its maturational effects on the developing brain. For these studies they use tadpoles and mice.

A related interest is how hormones influence the timing of critical developmental events. For example, tadpoles show large variation in the timing of metamorphosis that is directly influenced by the environment in which they grow. If food is scarce, if there is a high density of predators, or if the ponds that the tadpoles live in dry up, then they accelerate metamorphosis and transform into frogs early. This phenomenon is generally referred to as



Bob Denver

‘developmental plasticity’ or ‘phenotypic plasticity’ and it is a common, although understudied feature of the development of all living organisms. Phenotypic plasticity results from the interaction between the genotype (‘nature’) and the environment (‘nurture’). Denver and coworkers found that a stress hormone (corticotropin-releasing factor - CRF) produced in the tadpole’s brain mediates the effects of the environment on the acceleration of metamorphosis. A similar brain hormonal pathway controls the timing of birth in humans, where the fetus ‘tells’ mom that it is time to be born by increasing its production of stress hormones. The stress hormones cross the placenta and increase uterine contractility.

Bob Denver continued on page three

JANINE MADDOCK HONORED WITH 2006 IMES AND MOORE FACULTY AWARD

Associate Professor Janine Maddock has been honored with the 2006 Imes and Moore Faculty Award in recognition for her exceptional contributions toward recruiting and mentoring graduate students to the sciences who are from disadvantaged and non-traditional backgrounds.

Janine Maddock's outstanding skills in showing students how to fit in at Michigan are pivotal in helping MCDB ensure a diverse academic setting.

Dr. Elmer S. Imes was the second African American to earn a doctorate in physics in the United States, and the first to make a significant research contribution. Dr. Willie Hobbs Moore was the first African American woman to receive a doctorate in physics in the United States.

The Imes and Moore Faculty Award was officially awarded to Janine Maddock on Monday, September 25, 2006.



Janine Maddock

Bob Denver Continued

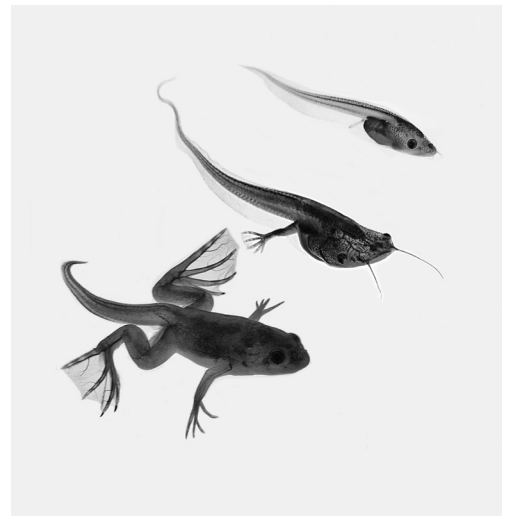
Denver's group collaborates with human biologists to understand the factors that cause preterm birth.

The hormonal environment experienced by the larva/fetus during early development can have profound effects on growth, behavior and physiology later in life. Recent studies in mammals show that exposure of the fetus to stress hormones in the womb predisposes individuals to reproductive dysfunction, adult-onset diseases and behavioral disorders.

Denver's group uses amphibian model systems to understand the basic developmental and molecular mechanisms that underlie the effects of exposure to stress early in life on neurological development and function.

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An important outcome of exposure to stress hormones in the womb is an altered appetite, that may lead to obesity and diabetes as an adult. Denver's group has focused on hormones that regulate feeding, and recently identified the frog version of the human fat hormone leptin. They reported their findings in the prestigious journal the Proceedings of the National Academy of Sciences. Leptin is a powerful appetite suppressant in frogs as it is in mammals, and it acts on the brain to signal when the body has sufficient energy stores. Owing to the obesity epidemic in developed countries, leptin has received a lot of attention for its role as a regulator of food intake. But Denver's group also



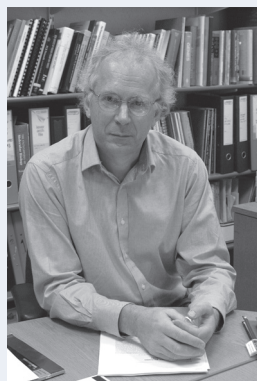
Tadpole metamorphosis is controlled by hormones.

found that leptin caused the tadpole's hind limbs to grow and the digits to differentiate. Thus, leptin performs roles other than appetite regulation, serving as a growth factor during early development. They are now studying the roles that this important hormone plays in the growth and development of the tadpole, which serves as a model for basic mechanisms of hormone action during human development.

SIXTH ANNUAL PRISCILLA CONNELL MEMORIAL LECTURE

The Sixth Connell Lecture held on Tuesday, October 3rd, 2006, featured Dr. David Baulcombe, Professor of Biology of The Sainsbury Laboratory. Dr. Baulcombe presented his talk on "Silencing RNA: The Dark Matter of Genetics."

Baulcombe has pioneered genetic engineering of virus resistance in plants and has characterized genes conferring resistance against virus disease. Baulcombe's work in this area has emphasized the importance of plants as model systems for basic biology as his findings are relevant to RNA interference in animals.



Dr. David Baulcombe

David Baulcombe has published more than 50 articles in *Nature*, *Science* and specialist journals in plant science, virology and molecular biology and is a member of the Society for Experimental Biology, International Society for Plant Molecular Biology, Society for General Microbiology, and American Society of Virology.

This lecture was made possible from a generous endowment by Mr. Paul Connell, in loving memory of his wife Priscilla Harrison Connell. Priscilla Connell was a renowned nature photographer whose work has appeared in Sierra Club and Audubon Society magazines and calendars, as well as other notable publications. She won the Roger Tory Peterson award for her breathtaking simplicity in capturing the beauty of nature.

CHARLES F. YOCUM ALFRED S. SUSSMAN DISTINGUISHED UNIVERSITY PROFESSOR LECTURE

Professor Charles F. Yocum presented the Alfred S. Sussman Distinguished University Professor Lecture Tuesday, March 28th, 2006. His talk was entitled "Photosynthetic Oxygen Production: Biochemistry at a Protein-Metal Interface."



Charles Yocum

Professor Yocum is among the world's top half-dozen researchers in photosynthesis and has earned international recognition. In addition to earning the highest honor accorded faculty members

by the University of Michigan, Professor Yocum has been recognized nationally as a senior Fulbright scholar, a fellow of the John Simon Guggenheim Foundation, and an elected fellow of the American Association for the Advancement of Science.

2005 SPONSORED RESEARCH HIGHLIGHTS

Chang, Amy	NIH	Trafficking Pathways to the Cell Surface in Yeast
Duan, Cunming	NIH	IGF-1 and Its Binding Proteins in Vascular Smooth Muscle Cells
Hume, Richard	NIH	Studies of P2X ATP Receptors
Li, Jianming	NIH	Molecular Genetic Studies of Plant Steroid Signaling
Li, Jianming	Department of Energy	Perception of Planet Steroid Hormone at the Cell Surface
Maddock, Janine	Human Frontiers in Science	Proteomics, Genetics and Ultrastructure of Predator-Prey Interactions in LTF



*The Michigan
Difference*

Funding priorities for MCDB
and detailed descriptions
are available at:

[http://www.lsa.umich.edu/
UofM/Content/lsa/
document/MCDB-product.pdf](http://www.lsa.umich.edu/UofM/Content/lsa/document/MCDB-product.pdf)

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MCDB NEW FACULTY!

On January 1, 2007, Assistant Professor Haoxing Xu will join the department from the Howard Hughes Medical Institute and Harvard Medical School where he was an instructor. Dr. Xu received his BS from Peking University (Beijing, China) and Ph.D. from Georgia State University in Atlanta, Georgia. He was a postdoctoral fellow (HHMI) in David Clapham's laboratory at Children's Hospital, Harvard Medical School in Boston, Massachusetts. His research involves a set of ion channels that play important roles in temperature and taste sensation.



Haoxing Xu

EMERITA HONORS

Kathryn W. Tosney, Ph.D., was named Professor Emerita of Molecular, Cellular, and Developmental biology on January 1, 2006, after a distinguished career as a teacher and researcher. After completing her postdoctoral studies at Yale University and the University of Connecticut, she joined the University of Michigan faculty as an assistant professor in 1984. Tosney was promoted to associate professor in 1989 and professor in 1995.

Tosney is an internationally recognized leader in developmental neurobiology. Her research has focused on studying the cellular mechanisms that allow the axons of motor neurons to find their way out of the spinal cord and then connect to the proper set of target muscle cells in the developing limb. Kathryn served as associate department chair from 1991-95 and was a member of the College of Literature, Science, & Arts Executive Committee as well as the LS&A and Rackham divisional boards.

MCDB FACULTY HAPPENINGS

James Bardwell was promoted to Professor.

Matthew Chapman chaired a session, Bacteria Lead the Way, at the Keystone Meeting for Functional Amyloids in Breckenridge, Colorado.

Steven Clark was the Keynote Speaker for the International Conference on Legume Genomics and Genetics in Brisbane, Australia.

Bob Denver was promoted to Professor and began serving as Chair in the Division of Comparative Endocrinology for the Society for Integrative and Comparative Biology.

Cunming Duan received the Changjiang Scholar Visiting Professorship from the Ocean University of China.

Daniel Klionsky was named National Academies Education Mentor in the Life Sciences.

Laura Olsen was named National Academies Education Fellow in the Life Sciences.



❧ IN MEMORIAM ❧

Robert Helling

Dr. Robert Helling, age 69, peaceably passed away at his home on January 17th, 2006. He retired in May 2003 from the University of Michigan where he was a faculty member for 38 years. A professor in Biology, Dr. Helling conducted ground-breaking studies on the regulation of uptake and metabolism of the sugar arabinose by the bacterium *Escherichia coli*. In 1973 he participated in pioneering work to artificially propagate (“clone”) DNA fragments. His work formed the basis for recombinant DNA technology and built the foundation of the biotechnology industry.

Robert J. Lowry

Dr. Robert J. Lowry passed away at age 93 on March 1st, 2006. He worked on the Manhattan Project during World War II as an experimental physicist and participated in a 3-month biological expedition to the Arctic. He earned his PhD in botany. He taught many generations of students during his long career at the University. Dr. Lowry joined the Biology faculty in 1948 and retired in 1981 as Professor Emeritus.

2006 UNDERGRADUATE HONORS RECIPIENTS

Honors in Cell and Molecular Biology

Highest Honors

Renee VanderLaan, The Dependence and Fidelity of DNA Polymerase IV in Nonhomologous End Joining in *Saccharomyces cerevisiae*

High Honors

Megan Bradley, Effects of Regulator of Sex-limitation (Rsl) on Major Urinary Proteins (MUPs) and Mouse Reproduction

Katherine Drake, Characterization of Putative Peroxisomal Matrix Protein Proteases

Nisreen Mesiwala, Histamine 3 Receptor Mediates Inhibition of Acid Secretion during *Helicobacter*-induced Gastritis

Ayako Nagashima, The Behavioral, Electrophysiological, and Genetic Analysis of the Zebrafish Behavioral Mutant, relatively relaxed (*ryr*)

Nikhil Oak, The Role of C/EBP α Phosphorylation on Response of Adipocytes to Insulin

Deanna Sikorski, Analysis of gene expression profiles based on the mutational status of p53—identification of novel p53 target genes and putative chromosomal aberration associated with p53 mutation

Stephanie Taylor, Analysis of Transgenic Mouse Lines

Honors continued on page seven

PHD DEGREES GRANTED

Jennifer Fuentes (Maddock)

“Characterization of *Saccharomyces cerevisiae* Nog 1 p: A nucleolar putative GTPase critical for 60S ribosome biogenesis.”

Susan Klinedinst (Bodmer/Cadigan)

“The Functions of the GATA Factor Pannier and It’s Partner U-Shaped in Specifying the *Drosophila* Heart.” Susan will be moving to a postdoctoral fellow position in the lab of Paul Garrity, Brandeis University in Waltham, MA.

Mengxi Jiang (Maddock)

“Identification of Novel Ribosome Associated Proteins and Functional Characterization of a

Ribosome Assembly Factor CgtAE in *Escherichia Coli*.” Mengxi will be moving to a postdoctoral fellowship in the lab of Michael Imperiale at the University of Michigan.

David Parker (Cadigan)

“Genetic and Molecular Analysis of Wingless Signal Transduction in the nucleus.” David will be moving to a postdoctoral fellow position in the lab of Scott Barolo at the University of Michigan.

Weibin Zhou (Kuwada)

“Characterization of Two Zebrafish Motor Behavior Mutants: Relaxed and Non-Active.” Weibin is currently a postdoctoral research fellow in Professor Friedhelm Hildebrandt’s lab in the Department of Pediatrics, UM Medical School.

Honors in Biology

Undergraduate Honors continued

carrying a 200 kb YAC Construct containing the Human Beta-globin Gene Locus

Jason Waldinger, Hedgehog Signal Transduction in Hair Follicle Epithelium is Essential for Proliferation, Proper Epithelial-Mesenchymal Interactions, and Postnatal Hair Morphogenesis

Honors

Timothy Ferng, High-throughput Screening for Small-molecule Inhibitors of the LARG/RhoA Interaction

Ashley Holland, Analysis of the Expression Pattern of Factor V in Zebrafish (*Danio rerio*)

Jennifer Knoester, The Effects of Phenolic Compounds on Superoxide Dismutase Activity in Caterpillars

Jaclyn Lynem, Sweeten the Fiber: GlcNAc-6-P deacetylase NagA and nag Repressor NagC—Mutants that Alter Curli Expression

Christina Nisonger, Characterization of CsgE and CsgF Localization and Interactions

Akinwunmi Oni-Orisan, Alterations in Vesicular Glutamate Transporter Expression in Schizophrenia

Magdalena Paczkowski, The Presence and Distribution of the *aufG*, *aaspG*, and *pbhr* Genes in a Collection of Uropathogenic *Escherichia coli* shared between Heterosexual Partners

Tara Reddy, Role of Hes5 in Motor Neuron Development

Brian Renard, Preliminary Analysis of the Structural and Functional Roles of the BRCT Domains of DNA Ligase IV

High Honors

Bradley Buck, GAD65 and GAD 67 Expression within Brainstem Cardiovascular Control Regions in High and Low Aerobic Capacity Rates: Implications for Altered Arterial Pressure

Matthew Pianko, A Murine Model of Fungal Sepsis and the Inflammatory Response

Randa Tao, Gene and Species Trees under the Coalescent Process: Analysis of Discordance within Five Taxa

Honors

Kalub Fedak, Soil Nutrient Leaching and Foliar Nutrient Content in Sugar Maple Forests along a Regional Air Pollution Gradient

Jacqueline Gauthier, Alginate-encapsulated Neural Stem Cells as a Biocompatible Coating for Neural Probes: An in vitro Assessment of Cell Survival and Proliferation

Jonathan Gotfried, A Phylogenetic Study of Gyps Vultures

Heather Grifka, Quantitative Chromatin Immunoprecipitation Studies on Nuclear Factor kappa-B Regulation of CSF1

Matthew Klaver, Phylogenetic Analysis of the Avian Genus *Leucopertnis* (Aves: Accipitridae) using Mitochondrial and Nuclear DNA

Miriam Livny, Dietary Fatty Acid Composition Influences β -cell Function, an Important Factor in Development of Diabetes in Zucker Diabetic Fatty Rats

Sara Maier, Corticosteroid-mediated Transactivation and Transrepression by the Mineralocorticoid Receptor and Glucocorticoid Receptor

Jennifer Pfau, Hippocampal Synaptic Plasticity and Neurogenesis in a Study of Behavioral Intervention after Neonatal Cerebral Hypoxia-ischemia in the Rat

POST-DOCTORAL FELLOWS

WHERE ARE THEY NOW?

Hiromi Hirata, Assistant Professor at Nagaya University, Japan. *Mentor* — *John Kuvada*

Stefan Gleiter, Group Leader position at the Downstream Processing Department at Pharmaceutical Biotech Production, Roche Diagnostics in Roche, Germany. *Mentor* — *James Bardwell*

Hirofumi Michimae, Adjunct Assistant Professor at Hokkaido University, Japan. *Mentor* — *Bob Denver*

Jeannette Winter, Group Leader position with an Emmy-Noether Scholarship at the Technical University Munich, Germany. *Mentor* — *Ursula Jakob*



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