



MCDB News

Molecular, Cellular, and Developmental Biology

Fall 2004

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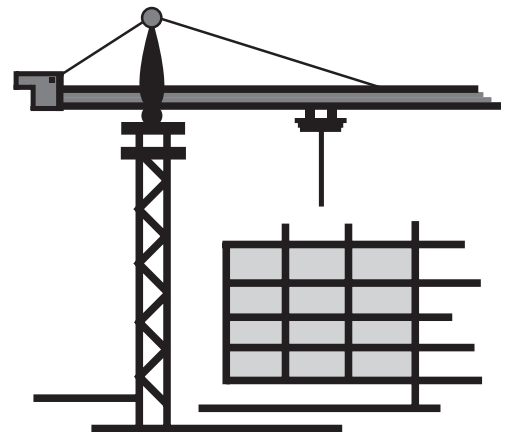
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NEW RESEARCH FACILITY BUILDING PLANNED FOR MCDB

The steady hum of MCDB researchers going about their daily activity has increased to a buzz of excitement about recent developments which will lead to a new biology research facility! After completion of a recent engineering survey of the Kraus Building that concluded it would cost more to retrofit the building to mid 1990s standards than to construct a new building to 21st century standards, the administration of the College of LSA and the University have decided to move forward with plans to relocate MCDB into a new research facility.

A team of architects from the firms of Pei Cobb Freed & Partners and the Smith Group were recently hired to carry out the planning and design phase for the new MCDB building. Pei Cobb Freed is noted for their design of such buildings as the Holocaust Museum in Washington DC, and the pyramid entrance to the Louvre in Paris. The Smith Group has taken the lead in designing state-of-the-art labs in the Life Science Institute at Michigan, at Cal Tech, and at the University of California San Francisco. The Cal Tech project was done in collaboration with Pei Cobb Freed.

MCDB has established a Building Committee to work closely with the architects as the planning progresses. The committee members are: Bob Denver, Rich Hume, Ursula Jakob,



Laura Olsen, Eran Pichersky and Gloria Salmon. The exact site for the new building has yet to be finalized but it is expected to be in close proximity to the new Life Sciences Institute and the Undergraduate Science buildings.

It is anticipated that most of the funds for this building will come from internal University resources, but we hope to round out the funding through the current University capital campaign (see Website link on page four).

It is our hope that by the end of the design phase this coming March, the funding will be firmed up, and we will be able to move directly to the construction phase which would allow us to move into the new building about 4 years from now! This new research facility will undoubtedly provide an outstanding environment in which to nurture our research initiatives and will allow MCDB to continue to attract and retain outstanding faculty members.

A MESSAGE FROM THE CHAIR

The Department of MCDB is now in its fourth year, and I was delighted to take on the role as its second Chair in September 2003, when our founding Chair, Eran Pichersky returned to full time research and teaching. Eran did a superb job of establishing a dynamic, highly energized department. The year 2005 promises to be a momentous one for our Department, as we have four major initiatives under way.

First, we plan to hire additional faculty members for the Department, to better meet the needs of our undergraduate students and expand our efforts in exciting research areas. Our target for this year is to fill at least three positions in the general areas of cell biology and developmental biology, and we plan to fill 12 faculty positions over the next five years.

Second, we are developing undergraduate majors that bring existing courses together in new and

creative ways. Drawing on the expertise of faculty outside MCDB, we are currently working with colleagues in the Department of Psychology to develop an undergraduate Neuroscience major, and with colleagues in the Medical School, the School of Public Health and the Department of Ecology and Evolutionary Biology to revive a concentration in Microbiology. We hope that both will be up and running by fall term, 2005.

Third, at the end of 2005 we will begin moving all of our undergraduate lab courses except for Introductory Biology to the new Undergraduate Science Building, which is located between the Dental School and the Life Science Institute. This new building also has classrooms with a variety of innovative new designs that will foster interaction between students.



Richard Hume

Arthur F. Thurnau Professor and Chair

Finally, as noted on page one, we are deep into the process of planning a new building to house MCDB research. By this time next year I expect to be able to tell you much more about this exciting project.

We always are glad to hear from graduates of our programs, so please send a note or an e-mail message to MCDB.alumni@umich.edu if there is news you would like to share, or if you would like more information about developments in the Department.

SCIENCE SPOTLIGHT WITH KEN CADIGAN

When dealing with complex questions of how cells divide, undergo death, or decide whether to become a muscle or a nerve cell, one would think a fly would be different than a human. “It’s really been remarkable how many times the answer to these questions is ‘No,’” says Dr. Ken Cadigan. At the cellular level, many pathways working in the fly exist in humans and seem to work exactly the same way.



Ken Cadigan

through a biochemical cascade called a “signaling pathway.” The pathway Professor Cadigan has been working on for the last ten years is the Wnt signaling pathway.

The Wnt pathway is a good example of the conservation between flies and humans. The first Wnt was found because it caused breast cancer when misexpressed in mice. However, for the next fifteen years a link between Wnt signaling and human cancer could not be established. When scientists found that Wnts are present in *Drosophila* (where they are essential for development), they used this

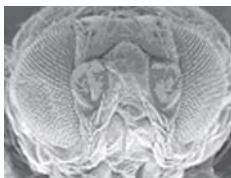
Ken Cadigan continued

simpler system to learn more about how this signaling pathway operates. Several components of the pathway were discovered, and mutations that activate the pathway in an uncontrolled fashion were identified. Mammalian counterparts of these fly genes were quickly found and shown to be required for Wnt signaling in these organisms. Cancer researchers used the information from *Drosophila* to demonstrate that mutations which activate Wnt signaling were present in many human cells isolated from cancerous tumors. This is an excellent example of how basic research in a simple system can lead to breakthrough in more clinical areas.

The Cadigan lab has performed several genetic screens to identify additional components of the Wnt signaling pathway. They have identified several factors essential for the pathway, including Pygopus and Spilt ends. These proteins are required at the bottom of the pathway, in the nucleus, where they regulate the expression of Wnt target genes. As with other components, these genes have close relatives in humans.

While the screens employed have been successful in learning more about Wnt signaling, they also identified genes that regulate a specific form of cell death called apoptosis. This process is very important in removing excess cells during development as well as in maintaining the proper number of cells in a tissue. In the same screen

continued on page 5



OUR NEW FACULTY

Amy Chang

Dr. Amy Chang joined us as Associate Professor in 2003. After receiving her A.B. in Biochemistry from Harvard-Radcliffe College with cum laude honors, Dr. Chang received her Ph.D. from Yale University School of Medicine in Cell Biology. Her post-doctoral work was spent at Yale University School of Medicine from 1987 to 1991 and Whitehead Institute for Biomedical Research at MIT from 1991 to 1994.



Her work focuses on understanding basic mechanisms of intracellular protein targeting and processes that are implicated in human health given that a wide range of diseases are associated with defects in protein trafficking in the secretory pathway, including cystic fibrosis and familial hypercholesterolaemia.

Dr. Chang is a member of the American Society for Cell Biology. She has obtained grant support from both NSF and NIH. Her most recent funding from NIH is for research on trafficking pathways to the cell surface in yeast.

Jonathan B. Demb

Dr. Jonathan Demb accepted a joint appointment as Assistant Professor in the MCDB and Ophthalmology departments in 2003 after holding a postdoctoral position at the University of Pennsylvania. Dr. Demb graduated summa cum laude with B.A. in Psychology from Boston University in 1993. He received his Ph.D. in Physiological Psychology from Stanford University.



Dr. Demb's research focuses on understanding the relationship between behavior and synaptic mechanisms in the visual system. The present goal is to understand the cellular basis for "adaptation," or the adjustment of visual sensitivity to the present environment.

Since his arrival, Dr. Demb has received the Neuroscience Scholar Award from the University of Michigan and the Research to Prevent Blindness Career Development Award. He was named an Alfred P. Sloan Research Fellow and is a member of the Society of Neuroscience and the Association for Research in Vision and Ophthalmology.

JULIAN ADAMS NAMED SCIENCE FELLOW

On May 26, 2004, Dr. Julian Adams, Professor of Molecular, Cellular, and Developmental Biology was named a Jefferson Science Fellow at a ceremony in Washington D.C. In attendance for the recognition and ceremony was Secretary of State, Colin Powell and University of Michigan provost and executive vice president for academic affairs, Paul N. Courant.



Julian Adams

Julian was one of only five to receive the honor of an inaugural Jefferson Science Fellowship. Candidates for the fellowships were chosen based on their scientific achievements, articulation and communication skills, abilities to accurately describe scientific topics for non-scientific audiences, and their interest in science policy. The finalists are chosen by a

selection committee overseen by the National Academies.

The Science Fellows will work to develop a relationship between the U.S. academic science and technology community and the State Department. Through their participation in discussions, the Fellows will seek to advise and educate policy officials on complex technical and scientific issues.

This fellowship will allow them to provide various perspectives on national as well as international implications of emerging scientific developments.

Each year, during the three-year pilot program, five experienced, tenured research scientists and engineers from the American academic community will join the U.S. Department of State for one-year assignments in Washington, D.C. and/or at U.S. embassies abroad. We are proud to have one of our MCDB faculty members selected for such a prestigious fellowship.



EMERITUS HONORS

Stephen S. Easter, Jr., Ph.D., was named Professor Emeritus of Molecular, Cellular, and Developmental Biology on December 31, 2003. Professor Easter's major research accomplishments are in the area of visual neuroscience. His work on the development of the projection of axons from the retina to the optic tectum led to international recognition. Dr. Easter joined the University of Michigan in 1970 as assistant professor and was an associate professor from 1974 – 1980. He was promoted to Professor in 1980 and was awarded the title of Mathew Alpern Collegiate Professor in 1998. He also spent time on the executive committee of the College of LS&A and as Associate Chair of the Department of Biology.

Bruce Oakley, Ph.D., was named Professor Emeritus of Molecular, Cellular, and Developmental Biology on May 31, 2003. Professor Oakley is a neuroscientist, widely recognized for his contributions to understanding chemical senses, especially the sense of taste. Dr. Oakley joined the University of Michigan as an assistant professor of Zoology in 1966. From 1990 – 2000 he was the director of a training grant from the National Science Foundation that funded summer research fellowships for a large number of undergraduate students. Professor Oakley was designated as a Jacob Javits Investigator by the National Institutes of Neurological Disorders and Stroke in 1984. Other honors include being elected as a Fellow of the American Association for the Advancement of Science and as President of the Association for Chemoreception Sciences.

Emeritus Honors continued on page 7



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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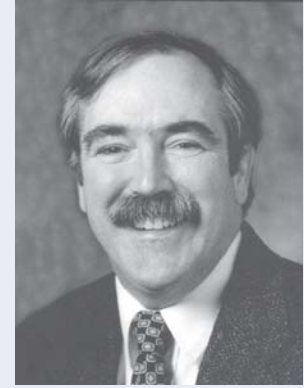
THIRD ANNUAL PRISCILLA CONNELL MEMORIAL LECTURE

The third Annual Priscilla Connell Memorial Lecture held April 10, 2003 featured Dr. Eric Wieschaus, Squibb Professor in Molecular Biology, Princeton University HHMI Investigator and 1995 Nobel Laureate in Physiology or Medicine. Dr. Wieschaus presented his talk on “From long range gradients to local changes in the cytoskeleton: How *Drosophila* embryos control cell shape.”

The work of many laboratories (including Dr. Wieschaus’) has provided the molecular description of this segmentation pathway and led

to a general paradigm for pattern formation, i.e., developmental fields are specified by an ordered array of cell fate decisions, starting with broad regions of the field, followed by specification events involving progressively smaller groups of cells.

Dr. Wieschaus’ laboratory has continued to focus on the gene products of this original screen and a subsequent screen performed with Trudi Schüpbach. This work has led to fundamental advances in the fields of cell-cell communication and cell shape changes. Dr. Wieschaus’ talk summarized some



Eric Wieschaus

of the conclusions of his research, starting from the whole embryo down to the behavior of individual cells.

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.

Ken Cadigan article continued from page 3 that identified Pygopus, Professor Cadigan’s group has also identified a class of proteins that can protect cells from stimuli that induce cell death. They have characterized one of these genes in detail. It encodes a protein kinase, a class of enzymes which can add phosphates onto other proteins, altering their activity. “One interesting thing about the kinase we found is that it seems to promote cell growth, as well as inhibit cell death. That makes our kinase exciting in that it may be one of the factors that links these two

processes together.” Such factors have been postulated to play important roles in the progression of cancer.

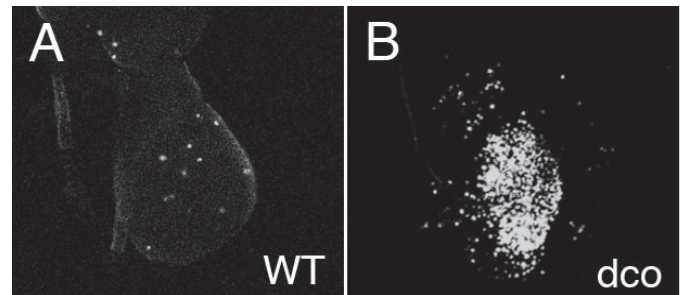
Despite the connections between his research and human disease, Professor Cadigan has no desire to become a cancer biologist.

Professor Cadigan’s group has identified a class of proteins that can protect cells from stimuli that induce cell death.

“My lab is going to do what we do well, which is try to understand basic mechanisms using genetics in a simple organism and hopefully that information will inspire people who are

more directly interested in disease,” he says.

“Basic research is really scientists indulging their own curiosities, but there is a practical benefit as well. You just have a hard time knowing where that benefit is going to come from. Sometimes you just have to let people follow their noses for several years and then a target of opportunity comes.”



Wing primordai from wild type (WT; A) and *discs overgrown* (*dco*; B) *Drosophila* larvae stained for apoptotic cells. There is a dramatic elevation of apoptosis in wings from *dco* mutants compared to wild type.

2003 SPONSORED RESEARCH HIGHLIGHTS



Akaaboune, Mohammed	NIH	Dynamics of Acetylcholinesterase in Normal and Mutant Synapses in Living Animals
Bender, Robert	NIH	Regulation of Microbial Nitrogen Metabolism
Chapman, Matthew	NIH	Biogenesis and Function of Bacterial Amyloid Fibers
Chang, Amy	NIH	Trafficking Pathways to the Cell Surface in Yeast
Maddock, Janine	NSF	Role of the Obg protein in <i>Saccharomyces cerevisiae</i>
Pichersky, Eran	NSF	Arabidopsis 2010 project: Collaborative research on the functions of the SABATH family methyltransferases
Pichersky, Eran	NSF	Metabolic Engineering of Floral Scents
Pichersky, Eran	BARD/ USDA	Intergrating Biochemical and Genomic Approaches to Elucidate C6-C2 Volatile Production: Improvement of Floral Scent and Fruit Aroma
Schiefelbein, John	NSF	Role of an LRR Receptor-Like Kinase in Root Epidermal Patterning.
Tosney, Kathryn	NSF	Focal Rings and Filopodial Emergence in Neuronal Growth Cones

IN MEMORIAM

Lyle R. Carter (1941 – 2004)

Lyle Carter, former Building Services Coordinator for the Kraus Building, died at his home Wednesday, June 9, 2004. Lyle worked in the natural science building from March 1, 1997 until he retired on September 5, 2002 from the University. He was well known for his positive outlook and upbeat attitude as he went about his work. He was 63 at his passing.

Norman E. Kemp (1917 – 2003)

Norman Everett Kemp, a former faculty member in the Department of Zoology, died Jan. 8, 2003. He was 86. Norman Kemp was born June 20, 1916, in Otisfield, Maine, to John and Marian Foster Kemp. He graduated from Deering High School in Portland, Maine, in 1933 and from Bates College in 1937. He received his Ph.D. from the University of California, Berkeley, in 1941. Norman Kemp had a

postdoctoral year at Yale University, then taught for a year at Wayne State University before joining the faculty of the U-M Department of Zoology, where he served from 1947-86. He was an experimental embryologist and an early electron microscopist who worked primarily on amphibians and fish. Norman Kemp served for many years as the secretary of the Michigan Chapter of Phi Beta Kappa.

THE MCDDB NEWS IS PUBLISHED BY:
THE DEPARTMENT OF MOLECULAR, CELLULAR, AND DEVELOPMENTAL BIOLOGY
UNIVERSITY OF MICHIGAN, ANN ARBOR, MI 48109-1048.

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Emeritus Honors continued from page 4

Larry D. Noodén, Ph.D., was named Professor Emeritus of Molecular, Cellular, and Developmental Biology and Ecology and Evolutionary Biology, on May 31, 2003. Professor Noodén has investigated how the physiological processes of plant growth and aging are affected by various plant hormones. He was one of the first researchers to identify the regulatory effects of the DNA-binding proteins known as histones on the regulation of gene expression. Professor Noodén joined the faculty at the University of Michigan as an assistant professor of Botany in 1965. Professor Noodén was a Fulbright senior research fellow in 1983.

Robert B. Helling, Ph.D., was named Professor Emeritus of Molecular, Cellular, and Developmental Biology on May 31, 2003. In his early years at the University of Michigan, Dr. Helling carried out groundbreaking studies on the regulation of uptake and metabolism of the sugar arabinose by the bacterium *Escherichia coli*. In later years, his research focused on biochemical and physiological bases for evolutionary change in microorganisms. Professor Helling joined the University of Michigan in 1965 as Assistant Professor of Botany. He was Chair of the Department of Cell and Molecular Biology, within the Division of Biological Sciences from 1982 – 1984.

MCDB FACULTY HAPPENINGS

James Bardwell was interviewed on Michigan Radio-Stateside regarding his 2004 paper in Science on the formation of protein disulfide bonds.

Kenneth Cadigan and **Jianming Li** both advanced to Associate Professor with tenure.

Jonathan Demb was one of 116 faculty members nation wide to receive a Sloan Research Fellowship from the Alfred P. Sloan Foundation.

Robert Denver served as Chair Elect for the Division of Comparative Endocrinology of the Society for Integrative and Comparative Biology. He served on the EPA Scientific Advisory Panel: “Effects of Atrazine on Amphibians”.

Daniel Klionsky was awarded the NSF Director’s Award for Distinguished Teaching Scholars.

Anuj Kumar was recognized as a University of Michigan Biological Sciences Scholar.

Janine Maddock began serving as Associate Chair for Graduate Studies and was also the recipient of the Bernard B. & Gloria L. Rinella Award for Teaching Enrichment & Innovation.

Laura Olsen chaired the National Committee on Women in Plant Biology for the American Society of Plant Biologists and was also a recipient of the University of Michigan Elizabeth C. Crosby Award.



PHD DEGREES GRANTED

Kirsten Green (Clark) “Genetic and Molecular Characterization of CORONA, a Novel Regulator of Meristem Development in *Arabidopsis Thaliana*.”

Soochin Cho (Ellis) “Hermaphrodite or Female: Rapid Evolution of Mating Systems in Nematode Genus *Caenorhabditis*.”

Tanya Johnson (Olsen) “Mechanistic Analysis of the PTS2 Import Pathway.”

Jacqueline Tan (Bardwell) “Mutational Analysis of DsbA and DsbB, Two Disulfide Catalysts, to Identify Residues Involved in Their Functions.”

Qijin Xu (Duan) “Molecular and Cellular Mechanisms of Insulin-Like Growth Factor Binding Protein-5 Actions.”

Patrice Malone (Maddock) “Functional Characterization of the Obg Subfamily Proteins Rbg1p and CgtaE of *Saccharomyces cerevisiae* and *Escherichia coli*, Respectively.”

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