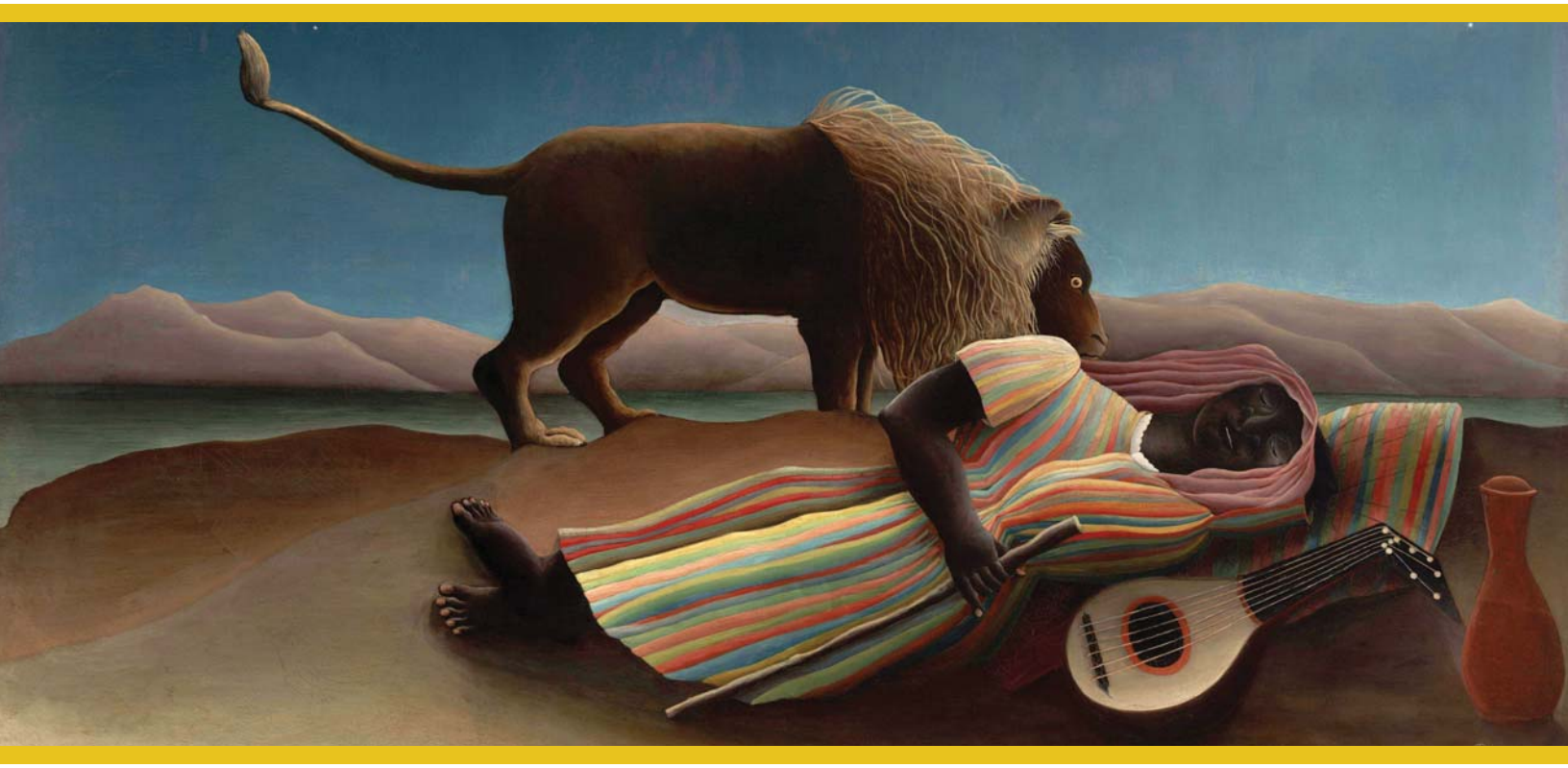
MCDB News

Molecular, Cellular, & Developmental Biology

University of Michigan



In This Issue

Research from New MCDB Faculty

Sara Aton

Sara Aton joined MCDB in July 2012. Her lab is focused on how sleep promotes adaptive changes (i.e., plasticity) in brain circuitry. Such changes are important for learning and memory formation, and while sleep loss can lead to profound cognitive deficits, the mechanisms by which sleep promotes optimal brain function are largely unknown. To address this issue, the Aton lab studies sleep-dependent plasticity in defined neuronal circuits in the mouse brain, following novel sensory or learning experiences.

Research continued on page two

Research continued from page one

Why would sleep be required for some brain functions? Sleep is distinct from wakefulness in several ways; one important distinction is that patterns of brain activity are dramatically different in the two states. Research in the Aton lab employs long-term recording of activity in individual neurons in the mouse visual cortex and hippocampus, to clarify how sleep changes network activity in these circuits, and how sleep-dependent activity changes relate to plasticity. The lab also employs newly-developed optogenetic tools, to manipulate activity in specific neurons within the circuits during sleep. These studies will clarify what changes in network activity are necessary for sleep-dependent plasticity, and what is sufficient for promoting plasticity in the absence of sleep. Using electrophysiological and biochemical techniques, the lab will next investigate how sleep-dependent brain activity and plasticity are altered in mouse models of human neurodevelopmental disorders - which are characterized by deficits in both sleep behavior and cognitive function.

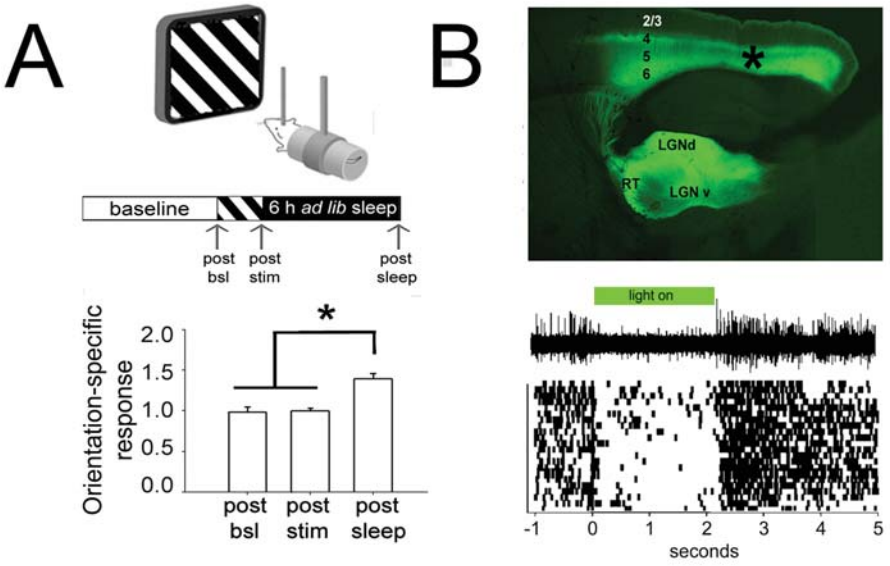


Figure: A) By presenting a visual stimulus of oriented bars to mice for a several minutes, plasticity can be initiated in visual cortex neurons. While no change in visual responses is evident immediately after stimulus presentation, orientation-specific response potentiation occurs when mice are allowed to sleep for the next 6 hours. Mice kept awake over the same time period shown no cortical response changes. B) The low-frequency, high-amplitude thalamocortical oscillations that characterize slow wave sleep are maintained through the activity of layer 6 neurons. These layer 6 neurons in the visual cortex express green fluorescent protein - which labels their axons terminating in the visual thalamic nucleus, the LGN - and Archaerhodopsin, a light-activated proton pump. When stimulated with green light, Archaerhodopsin is activated, silencing layer 6 neurons, and desynchronizing slow wave sleep thalamocortical oscillations. Using this optogenetic tool, the Aton lab is testing the role of these oscillations in sleep-dependent consolidation of visual cortex plasticity.

New Grants

Cadigan, Kenneth Direct transcriptional repression mediated by Wnt/β-catenin signaling, *American Heart Association*

Denver, Robert Thyroid hormone-dependent DNA methylation in the developing brain, *Health and Human Services, NIH*

Jakob, Ursula Cellular stress response to the oxidizing effects of bleach, *Health and Human Services, NIH*

Li, Jianming Function and Regulation of AIFs in Brassinosteroid Signaling, *NSF*

Miller, Ann Regulation of Cytokinesis and Tumor Formation by RhoA, *Health and Human Services, NIH*

Schiefelbein, John Molecular Basis of Positional Signaling in *Arabidopsis* Root Epidermal Development, *NSF*

Xu, Haoxing Identification of Activators and Inhibitors of TRPML1 for the Treatment of Type IV Mucolipindosis and Niemann-Pick Diseasaes, *Health and Human Services, NIH*

Xu, Haoxing TRPV3 Ca2+ Channel as a Novel Target of Epithelial Cancers, *Elsa U. Pardee Foundation*

Message from the Chair

Pamela Raymond

The past year has been an exciting and productive time for the Department of MCDB. We are proud of our faculty and students who have won prestigious internal and national awards; our sponsored research funding levels have continued to increase; and our educational programs at all levels are thriving. This year we launched a new thesis-based Master's program, the goal of which is to enhance diversity by providing a bridge to the PhD. As the University plans for its bicentennial celebration and launches its next capital campaign, a top priority of the College will be to seek funding to modernize the research facilities for biological sciences and to re-envision the Exhibit Museum of Natural History so that it serves its historic purpose of providing a crucial site for scientific communication with the public. We will be reaching out to partner with you as we work to build a third century of biology at Michigan.

Faculty News

Mohammed Akaaboune was featured in the "In Focus" section in the Journal of Cell Biology for his publication "Neuregulin/ErbB regulate neuromuscular junction development by phosphorylation of α-dystrobrevin."

Marc Ammerlaan was selected as one of three inaugural Collegiate Lecturers at U-M's Ann Arbor campus for his achievements and many contributions to the education of U-M students.

Gyorgyi Csankovszki was awarded the 2012 Class of 1923 Memorial Teaching Award for her outstanding teaching of undergraduates.

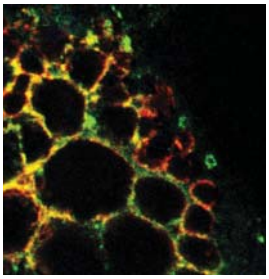
Robert Denver was awarded the LSA Excellence in Education award. The award is given annually to faculty, recognizing their outstanding teaching efforts and special contributions to undergraduate education.

Ursula Jakob's research is featured in the U-M News Service articles "Does presence of oxidants early in life help determine life span?" and "It takes two to tango: Pairs of entwined proteins handle the stress."

Eran Pichersky was issued US patent #8,124,375: "Geraniol synthase, methods of production and use thereof."

Lyle Simmons was the session chair at the sixty-third meeting on Bacteria, Archaea & Phages, held at Cold Spring Harbor Laboratory, August 21-25, 2012.

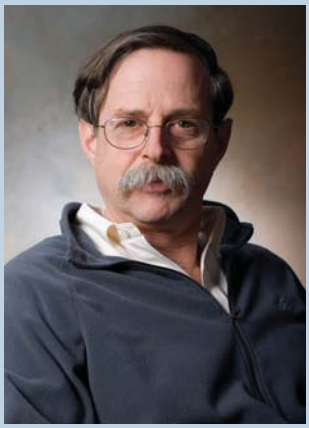
Haoxing Xu was selected for the 2012 Henry Russel Award, one of the highest honors the university bestows upon junior faculty. Xu's work was also featured in the U-M News article "U-M biologists find potential drug that speeds cellular recycling."



Robert Bender and **Lyle Simmons** received back-to-back comprehensive reviews in *Microbiology and Molecular Biology Reviews*. Simmons's "Regulation of the Histidine Utilization (Hut) System in Bacteria" and Bender's "DNA Repair and Genome Maintenance in *Bacillus subtilis*" were both published September 2012.

Highlighting MCDB's range of research, three MCDB labs' papers were published in the July 10th issue of PNAS. The cell biology section features a paper from the **Daniel Klionsky** Lab, "Ume6 transcription factor is part of a signaling cascade that regulates autophagy," the neuroscience section features a paper from the **Haoxing Xu** Lab, "Phosphoinositide isoforms determine compartment-specific ion channel activity," and the plant biology section features a paper from the **Jianming Li** Lab, "Evolutionarily conserved glycan signal to degrade aberrant brassinosteroid receptors in *Arabidopsis*."

The Tenth Annual Priscilla Connell Memorial Lecture


Arthur Horwich

The tenth annual Priscilla Connell Memorial Lecture will be held Friday, April 19th, 2013, at 4:00 p.m. in the Rackham Amphitheater. Professor Arthur Horwich, Eugene Higgins Professor of Genetics and Pediatrics, Yale School of Medicine, and Howard Hughes Medical Institute Investigator will be featured speaker.

Horwich's work was initially involved with protein import into mitochondria and resulted in discovery of a "folding machine" inside mitochondria, Hsp60. He has used genetic, biochemical, and biophysical tools to study the mechanism of action of these ring-shaped "chaperonin machines" that provide essential assistance to protein folding in many cellular compartments. More recently he has focused on neurodegenerative diseases caused by protein misfolding, seeking to understand how misfolded SOD1 enzyme in the cytosol of motor neurons leads to one form of ALS. His lab is modeling mutant SOD1-linked ALS in *C.elegans*, which are paralyzed with mutant but not wild-type SOD1, and in mice made transgenic for mutant OD1-YFP that likewise are paralyzed. Mutant mice are being analyzed at the level of EM, laser capture of motor neurons for gene profiling, by ES cell production and motor neuron differentiation, and by genetic modification.

This lecture was made possible from a generous endowment by Mr. Paul Connell in loving memory of his wife Priscilla Harrison Connell.

PostDoctoral Fellow, Graduate, and Undergraduate News

Undergraduate **Christina Lee**, a member of the Nielsen Lab, was awarded the Summer Undergraduate Research Fellowship from the American Society of Plant Biologists. Lee was one of 15 SURF award recipients in the nation.

Xiang Wang, a graduate student in the Xu Lab, and **Kai Mao**, a graduate student in the Klionsky Lab, were awarded the Rackham Predoctoral Fellowship.

Sukanya Punthambaker, a member of the Hume Lab, received the Outstanding Graduate Student Instructor Award from Rackham Graduate School. Sukanya is one of 20 students to receive the Outstanding GSI Award this year.

Yi Xiang, a former student in the Wang Lab, was awarded a ProQuest Distinguished Dissertation Award for 2011 from Rackham Graduate School. The award is given in recognition of the most exceptional and unusually interesting scholarly work produced by doctoral students at the University of Michigan who completed their dissertations in 2011.

Fangwei Gu, a graduate student in the Nielsen Lab, received one of the Best Research Poster awards at the 2012 Plant Cell Wall Gordon Research Seminar.

David Payne, a graduate student in the Boles Lab, was selected to give a talk at the 13th annual meeting of the Network on Antimicrobial Resistance in *Staphylococcus aureus* (NARSA.) His talk was entitled "Tannic Acid Inhibits *S.aureus* Biofilm Formation in an IsaA Dependent Manner."

U-M junior **Connie Shi**, a Cellular and Molecular Biology (CMB) major, was selected as one of 15 players to compete in the prestigious "Jeopardy!" College Championship that started Wednesday, February 2nd. Shi won her first round and finished with $19,000 and moved into the semi-finals. The winner, Monica Thieu from the University of North Texas, won the grand prize of $100,000.

Shu Quan, a member of the Bardwell lab, had her article on Spy protein recognized by Faculty of 1000 (f1000.com) as the 6th most highly ranked article in microbiology for the year 2011 and was one of the top 25 of all articles ranked in all disciplines in 2011 by Faculty of 1000. Quan's paper, "Genetic selection designed to stabilize proteins uncovers a chaperone called Spy," *Nat Struct Mol Biol*, 18:262-69, 2011, was also the paper was the subject of a "News and Views" in *Nature*.

Student News continued on page five

Ph.D. Degrees Granted

Karishma Collette Roles for Condensin in *C.elegans* Chromosome Dynamics.
Mentor – Gyorgyi Csankovszki

Eric Horstick Characterization of the Novel Zebrafish Motor Mutant *mi34*.
Mentor – John Kuwada

Gizem Kalay Rapid Evolution of cis-Regulatory Architecture in the *Drosophila yellow* Gene.
Mentor – Patricia Wittkopp

Pia Bagamasbad Molecular Mechanisms of Nuclear Hormone Receptor Transcriptional Synergy and Autoinduction.
Mentor – Robert Denver

Sukanya Punthambaker Elucidation of the Structure and Function Relationship of the P2X Receptor.
Mentor – Richard Hume

Dongbiao Shen Regulation of TRPML1 by Lipids in Lysosomes.
Mentor – Haoxing Xu

Michael Wells *Caenorhabditis elegans* Dosage Compensation Directs Chromatin and Transcriptional Regulation on Hermaphrodite X Chromosomes.
Mentor – Gyorgyi Csankovszki

Lisa Sramkoski Elucidating the Genetic Basis of Pigmentation Differences between *Drosophila* species.
Mentor – Patricia Wittkopp

Molly Day Histone Acetylation Regulates Autophagy by Controlling Atg8 Expression.
Mentor – Daniel Klionsky

Student News continued from page four

Eileen Brandes, a member of the Simmons Lab, achieved high honors in both academia and athletics. In this past year, Brandes completed a research thesis sponsored by Dr. Lyle Simmons entitled "RecO couples the assembly of RecA-mediated DNA repair complexes to replication forks in *Bacillus subtilis*." Her thesis won the Christine Psujek Memorial Award and the inaugural Marshall Nirenberg Award in Life Sciences. In addition to her studies in the lab, Brandes was co-captain of the women's field hockey team in Fall 2011, leading the team to a regular season Big Ten title and an Elite Eight finish in the NCAA tournament. Brandes is a five-time Academic All American and received this year's Player's Player award, which is given to the single athlete who represents what it means to be a UM field hockey player.

Staff News

Vlad Miskevich joined the department in May as the new biology IT Associate Director. Miskevich brings over 15 years of system support and customer service experience, including over nine years with the College of Literature, Science, and the Arts IT. Miskevich joined LSA IT in 2002, supporting LSA and the Museum Support Zone including the Ruthven Museums, Kelsey Museum of Archaeology, the Campus Safety Services Building and U-M Herbarium. He received an LSA Staff Achievement Award for outstanding service in 2003.

Michael Amburgy, Animal Care Technician, retired from the University this summer. Mike has been with the department for the duration of his career, which began in 1990. Congratulations to Mike for his 22 years of service!

Anna LaForest joined the department in July as an animal care technician. Anna is new to the University and brings over 10 years of animal care experience. She is a recent graduate of Eastern Michigan University with a BS in Biology.

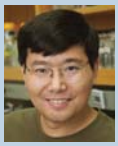
The teaching labs for Introductory Biology 173 in the Undergraduate Science Building earned the silver rating from the Office of Campus Sustainability. The Sustainable Laboratory Certification Award resulted from a class project done by several students in the Program in the Environment/Residential College ENVIRON/RCIDIV 391: Sustainability and the Campus. The students analyzed sustainability practices in these labs through observation and meetings with the lab staff. According to the project summary, "Labs are energy hogs, consuming three to eight times more energy than class or office rooms providing an opportunity to investigate potential energy savings." The lab supervisory team consisted of **Dennis Drobeck**, **Mark Brahce**, **Chris Davis**, **Charles Davey**, and **Carrie Stevens**.

Left to right: Mark Brahce, Carrie Stevens, Dr. Sudhakar Reddy, Chris Davis, Dennis Drobeck

Postdoctoral Fellows
Where Are They Now?

Jennifer Gagne moved to Madison, Wisconsin.
Mentor – Steven Clark

Feng Guo moved to a postdoctoral position at the U-M Medical School's Department of Microbiology and Immunology.
Mentor – Erik Nielsen



Yongfeng Guo is an Assistant Professor at the Chinese Academy of Agricultural Science.
Mentor – Laura Buttitta

Takeshi Onuma is an Assistant Professor at Osaka University in Japan.
Mentor – Cunming Duan

Heather Tienson is a Lecturer at UCLA in Los Angeles, CA.
Mentor – Ursula Jakob

Amy Szumlanski Klocko moved from the lab of John Fowler at Oregon State University, to the lab of Steven Strauss, also at Oregon State University.
Mentor – Erik Nielsen

2011 Undergraduate Honors Recipients

Highest Honors

Biology

Eileen Brandes, RecO Couples the Assembly of RecA-Mediated DNA Repair Complexes to Replication Forks in *Bacillus subtilis*.

Wesley McLaughlin, Eluciating Developmental and Evolutionary Pigmentation Divergence in *Drosophila americana* and *D. novamexicana*.

Cellular & Molecular Biology

Amy Strom, Long-range Enhancer-Promoter Interactions: The *Sine oculis* Story.

Aaron Talsma, Investigating the Role of a Circadian Neuropeptide as a Prominent Neuroendocrine Signal in *Drosophila melanogaster*.

High Honors

Cellular & Molecular Biology

Melissa Meyer, Regulation of Skeletal Morphogenesis by the Protein Tyrosine Phosphatase SHP-2.

Ecology & Evolutionary Biology

John Schroeder, *Pouteria Reticular* (Engl.) *Eyma (Sapotaceae)* microsatellite development and analysis of spatial genetic structure.

Cassondra Vernier, The Influence of Ploidy and Condition Dependence on Fluctuation Asymmetry in the Paper Wasp *Polistes dominulus*.

Microbiology

James Ray Lim, Natural Killer Cell Homeostatis is Under the Control of Transforming Growth Factor-β.

Neuroscience

Hussein Hamid, Dynamic Changes in Mitochondria Distribution within Cutaneous Nerves Induced by Diabetes and Diabetic Peripheral Neuropathy.

Koto Kikuma, Mechanisms Underlying the Selective Localization of Distinct FGFs Promoting Synaptic Differentiation.

Aimee Vester, Investigating the Role of Histidyl-tRNA Synthestase (HARS) and Glycyl-tRNA Synthestase (GARS) Mutations in Charcot-Marie-Tooth Disease.

Honors continued on page seven

Honors

Biology

Daniel Meister, Immune Reconstitution in *Cryptococcus neoformans* Infected Mice Results in a Persistent Inflammation in the Lungs and an Imbalance between Pro-Inflammatory and Anti-Inflammatory Cytokines.

Stephanie Wolffe, P-selectin Glycoprotein Ligand-1 Deficiency is Protective against Inflammation-Induced Endothelial Dysfunction.

Cellular & Molecular Biology

Kyle Helzer, Processing of Citrate Synthase by the Peroxisomal Protease DEG15 in *Arabidopsis thaliana*.

Hannah Hill, Superparamagnetic Iron Oxide Nanoparticles as a Platform for Targeted Delivery to Brain Tumors.

Min Oh, Identification of Pro-Inflammatory Biomarkers in Gingival Crevicular Fluid During Periodontal Disease Progression and Treatment.

Elyse Reamer, *Chd7* is Necessary for Development of Multiple Organs.

Sherry Shen, Characterization of the Putative Glyoxysomal Protease GX06 in *Arabidopsis thaliana*.

Cellular & Molecular Biology: BME

Steven Colvin, The Absence of Ultraviolet Cones Disrupts the Cone Photoreceptor Mosaic in Zebrafish.

Hiu Tung Wong, Effects of BDNF and NT-3 on Promoting Spiral Ganglion Neuronal Fiber Re-growth in the Deafened Adult Guinea Pig Ear.

Ecology & Evolutionary Biology

Judy Jinn, Effects of Body Size on Eye Morphology and Visual Signal Production in Social Wasps.

Microbiology

Nicholas Bolz, Characterization of Pathogenic Human mlh1 Missense Mutations in *Bacillus subtilis* mutL.

Alexander Myong, Characteristics of RNA that Contribute to Higher Order Multimerization of HIV-1 Gag Proteins.

Neuroscience

Rohit Abraham, Time-course of Motor Deficits in a Rat Model of Parkinson's Disease.

Katherine Adams, Linguistic Markers of Emotional Elaboration in the Past and the Present in Online Blogs.

Abram Davidov, Microdialysis Delivery of the Sedative/Hypnotic Eszopiclone to the Basal Forebrain Differentially Alters Acetylcholine Release in Lean/Fit (HCR) Rats and Obese/Metabolic Syndrome (LCR).

Sarah Feenstra, Pain, Sleep, and Mood in Individuals with Spinal Cord Injury.

Michael Frank, Replacing Leptin in Leptin-Deficient Mice Restores the Antinociceptive Effects of an Adenosine A1 Receptor Agonist in the Pontine Reticular Formation.

Yamini Jadcherla, The Effects of Postnatal Administration of Flutamide and Rosiglitazone on Mating Behavior in Suffolk Sheep with Prenatal Testosterone Treatment.

Claire Meurice, Sex Differences in the Effects of Adolescent THC Exposure on Adult Rat Behaviors.

Nolan O'Hara, ERN Sensitivity to Honest and Dishonest Self-Reports.

Andrea Plawecki, GABAergic Elicitation of Fear and Feeding Behaviors in the Nucleus Accumbens Shell are Dopamine Independent.

Zubin Sedghi, Examining Interactions between Kappa-Opioid Receptors and Dopaminergic Transmission in the Striatum of Socially Monogamous Prairie Voles.

Romeissa Selmane, The Effects of Deep Brain Stimulation on Taste Reactivity in the Central Nucleus of the Amygdala.

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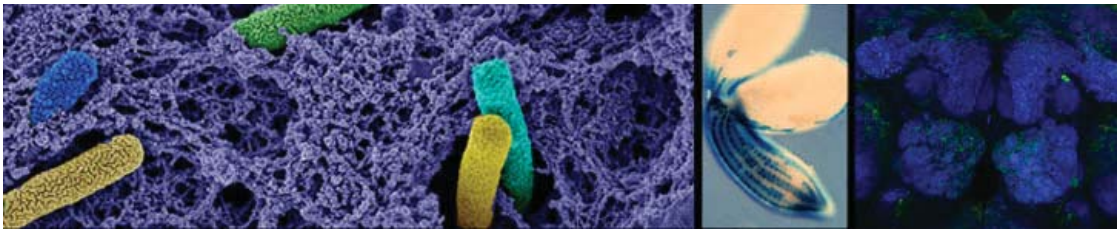

Recent advances in the life sciences have set the stage for extraordinary new discoveries about the molecular basis of life and for the application of these discoveries to biotechnology, agriculture, and human health and disease.

The faculty in MCDB, along with the students and postdoctoral fellows they train, are leaders in the generation of new knowledge. Because of our research accomplishments and commitment to education, MCDB is responsible for educating most of the University of Michigan undergraduates who will became the next generation of physicians, biomedical and plant researchers and scientists. By providing our students with a curriculum that exposes them to the newest ideas of world class scientists, and lets them participate in the research experience to make their own discoveries, we prepare our students for positions of leadership in their professions.

We acknowledge and thank the many donors who have supported MCDB in the past. We welcome contributions at any level to support the following: scholarships and research funds for undergraduates, graduate fellowships, capital equipment for imaging and biochemical analysis, pilot funds for new research directions, endowed professorships, infrastructure upgrades for research laboratories and public spaces in the Kraus building.

You may use the enclosed gift envelope or visit our webpage for more information at: http://www.mcdb.lsa.umich.edu/

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