MCB

Department of
Molecular and Integrative Physiology

GREETINGS FROM THE HEAD

Milan Bagchi

Welcome to the 2015 edition of the MIP newsletter. As you turn its pages, you will come across an article that describes the early history of our department. You will be impressed that physiology has a long and rich tradition at the University of Illinois. The University opened its doors in 1867 and physiology was taught as a subject starting in 1871. A long line of dedicated faculty members continued to carry the flag of physiology until the department was formally established in 1949 with R.E. Johnson as Head. In 1959, the department moved to its current location in Burrill Hall. For the past 66 years, the department has continued to thrive as one of the oldest and most prestigious physiology departments in the nation recognized for its cutting edge research in comparative physiology, cardiovascular physiology, biophysics, neuroscience, endocrinology, reproductive biology, and metabolic health.

A watershed event this year was the announcement that the University of Illinois Regional College of Medicine (COM) at Urbana-Champaign will close its doors within the next few years. The Carle Illinois College of Medicine, an engineering-based medical school, will take its place. One cannot help but feel a bit nostalgic about the old COM, which was intimately associated with our department and provided such stellar faculty as Benita Katzenellenbogen, Byron Kemper, Martha Gillette, David Sherwood, Phil Best, and many others. However, as the torch is passed to the new college of medicine, we are excited that it will provide new opportunities for our faculty to engage in medical education and collaborative biomedical translational research.

Over the past few years, the MIP department was fortunate to have recruited several talented faculty members who are setting up new programs, winning extremely-competitive federally funded research grants, and publishing in front-ranking journals with high impact. These rising stars have reinvigorated the department with new energy and enthusiasm. So, there is much to be hopeful about our department's future. We hope that our alumni, friends, and well-wishers will appreciate this positive trajectory of the department. It is critical that in these difficult economic times for the State of Illinois and the University, you will remain actively engaged with us so that we can keep moving forward as a vibrant academic unit, maintaining our excellence in research and teaching.•

DECEMBER 2015 NEWSLETTER

IN THIS ISSUE

ABOUT THE NEWSLETTER

The Molecular and Integrative Physiology Newsletter is an annual publication of the Department of Molecular and Integrative Physiology in the School of Molecular and Cellular Biology at the University of Illinois, Urbana-Champaign. The newsletter is written by MIP faculty and friends, and designed by MCB Communications.

Our alumni are important to us. We want to hear from you. Send us your latest news, and we'll include it in the next newsletter's MIP Family News. We also welcome articles and suggestions for future newsletters. Here's how to reach us:

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ILLINOIS
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PROGRESS IN WOMEN'S REPRODUCTIVE HEALTH AND FERTILITY

Jeanne Bullock Goldberg, M.D.

Through the ages, fertility has played a central role in civilizations. Its cultural, socioeconomic, demographic, religious and global implications were and still are incalculable. A Wikipedia search for "fertility gods," for example, yields a list of 35 cultures with one, and often multiple, fertility deities. Cultural associations of fertility with happiness and productivity are woven into the very fabric of societies. In today's world, societies are concerned about the role that their fertility rate may play in global economic and political affairs.

Pioneering research in the Department of Molecular and Integrative Physiology (MIP) at the University of Illinois at Urbana-Champaign currently focuses on factors that influence uterine receptivity and successful implantation, the ingredients of a successful pregnancy. Placental abnormalities are being studied in addition to endometriosis, a painful disease affecting up to 15% of reproductive age women. A novel approach to endometriosis has led to an exciting breakthrough—two potential agents to treat it!

The laboratories of Milan Bagchi, Professor and Head of the Department of MIP and of Indrani Bagchi, Professor of Comparative Biosciences, have collaborated to define the molecular pathways governing implantation. Their work has increased our understanding of the causes of infertility, endometriosis and even endometrial (uterine) cancer.

In recent years, ART (assisted reproductive technology) has benefited some childless couples, but the success of ART is dependent upon a receptive uterus to which the fertilized embryo can attach and develop. Using mouse models and cultures of human endometrial cells, the Bagchi laboratories have demonstrated how the intracellular estrogen and progesterone receptors bind to specific DNA sequences in the genome, thereby activating or repressing the expression of specific genes. These receptors regulate transcription of target genes to produce messenger RNA, which are subsequently translated into proteins that mediate specific cellular functions (Figure 1).

Estrogen (E) and progesterone (P) both play critical complementary roles in preparing the uterus for successful implantation of the embryo. Estrogen promotes growth of the uterine lining composed of epithelial cells just before ovulation, and progesterone levels then increase after ovulation to remodel the uterine lining, glands and deeper stromal compartment, a process known as decidualization (Figure 2). A sequence of precisely timed, complex molecular pathways involved in the communication between the epithelial and stromal uterine cells, driven by E and P, are essential for implantation (Pawar et al., *Mol Endocrinol.* 28:1408-22, 2014).

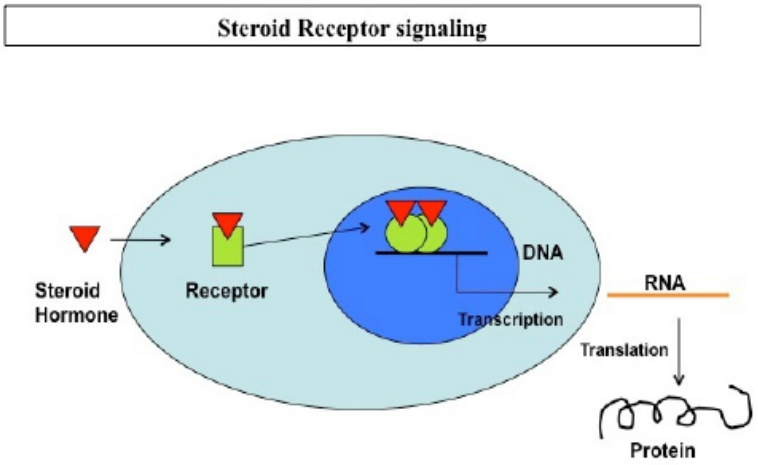

Figure 1. A schematic of steroid hormone signaling via intra-cellular receptors, which regulate transcription of target genes in the nucleus. The resulting messenger RNA are translated into new proteins that change cellular functions.

The fact that P inhibits proliferation of the epithelial cells has been known for many years, but the Bagchi laboratories have discovered that a gene, HAND2, is a major driver of this action, acting as a "brake" on epithelial cell proliferation by inhibiting the production of fibroblast growth factors in the uterine stroma (Li et al., *Science* 331: 912-916, 2011). By deleting HAND2 in mice, they have shown that the epithelial cells proliferate in an uncontrolled manner, creating uterine tissue that is unreceptive to an embryo and resulting in implantation failure. Deletion of the HAND2 gene has also been shown to "down-regulate" a tumor suppressor gene, Pten, an event that can lead to the development of uterine carcinoma.

Epigenetics lies at the heart of this research. The human genome consists of approximately 30,000 genes, each containing information incorporated in nucleic acid base pairs (DNA) arranged in a specific sequence. However, various environmental influences (e.g. exposure to endocrine disrupting agents) can activate or suppress a given gene without changing the sequence of its DNA. Interestingly, the epigenetic alteration of the gene HAND2, resulting from a chemical modification, known as methylation, at specific sites in the gene, has the effect of suppressing its action (Jones et al., *PLoS Medicine* 10: e1001551, 2013). The "braking" capability of HAND2 is thereby compromised, which then drives epithelial cell proliferation and pre-malignant cellular changes, precursors to endometrial (uterine) cancer. The HAND2 research results may be helpful in the development of early detection methods for uterine cancer and new treatment options as well.

Endometriosis affects up to 15% of reproductive-age women (perhaps higher than 15% due to failure to diagnose this condition) and is characterized by endometrium-like tissue deposits located in sites outside the uterus such as the peritoneal lining in the pelvis and the ovaries. These deposits, which actually show molecular characteristics that are distinct from normal endometrium, can be painful and also cause infertility due to

scarring of the fallopian tubes and ovaries. It has been known for many years that estrogen (E) is a driver of endometriosis. E binds to nuclear proteins known as alpha and beta estrogen receptors which, in turn, act as signaling proteins in complex pathways to regulate the activity of numerous genes. As a result, an array of inflammatory proteins is produced, and the development of nerves and blood vessels in the abnormal deposits is promoted, resulting in pain, a cardinal symptom of endometriosis.

Therapies for endometriosis have traditionally been directed towards reducing blood levels of E, but side effects resulted, and the inflammatory process was not dampened. Dr. Benita Katzenellenbogen (Department of MIP), who has intensively studied the estrogen and progesterone receptors for many years, and Dr. John Katzenellenbogen (Department of Chemistry), a renowned chemist, have developed two different drug compounds, chloroindazole (CLI) and oxabicyclo-heptene sulfonate (OBHS), which bind strongly to the beta and alpha estrogen receptors respectively (Zhao et al., *Sci Transl Med.* 7:271ra9, 2015). These compounds, which don't compromise fertility, have a dual action: (1) they block the establishment of endometriotic lesions and reduce the size of existing lesions; and (2) they exhibit strong anti-inflammatory action by blocking macrophage-induced production of inflammatory cytokines.

The role of inflammation, highlighted by the endometriosis research projects described above, is gaining increasing attention in a wide spectrum of human disease. Of interest is the fact that CLI has also been shown to be a successful treatment for multiple sclerosis (MS) in mice. CLI and OBHS show promise as potential treatments for endometriosis, but because of the ability of these compounds to suppress inflammation in a hyperestrogenic environment, they may also prove useful, after appropriate clinical testing, in the treatment of certain breast cancers, some lung disorders, liver fibrosis and cardiovascular and metabolic effects related to obesity.

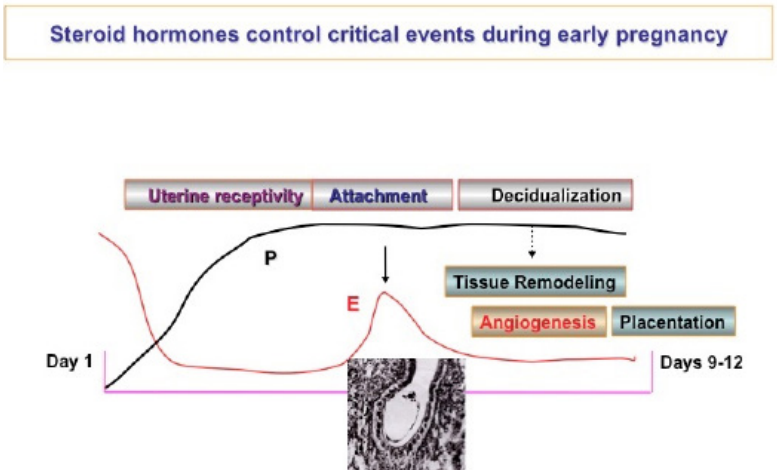

Figure 2. In mice, the implantation process, guided by estrogen and progesterone, progresses through various phases. On day 4 of pregnancy, embryo attaches to the receptive uterus, triggering decidualization, which involves extensive tissue re-

An intriguing area of research in the laboratory of MIP Professor Derek Wildman centers on the placenta. This research focusing on disorders of placentation can enable understanding of obstetrical syndromes such as pre-term birth and pre-eclampsia. Pre-eclampsia is a common cause of a failed pregnancy. The wide variation in placental shape, size, type of blood flow and type of fetal-maternal interfaces within species and across species is large, and this makes it difficult to find animal models to study human diseases of placental dysfunction. Nevertheless, Dr. Wildman has been able to show, by genetic analysis, that our closest ancestors (chimpanzees and gorillas) adaptively evolved towards a placenta resembling modern humans.

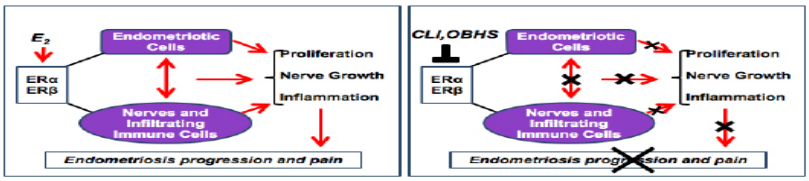

Figure 3. Model showing the contrasting stimulatory effect of estradiol (E2) and suppressive effects of CLI and OBHS on endometriotic lesions in terms of proliferation, nerve growth, and inflammation, and their relationship to endometriosis progression

A fascinating area of placental research centers on the ability of the placenta to adapt to environmental challenges such as hypoxia and poor nutrition. In a recent scientific paper, Dr. Wildman describes how native populations in high altitudes (hypoxic) in the Andes and in Tibet have adapted to these conditions by selecting for genes that enhance placental oxygen exchange between mother and fetus (Gundling and Wildman, *Philos Trans R Soc Lond B Biol Sci.* 370(1663):20140072, 2015). Recent migrants to high altitude settings deliver low birthweight infants, since they haven't yet adapted to the hypoxic environment, while native women deliver normal birthweight infants. Interestingly, the Andean and Tibetan populations, living great distances apart from one another, have separately evolved these adaptive genomic responses (convergent evolution).

Another example of placental plasticity or adaptability involved Dutch women during a famine in World War II. Epigenetic studies utilizing blood samples from individuals who were conceived during, before, and after the famine revealed differential expression (activation) of the placental genes in these three populations affecting nutrient exchange and fetal growth.

Women's reproductive health plays a critical role in society, and research in this area, while severely underfunded, expands our understanding not just of reproductive health issues but also of broader subjects such as epigenetics and evolution, integral to all biological systems. This research is already guiding us towards early detection and treatment methods for endometriosis and uterine cancer, and it has underlined the importance of inflammation as a common denominator in a whole spectrum of diseases ranging from MS to obesity.•

PHYSIOLOGY AT UNIVERSITY OF ILLINOIS, URBANA-CHAMPAIGN: THE FIRST HUNDRED YEARS (1870-1970)

Deb Aronson

Physiology has a long and distinguished career at the University of Illinois. While methods and techniques have advanced through the years, physiology has been central to the teaching mission of the university almost from its inception. Historically, the program has been strong in comparative physiology, biophysics, neurophysiology, reproductive physiology, and cardiovascular and renal physiology. In addition, through the years, physiology has been instrumental as an incubator for several interdisciplinary new programs on campus.

Physiology was first taught in 1871, just three years after the University was founded. At that time, the University consisted of University Hall, one other building and 1,000 acres of land. Students studying agriculture, natural history, English and chemistry all were required to take physiology, which was taught together with human anatomy. Although the subject matter has always been taught, it was frequently incorporated into the Department of Zoology.

In 1892, once the Natural History Building (NHB) was complete, the university hired its first official professor of physiology, Henry Elijah Summers, who received his bachelor's degree in natural history from Cornell University. Physiology shared the NHB with other biological sciences.

George Theophilus Kemp, who was hired in 1897, was technically the first head of physiology, since physiology became a separate department for the first time when he arrived. However, when Kemp left in 1908 the department was, once again, reabsorbed into zoology. By 1912, three faculty taught various physiology courses, which were popular among students and often required for various majors.

Physiology continued to be taught in the Department of Zoology until the arrival of C. Ladd Prosser. Prosser came to the University in 1939 and was a significant contributor to the department for almost 50 years. Shortly after his arrival, the department was named Department of Zoology and Physiology, and Carl G. Hartman, a distinguished reproductive physiologist, was chosen as its Head. Prosser's research topics were widely varied, from muscle contraction to invertebrate neurobiology. During WWII, Prosser led a group of scientists studying the effects of radiation on living creatures for the Manhattan Project. That work led him to sign the Szilard-Einstein letter to President Truman, warning against the use of a nuclear bomb. Prosser also trained 45 graduate students in physiology, biophysics and neurobiology, was elected to the National Academy of Sciences and wrote a standard textbook of comparative physiology, *Comparative Animal Physiology*.

During the forties, interest in physiology steadily grew. In 1949 the College of Liberal Arts and Sciences decided to create a new, separate Department of Physiology. "This heralded a new era for physiology at Illinois," wrote Prosser in his autobiography. Robert Johnson was voted the first head of the new department. Beginning in 1960, Prosser served as head of the department for another 10 years. After Prosser stepped down as head, William Sleator, a cardiac muscle physiologist, served as head until 1976.

Beginning in the 1940s, biophysics began to be taught within the Department. At Illinois the subject had four divisions: electrophysiology, photobiology, thermobiology and radiobiology. Prosser organized the electrophysiology course because he was interested in muscle and nerve electrophysiology. Robert Emerson, an eminent scientist who was a member of the National Academy of Sciences, led the photobiology group: his interest was in photosynthesis. Emerson brought Eugene Rabinowitch to campus, who also became a major figure in photosynthesis. Rabinowitch wrote a three-volume work on photosynthesis and edited the "Bulletin of Atomic Scientists." Howard Ducoff, who came to campus in 1957, taught radiation biology and researched DNA damage and heat shock proteins.

Figure 1. The Natural History building from the north. Physiology occupied part of the fourth floor from 1892 to 1959.

Biophysics was quite active and offered a PhD program, supported by a training grant, in Physico-chemical Biology. In recognition of the growing interest in biophysics, Prosser and other faculty convinced the LAS to officially rename physiology as the Department of Physiology and Biophysics in 1962, a unit name that lasted for 30 years.

Physiology remained physically in the NHB until Burrill Hall was built in 1959. This was the first building to serve basic biosciences since the NHB had been built in 1892. John Anderson and Robert Johnson were pivotal in planning the building. Thomas Burrill, for whom the building is named, is renowned for establishing bacterial causes for plant disease. He also introduced the microscope

into the classroom for individual student use. The Burrill Hall space was double that of the NHB and so it provided rooms for private labs, animal quarters and a surgery suite, in addition to teaching labs. Research topics undertaken by faculty ranged from clinical nutrition and the effect of low calorie rations on survival conditions to tissue elasticity and concepts concerning environmental determinism. On a fun note, Burrill lived on the corner of Green and Mathews. He grazed his cow where Burrill Hall now stands.

1959 was a big year for the department. In addition to moving into new, improved space, the department hosted the American Physiological Society meeting in September. Frederic Steggerda, as well as several other faculty, was essential to planning the meeting's events. Burrill Hall was dedicated at this conference. In 1960, the Department established the Human Environmental Research Lab in the basement, where they undertook metabolic and nutrition studies, environmental physiology, and exercise physiology.

Figure 2. Burrill Hall from the southwest. Physiology moved into the fourth and fifth floors and half of the basement in 1959.

Also at this time the School of Life Sciences was organized. It was determined that such a school, under the umbrella of the College of Liberal Arts and Sciences was better able to organize resources than five separate departments. In addition, biology was becoming more and more interdisciplinary, so it was important to all be connected. The Department of Physiology helped develop University-wide curricula in genetics, endocrinology and morphology. In addition to research, the department continued to provide physiology courses to a wide range of students. The Physical Education students, for example, were required to take basic physiology. Many of them minored in physiology.

The 1960s and '70s were a time of great change, both within physiology and on the Illinois campus. By 1962, just two years after it was completed, Burrill Hall was bursting at its seams; the department instructed 1,200 students per year, and the graduate program held almost 80 students. By 1965, enrollment at Illinois had grown to 28,000. The Department at this time held 98 graduate students, 30 faculty, 30 TAs, and 26 research assistants.

Meanwhile, several interdepartmental graduate research programs were being developed. Not surprisingly there was some tension between new developments, such as genetics, and classical physiology. This was a period of enormous change and advances in the field of biology, with the development of genetic techniques. One area of significant expertise that developed in the department was neurobiology, which continues to be a strength today. In collaboration with the Department of Psychology, a Neural and Behavioral Biology program was started, which eventually developed into what is now known as the Neuroscience Program.

With the development in the 1970s of DNA sequencing, as well as the advancement of microprocessors, the stage was set for physiology to enter an exciting new era. These new tools enabled researchers to begin to understand an animal system from the molecular level to the whole organism, including how molecules work in concert to create structures and enable physiological functions. These efforts, which began in the 1970s, continue today.•

MIP FAMILY NEWS FACULTY AWARDS AND MILESTONES

The Endocrine Society Honors Drs. Benita and John Katzenellenbogen

The Fred Conrad Koch Lifetime Achievement Award has been jointly received by Drs. Benita Katzenellenbogen and John Katzenellenbogen. This annual award recognizes lifetime achievements and exceptional contributions to the field of endocrinology. Their contributions to the field of endocrinology have improved the understanding of the broad actions of estrogens and their receptors in diverse target tissues, and have spanned more than four decades.

IFPA Placentology Award — Dr. Derek Wildman

Dr. Derek Wildman was selected as the winner of the International Federation of Placenta Associations (IFPA) Award in Placentology for 2015. This award acknowledges outstanding contributions to the field of Placentology. As an IFPA Award winner Dr. Wildman presented a plenary lecture at the IFPA meeting in Brisbane, Australia, in September, 2015.

Dr. Dennis Buetow Celebrates 50 years of Service.

Dr. Derek Wildman is appointed as the Editor-In-Chief in Elsevier Scientific Journal: Molecular Phylogenetics and Evolution

FACULTY PROMOTIONS

Dr. Jongsook Kim Kemper was promoted to full professor. Dr. Kim Kemper's research is recognized nationally and internationally and has strongly impacted the field of nuclear hormone receptors as well as metabolic diseases associated with lipid dysregulation. She is a dedicated and inspiring teacher of a popular physiology course, "MCB 493: Human Metabolic Disease."

Dr. Phyllis Wise, an eminent neuroscientist and endocrinologist, who served as the chancellor of the University of Illinois at Urbana-Champaign from 2011-2015, has joined the faculty of the Department of MIP. Her research interests include endocrine and neurochemical mechanisms regulating neural plasticity during aging, and neuroprotective actions of estrogen after injury and during aging.

STUDENT NEWS

Graduate Student and Postdoc Awards

Ting Fu, a graduate student of Dr. Jongsook Kim Kemper, received an outstanding thesis award.

Itamar Livnat, a graduate Student of Dr. Jonathan Sweedler received a predoctoral NRSA fellowship from National Institute of Health "Identification of D amino acid containing peptides in the nervous system."

Hanna Erickson, a graduate student of Dr. Sayee Anakk, received a James Heath Award for Excellent in Teaching.

Matthew Biehl, a graduate Student of Dr. Lori Raetzman received a predoctoral NRSA fellowship from National Institute of Health "Timing Lineage and Mechanism Underlying Development of Arcuate Nucleus Neurons."

Whitney Edwards, a graduate student of Dr. Lori Raetzman, received a Endocrine Society Annual Meeting Poster Award-Presidential Poster Award from The Endocrine Society.

Donghyun Kim - Postdoc of Dr. Jongsook Kim Kemper received a Postdoctoral Fellowship from American Heart Association, "Functional Roles of Elevated FXR Acetylation in Obese Mice and Fatty Liver Patients."

Kirsten Eckstrum, a graduate student of Dr. Lori Raetzman, received a Young Investigator Award from the Midwest Chapter of the Society of Toxicology.

Sean Carlo Blanco, a graduate student of Dr. Milan Bagchi, received the Howard S. Ducoff Award for Best Senior Thesis.

Phil VanDuyne, a graduate student of Dr. Sayee Anakk, received the C. Ladd Prosser Outstanding Achievement Award.

New Ph.D.s 2014-2015

Gwendolyn Humphreys (Ph.D., June 2015) "Identification of Estrogen-Regulated Genes in the Cerebral Cortex and Development of a Novel Method to Detect Methylated DNA" with Ann Nardulli. Gwendolyn has secured a position at Northwestern, Innovation and New Ventures (INVO) as Invention Associate.

Lily Mahapatra (Ph.D., July 2015) "Identification and Characterization of a Small Molecule Inhibitor of IMP-1 that Decreases Expression of IMP-1 Target MRNAS and Inhibits Proliferation of IMP-1 Positive Cancer Cells" with David Shapiro. Lily is presently completing her studies for her M.D.

ALUMNI UPDATES

Carol Curtis (Nardulli lab) started her own company, C^2 Consulting, and recently accepted a position with the Oklahoma City-based venture development group, i2E.

Jaeyeon Kim (Bagchi lab) has started as an Assistant Professor in the Department of Biochemistry and Molecular Biology at Indiana University School of Medicine, and received an NIH K99/R00 Pathway to Independence Award.

Sang-Hun Lee (Cox lab) has started as an Assistant Professor in the Department of Neurology at the University of Arkansas for Medical Sciences.

Jennifer Wood (Nardulli lab) was promoted to Associate Professor at the University of Nebraska in Lincoln.

Sungsoon Fang (Kemper lab) was a post-doctoral researcher with Ron Evans at Salk, and has taken a new position as an Assistant Professor at Sejong University, Seoul, Korea.

Ting Fu (Kemper lab) is now working as a post-doctoral researcher with Ron Evans at Salk.

Ji Miao (Kemper lab) has been promoted to an Instructor at Boston Children's Hospital, Harvard Medical School.

FACULTY GRANTS NEWLY AWARDED IN 2015

Sayeepriyadarshini Anakk
National Institute of Health R03 Grant
"Nuclear receptor regulation of bile acid metabolism"

Catherine Christian
Brain and Behavior Research Foundation
"Endozepine/Benzodiazepine Interactions in Modulating Synaptic Inhibition and Cognition"

Whitehall Foundation "Astrocytic modulation of synaptic inhibition"

Hee Jung Chung
National Institute of Health R01 Grant
"Tuning neuronal excitability by axonal targeting of Kv7 channels"

Benita Katzenellenbogen
Breast Cancer Research Foundation
"Genomic Profiling of the Estrogen Hormonal Pathway for Breast Cancer Prevention and Treatment"

Jongsook Kim Kemper
American Diabetes Association 3-year Innovative Basic Science Research Grant
"Gene-specific control of energy metabolism by jmjd3 histone demethylase"

Daniel Llano
National Institute of Health R01 Grant
"Functional Organization of the Auditory Corticocollicular System"

National Institute of Health R21 Grant
"Thalamic reticular nucleus modulation of auditory thalamocortical function"

Spastic Paralysis Research Foundation / Kiwanis International
"Seeing Phantom Sounds Imaging the Neural Correlates of Tinnitus"

National Science Foundation, Collaborative Research in Computational Neuroscience
"CRCNS: Community Dynamic Imaging of Corticothalamic Projections"

Campus Research Board Program (with Dr. Susan Schantz)
"Impact of developmental PCB exposure on synaptic inhibition in the rodent auditory cortex"

Nien-Pei Tsai
Simons Foundation
"Dysregulation of Mdm2-mediated p53 Ubiquitination in Autism Mouse Models"

Brain and Behavior Research Foundation
"The Study of Homeostatic Downscaling in Psychiatric Disorders"

RESEARCH PUBLICATIONS IN 2015

Anastasio TJ. "Temporal-logic analysis of microglial phenotypic conversion with exposure to amyloid-ß." *Molecular Biosystems.* February 2015

Anastasio TJ. "Computational identification of potential multi-drug combinations for reduction of microglial inflammation in Alzheimer disease." *Frontiers in Pharmacology.* June 2015

Aujla PK, Bogdanovic V, Naratadam GT, Raetzman LT. "Persistent expression of activated notch in the developing hypothalamus affects survival of pituitary progenitors and alters pituitary structure." *Developmental Dynamics.* August 2015

Biehl MJ, Raetzman LT. "Rbpj-κ mediated Notch signaling plays a critical role in development of hypothalamic Kisspeptin neurons." *Developmental Biology.* August 2015

Davila J, Laws MJ, Kannan A, Li Q, Taylor RN, Bagchi MK, Bagchi IC. "Rac1 Regulates Endometrial Secretory Function to Control Placental Development." *PLoS Genetics.* August 2015

Dietrich AK, Humphreys GI, Nardulli AM. "Expression of estrogen receptor α in the mouse cerebral cortex." *Molecular and Cellular Endocrinology.* May 2015

Fu T, Kim YC, Byun S, Kim DH, Seok S, Suino-Powell K, Xu HE, Kemper B, Kemper JK. "FXR primes the liver for intestinal FGF15 signaling by transient induction of ßKlotho." *Molecular Endocrinology.* Accepted October 2015

Gonzalez-Gutierrez G, Grosman C. "The atypical cation-conduction and gating properties of ELIC underscore the marked functional versatility of the pentameric ligand-gated ion-channel fold." *Journal of General Physiology.* July 2015

Jameson Kiesling NM, Yi SV, Xu K, Gianluca Sperone F, Wildman DE. "The tempo and mode of New World monkey evolution and biogeography in the context of phylogenomic analysis." *Molecular Phylogenetics and Evolution.* January 2015

Jang SS, Royston SE, Xu J, Cavaretta JP, Vest MO, Lee KY, Lee S, Jeong HG, Lombroso PJ, Chung HJ. "Regulation of STEP61 and tyrosine-phosphorylation of NMDA and AMPA receptors during homeostatic synaptic plasticity." *Molecular Brain.* September 2015

Jewett KA, Zhu J, Tsai NP. "The tumor suppressor p53 guides GluA1 homeostasis through Nedd4-2 during chronic elevation of neuronal activity." *Journal of Neurochemistry.* August 2015

Kaya HS, Hantak AM, Stubbs LJ, Taylor RN, Bagchi IC, Bagchi MK. "Roles of progesterone receptor A and B isoforms during human endometrial decidualization." *Molecular Endocrinology.* June 2015

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Kim YC, Fang S, Byun S, Seok S, Kemper B, Kemper JK. "Farnesoid X receptor-induced lysine-specific histone demethylase reduces hepatic bile acid levels and protects the liver against bile acid toxicity." *Hepatology.* July 2015

Kim YC, Chen C, Bolton EC. "Androgen Receptor-Mediated Growth Suppression of HPr-1AR and PC3-Lenti-AR Prostate Epithelial Cells." *PLoS ONE.* September 2015

Lee KY, Royston SE, Vest MO, Ley DJ, Lee S, Bolton EC, Chung HJ. "N-methyl-D-aspartate receptors mediate activity-dependent down-regulation of potassium channel genes during the expression of homeostatic intrinsic plasticity." *Molecular Brain.* January 2015

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Ma C, Kenyon RF, Forbes A, Berger-Wolf T, Slater BJ, Llano DA. "Visualizing dynamic brain networks using a dual-representation." *Computer Graphics Forum.* Accepted October 2015

Park HJ, Bolton EC. "Glial cell line-derived neurotrophic factor induces cell proliferation in the mouse urogenital sinus." *Molecular Endocrinology.* February 2015

Pawar S, Laws MJ, Bagchi IC, Bagchi MK. "Uterine Epithelial Estrogen Receptor-α Controls Decidualization via a Paracrine Mechanism." *Molecular Endocrinology.* September 2015

Slater BJ, Fan AY, Stebbings KA, Saif MT, Llano DA. "Modification of a Colliculo-thalamocortical Mouse Brain Slice, Incorporating 3-D printing of Chamber Components and Multi-scale Optical Imaging." *Journal of Visualized Experiments.* September 2015

Stebbings KA, Choi HW, Ravindra A, Caspary DM, Turner JG, Llano DA. "Aging-related changes in GABAergic inhibition in the mouse auditory cortex, measured using in vitro flavoprotein autofluorescence imaging. *Journal of Physiology.* Accepted October 2015

Willis AM, Slater BJ, Gribkova E, Llano DA. "Open-loop organization of thalamic reticular nucleus and dorsal thalamus: A computational model." *Journal of Neurophysiology.* August 2015

Zhao Y, Gong P, Chen Y, Nwachukwu JC, Srinivasan S, Ko C, Bagchi MK, Taylor RN, Korach KS, Nettles KW, Katzenellenbogen JA, Katzenellenbogen BS. "Dual suppression of estrogenic and inflammatory activities for targeting of endometriosis." *Science Translational Medicine.* January 2015

Molecular & Integrative Physiology
University of Illinois at Urbana-Champaign

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SHARED EQUIPMENT FACILITIES

Funds donated by alumni and friends of MIP are critical for maintaining the excellence of our programs. On the front page, you read about the outstanding response to our efforts to establish the C. Ladd Prosser Lecture endowment. To maintain excellence in our research and teaching missions, we have other critical needs. One of our priorities for the resources of the LAS-Development Fund (see below) for the next few years will be to establish additional shared equipment facilities. The cost of research, and particularly equipment, has dramatically increased over the years so that individual faculty members can no longer purchase essential equipment from their research grant funds. Donated funds are anticipated to be matched by contributions from the department/school and faculty research grants so that a $100 donation will generate $200 for equipment purchases. We have set an ambitious goal of $25,000 per year in donations for this purpose and hope that you will consider helping us maintain our research excellence.

I would like to make the following contribution to MIP

$_____ General Support LAS Development Fund-MIP (5M 9GX/334866)

Name / Spouse / Partner name if a joint gift: _____

Email Address: _____ _____

My check is enclosed, payable to the **University of Illinois Foundation**

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