



COLLEGE OF LIBERAL ARTS & SCIENCES

The Department of

BIOLOGY

www.biology.uiowa.edu

Winter 2013

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THE 
UNIVERSITY
OF IOWA

A YEAR IN REVIEW



It is that time of the year when the work on the newsletter begins in earnest, and I look back to orient myself on how to move forward. What a year it has been with stocks going up and down before and after the government shutdown, people being scared about another recession, and many hoping for the best. What is one person's savior is the other person's disaster. Beyond the usual excitement about the financial situation and the hopes for an eventual improvement, it appears the Department of Biology is reaching calmer water in many respects.

For the first time since I arrived five years ago, I had no faculty retire! However, we lost two of our emeriti, and you will find a short obituary on them in this newsletter. Given the past retirement wave, we are still struggling to gain ground and had two faculty job searches in the spring. One of the searches was successful, and we will soon be able to welcome a new faculty member, Anna Malkova, to the department. Her research focuses on yeast to understand the mechanisms of DNA breaks as they are so prominent in cancer, a disease that is projected to increase dramatically over the next few years with the rising population of senior citizens.

Thus, this basic research has a very strong translational component. We also 'gained' a new faculty member in an unusual way. The long-time Dean of the College of Liberal Arts and Sciences, Linda Maxson, has joined the ranks of our faculty for the next few years. Welcome Linda! This past year we promoted Dr. John Manak, who was the first faculty member that started on the tenure track when I arrived 5 years ago. Well-deserved Associate Professor Manak!

As we already know, the financial support from federal agencies is shrinking — thanks to the sequester. The National Institutes of Health (NIH) sends an email every other month specifying where the next funding cut will be. Other programs that fund investigator-driven research, for example, research infrastructure, have been cut; thus, exacerbating the already difficult funding situation of many central core facilities. The department is not exempt from these problems and a recently awarded core support grant will be discontinued in two years. On the bright side, several senior and junior faculty have had excellent success with their grant application, indicating that science-related funding is still available but is hard to attain. With this in mind, a special congratulations to those who received their award. Please find short stories of their funded research in this newsletter. My apologies are extended to the faculty who were not as successful. Keep your hopes up!

This year marks the beginning of our new I-Bio (Integrated Biology) Graduate Program that was developed by the Associate Chair for Graduate Education, Dr. Joshua Weiner. This new program has several new innovations including three shortened lab rotations during the first semester instead of the first year. I would also like to take this opportunity to thank the Developmental Studies Hybridoma Bank (DSHB) and its Director, David Soll, for the generous support of the graduate program.

Finally, the department had an outstanding year in undergraduate training and teaching. In the Midwest, the Department of Biology now has the largest number of faculty trained in the new emerging way of teaching that is dramatically enhanced with the completion of a TILE (Transform, Interact, Learn, Engage) classroom in the Biology Building. Such advances in teaching are needed to maintain the United States' global preeminence and keep biology education at the forefront in the Midwest. The curricular reforms driven by the Associate Chair for Undergraduate Education, Dr. Bryant McAllister, and his team are beginning to show effects with the restructuring of the introductory biology course sequence that was implemented in the Fall 2012 semester. Beyond the already restructured introductory courses are the advanced courses. Changing their structure requires additional investment beyond the capacity of the department or college. I am particularly happy to say that Dr. McAllister has submitted what I consider an extremely well-planned proposal for the Howard Hughes Medical Institute (HHMI) funding which could provide the means to complete our restructuring process. The plan is to expand introductory laboratory experiences and to develop a novel upper-level investigative laboratory course that will make use of the diverse expertise of several faculty. This will provide students with hands-on experience in research at the forefront of molecular developmental evolutionary biology, one of the major frontiers of current biology for the foreseeable future. I hope to have good news to report in regards to this proposal in the next newsletter.

Sincerely,

Dr. Bernd Fritzsich
Departmental Executive Officer (DEO) and Professor

Photo on the cover:

One-eared frog embryo: Head of a frog embryo following removal of one ear. The nerves are labeled with an antibody against acetylated tubulin (green), and hair cells of the remaining ear are labeled with an antibody against Myosin VI (red). Cell nuclei are blue. See article on page 8.

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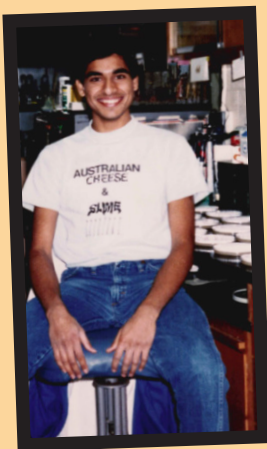
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To learn how gifts can make a difference for faculty, staff, and students in the Department of Biology, please visit www.givetoioowa.org/biology or contact Chris Wilson at the UI Foundation (chris-wilson@uiowa.edu; 319-467-3814).

Alumni Return to Speak at Department Seminars

The Department of Biology holds a weekly seminar each Friday during the academic year, featuring a speaker who presents on his/her research. This fall, the seminar committee invited five Biology alumni to return to the department to speak. This was a great way to reconnect with a few of our alumni who have been very successful in their careers and feature them in this newsletter. Below is a brief biography of each of the five alumni. In addition, an alumna, Dr. Tanya D'Souza, was the featured speaker at the first "I-Bio (Integrated Biology) Graduate Program Career Options Lunch Talk" on November 1, 2013. The career options lunch talk will be held each semester to provide graduate students with exposure to a wide variety of successful people sharing the story of their science-related career in a friendly, informal lunchtime setting. Dr. D'Souza's brief biography is provided below.



Anand Chandrasekhar

Anand Chandrasekhar was born in Bombay, India, and received undergraduate degrees in Biology and Electrical Engineering from BITS Pilani, India. He came to the University of Iowa (UI) in 1987 because of his interest in the work of Professor David Soll, with whom he earned his Ph.D. degree in Biology in 1994.

Chandrasekhar said coming from India to the UI, and Soll's Lab in particular, was an exciting experience, with profound impact on his scientific and social skills. He fondly remembers everything from football Saturdays to the Mill Restaurant seminars and describes Iowa City as "the perfect college town." Chandrasekhar met his wife while attending the UI, and they have two children. He currently is a Professor of Biological Sciences at the University of Missouri where he joined in 1998, following a postdoc at the University of Michigan. He and his family continue to visit Iowa City when traveling to see his wife's family in Iowa. He said, "it always feels like I am coming back home."

It was one of Chandrasekhar's undergraduate mentors that "lit a spark" in him to read broadly in cell biology and genetics. That's when he encountered Soll's "fascinating" research, decided to go to graduate school, and as the saying goes, "the rest is history."

Chandrasekhar credits "all the Biology faculty, especially Soll and Wu," with molding him into the scientist that he is today. His lab studies the mechanisms by which neurons migrate within the vertebrate nervous system. His work provides insight into brain disorders like Lissencephaly, and may help improve stem cell therapies for neurodegenerative disorders, such as Parkinson's and ALS. In addition, the Chandrasekhar Lab is investigating the neural circuits that control feeding with potential for a better understanding of the metabolic and hormonal regulation of food intake, which has wide-ranging impact on human health.

Eric Cole

Eric Cole has lived in several states and large cities but currently resides in Nerstrand, MN, a town with only a population of 270! A native Iowan, born in Waterloo, Cole went back to his roots to receive his Ph.D. in Biology (1990) at the University of Iowa (UI) after receiving his Bachelor's degree from Reed College (1978) and Master's degree from the University of Washington (1983).



It was Cole's mother who sparked his interest in science and nature. She allowed me "to bring all manner of beasts into our living room — everything from snakes, frogs, and snapping turtles to scorpions and praying mantis." He went on to say that he learned to love the outdoors from his father who took him and his brother camping and on canoeing and hiking trips.

Cole was attracted to the UI after meeting a former Iowa graduate in Seattle who had worked in Professor Joe Frankel's Lab. Frankel's research on pattern formation in the ciliates was fascinating to Cole. Thus, it was Frankel who led Cole to the UI. He researched in Frankel's Lab (1984-1990) and eventually became the last graduate student to study under him. Frankel retired on June 30, 2013, after serving over 50 years in the Department of Biology. Cole was recently back on campus to celebrate Frankel's retirement. He credits his mentor for having the biggest influence in his career. "It was at Iowa, and because of Joe in particular, that I found the focus and commitment necessary to build a career in Biology."

Cole calls the UI a special place because it's where he met his wife, Kate, with whom he adopted two lovely girls, Atia and Liani, from China. Some of the fondest memories he recalls in the department include "Jeff Denburg roller skating up and down the hallways, the incredible tough exams of Gary Gussin, John Menninger's 'frogometers,' John Stefaniak's mellow and musical family, and the immeasurable kindness of Jim and Jenny Lin," to name a few.

He is currently a Professor of Biology at St. Olaf College in Northfield, MN, where he has been since 1993.

Tanya D'Souza

After growing up in the Middle East and India and spending most of her life in big cities, Tanya D'Souza was unsure about studying and living in Iowa. However, D'Souza's friends at Grinnell College encouraged her to consider the University of Iowa.

At first, D'Souza did not like the small town atmosphere of Iowa City. She described it as a "ghost town" with the dorms being the tallest buildings when moving here during the summer of 1992. But, by the end of her time in Iowa City, "you had to pry me away," D'Souza said. During her work toward both her Ph.D. in Biology (2000) and J.D. from the College of Law (2003), she fell in love with the comforts, accessibility, and friendly faces that Iowa City had to offer.

While pursuing her Ph.D. in the Department of Biology, D'Souza worked in Chi-Lien Cheng's Lab (1994–2000) studying senescence (biological aging) and sugar in the model plant, *Arabidopsis thaliana*. In

addition to professors Cheng and Erin Irish serving as great mentors and always a source of support, there were other individuals in the department who provided assistance when needed. One such person, Ken Jensen, manager of the Biology Greenhouse at the time, helped her deal with aphids (plant lice), which she referred to as being "the bane of my lab work and one of the downsides about working with living organisms." During her time in the department, D'Souza was also a Graduate Teaching Assistant in genetics and plant biology and served as an instructor for the Howard Hughes Life Science Summer Program (2000).

Upon completing her degrees, D'Souza began to practice intellectual property law with the large law firm, Faegre & Benson (now Faegre, Baker, Daniels). This position gave her considerable experience working on a wide range of patents and different types of clients, such as large companies and universities. After several years in



this setting, she accepted a position as Director of Research and Development at the University of South Dakota. Currently, she is at a boutique patent firm, IPLM Group, P.A., working with large companies and institutions in what she described as "a perfect mix for my background in academia and patent law." Her clients consist of universities and biotechnology, pharmaceutical, medical device, chemical, environmental, and agribusiness companies.

Michael Herman

Coming from Omaha, Nebraska, Michael Herman was interested in research and came to the University of Iowa (UI) for the strengths in the Biology and Music programs.

While at Iowa, Herman did undergraduate research with David Soll, Professor of Biology, an experience that he said, "changed my life." In the Soll Lab, he studied the infectious yeast, *Candida albicans*, characterizing the differences between the vegetative budding and the invasive mycelium forms. He and Soll pioneered methods to examine growth characteristics of individual cells. He also credits Michael Solursh, Gary Gussin, Joseph Frankel, John Menninger, and Carol Newlon for "providing a good foundation of knowledge and mentorship throughout my career."

His Bachelor of Science degree in Zoology (1984) at the UI provided him with the opportunity to attend graduate school at the Massachusetts Institute of Technology (MIT)

where he graduated with a Ph.D. in Biology (1991). After completing a Postdoctoral Fellowship at the University of Minnesota in 1996, he then obtained a faculty position in the Division of Biology at Kansas State University (KSU) and has been there ever since.

His research currently focuses on the ecological genomics of nematode-bacterial interactions using both field-based approaches and laboratory experiments with the model nematode (roundworm), *C. elegans*. As part of this work, he and his lab group are studying the defense responses of *C. elegans* toward the emerging hospital-acquired pathogen *Stenotrophomonas maltophilia*.

In 2003, Herman co-founded the KSU Ecological Genomics Institute, and serves as Co-Director. In addition, Herman has served on the Board of Advisors (1994-2006) of the Developmental Studies Hybridoma Bank (DSHB) which is housed in the UI

Department of Biology and is directed by David Soll. Since 2001, he has also been a member of Faculty of 1000 and a panel member on breast cancer research programs among many other honors and awards.

He met his wife, Linda, while at Iowa and was married to her at the Danforth Chapel on the UI campus in 1986. They have two sons, Jacob and Philip. He also was involved in the jazz program at Iowa and currently plays the electric bass in a blues band with other KSU faculty.



Clark Stanford

Dr. Clark Stanford came to the University of Iowa (UI) from Northbrook, Illinois, in 1979. Clark enjoyed the small town atmosphere and the friends he made while in Iowa City after coming from a large Chicago suburb.

He graduated with a Bachelor of Science degree in Zoology (1984), D.D.S. (1987), Ph.D. in Biology (1992), and a Certificate in Prosthodontics (1992) — all from the UI. While working toward his degrees, he studied in the lab of his mentor, Michael Solursh, for both his B.S. (1981-1983) and Ph.D. (1987-1992). He credits his father, who was a Biochemist, and Professor Solursh's mentoring support, for influencing him to pursue a career in oral health research. He also recalled former Biology faculty George Cain and Eugene Spaziani along with current Professor David Soll, as other individuals who impacted his career.

Dr. Stanford said his education “defines in many ways what I do on a day-to-day basis” as the Associate Dean for Research, Centennial Fund Professor, and Director of

Clinical Research in the College of Dentistry. He also holds secondary appointments in the Department of Orthopaedics and Rehabilitation (College of Medicine) and the Department of Biomedical Engineering (College of Engineering).

His expertise area is implant dentistry with his main clinical research interests in implants, implant biomaterials, and dental materials. He is also interested in bone biology including biologically-mediated bone mineralization (implants), bone metabolism, osteoblasts, and isolating and characterizing human osteogenic cells.

In 2006, he received the Board of Regents Award for Faculty Excellence, and in 2007, the Distinguished Scientist Award from the International Association for Dental Research.

Dr. Stanford serves on the committees of several professional organizations including the International Association for Dental Research (IADR) and the Food and Drug



Administration (FDA), and is a member of many others.

Beginning with his education at the UI in 1979 and his professional experience since joining the College of Dentistry in 1992, the phrase “once a Hawkeye, always a Hawkeye,” is certainly fitting for Dr. Stanford.

Reference: The University of Iowa College of Dentistry website. Retrieved from www.dentistry.uiowa.edu/clark-m-stanford

Wei-Dong Yao

In 1991 as a young physics student at Beijing's Tsinghua University, Wei-Dong Yao attended seminars given by University of Iowa (UI) Professor of Biology, Chun-Fang Wu, and Professor Mu-Ming Poo (who at the time was at Columbia University), and became fascinated by the unknowns in the field of neurobiology compared to the field of physics. He decided then that he wanted to study Biology and specifically, the brain. Yao was offered the opportunity to study under Wu at the UI and later graduated with a Ph.D. in Biology (1998).

Being a man of simplicity, Yao enjoyed the UI for its clean and beautiful campus and the rich student life. His wife, Hui-Hui Dai, is also a graduate of the Department of Biology, earning her master's degree in 1997.

Yao described his time in the Wu Lab (1992-1998) as “an exciting period” due to the many exceptionally talented and dedicated students who were in the department and

are now leaders in their respective fields. What he enjoyed most was the Wu Lab journal club meetings held every Wednesday night from 8-10pm where participants from several Biology labs (Wu, Green, and Soll to name a few) would discuss 3-4 recent papers. “Most of the time the atmosphere was light and peaceful but sometimes it would get heated and tight because we could not agree with each other on certain aspects of the papers presented, and no one was willing to give up or compromise,” explained Yao. “The journal club was especially valuable to someone like me with a non-biology background,” he added. Many years later, “I tried to implement a similar journal club in my own lab but seemed to never match the ones I had during my years at the UI.”

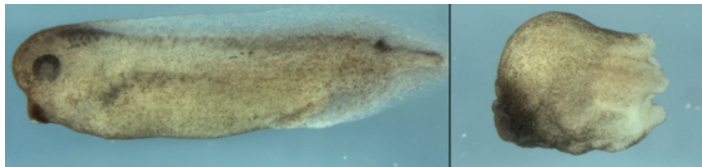
Yao said he learned essentially everything he needed to be an academic scientist through his Ph.D. degree in Biology at the UI—“from the English language, scientific

writing, creative thinking, and experimental approaches, to mentoring.” Currently, Yao is an Assistant Professor at the Department of Psychiatry, Beth Israel Deaconess Medical Center, and Head of Molecular Cellular Neuroscience Laboratory at the New England Primate Research Center, a major research facility of Harvard Medical School, where he has received many notable awards.



RESEARCH

Studies in Frog Embryos may Help Identify Treatments for Human Cancers



Inhibiting Wnt signaling disrupts dorsal axis formation. An untreated tadpole is on the left, showing normal body axis patterning. On the right is an embryo in which the Wnt pathway was blocked in early development. This embryo lacks all dorsal tissues and fails to form a head, nervous system, and muscles. Identifying treatments that block Wnt activity in frogs could potentially be used to block Wnt activity driving many human cancers.

misregulated in cancers. Houston studies these conserved signaling pathways; in particular, one that is controlled by the Wnt family of secreted growth factors. Wnt growth factor activity is essential for stem cell maintenance in the adult and is overactive in a majority of colorectal and liver cancers. Importantly, Wnt activity is essential for dorsal tissues to form in early embryos and studies in frogs have contributed greatly to understanding how this signaling pathway is regulated.

For this newly funded grant, Houston will study how dynamic changes in the microtubule cytoskeleton after fertilization regulate the activity of the Wnt pathway and affect dorsal cell fate specification. Rearrangements of the cytoskeleton have long been known to control dorsal fates, but the mechanisms remain unknown. Additionally, he will use proteomic analyses to identify important Wnt regulatory molecules localized in the cortical (outer) cytoskeleton of the frog egg. “By working out the normal development of early cell types and understanding how the disruptions of conserved basic regulatory pathways affect that development, we hope strategies can be devised to better predict or treat birth defects, cancers, and genetic diseases,” said Houston.

Douglas Houston, Associate Professor of Biology, has received a four-year, \$1.2 million grant from the National Institutes of Health (NIH). The grant is a renewal of his previous work to study the impact of maternal gene products on the formation of different cell fates in the early embryo.

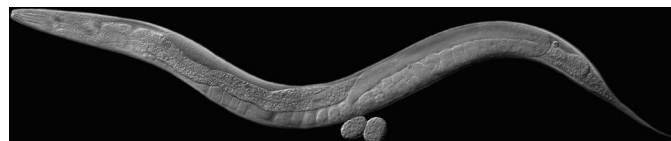
Houston’s general research interests lie in the basic mechanisms of how the dorsal body tissues (e.g., central nervous system, muscle tissue) are formed in frog embryos (*Xenopus*). Frog embryos develop externally in simple saline media, are large and easy to work with, and share many features of development with all vertebrates, including humans. Additionally, many of the molecular pathways that affect early development also control adult tissue homeostasis and are often

Research may Lead to New Insight into Stem Cell Division and Tumor Formation

Bryan Phillips, Assistant Professor of Biology, was awarded a three-year grant by the Roy J. Carver Charitable Trust in the amount of \$372,828.

The Phillips Lab studies how multicellular animals, including humans, build adult organisms with thousands or millions of cells that all derive from a single cell, the fertilized embryo. One of the ways cells increase in diversity is through asymmetric cell division — a cell division where the two daughter cells from a mother cell division are already distinct. With this grant, Phillips will study proteins that regulate asymmetric stem cell division and cell fate specification during development.

Defects in asymmetric division in stem cells are seen in a host of cancers and metastases, including colorectal cancer, the second leading cause of cancer death in the United States. Over 90 percent of all colorectal tumors contain mutations that result in defects in a specific type of cell-cell communication, termed the Wnt pathway. The Wnt pathway is a well-conserved mechanism of cell communication that controls their development, which is currently under study in the Phillips Lab.



An image of a *Caenorhabditis elegans* (*C. elegans*), an experimental model animal studied in the Phillips Lab. *C. elegans* is a free-living, non-parasitic soil roundworm with a large number of genes very similar to other organisms, including humans.

Photo provided by Maria Gallegos.

Phillips’ research will more specifically focus on studying Wnt pathway control of asymmetric cell division in *C. elegans*, a powerful and widely used experimental model animal that utilizes the same mechanisms of cell fate specification as humans. With his research, Phillips hopes to gain new insight into the activation of the Wnt cell signaling pathways and how they control asymmetric cell division and tumor formation. This could translate to the development of new drugs aimed at Wnt signaling components during defective asymmetric division in human disease.

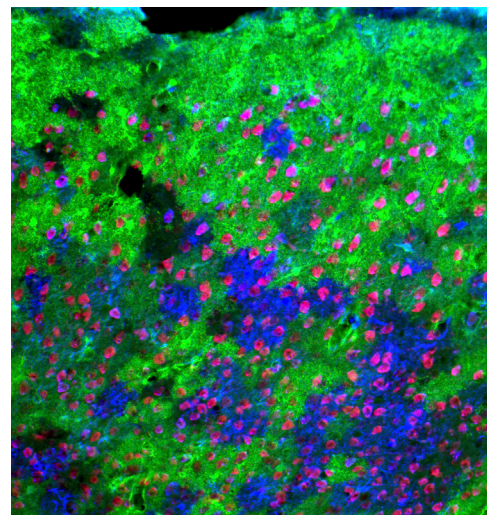
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\$2 Million Grant Awarded to Study Circuit Formation in the Cerebral Cortex

■ **Joshua Weiner, Associate Professor of Biology**, was awarded a five-year, \$2 million grant from the National Institutes of Health (NIH). This grant is a renewal of a prior award from 2007-2012. In autism, intellectual disability, and other neurodevelopmental disorders, connections between brain cells (neurons) are disrupted. For neural circuits to form correctly, neurons must correctly grow branched, tree-like structures called dendrites, through which they receive messages from other neurons. This new grant will allow Weiner to continue his work investigating a group of proteins that assist in this process in the cerebral cortex, the site of higher cognition in the brain.

The Weiner Lab focuses on “sticky” proteins called cell adhesion molecules, which help cells interact with each other in specific patterns. The lab has shown that mice lacking a family of 22 such cell adhesion molecules, the gamma-Protocadherins, exhibit defects in the formation of their dendritic trees. Because the gamma-Protocadherin proteins can combine in ways that can generate over 10,000 distinct neuronal “signatures” at the cell surface, it may be that the growth of dendrites in the brain requires matching specificity of contacts between neurons. Weiner’s new grant focuses on this theory, which will help lay the basic science groundwork necessary for future therapeutic approaches aimed at restoring normal neuronal network connectivity and function. “We know that these “sticky” proteins are very particular with whom they interact,” said Weiner. “Now that we have defined the ways in which they combine to specify interactions between individual cells, we want to show that this specificity is important for the dendritic roles we have previously identified for the gamma Protocadherins.”

Weiner, along with collaborator Britta Engelhardt, Theodor Kocher Institute, University of Bern, Switzerland, was also awarded a one-year, \$40,000 pilot grant from the National Multiple Sclerosis Society. This award will go toward developing a new line of research into the roles played by the gamma-Protocadherins in neuro-immune interactions. In addition to their roles in neurons, these cell adhesion molecules are highly expressed at key sites through which the infiltration of immune cells into the brain is regulated. The Weiner Lab has also found that gamma-Protocadherins are present on the surface of such immune cells. This suggests these proteins might regulate whether an immune response is mounted in the brain following a challenge, based on the specificity of Protocadherin interaction. The planned research will utilize a mouse model of multiple sclerosis, a devastating autoimmune disorder of the brain, to determine the roles played by the gamma-Protocadherins in regulating disease progression. The gamma-Protocadherins and their associated signaling pathways could represent future targets for therapeutic drugs aimed at reducing the severity of autoimmune disorders in the brain.



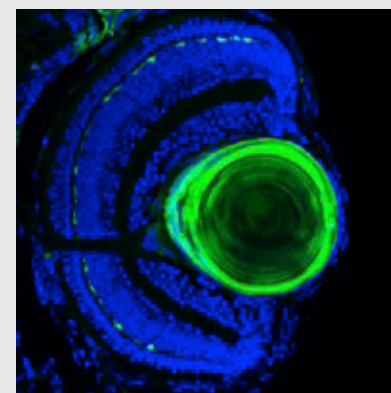
A mouse cerebral cortex showing astrocytes (star-shaped glial cells) genetically engineered to express green fluorescent protein (GFP, shown in green), astrocytes that do not express GFP (blue), and neuronal nuclei (red). This method is being used by the Weiner Lab to track glial cells in the brain that are mutant for genes of interest to cortical development. Glial cells are used to provide support and protection for neurons.

New Funded Project Aims to Understand Blinding Disorders

Understanding basic developmental processes can provide critical insights for the pathophysiology of human diseases. **Diane Slusarski, Professor of Biology**, has a long-standing interest in the signal transduction mechanisms that shape the developing embryo.

The Slusarski Lab utilizes the zebrafish animal model to functionally characterize the mechanisms by which individual genes and interacting biochemical pathways are coordinated for proper development and visual function. The rapid development of the zebrafish, with visual function by three days after fertilization, allows for the identification and validation of treatment paradigms for blinding disorders. In addition, the zebrafish are transparent with readily visible organs, blood circulation, and brain structures.

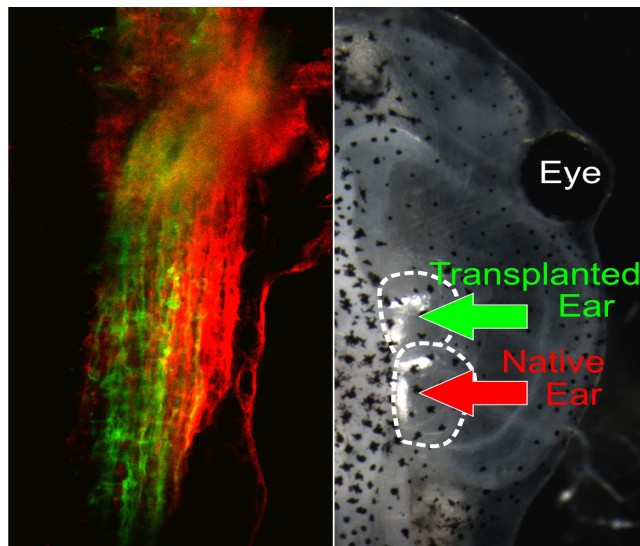
Human syndromes such as Bardet-Biedl syndrome (BBS) are characterized by several phenotypes including obesity, retinal degeneration, polydactyly, hypertension, and cardiovascular defects. There is considerable interest in understanding the molecular mechanisms involved in BBS as phenotypes associated with this disorder are commonly found within the general population. This five-year project titled, “Complex Mechanisms in Bardet-Biedl Syndrome,” is funded by the National Institutes of Health (NIH) in collaboration with the laboratory of Val Sheffield, Professor of Pediatrics at the University of Iowa. It will prove to be a powerful approach to understanding the role of newly discovered retinal disease-causing genes in both development and disease progression.



A zebrafish eye imaged with a microscope showing a BBS gene (green) in the retina. The nuclei of cells (blue) can also be seen in this image.

To learn how gifts can make a difference for faculty, staff, and students in the Department of Biology, please visit www.givetoioowa.org/biology or contact Chris Wilson at the UI Foundation (chris-wilson@uiowa.edu; 319-467-3814).

Research on the Inner Ear of Frog Embryos may assist Astronauts



Three-eared frog embryo: Injections of dyes into the native ear (red) and an ear transplanted in the native orientation rostral to the native ear (green) show an overlap of inner ear sensory afferent projections from the two ears in the vestibular nucleus.

Thompson works with undergraduate students in the Department of Engineering to generate variable stimuli that test if altered gravity can accelerate learning to cope with the asymmetric gravity input provided by the extra ear. This training can help astronauts to minimize the negative effects of long-term exposure to microgravity during space travel.

Karen Thompson, a Biology Ph.D. graduate student in the Fritzsich Lab, and six undergraduate students at the University of Iowa received stipends through a three-year, \$225,000 grant from the NASA Iowa Space Grant Consortium. Thompson and the undergraduate students collaborate across three departments and colleges on research for a project titled, “Understanding Gravity Sensing Defects Through Targeted Ear Manipulations.” Their research focuses on alterations of gravity perception that occurs when astronauts return from microgravity in space to the presence of gravity on earth.

In order to understand how gravity influences sensory development, Thompson and the undergraduate students manipulate molecularly or through transplantation the gravity-sensing organ, the inner ear. For example, for her Ph.D. project, Thompson transplanted ears from donor frog embryos to host embryos to generate one- and three-eared frogs, respectively. These ‘three-eared’ frogs carry two ears on one side in tandem that both project to the hindbrain and effect the development of hindbrain neurons that process the gravity information. The results suggest that gravity helps fine tune connections of the inner ear with the hindbrain and shapes hindbrain target neurons that use gravistatic inputs to guide swimming behavior of the animal.

Studies to Provide Insight into Potential Evolutionary Advantages of Sexual Reproduction

Joel Sharbrough, a University of Iowa Ph.D. candidate in the Biology Graduate Program, and his advisor, **Assistant Professor of Biology, Maurine Neiman**, were recently awarded two external grants that will allow them to evaluate whether asexual organisms suffer health consequences of mutation accumulation.

The National Science Foundation awarded Sharbrough and Neiman \$20,000 and the Iowa Academy of Sciences added another \$5,000 that will be used to determine whether asexual forms of a New Zealand freshwater snail species suffer from harmful mutations to a greater extent than sexual versions of the same species. The results of this research will provide novel insights into one of the most important unanswered questions in evolutionary biology: “Why do most organisms produce offspring via sexual, instead of asexual, reproduction?” Sharbrough and Neiman’s research is also of direct relevance to the many biologists and medical researchers who study the links between mutations and organismal function, including those who focus on the causes of human disease.

One of the first investigations of its kind, Sharbrough and Neiman will evaluate connections between mutation and phenotype



Potamopyrgus antipodarum, a freshwater snail native to New Zealand. Photo provided by Bart Zijlstra.

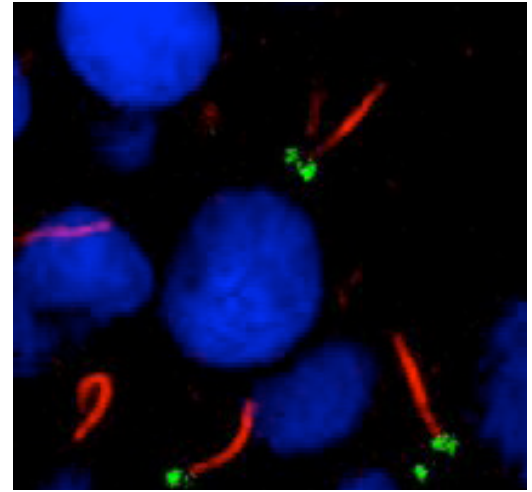
at multiple levels of biological organization — from genes to organelles to whole organisms. A particularly exciting component of the research is that it will involve collaborations with multiple undergraduates from the University of Iowa and the University of St. Thomas (via their collaborator at St. Thomas, Professor Jennifer Cruise), as well as students from Solon High School (Solon, IA).



Biology Researchers Hope to Better Understand Polycystic Kidney Disease

Polycystic Kidney Disease (PKD) is characterized by the formation of multiple kidney cysts thought to result from over-proliferation of renal epithelial cells. Aside from kidney transplantation, no treatment is currently available. Therefore, understanding PKD is of profound medical importance. Scientists have found that a tiny cell surface organelle, called the cilium, has a critical role in PKD pathogenesis. However, how this organelle regulates cellular responses in the diseased state is not fully understood.

The University of Iowa Department of Internal Medicine, Division of Nephrology, has awarded a one-year, \$50,000 Polycystic Kidney Disease Pilot and Feasibility grant to **Department of Biology professors, Diane Slusarski and Dan Eberl**. The award was made possible by a generous gift from the Hills family to fund Polycystic Kidney Disease Research. The funded project will study the basic aspects of cilia formation in order to provide critical insights for understanding the mechanisms of PKD. The Eberl Lab uses the *Drosophila* (common fruit fly) model organism to dissect cilia formation in ciliated sensory neurons, key structures affected by PKD genes. The Slusarski Lab utilizes the zebrafish model organism where kidney development is readily visible throughout embryogenesis and shows similar morphological and physiological changes in response to alteration of proteins involved in PKD in humans. The grant will investigate the interaction of two novel proteins critical for cilia development that when mutated leads to deafness in *Drosophila* and cystic kidneys in zebrafish. The goal of this pilot project is to combine the strengths of the Slusarski and Eberl groups to uncover the pathogenic mechanisms of PKD and eventually to provide insight for the effective treatment and management of this disease.



Here is a picture of cilia in a zebrafish. Red = cilia, blue = nuclei, green = a centrosomal protein

Graduate Student Focuses on Understanding the Cause of Seizures

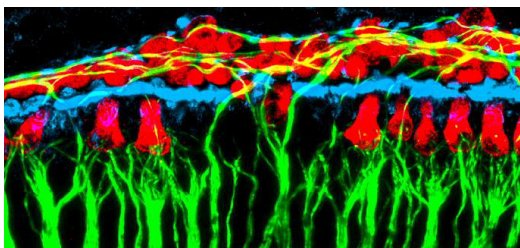


A mosaic *Drosophila melanogaster* (common fruit fly): Early during development, the precursor cell to half of this fly lost one of its two X chromosomes so that half became male. Thus, in this fly, the left side is male while the right side is female. The Wu Lab uses these mosaic flies to study the neural circuits that generate seizures.

Atulya Iyengar, a Ph.D. student in the Interdisciplinary Graduate Program in Neuroscience and a member of Chun-Fang Wu's Lab in Biology, received a three-year, \$76,856 grant from the National Institutes of Health (NIH). His research focuses on explaining the mechanisms by which altering sodium channel function disrupts patterned activity of neuronal circuits using the common fruit fly, *Drosophila melanogaster*, as a model system. Voltage-gated sodium channels are critical for the proper function of individual neurons and the nervous system as a whole.

Iyengar uses a variety of genetic, electrophysiological, and computational techniques to determine how sodium channels shape motor circuit function during normal conditions (e.g. flight) as well as during abnormal states (e.g. seizures). By combining sodium channel mutations with mutations to other genes that lead to hyperexcitability, he is able to analyze how sodium channels interact with other key regulators of excitability in driving neuronal circuit functions. The findings of this work may have direct implications in understanding the cause of neuronal excitability disorders, such as epilepsy.

Biology Researcher Studies Hearing Loss



The organ of Corti of a 7-day old mutant mouse with genetic manipulations of genes relevant for hair cell formation shows unusual innervation (green) to the disorganized hair cells (red).

A widespread disability in humans is hearing defects caused by progressive loss of hair cells. **Israt Jahan**, an Assistant Research Scientist with the Fritzsche Lab in the Department of Biology, received her second-year Emerging Research Grant (\$25,000 per year) from the Hearing Health Foundation. Her research goal is to understand the topologically correct regeneration of hair cells in patients with hearing loss using the mouse model.

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BIOLOGY GRADUATES

Doctor of Philosophy (Ph.D.) in Biology

December 2012

Sarah Derry (Slusarski Lab)

Thesis Title: "Calcium-induced Naked1 Activity in Wnt Signaling"

Ukpong Eyo (Dailey Lab)

Thesis Title: "Purinergic Regulation of Microglial Mobility and Viability during Ischemic Conditions in Developing Mouse Brain Tissues"

Rebecca Hart-Schmidt (McAllister Lab)

Thesis Title: "Geographically Patterned Variation in Diapause and its Relationship to other Climate-associated Phenotypes and Genotypes of *Drosophila americana*"

May 2013

R. Taylor Raborn (Logsdon Lab)

Thesis Title: "Genome-wide Analysis of Transcription Initiation and Promoter Architecture in Eukaryotes"

Summer 2013

Xiaojing Hong (Manak Lab)

Thesis Title: "Utilizing High-throughput Genomics Methodologies to Explore Transcriptomes and Exomes"

Bachelor of Science in Biology with Honors

December 2012

Rachael Payne (Manak Lab)

May 2013

Nathan Balukoff (Smolikove Lab)

John Jung (Slusarski Lab)

Joshua Krutsinger (Eberl Lab)

Ryan Logan (Logsdon Lab)

Sam Miner (Dailey Lab)

Connor Pennino (Llopart Lab)

Dane Pratt (Green Lab)

Mason Sweat (Fassler Lab)

Dylan Todd (Green Lab)

Donald Warren (Neiman Lab)

Alexander Wickenkamp (Smolikove Lab)

Xin Yuan (Erives Lab)

Master of Science (M.S.) in Biology

December 2012

Ramon Galindo (Green Lab)

Thesis Title: "The Effect of Neurotrophic Factors on Spiral Ganglion Neurons *in vitro*"

May 2013

Zhe Wang (Wu/Fritsch Labs)

Bachelor of Arts in Biology with Honors

May 2013

Tina Hosch (Slusarski Lab)

Nicole Krois (Neiman Lab)

Nicholas Zachar (Neiman Lab)



Developmental Studies Hybridoma Bank Provides Financial Support to Graduate Students

Under the direction of **David Soll, Professor of Biology**, the Developmental Studies Hybridoma Bank (DSHB), has contributed \$50,000 to the Department of Biology for two graduate student fellowships. The fellowship recipients for the 2013-2014 academic year are **Rachel Harney** in the Albert Erives Lab and **Felicia Ooi** in the Veena Prahlad Lab. Both students are working with Dr. Karla Daniels, Brian Berger, and Rebecca Glover in the production of a monoclonal antibody related to their research in *Drosophila* (the common fruit fly) and *C. elegans* (roundworm) model systems.

In addition, the DSHB again contributed up to \$10,000 in support of the Integrated Biology (I-Bio) Graduate Program Student Retreat held at the Isle of Capri Hotel and Casino in Bettendorf, Iowa on Saturday, October 26, 2013. The keynote speaker for the retreat was Dr. Michael Levine, a Professor of Genetics, Genomics and Development, at the University of California, Berkeley. Drs. David Soll, Department of Biology, and Robert Cornell, Department of Anatomy and Cell Biology, were guest speakers.

The DSHB, a National Resource created by the National Institutes of Health (NIH), is housed in the Department of Biology on the University of Iowa campus. For more information about the DSHB, please visit dshb.biology.uiowa.edu

Send us your news and updated contact information! Send an email to biology@uiowa.edu or visit www.biology.uiowa.edu/alumni.php and complete the "Keep-In-Touch" form.

IN REMEMBRANCE...

OBITUARIES

- Andrews, Ted F.** M.S. Zoology, 1942. (September 23, 2009)
- Becker, Steven A.** M.S. Botany, 1966; Ph.D. Botany, 1968. (May 31, 2009)
- Benson, Walter A.** B.A. Botany, 1958. (February 18, 2013)
- Bovbjerg, Ann M.** M.S. Zoology, 1959; Ph.D. Zoology 1961. (March 17, 2013)
- Carron, Christopher P.** B.A. Zoology, 1974. (February 19, 2012)
- Crosman, Arthur M.** B.A. Zoology, 1950. (March 19, 2008)
- Hahn, L. Donald** M.S. Zoology, 1952. (March 28, 2013)
- Hanzlik, Martin N.** B.A. Zoology, 1949. (October 11, 2012)
- Highsmith, Raymond C.** B.A. Zoology, 1972. (July 10, 2013)
- Jefferies, Francis C.** B.A. Zoology, 1937. (July 14, 2009)
- Levin, Arthur J.** M.S. Zoology, 1940. (April 03, 2013)
- Melnick, Sidney** B.A. Zoology, 1936. (October 12, 2012)
- Morris, Everett F.** Ph.D. Botany, 1955. (August 13, 2013)
- Putz, Robert E.** M.S. Zoology, 1962. (December 13, 2009)
- Ridout, Bill** M.S. Zoology, 1967. (September 14, 2009)
- Shea, Timothy J.** B.A. Zoology, 1976. (November 05, 2012)
- Gray Shiffler, LuVern** M.S. Zoology, 1938. (December 05, 2012)
- Sperando-Sales, Shannon R.** B.A. Biology, 2005. (December 12, 2009)
- Suddick, Richard P.** Ph.D. Zoology, 1968. (October 19, 2012)
- Thompson, Robert G.** B.A. Zoology, 1949. (July 15, 2008)
- Van Breemen, Eileen B.** B.A. Zoology, 1945. (January 07, 2013)
- Williams, Kathleen R.** B.A. Zoology, 1944. (December 18, 2012)

*Deceased date is listed in parenthesis.

Reference: UI Division of Alumni Records

We Remember...

☒ **Richard Glen Kessel** (1931-2013), a professor in the University of Iowa (UI) Department of Biology from 1961 to 1997, died on March 13, 2013, in Rapid City, SD. He was 81.

Kessel received his Bachelor of Science degree summa cum laude in Chemistry from Parsons College (Fairfield, IA) in 1953 and his Master of Science (1956) and Ph.D. (1959) degrees in Zoology from the UI.

After graduation, he accepted a teaching and research position in the Anatomy Department at Wake Forest University. In 1961, he was offered the opportunity to return to the Department of Zoology (which later was renamed Department of Biology) as a faculty member where he remained for the duration of his career until his retirement in 1997. During his tenure at the UI, Kessel performed research in cell and developmental biology and taught undergraduate and graduate students in cell biology, electron microscopy, and microscopic anatomy (histology). He published more than 120 scientific research and review articles and is the author of 5 books. He was the first recipient at the UI of a five-year U.S. Public Health Service (USPHS) Research Career Development Award and a Developmental Biology training grant.

Kessel was Chairman of several UI committees including the University Scanning Electron Microscope Steering Committee, University Research Council, and Library Committee. He also was a member of the American Association for the Advancement of Science (AAAS) and many other professional societies. Kessel established scholarships in his name at the UI Department of Biology and College of Medicine, Cornell College in Mount Vernon, IA, and the Marine Biological Laboratory (MBL) in Woods Hole, MA. Following retirement, he lived for eight years at Melrose Meadows in Iowa City, and in November 2012, moved to Rapid City, SD, to be close to relatives.

For the complete obituary on Richard G. Kessel, please visit www.lensingfuneral.com

Reference: Lensing Funeral & Cremation Service website.
Retrieved from www.lensingfuneral.com

☒ **Dawson Mohler**, a professor in the Department of Biology/Zoology at the University of Iowa (UI) from 1966 to 1990, died on March 21, 2013, due to complications from Parkinson's disease and liver failure. Mohler was living in the Assisted Living facility of Piedmont Gardens in Oakland, CA. He died peacefully in his sleep.


Mohler received his Ph.D. from the University of California, Berkeley, in 1955. He came to the UI as an Associate Professor from Oregon State University. He worked on the regulation of gene activity in crossveinless-like strains of *Drosophila*. Mohler served as Chairman of the Interdisciplinary Graduate Program in Genetics at the UI from 1976 to 1982.


He is survived by his wife, Bobby, three children, and two grandchildren. He was 86 years old.


Reference: Spaziani, E., and Stromsten, F. A. *History of the Biological Science Departments at the University of Iowa: 1855 - 2012*.


To learn how gifts can make a difference for faculty, staff, and students in the Department of Biology, please visit www.givetoioowa.org/biology or contact Chris Wilson at the UI Foundation (chris-wilson@uiowa.edu; 319-467-3814).

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The Department of
BIOLOGY

Photo on the right:
Library preparation for Next
Generation Sequencing at
the Roy J. Carver Center
for Genomics (CCG) in the
Department of Biology.

