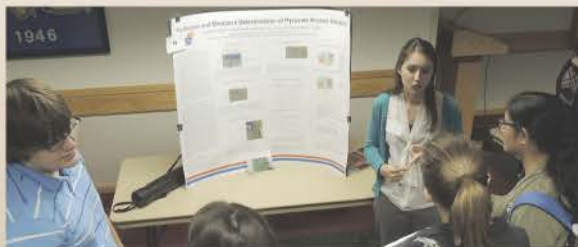


BIOHAWK

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Welcome to our 2016 edition of the BioHawk!

We have focused this issue on the impact that donors have had on mentoring and educating new generations of graduate and undergraduate biology students. Our feature article highlights the generosity of our alumni, as well as the students who have thrived as a result. We have profiled a set of donors, individuals who have been honored through donations, and student research projects that were made possible by alumni donations.

As in past BioHawks, we share recent news from our biology departments and program. Highlights from Undergraduate Biology include recent upgrades to the anatomy lab and the addition of a new applied science degree in biotechnology, offered at the KU Edwards Campus. Ecology and Evolutionary Biology reviews recent successes in research funding, the hiring of two Foundation Distinguished Professors, and the transformation of undergraduate courses to enhance student learning and retention. Molecular Biosciences details recruitment of new faculty, describes grants to study a wide range of research questions from basic aspects of cell division to novel approaches to cancer therapy, and discusses how funding has supported creative research conducted by graduate and undergraduate students.

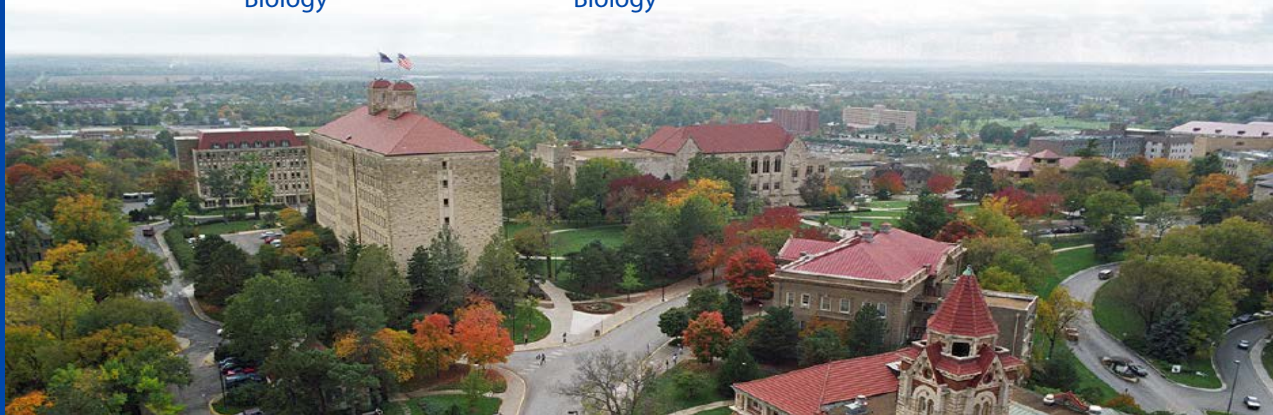
Check out the outstanding undergraduate and graduate students profiled in this issue. Their passion for biology is evident through their accomplishments in and out of the classroom. The successes of these students have been fostered through scholarships and awards, faculty mentorship, and the unique research opportunities available to them in KU Biology. Our students have contributed novel research findings and developed valuable skills that prepare them to be future scientific leaders. *We are so proud of them!*

Thank you for your continued support of KU Biology. We sincerely appreciate all of our alumni and friends, including those whose donations this past year have contributed so much to KU Biology (p. #23) and those who made it possible for us to purchase an industrial glassware washer (enabling our students to spend time on research instead of glassware cleaning) (p. #22). As always, we hope to stay connected and we invite you to visit us online at kubiology.ku.edu where you can share your news and stay current with what is happening in KU Biology.

Dr. Greg Burg
Director
Undergraduate
Biology

Dr. Chris Haufler
Chair
Ecology and Evolutionary
Biology

Dr. Susan Egan
Chair
Molecular Biosciences



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• **BSAB Board Meeting**
Thursday,
October 13, 2016

• **Career Night**
Thursday,
October 25, 2016
Kansas Union
Ballroom

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The University of Kansas is committed to providing programs and activities to all persons, regardless of race, religion, color, sex, disability, national origin, ancestry, sexual orientation, marital or parental status and, to the extent covered by law, age or veteran status.

We would like to thank everyone who contributed to making this issue of BioHawk a success. Without your support it would not be possible. A special thanks to all of those who contributed material and images.





Greg Burg
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Undergraduate Biology Program: Offering an Enriching Educational Experience and Preparing Students for Careers in Biology

It has been a few years since we have compiled an update for Undergraduate Biology and they have been busy years. Our enrollment remains strong, and at last count we had 1,380 majors across all of the undergraduate degrees offered in the biological sciences at KU. We have invited new BioScholars to campus, and more than 270 students per year continue to participate in faculty-led research. Since 2014, we have recognized outstanding research achievement by awarding departmental honors to 12 students, and an additional 18 students received departmental awards or scholarships. The newly renovated and enlarged Human Anatomy lab opened during the fall 2014 semester, which enabled us to accommodate 45 more students per semester who need the Human Anatomy Lab as part of their plan of study. There are also some new faces in Undergraduate Biology following the departure of staff members in biochemistry, microbiology, and human anatomy.

BioScholarships for Students

We welcomed six BioScholars in fall 2014, joining our 12 continuing BioScholars. **Chloe Adams** (Howieson BioScholarship; Shawnee, KS), **Marilyn Barragan** (Howieson BioScholarship; Olathe, KS), and **Zachary Grant** (Howieson BioScholarship; Wichita, KS) are pursuing microbiology, **Michael Cory** (Smiley-Gilligan Family BioScholarship; Wichita, KS) is pursuing biochemistry, **Elise Base** (Robert & Lillian Bell BioScholarship; Norman, OK) is pursuing molecular, cellular, & developmental biology, and **Paige Hansen** (Howieson BioScholarship; Brookings, SD) is pursuing ecology, evolution, & organismal biology. In addition, we have two new BioScholars who entered KU during the fall 2015 semester. **Claire Byers** (Elio Schaechter Bioscholarship, Wichita, KS) is pursuing ecology, evolution, and organismal biology and **Joseph Loomis** (James A. Orr BioScholarship, luka, KS) is pursuing biochemistry. We are very proud of our BioScholar alumni who are teachers, surgical residents, post-doctoral associates, and students pursuing medical, pharmacy, veterinary medicine, and Ph.D. degrees.

Departmental Biology Honors

We also recognized 12 students who completed departmental honors in Biology in May 2014 and May 2015. Recent recipients (and their mentors) include:

May 2014

- **Abby Glauser** (Dr. Thomas Taylor, Department of Ecology & Evolutionary Biology). Reexamination of microspore contents in Pennsylvanian spores and pollen grains.
- **Holly Lafferty** (Dr. James Thorp, Department of Ecology & Evolutionary Biology). Hunger games: Isotope ratios in nutrient stressed fish.

- **Kendra Marr** (Dr. Justin Blumenstiel, Department of Ecology & Evolutionary Biology). Factors influencing eggshell defects in a strain of *Drosophila virilis* that carries a high transposon load.
- **Betsy Ramirez** (Dr. Audrey Lamb, Department of Molecular Biosciences). Isolation and crystallization of PvdJp2, a non-ribosomal peptide synthetase domain in *Pseudomonas aeruginosa*.
- **Julio Ramirez** (Dr. Marie Orive, Department of Ecology & Evolutionary Biology). Shielding effect of asexual reproduction on mutation load.
- **Timothy Turkalo** (Dr. Mizuki Azuma, Department of Molecular Biosciences). Ewing's sarcoma protein Ewsa regulates chondrogenesis in zebrafish by modulation of Sox9 transcriptional activity.
- **Ryan Xiao** (Dr. Brian Ackley, Department of Molecular Biosciences). The *C. elegans* hmr-1 classical cadherin interacts with a Wnt pathway and fmi-1/flamingo to control anterior-posterior axon outgrowth in the VD GABAergic neurons.

May 2015

- **Brendan Martin** (Dr. James Thorp, Department of Ecology & Evolutionary Biology). Benthic invertebrate distribution in a seasonally stratified lake with a deep water algae belt.
- **Matthew A. Miller** (Dr. Kristi Neufeld, Department of Molecular Biosciences). Demonstrating a role for nuclear adenomatous polyposis coli in intestinal epithelial cellular differentiation.
- **Mia Phillips** (Dr. Rafe Brown, Department of Ecology & Evolutionary Biology). Space use in the little scrub island ground lizard, *Ameiva corax*.
- **Sukhindervir Sandhu** (Dr. Lena Hileman, Department of Ecology & Evolutionary Biology). Analysis of differential trichome production in *Mimulus guttatus* virus-induced gene silencing.
- **Bailey Wilkerson** (Dr. Liang Xu, Department of Molecular Biosciences). MicroRNA targeting of musashi-1 in breast cancer.

Biology Department Awards and Scholarships

Student recipients of biology awards and scholarships during 2014 and 2015 include **Olivia Lynch** and **Teale Muir** (Lance S. Foster Outstanding Junior in Biology); **Benjamin Jang** and **Holly Lafferty** (Undergraduate Biology Program Outstanding Senior Award); **Emily Frese** and **Abby Glauser** (Pauline Kimball Prize for an Outstanding Woman Senior in Biology); **Emily Frese** and **Alicia Genilo** (Robert Tweed Hersh Memorial Scholarship Award in Human Biology); **Ashley Farris**, **Carla Harper**, and **Mackenzie Bloom** (Ida H. Hyde Scholarship for Women in Science); **Kayla Sale** and **Sukhindervir Singh Sandhu** (J. O. & V. H. Edson Scholarship);

Kayla Sale (Jenna Robinson Memorial Scholarship); **Abby Glauser** and **Holly Lafferty** (Nathan B. Parker, Ph.D.-Student Award in Biology); **Lauren Arney** (Paul A. Kitos Award for Excellence in Undergraduate Biochemical Research); **Lauren Arney, Brittany Varnado**, and **Graham Wehmeyer** (Del and Carol Shankel Biomedical Scholarship); and **Leigh Loving** (Erma Reed Peterson Scholarship).

Thanks to the generous support of **Dr. John Howieson** (c'50, d'55), undergraduate biology students may apply for funding to help cover expenses to travel for off-campus research or conferences through the Howieson Opportunity Fund. Recent recipients include **Thomas Anneberg** (Kansas City, MO for Ecological Genomics symposium), **Gwynne Carpenter** (St. Louis, MO for American Association of Physical Anthropologists conference), **Ashley Farris** (Bangalore, India for bioengineering research with inStem), **Abby Glauser** (Boise, ID for Botanical Society of America conference), **Tim Hieger** (Boise, ID for Botanical Society of America conference), **Nathan Kern** (San Francisco, CA for Biophysical Society conference), **Brendan Martin** (Bonaire for KU Field Studies in Marine Biology program), **Ry Patton** (Palm Beach, FL for Society of Integrative and Comparative Biology conference), and **Jacqueline Sullivan** (Sakaerat Environmental Research Station and Kasetsart University, Bangkok, Thailand for herpetology research).

This year saw our inaugural Undergraduate Biology Program Research Awards. The first recipients who received research support included **Tim Hieger** and **Ry Patton** (Smiley-Gilligan Family Funds) and **Ashutosh Agarwal, Rana Aliani, Mackenzie Bloom, Matt Miller, Mia Phillips**, and **Graham Wehmeyer** (Ken & Helen Nelson Opportunity Fund).

In addition, 26 students received competitive research awards over the past year through the Center for Undergraduate Research – **Rana Aliani, Thomas Anneberg, Lauren Arney, Emily Binshtok, Matthew Buehler, Luke Daniels, Erin Evans, William Gunderson, Emily Haynes, Timothy Hieger, Brianna Jackson, Nathan Kern, Maija Mallula, Justin Massey, Adam Miltner, Vivek Patel, Ry Patton, Betsy Ramirez, Julio Ramirez, Allora Richey, Alexandria Roy, Sukhindervir Singh Sandhu, Ashwaan Uddin, Dan Vu, Raeann Whitney, and Bailey Wilkerson.**

We are proud of our biology students, who excel not only within our program but also across the university, in the community, and even nationally and internationally. Six biology students were among the 20 sophomore students selected as 2014 University Scholars, who are chosen on the basis of their academic excellence: **Jenny Stern** (ecology & evolutionary biology), **Rachel Lietz** (biochemistry), **Bahar Barani** (biochemistry), **Adelle Loney** (microbiology), **Jessica van Loben Sels** (microbiology), and **David Dimachkie** (biology). An additional three biology majors were selected as University Scholars for 2015 – **Tomara Konstantinova** (biology & anthropology), **Emily Lenherr** (neurobiology), and **Daniel Pham** (biochemistry). **Graham Naasz** (biology) won the ExCEL award during the Fall 2014 semester in

recognition of his leadership, communication skills, and community involvement. **Elliott Brady** (biology) and **Lauren Arney** (biology) were 2015 ExCEL finalists. **Leigh Loving** (genetics) and **Sebastian Schoneich** (biochemistry & philosophy) were selected as Hall Center Scholars based on their strong academic performance and activity in the KU community. **Albert Kim** (cell biology) and **Timothy Turkalo** (cell biology) received cash prizes for their presentations during the 12th annual IDEa network of K-INBRE in Kansas City.

On the national scene, **Jessica van Loben Sels** was awarded a Goldwater Scholarship and nominated for a Marshall Scholarship, and she and Jenny Stern (ecology and evolutionary biology) received KU's first two Astronaut Scholarships. **Jenny Stern** was awarded the Udall Scholarship and was nominated for the Marshall and Rhodes Scholarships. **Ashley Farris** (biochemistry) and **Kayla Sale** (ecology and evolutionary biology and mathematics) earned NSF graduate fellowships, and both were nominated for the Goldwater Scholarship. **Leigh Loving** (genetics) was nominated for the Rhodes and Truman Scholarships. All these students are to be congratulated for being competitive for national awards.

Each Spring semester, we ask graduating biology majors to nominate their favorite professor, and we are always pleased with the enthusiastic and thoughtful responses we receive. The Class of 2014's most favorite professor was Dr. **Stephen Benedict**, Department of Molecular Biosciences, and in 2015, two favorite professors were recognized; Dr. **Kristi Neufeld**, Department of Molecular Biosciences, and Dr. **Gerrit de Boer**, Department of Ecology & Evolutionary Biology.

Faculty and Staff Changes

Long-time biology employees Dr. Tim West and Martha West retired from KU in 2014, and Dr. David McLeod left for a faculty position at James Madison University in Virginia. We were sad to see them go and we wish them well as they explore their new opportunities. At the same time, we welcomed seven new members of the Undergraduate Biology staff in 2014 and 2015: **Suzanne Scales**, events specialist responsible for alumni relations and outreach, **Craig Corpstein, Melissa Meyers** (c'10), and Dr. **Connie Hallberg**, lab coordinators in introductory biology, microbiology, and biochemistry/cell biology lab groups, respectively, Dr. **Victor Gonzalez** (PhD'08), director of human anatomy labs, **Sandy Leppin**, biology advisor and outreach coordinator at the Edwards Campus, and Dr. **Randy Logan** (c'05, g'10, PhD'13), Director of the Bachelor of Applied Science in Biotechnology degree program at the Edwards Campus. Each is beginning to make their mark in Undergraduate Biology. We are pleased they agreed to join us.

As always, we value our alumni and we celebrate your successes. Please keep in touch. Visit us on Facebook (KU Biological Sciences Alumni) and join our growing list of members.



Chris Haufler
 Chair, Ecology and Evolutionary Biology
 vulgare@ku.edu

Ecology and Evolutionary Biology:

Exploring the Complexity of Life on Earth from Genes to Ecosystems; Educating Next Generation Scientists and Innovators in Biology.

“WE
 ENCOURAGE
 YOU TO
 WORK
 WITH US
 TO
 ENSURE
 A STRONG
 FUTURE
 FOR
 KU
 BIOLOGY.”

eeb.ku.edu

Just as the Great Seal of the state of Kansas encourages, over the past year, the Department of Ecology and Evolutionary Biology (EEB) has been “reaching for the stars through adversity.”

- While state contributions to KU are shrinking, and regular avenues for hiring new faculty are minimal, we have taken advantage of emerging opportunities and gained four new faculty colleagues.
- EEB faculty members have also bucked national funding trends. With the percentage of grant proposal success at federal agencies hovering in the single digits, EEB has doubled its external grant dollars over the past two years.
- And we have found ways to boost classroom performance. Whereas other units in the College of Liberal Arts and Sciences have seen student enrollments drop and tuition dollars evaporate, EEB faculty members have innovated teaching practices and transformed classes, resulting in improved retention of undergraduate majors, greater rigor in evaluating student learning, and increased numbers of students taking the classes we teach.

Indeed, EEB faculty and graduate students have joined forces to meet the many challenges facing post secondary educational institutions today. By visiting our departmental web page (eeb.ku.edu), you can see the numerous achievements and accolades that have been gained by EEB faculty members and students. As the following paragraphs elaborate, our combined efforts are helping to raise the profile of the department significantly and encourage wonderful colleagues and students to work collaboratively and successfully.

New Faculty Hires: In 2012, the Kansas legislature funded a several year initiative to recruit twelve distinguished scholars to KU. Called “Foundation Professors,” the program sought to provide an immediate injection of preeminent research and expertise to KU by hiring extraordinary individuals with proven track

records of innovation and disciplinary leadership. In partnership with the Biodiversity Institute, EEB attracted Dr. **K. Christopher Beard**, a paleontologist who is re-writing the course of primate evolution. Dr. Beard held the Dawson Chair at the Carnegie Museum (named after Mary Dawson, a 1957 KU alum!) before accepting the offer to join the EEB faculty. Then, in an unprecedented move (given that there were only twelve of these professorships available), we partnered with the Kansas Biological Survey to gain a second Foundation Professor. Dr. **James Bever**, formerly on the faculty at Indiana University, spent a sabbatical semester working with KU colleagues, and then accepted our offer to move permanently to KU. Dr. Bever’s research program focuses on discovering how the fungi and bacteria that make up the soil micro-biome control the diversity of prairie communities. Professors Beard and Bever add considerable breadth and depth to our research and graduate programs, and we are already benefiting from their contributions. Since coming to KU, Professor Beard has published landmark papers on new primate fossils discovered in Turkey and Libya, and Professor Bever has submitted publications and developed collaborative grant proposals with his KU colleagues.

Last year, with the help of a university fellowship, we also were able to attract Dr. **Folashade Agusto** to KU. Since the late 1970s, KU has sponsored the Langston Hughes Visiting Professorship, which has attracted established or emerging ethnic minority scholars from across the country. Although these fellowships have been used to enhance minority representation in the humanities and social sciences, until EEB obtained one, none of these fellowships had been awarded to a science-oriented department. We are delighted to have Dr. Agusto join our department as she is bringing valuable expertise at the interface of mathematics and biology. Her research focuses on modeling diseases such as malaria and ebola, and she has already collaborated with EEB faculty members on papers and research grants.



Dr. K. Christopher
Beard



Dr. James
Bever



Dr. Folashade
Augusto



Dr. Amy
Burgin

Our fourth new faculty member holds a joint position in Environmental Studies and the Kansas Biological Survey. Dr. **Amy Burgin** conducts research that integrates across the fields of microbial ecology, biogeochemistry, and aquatic ecosystem ecology. She will add a new dimension to ongoing projects focusing on the importance of water and its conservation.

New Hires Offset Faculty Losses: Retiring from EEB in the recent past have been Professors **Daphne Fautin**, **Edith Taylor**, **Linda Trueb**, and **Edward Wiley**. In addition, the unexpected death of Professor **Larry Martin** left a gaping hole in our program. These valued colleagues devoted a combined remarkable total of more than 170 years building the research and education programs in biology at KU, and we benefited greatly from their intellect, their remarkable productivity, and their inspirational guidance. Their combined contributions are a potent reminder of the loyalty that our colleagues bring to KU biology.



A significant loss from our emeritus faculty ranks was the passing of Distinguished Professor **Charles Michener**, affectionately known as “Mich” to his friends and colleagues. Not surprisingly, Professor Michener was active and productive to the end. In May, 2015, an interview with him at age 96 was published in the journal *Nature*, noting that it had been 80 years since he published his first paper at age 16! Later that year, he co-authored a paper with a former student, thus marking an 80-year span of research publications. Then, on 1 November, Dr. Michener passed on, leaving a remarkable history of accomplishment. At the time, his close colleague Professor Michael Engel wrote a moving commentary on his life that included the following:

Aside from his numerous academic achievements, Mich was most importantly a genuinely wonderful human being. Soft-spoken and mild in demeanor, he was generous with his time and expertise, and was always unassuming. While many who achieve his level of fame become distant or self-absorbed, he was instead the consummate gentleman and had an open door through which one could walk in at any time and say, “Hi Mich, can I ask you a question?” To which he would always set aside what he was doing, turn with a warm smile, fold his hands characteristically, and listen and converse for as long as one would like, and on any subject. He treated everyone with the same level of affectionate dignity. His kind manner was a constant in a world of persistent change, and is missed.

Indeed, Dr. Michener’s gentle presence will long be fondly remembered, and his gifts to the world of bee biology will be

a lasting tribute. Dr. Engel is now working on the next edition of Michener’s “Bees of the World!” This spring we will host the next in the “Michener Lecture” series sponsored by gifts from alumni and friends.

EEB Research Contributions: The National Science Foundation (NSF) was conceived in 1950 as a way to provide funding across the U.S. for basic research. Over the decades since its inception, federal funding has not kept pace with the growth of science, and the costs involved with pursuing the fundamental research that underpins contemporary applications. Today, political wrangling has resulted in a stagnant NSF budget, and the percent funding of proposals submitted to the NSF has plummeted into the single digits (about 4% at the last calculation!). Competition for the available funds is enormous. In this climate, however, EEB faculty members have doubled the amount of NSF funds brought to the KU research enterprise. Further indicating that we continue to reach for the stars, all of our early career faculty members have been successful in obtaining external funding for their research programs.

Over the past five years, EEB has contributed more than \$7 million in research overhead to the University, and the total federal funding of EEB research has exceeded \$43 million. Especially considering that “organism-centered” departments nationwide have historically obtained smaller research grants, EEB faculty members appear to be exceeding their potential and truly giving back to the University. In terms of research productivity, of particular note is a statistic provided by Thompson Reuters recently. This group annually issues a list of some 3000 researchers from around the world whose work is “highly cited.” Although not the only metric for demonstrating the strength of research programs, citation indices do demonstrate that fellow scientists are referring to the work of these individuals more frequently than others. In the state of Kansas, there were only three individuals on that list, and all three are members of EEB: Foundation Distinguished Professor **James Bever**, and Distinguished Professors **Town Peterson** and **Jorge Soberón**.

EEB Participates in the International Arena: Faculty members and students associated with EEB have played significant roles in making discoveries around the world. To cite recent contributions: Dr. **Joy Ward** represents US research interests in such far-flung locations as Japan and Saudi Arabia; Dr. **Rafe Brown** and his colleagues exposed new species of lizard in the Philippine black market; and Foundation Professor **Chris Beard** discovered early anthropoid primate species in Libya. In many of these locations, we encounter alumni who are delighted to see others proudly wearing Jayhawk apparel!



Mark Mort engages with students in a larger classroom setting.



Rafe Brown's discovery of a new monitor lizard was led by former student Luke Welton (on the right).



Chris Beard, KU postdoc Pauline Coster, and students and colleagues from the University of Tripoli (Libya) and University of Poitiers (France) explore early Oligocene fossil sites in Libya. Near Zallah Oasis in central Libya, the team discovered an entirely new site that has yielded the first Oligocene anthropoid primates and other new taxa of fossil mammals.

CONTINUED FROM PAGE 7

EEB Stimulates Teaching Innovation: EEB faculty members are helping to raise the profile of KU by pioneering contemporary approaches to teaching and learning. Our department contributed to the successful application for a biology "Postdoctoral Teaching Fellow" sponsored by the university.

Associate Professor **Mark Mort**, who authored that proposal, has led the charge to transform our large introductory courses and ensure that our students become "engaged learners." By changing the way we organize our large classes, we are designing opportunities for students to use the internet to truly prepare for success in the classroom, work collaboratively in small groups during class, and respond to questions using electronic "audience response systems" that generate an instant poll of student learning. These methods literally transform our large (300-900 students) classes into much smaller and more intimate learning experiences for our students.

Dr. Mort and others in EEB have participated in national conversations about the need to retain students in our classes and at KU. He and our Biology Teaching Fellow, Dr. **Stefanie DeVito**, have demonstrated that through teaching innovation we are not only seeing significant improvements in student retention in our large classes, we are also asking more challenging questions of our students. Thus, we are both retaining more students and ensuring that they have a deeper understanding of the concepts and skills necessary to apply biological principles. Aiding and funding this important effort, Dr. Mort was co-PI on a major NSF grant to KU that will enhance learning environments across the campus.

Looking to the Future: We hope that this brief overview demonstrates the forward thinking and ongoing strength of EEB faculty members, our research programs, and our teaching performance. Please visit our website (eeb.ku.edu) and click the "Department News" link to see more specific examples of our many achievements. As the University makes plans to improve the science infrastructure through new buildings and renovation of old buildings, we will continue to rely on the generous contributions from our alumni to take advantage of these facilities, to support our graduate students as they achieve their potential, and to enhance our research and education capacities. We encourage you to work with us to ensure a strong future for KU biology. Hopefully this narrative shows how EEB faculty members are contributing to this goal, and we invite you to help us continue reaching for the stars!





Susan Egan
Chair, Molecular Biosciences
sme@ku.edu

Molecular Biosciences:

Promoting Well-Being, Finding Cures and Educating Future Scientific Leaders

Welcome! The past year and a half has been very exciting (and busy) as I've begun my term as Chair of the Department of Molecular Biosciences (MB). In recent years, members of MB have continued to make important scientific discoveries and to educate students who will be among the next generation of scientific leaders. I feel privileged to facilitate departmental operations and help empower my talented colleagues through my role as Chair.

You can read much more MB news in our latest newsletter at:

<http://molecularbiosciences.ku.edu/newsletter>

World-Class Undergraduate Research and Teaching

In the past year, MB faculty members had the opportunity to work with well over 100 KU undergraduate students on research. Among the superb accomplishments of MB undergraduates, many received Undergraduate Research Awards: recent MB recipients (and mentors) were **Lauren Arney** (Lamb), **Dan Vu** (Timmons), **Justin Massey** (Hefty), **Emily Binshtok** (Xu), **Dharam Patel** (Lamb), **Ellen (Brook) Nasser** (Chandler) and **Margaret (Meggie) Brophy** (Neufeld).

Other undergraduate research awards went to: **Rana Aliani** (Lundquist lab), K-INBRE Undergraduate Scholar to study the role of the Neurofibromatosis type II protein NFM-1 in neuronal migration; **Kyle Monize** (Chandler lab), K-INBRE Undergraduate Scholar to study a virulence regulator in the human pathogen *Burkholderia pseudomallei*; **Daniel Pham** (Xu lab), KU Cancer Center Summer Student Research Training Award for "Molecular cancer therapy targeting RNA binding protein Musashi-1." **Michael Cory** (Karanicolas) and **Aidan Dmitriev** (Hefty) were named the inaugural Beckman Scholars, and will receive support for 15 months of intensive research.

Finally, **Jessica van Loben Sels** (Davidov) was awarded a prestigious Barry M. Goldwater Scholarship to study how cellular factors affect herpes simplex virus-1 (HSV-1) gene.

MB Graduate and Undergraduate students participate in Science Outreach

In April 2015, MB graduate students and undergraduates participated in the inaugural Kansas DNA Day. Organized by **Lynn Villafuerte**, Program Coordinator for the Office for Diversity in Science Training and **Sonia Hall**, MB Ph.D. student, Kansas DNA Day deployed more than 50 graduate and undergraduate "ambassadors" to 14 Kansas high schools to share their research projects, and lead simple experiments designed to show everyday applications of genetics and biotechnology. More than 1000 Kansas high school students had the opportunity to interact with these young scientists, giving many of them their first encounter with a real research scientist who was encouraging of them to consider STEM (Science, Technology, Engineering and Mathematics) disciplines for college. To extend this science outreach, Haifa Alhadyan, MB graduate student, organized the first Saudi Arabia DNA Day in July 2015 as a joint program to the University of Kansas. MB student ambassadors are hard at work preparing for Kansas DNA Day 2016, which is scheduled for April 21.



Left to right: Lynn Villafuerte, Sonia Hall, Haifa Alhadyan, Aleah Henderson, Max Iverson and Adam Miltner

"I FEEL
PRIVILEGED TO
FACILITATE
DEPARTMENTAL
OPERATIONS
AND HELP
EMPOWER
MY TALENTED
COLLEAGUES
THROUGH MY
ROLE AS
CHAIR."

molecularbiosciences.ku.edu





Worldly Graduate Students

MB faculty members also work very closely with many exceptional graduate students. The MB graduate program currently has 60 graduate students, including our fall 2015 class (below). One third of our graduate students are international and hail from Mexico, China, Zimbabwe, Saudi Arabia, India, Bosnia, and Nepal. Graduate students are an integral part of our research programs, and participate in most publications by MB faculty members.

MB Graduate Student Fellowships and Awards

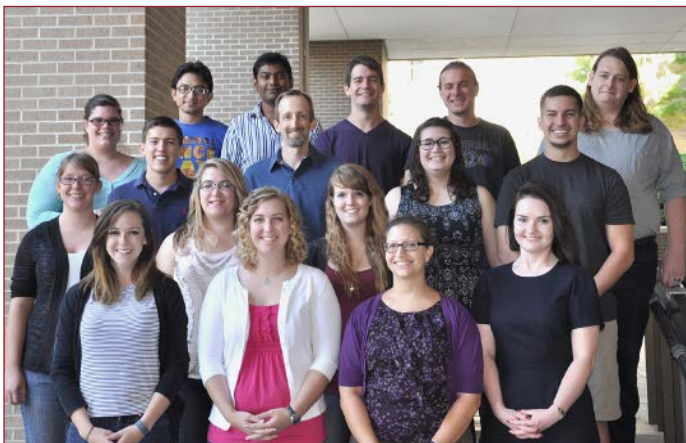
Aaron Bart (Scott) and **Bryce Blankenfeld** (Gamblin) were appointed to the Graduate Training Program in the Dynamic Aspects of Chemical Biology. **Amber Smith** (Xu) received the 2015 Newmark Award for "Therapeutic strategies targeting the RNA binding protein Musashi-1 in colorectal cancer."

Jenn Klaus (Chandler) won a poster award at the KU Chemical Biology Symposium for "Regulation of an antibiotic-induced virulence gene cluster in *Burkholderia pseudomallei*".

Andrew McShan (De Guzman) received a poster award at the KU Great Plains Symposium on Protein and Biomolecular NMR. **Andy Wolfe** (Neufeld) won an award for his poster "Suppression of intestinal tumorigenesis in Apc mutant mice by Musashi-1 deletion" at the KU Cancer Center Research Symposium and a Twomey Travel Award to present "TGF- β and Wnt Crosstalk Require SMAD 3 for Msi1 Induction in Colon."

Angela Fowler (Davido) received the Cora Downs Award to present "Specific CDKs enhance HSV-1 viral replication and interact with the immediate-early phosphoprotein, ICPO."

Christian Gomez (Neufeld) received an award to present "A Role for Tumor Suppressor APC in Goblet Cells and Inflammation." **Nikola Kenjic** (Lamb) received an award to present "PvdF as potential novel transformylase from *Pseudomonas aeruginosa*."



MB Graduate students of 2015

Receiving their Doctoral Degrees



MB Graduate Doctoral Degrees completed

Three MB graduate students received doctoral degrees in May 2015. Photo above, from left in picture: **Lakshmi Sundararajan** with mentor Lundquist; Ward, mentor of **Sonia Hall**; and Ackley, mentor of **Samantha Hartin**. In addition, **Amber Smith (Xu)** defended her doctoral dissertation in October.

World-renowned Faculty Members

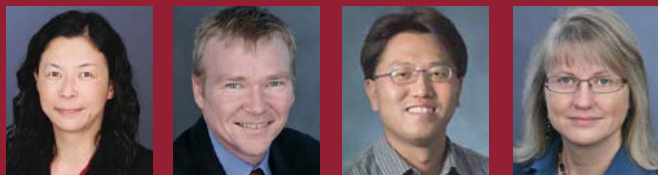
Did you know that in the last four years, MB faculty members have published nearly 400 research papers in peer-reviewed journals? And, research published by MB faculty members has been cited by more than 26,000 publications from around the world in that period of time, and has attracted more than \$50 million in research funding. These impressive numbers attest to the importance and impact of the research being performed.

New and Newly Promoted MB Faculty Members

The Department of Molecular Biosciences is excited to welcome two new faculty members: **Joanna Slusky** joined as an assistant professor in 2014 after a Ph.D. at the University of Pennsylvania and postdoctoral appointments at Stockholm University and the Fox Chase Cancer Center. She studies outer membrane protein folding. **Robert Unckless** will join MB as an assistant professor in August 2016 after a Ph.D. at the University of Rochester and postdoctoral work at Cornell University. His research explores ecology, evolution, and genetic conflict.

We congratulate **Mizuki Azuma** who was promoted to associate professor with tenure in 2015. Her laboratory aims to elucidate the molecular pathogenesis of a childhood bone cancer, Ewing sarcoma.

We also congratulate three MB faculty members who were promoted to full professor in 2015. **Chris Gamblin's** laboratory works to understand the mechanisms of aggregation of the microtubule-associated protein tau that cause neurodegeneration in Alzheimer's and related diseases. **Wonpil Im** uses



Left to right: Mizuki Azuma, Chris Gamblin, Wonpil Im and Audrey Lamb

computational biology to study structure, dynamics, and function of membrane proteins and glycoconjugates.

Audrey Lamb's research is focused on understanding the structure-function relationships of enzymes involved in iron-scavenging by pathogenic bacteria.

MB Faculty Awards

Erik Lundquist and **Ilya Vakser** (professors) have been elected as prestigious Fellows of the American Association for the Advancement of Science. Erik was recognized "for distinguished contributions to understanding molecular mechanisms of nervous system development, including axon guidance, using modern genetic and in vivo approaches." Ilya was honored "for distinguished contributions to the field of computational structural biology, particularly for theoretical studies of molecular recognition and methodology development for protein docking."

Jim Orr (professor) received the Joan S. Hunt Distinguished Mentoring Award from K-INBRE. This award was established in 2012 to recognize upper-level faculty for their mentoring success.

Kristi Neufeld (associate professor) was the recipient of the 2015 Grant K. Goodman Undergraduate Mentor Award, which recognizes faculty members who are selfless with their time and experience and maintain mentoring relationships long after they leave the classroom and was "Favorite Professor" of the KU Biology Class of 2015.

Wonpil Im (associate professor) was the recipient of a University Scholar Achievement Award. Dr. Im holds a joint appointment in the Center for Computational Biology and was recognized for his exceptional research contributions using theoretical and computational methods to chemical and physical problems in biology and materials science.

MB Faculty Research Grant Awards

Despite historically low funding rates for federal research grants, faculty members in Molecular Biosciences have been exceptionally successful at obtaining funding for their research. In addition to many research grant renewals, faculty members in MB have received major new research awards: **Yoshiaki**

Azuma (associate professor) received an award from the NIH to study the role of a novel protein in maintaining accurate cell division, a question that is important for determining the basis of human cancers.



Dr. Joanna Slusky



Dr. Robert Unckless

Liang Xu (associate professor) received a collaborative award from the NIH to test potential cancer therapies based on design of novel small molecule inhibitors of a protein that is overexpressed in many types of cancers.

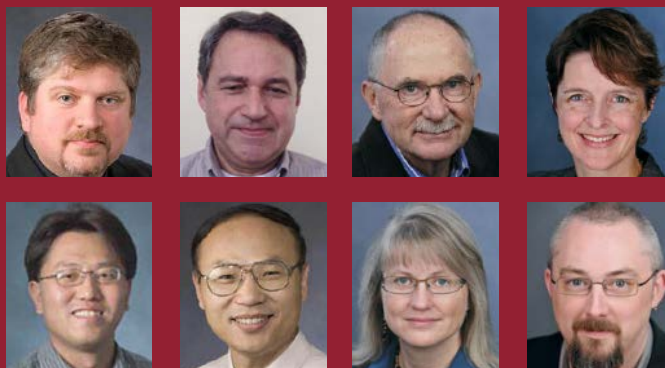
Kristi Neufeld received funding from the NSF for studies of beta-catenin in regulation of the asymmetric cell division that is critical for developmental cell fate and can play a role in cancer development.

Audrey Lamb (associate professor) is a director of the NIH Dynamic Aspects of Chemical Biology Training Grant, which has been renewed for five years and \$1.8 million to fund eight KU graduate student trainees per year. Tom Prinszano (medicinal chemistry) and Paul Hanson (chemistry) are the other directors. The NIH recently awarded \$1.7 million for the Post-Baccalaureate Research Education Program (PREP) to **James Orr** (professor) and Estela Gavosto (mathematics). The program provides mentored research and training to assist recent graduates with the transition to graduate school in biomedical and behavioral sciences.

Stuart Macdonald (associate professor) was awarded a \$2.7 million collaborative grant from the NIH to genetically dissect the factors responsible for biomedically-relevant trait variation, and enhance a powerful set of *Drosophila* (fruit fly) community resources.

In addition, faculty members in MB have also received a large number of somewhat smaller, but still important, research grant awards that are too numerous to list here.

MB faculty awardees



Top row: Erik Lundquist, Ilya Vakser, James Orr and Kristi Neufeld
Bottom row: Wonpil Im, Liang Xu, Audrey Lamb and Stuart Macdonald

ALUMNI GENEROSITY YIELDS BIOLOGY STUDENT SUCCESS



The Lawrence Journal World reported recently that the KU endowment had increased by more than 14% between 2013 and 2014, and now totals more than \$1.47 billion, ranking it 65th among more than 800 Canadian and U.S. colleges and universities. In KU Biology, the great generosity of donors has provided more than \$3.6 million in invested funds whose annual interest is dedicated to fund awards and fellowships for our undergraduate and graduate students. We have numerous accounts (some of

those that currently support students are listed below) that are large enough to be invested. Each of these funds has a unique story and here we recount the details associated with a selection of those who inspired or directly provided the support for our students. Just as distinctive are the stories of those students who have been touched by the funds, and have thrived as a result. We hope that these stories help to reveal the great value that alumni provide for future generations of Jayhawk biologists.

GIFTS SPARK AND *SUPPORT* UNDERGRADUATE RESEARCH

In undergraduate biology, mentors ignite curiosity and encourage discoveries that launch careers and change the world. Being mentored is the single most formative experience for an undergraduate student, and KU biology undergraduates have amazing opportunities to be guided in research laboratories; opportunities that open avenues for discoveries and doors to career possibilities. Student-mentor relationships involve dedicated faculty, postdoctoral fellows, and graduate students working in tandem with undergraduates while they conduct research experiments. The most rewarding experience for the mentor team is to witness an undergraduate's excitement when significant data are generated and the understanding of complex processes begins to form. Budding undergraduate researchers are equally thrilled to realize that results emerge from their efforts that lead to opportunities to present their findings and publish their work. Our alumni play a critically important role in these vibrant research-mentor relationships. What follows are two examples of how alumni have enhanced the research-mentoring experience for our students that enabled those experiences to flourish. One demonstrates the impact of a single gift and the second highlights a commitment that will last in perpetuity.

In the spring of 2013, **Nicole Balmaceda** (Lenexa, KS), **Matthew Miller** (Norton, KS), **Vinit Nanavaty** (Overland Park, KS), **Derek Danahy** (Overland Park, KS), **Caelyn Farquhar** (Olathe, KS), and **Bryan Tsao** (Hays, KS) were conducting research projects directed by faculty mentors. What they had in common was that their research goals were part of a much larger effort to understand better the processes associated with cancer biology and to unlocking cancer's secrets. Nicole, Matthew, and Vinit were students in Dr. Kristi Neufeld's lab where they were researching the nuclear function of two genes, adenomatous polyposis coli (APC) tumor

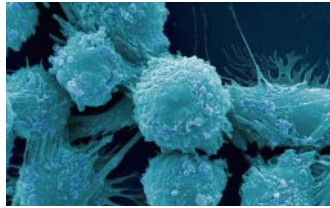
suppressor and musashi, and the role they may play in colon cancer (Nicole), determining the effects of one of those genes, APC, on cellular differentiation and stem cell homeostasis in intestinal epithelial cells (Matthew) and studying the loss of genetic heterozygosity in polyps from APC-mutant mice (Vinit). Derek was exploring the effect of chemokine receptors on cancer metastasis under the direction of Dr. Steven Benedict and Caelyn was in Dr. Lisa Timmons' lab conducting subcellular analyses of ABC transporter proteins, which are implicated in resistance of cancer cells to chemotherapy drugs when the genes coding for those proteins are over expressed. Finally, Bryan was investigating the interplay among the various modes of apoptosis or programmed cell death in the lab of Dr. Liang Xu.

What also tied these six students together is that their research was supported in part by a generous gift from Dr. **Mark Everley** (c'97, m'01) in memory of his wife **Heidi** (c'97) who died following a courageous battle with cancer. These six students were thrilled to have secured funding that enabled them to continue with their research and, ultimately, each had a transformative experience that was made possible through a combination of alumni support and dedicated faculty, postdoctoral, and graduate student mentors. **Derek** (B.S. Microbiology, c'14) is currently pursuing a doctorate in immunology at the University of Iowa, **Vinit** (B.S. Biochemistry, c'13) is in his third year at KU Med, and **Nicole** (B.S. Biochemistry, c'15) and **Matthew** (B.A. Biochemistry, B.A. French, c'15) are in their first year at KU Med. **Bryan** (B.S. Cell Biology, c'13) left KU after graduation and **Caelyn** should graduate in May 2017 with B.S. degrees in Biochemistry and Microbiology. These students were incredibly hard working and benefited greatly from dedicated faculty, postdocs, faculty mentors, and the support of a generous alumnus.



Dr. John Howieson (c'50, d'55) has been a long time supporter of KU biology and has given generously both of his time and resources. He recently stepped off our Biological Sciences Advisory Board after 15 years of valuable service and guidance and he leaves a legacy of support that will enrich student experiences long into the future. Dr. Howieson was one of several original alumni board members to endow a BioScholarship that makes funds available to offer four-year, renewable scholarships to incoming freshmen biology majors.

But he did not stop there. He followed up his BioScholarship gift with a second endowment fund designed to support undergraduates who travel away from the KU campus to conduct field research or attend a scientific conference. Through Dr. Howieson's generosity, 30 biology majors have been awarded BioScholarships and 60 students have been able to cover some of their travel expenses with Howieson Opportunity funds in the past 15 years. The names of students who have most recently (2011-15) received the Howieson Opportunity and BioScholarship funds can be found in the Awards & Scholarship section of the website (kuub.ku.edu/awards-scholarships).



FACULTY *INSPIRE* ALUMNI TO PAY IT FORWARD



Endowment funds also honor special faculty members. For example, **Dr. Robert Weaver** first joined the faculty at KU in 1971 after obtaining his Ph.D. in biochemistry from Duke University and completing a successful post-doctoral fellowship with U.S. National Academy of Sciences member William Rutter at the University of California, San Francisco.

Dr. Weaver served as the chairman of the Department of Biochemistry for 11 years and as the Associate Dean for Natural Sciences and Mathematics for 15 years in the College of Liberal Arts and Sciences at KU before his retirement in 2011. Throughout this time, Dr. Weaver taught graduate and undergraduate courses on topics from biochemistry to molecular biology and served as a mentor to graduate students. Dr. Weaver's former students have described him as "simply the best and most inspiring university teacher I ever had", and "the finest and most influential undergraduate educator that I have experienced during my early years of scientific training." Dr. Weaver was also well known and respected for his research on the molecular biology of a virus that affects insects. It is both of these attributes that have led to the establishment of awards in Dr. Weaver's name to preserve his legacy at the University of Kansas.

Bob Herman established the Robert Weaver Graduate Mentor Award, an honor that recognizes faculty in the biological sciences that have provided outstanding graduate student mentorship. Mr. Herman is a prominent civil rights attorney in St. Louis, MO. After he received a master's degree in biochemistry in 1978 studying with Dr. Weaver, he discovered that he didn't enjoy working in the scientific industry. He went to law school intending to specialize in patent law, but found his calling in the area of civil rights and constitutional law. In addition to his law career, Mr. Herman is also an accomplished oboe player, and regularly travels to Brazil to participate in music festivals. Although his career has taken a different course, Mr. Herman feels that his molecular biology training has made all the difference in his life, and says he still thinks like a molecular biologist. He is also very thankful to have had such a fantastic mentor. Herman wrote about Dr. Weaver, "He advocated creative problem solving, intellectual honesty

and perseverance. All lessons I still depend on today, even though I no longer toil in the scientific field."

Since 2011, the Weaver Graduate Mentor Award has been awarded to Dr. **Steve Benedict**, Dr. **Wonpil Im**, Dr. **Erik Lundquist**, and Dr. **Scott Hefty** in the Department of Molecular Biosciences, and Dr. **John Kelly**, Dr. **Kirsten Jensen**, Dr. **Edward Wiley** and Dr. **Linda Trueb** in the Department of Ecology and Evolutionary Biology.

As part of his research program, Dr. Weaver received an American Cancer Society Research Award in 1978 to support a sabbatical leave in the laboratory of Professor Charles Weissmann in Zürich, Switzerland. At the same time, a former KU undergrad Benjamin Hall, who was a professor of genetics at the University of Washington, was on sabbatical in Basel and was invited to Zürich to give a seminar. Rob Weaver and **Ben Hall** had been previously introduced by the chairman of the KU biochemistry department, Dr. Philip Newmark, on one of Dr. Hall's visits to his parents in Lawrence. Rob suggested that Dr. Hall visit the Weissmann lab while in Zürich to learn about the research that was being conducted there. The inspiration gained from their meeting greatly influenced Dr. Hall's later scientific thinking, and helped him develop the patented technology for expressing proteins from other organisms in yeast. "I decided that visit was so important to my mental development," Dr. Hall said, "that... if I was in a position when Rob Weaver retired, I would try to do something to perpetuate his memory at KU." Dr. Hall, who was recently elected to the U.S. National Academy of Sciences, established the Weaver Graduate Fellowship to support the stipend of a first year international graduate student. As Dr. Hall knew from his time as chair of his own department, fellowships are especially valuable for international students because there are fewer other funding sources available to them relative to domestic graduate students. Dr. Hall is now a professor emeritus of genome sciences and biology at the University of Washington where he studies evolutionary mechanisms in plants using modern techniques of DNA analysis. His research on the phylogeny of the plant genus *Rhododendron* is supported by revenues from his patents for the expression of proteins in yeast.

CONTINUED ON PAGE 14

The 2015 recipient of the Weaver Graduate Fellowship, **Amritangshu Chakravarty**, is from West Bengal, India. As a result, he was able to devote more research time to a very successful lab rotation with Dr. Roberto DeGuzman, as well as being productive with his second rotation with Dr. Joanna Slusky. Dr. John Karanicolas reports that the 2014 recipient, **Nan Bai**, has already contributed to a paper that will appear in the *Journal of Medicinal Chemistry*. She characterized how compounds identified by virtual screening disrupt the interaction of Mcl-1 with its cognate peptide. Moving forward, she has turned her attention to small-molecule inhibitors of protein-RNA interactions. She is planning on using computational tools developed in the Karanicolas lab to identify compounds that inhibit the protein "serine/arginine-rich splicing factor 2" (SRSF2), which plays an important role

in myelodysplasia (MDS). Dr. Steve Benedict reports that the 2013 recipient, **Anuja Bhatta**, has passed her orals in spring of 2015 and is on track for a timely graduation. She continues to pursue the effects of microenvironmental metabolic pH changes on differentiation of human T cells. This is a long term project and completely novel; as such it is slower to develop. So she has added a short term project to conduct at the same time and from which to generate near term publications. She has added a study of three of the statins used to lower cholesterol in humans. This is a follow-up to a study of LDL in atherosclerosis, conducted by Amy Newton for her Ph.D. Anuja is asking which, if any of the statins exert an effect on differentiation of naïve T cell's and whether they assume a proatherogenic phenotype as is the case with LDL effects or possibly an anti-atherogenic effect.

Recipients of the Weaver Graduate Fellowship



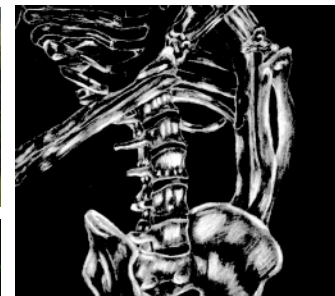
Anuja Bhatta
2013



Nan Bai
2014

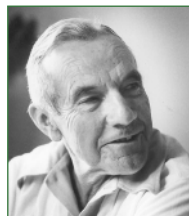


Amritangshu
Chakravarty
2015



DEVOTION TO DISTINCTIVE ORGANISMS MOTIVATES EXCEPTIONAL GIVING

There must have been something quite special about KU botany and entomology programs in the 1930's as individuals who were students during that period established several of our endowed accounts. Highlighting a couple of them will illustrate what interesting characters they were.



Consider Dr. **Donald J. Obee**, who earned his B.A., M.A., and Ph.D. from KU in the 1930s and specialized in botany. Upon graduation, after serving as a Ranger Naturalist at Rocky Mountain National Park, he relocated to Boise, Idaho, and devoted 30 years to the institution that ultimately became Boise State University.

After retirement, he and his wife, Doli, traveled around the world. In the mid-1990's, Dr. Obee communicated that he had read in the BioHawk about the faculty and students in botany at KU and that he would like to give back to the department that launched his career. Then Chair of the Department of Botany, Dr. Chris Haufler, and KU Endowment representative Terri Johnson met Donald and Doli Obee at a restaurant in Boise, Idaho. At the end of the meal, Dr. Obee gave Chris a check that started the D. J. Obee fund to support botany graduate students. Individuals receiving support wrote regularly to Dr. Obee and he was delighted by the range of studies that his contributions supported. Over the years, he continued (as he said) to "sweeten the pot" and the Obee fund more than doubled in size. Dr. Obee died in 2011, just a few months shy of his 100th birthday, but he would continue to be pleased by the research carried out through his support. In recent years, that fund has enabled investigations of the evolutionary history of plants in the genus *Crassula*, studies of the genetics of monkey flowers, and the discovery and description of fossil fungi.

From the entomology side, Dr. **John Deal** earned an M.A. in entomology from KU in 1931, and went on to finish his Ph.D. at the University of London. He was a research entomologist for the United Fruit Company in South America from 1934-36 and then joined the faculty at Pennsylvania State University, teaching entomology there until 1945. He appears to have re-engaged his wanderlust about that time and became a United Nations advisor to the Ministry of Agriculture in Shanghai, China from 1946-49, where he met and married Olive Schaeffer. From 1950-51, he was a United Nations consultant for the World Health Organization in South America and then U.S. advisor to the Ministry of Agriculture in Rangoon, Burma from 1952-55. Starting in 1955, he became a self-employed foreign agriculture consultant and lived in Tampa, Florida. He was a member of Phi Beta Kappa as well as various scientific societies, including the American Association for the Advancement of Science.

Entomology professor Chip Taylor was instrumental in establishing the Deal fund to support entomology student research, and he recalls that Dr. Deal was originally from Chillicothe, Missouri. In the 1970's, Dr. Taylor and KU Endowment representative Terri Johnson made arrangements to fly to Florida to meet with Dr. Deal to finalize arrangements for his gift. But, when they arrived, he declined to meet with them. Chip and Terri were not sure they would be able to bring Dr. Deal around, but when assured that KU would use the money to support the "best and brightest" among our entomology graduate students, he made his first contribution.

When Dr. Deal died in 1998, proceeds from his will enabled the fund to grow substantially, and since then the Deal fund has supported summer research for many entomology students and, in some cases, helped students complete the writing of their theses.

GIFTS KEEP ON *GIVING*

In addition to honoring the teaching and mentoring of biology faculty, the great generosity of our major donors has enabled us to provide significant support for graduate and undergraduate students to accomplish such activities as:

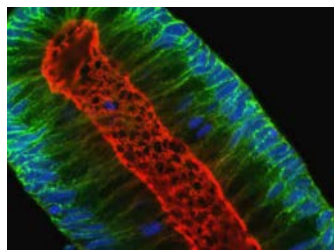
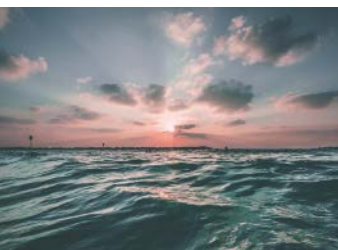
- **receiving grants for research activities;**
- **traveling to meetings and presenting the results of their research;**
- **conducting fieldwork in far-flung corners of the world;**
- **being funded for a final semester of concentrated writing to complete their dissertations;**
- **having summer support to enable continuity of their research programs through the year;**
- **obtaining supplies and specialized equipment necessary to address their research questions.**

Be it a single gift or a long-term commitment, our students benefit immensely from the donations of our biology alumni, and because of this support, KU biology students have opportunities that truly enrich their learning experience. We are grateful to individuals such as those described here who have provided funding directly or who have inspired others through their teaching and mentoring.

Listed below are selected endowment accounts that generate funds each year to enhance the success of our biology students. You may give directly to these (or other) accounts and thereby support students pursuing particular goals. If you have any questions about these or other accounts or want to know more about those honored by these endowments, please contact Jenna Goodman jgoodman@kuendowment.org

- **Arthur J. Mix Scholarship:** Scholarships for worthy persons majoring in botany and preferably research in mycology.
- **Carr Research Award:** Annual award to a graduate student in molecular biosciences for research related to biochemistry in the broadest sense.
- **D. J. Obee Botany Scholarship:** Scholarships for juniors, seniors, or graduate students in botany based on need and merit.
- **E. L. and Mildred Pursell Wolf Graduate Scholarship Fund:** Scholarships for graduates of Kansas high schools who are pursuing a graduate level degree in the biological sciences.
- **Florene B. Fratcher Botany Fellowship:** Fellowships for graduate students in botany.
- **H.B. Hungerford Fund:** Fellowships and awards for graduate students in entomology.
- **John M. Deal Scholarship:** Support for deserving students majoring in entomology.
- **Martha Mitchell Pearson Scholarship:** Scholarships for graduate students in ecology and evolutionary biology based on merit.
- **Dr. Stanley L. Twomey Memorial Award:** Awarded to a graduate student in physiology and cell biology.

- **William King Candlin Memorial:** Fellowships for graduate students in molecular biosciences.
- **Elio Schaechter BioScholar:** Renewable scholarship for incoming biology undergraduate students.
- **Haller Silva Biosciences Merit Scholarship:** Renewable scholarship for incoming biology undergraduate students.
- **Howieson BioScholar:** Renewable scholarship for incoming biology undergraduate students.
- **Jim A. Orr BioScholar:** Renewable scholarship for incoming biology undergraduate students.
- **Ken and Helen Nelson Opportunity in the Biosciences:** Supports undergraduate research in the biological sciences.
- **Robert and Lillian Bell BioScholar:** Renewable scholarship for incoming biology undergraduate students.
- **Smiley Gilligan Family BioScholar:** Renewable scholarship for incoming biology undergraduate students.
- **Smiley Gilligan Family Fund for the Biosciences:** Supports undergraduate research in the biological sciences.



The N E X T Generation of Graduate Students

"It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change."

- Charles Darwin



Kin Onn Chan
Mentor: Dr. Rafe Brown

My name is Kin Onn Chan and I was born and raised in Malaysia where there is an abundance of pristine forests and biodiversity. My parents exposed me

to the natural world at a very young age and this helped develop a strong fascination with organisms and how they interact with their environment. I was initially interested in insects but as I got older, I started to develop a keen passion for reptiles. When I enrolled at the National University of Malaysia for my bachelor's degree, I knew I wanted to do something that involved reptiles. In 2005, I joined an expedition led by an American herpetologist, Dr. Lee Grismer, who has an active field program in Malaysia. It was then that I really got involved in field research. I graduated soon after and continued with my master's degree at the same institution. During this time, I attended a conference on the biology of amphibians in the Sunda region at which Dr. Rafe Brown from the University of Kansas gave an excellent talk on the biodiversity of amphibians in the Philippines. We talked about the possibility of graduate school and in fall of 2011, I started the doctoral program in the Department of Ecology and Evolutionary Biology working with Dr. Brown.

I wanted to maintain my research interest in Malaysia, which has a tremendous amount of understudied and undiscovered biodiversity, especially among amphibians and reptiles. My research revolves broadly around the systematics, phylogenetics, and biogeography of Peninsular Malaysian amphibians. For my dissertation research, I am using modern genomic methods to more accurately delineate species boundaries and understand how gene flow affects population structure within and between different river systems.

In partial support of my research activities, I was recently awarded a National Geographic Explorer's Grant to conduct fieldwork in unexplored regions of Peninsular Malaysia. This work is a collaborative effort involving KU, La Sierra University (Riverside, CA) and Universiti Sains Malaysia. The funding will enable us to document, discover, and describe new species of amphibians and reptiles in places that have never been surveyed before. From 2003 to date, our research team has discovered and described more than 78 new species of amphibians and reptiles including a recent new genus of toad published in 2016. This work is especially important in light of the alarming rate of deforestation happening in Malaysia. We are literally in a race with habitat destruction to discover and learn about new species before they go extinct! ●



Matt Josephson
Mentor: Dr. Erik Lundquist

As a youth I spent many hours fishing, hunting, and exploring the wilderness surrounding my hometown of Juneau, Alaska. This fostered in me a deep appreciation of the natural world. Ever since childhood I have been interested in biology and have found my passion in genetics.

My bachelor's degree was earned from South Dakota State University where I received the Joseph F. Nelson Award to study quantitative genetics of rice seed dormancy in the lab of Dr. Xingyou Gu. After graduation I worked as a researcher in Dr. Thomas Burghardt's lab at Mayo Clinic studying how mutations in cardiac muscle genes affect the biophysics of muscle contraction.

At KU I am a 5th year graduate student in Dr. Erik Lundquist's lab studying nervous system development. In particular I examine the genetic networks that regulate the long-range migration of neurons. Recently we discovered new roles for the well-studied Hox transcription factors in the model organism nematode *Caenorhabditis elegans*. We find a cooperative role for three

Hox genes, *lin-39*, *mab-5*, and *egl-5*, in promoting neuron migration through expression in non-neural tissues. We think the Hox factors likely regulate transcription of numerous secreted and transmembrane molecules that form a sort of "track" that can guide neuron migration. We have gone on to identify one such gene downstream of MAB-5, the *C. elegans* F-spondin homolog *spon-1*.

My training at KU has been primarily funded by the Madison and Lila Self Fellowship. In addition to paying my stipend and tuition, the Self Fellowship provides extensive professional development training, and an opportunity to make connections in a variety of fields. Being a Self Fellow has been a highlight of my time at KU as I have made many close friends, and learned much to advance my career.

Beyond my Ph.D. I aim to transition into a field that has a personal connection, salmon genetics. Salmon were a major part of my childhood, and I want to help ensure that salmon populations remain healthy into the future. Specifically, I want to investigate population genetics/genomics of wild and hatchery populations. This field is closely associated with science policy, and I hope to influence fisheries policy through genetic work on salmon. ●

My name is Alex Erwin and I am a doctoral student in the Department of Ecology and Evolutionary Biology (EEB). In my sophomore year at Missouri State, I took a genetics course and fell in love with the discipline. I spent three years of my undergraduate career volunteering as a researcher in a grapevine genetics lab where I identified grape variants that had resistance genes to a harmful mildew. During this time, I developed a passion for the field of epigenetics. Epigenetic factors can be inherited and can modify how genes are expressed without altering the sequence of the DNA. Thanks to a summer scholarship from Missouri State, I was able to pursue an independent research project investigating epigenetic factors thought to be linked to longevity, which became the topic of my undergraduate honor's thesis. In 2012, I joined EEB and began working in the Blumenstiel Lab at KU as a doctoral student. Broadly, my doctoral work focuses on how genome conflict influences epigenetic factors in the germline. After engaging in this research, I was able to combine the new discoveries I was making with my previous interests in longevity. In 2014, I was awarded an American Federation of Aging Research (AFAR) Scholarship to pursue a project that investigates the epigenetic integrity of the aging germline.

Thanks to a National Science Foundation Graduate Research Fellowship that I was awarded in 2014, I have been able to supplement my research efforts with other rewarding endeavors. Recently, our EEB Graduate Student Organization started an

outreach group where we plan and participate in events that share science and research with the community. We have interacted with students from Wyandotte High School, 6-8th grade, in the Expanding Your Horizons program, Girl Scouts, and local elementary schools. Conveying the importance of research and making science interesting for others is something I really enjoy doing. With other graduate students in EEB as well as students from the Department of Molecular Biosciences we are bringing professional development and science career resources to our graduate student colleagues through a pilot Science Careers Symposium this spring. We hope that this event will provide useful information to our students and provide unique opportunities for networking with scientists in diverse career paths.

I enjoy the multifaceted immersion in science that graduate school brings. For my future career, I would love to remain in an academic setting where I can not only develop my own research program, but also teach and stay engaged with the community. ●

Alexandra Erwin
Mentor: Dr. Justin Blumenstiel



The **NEXT** Generation of Graduate Students continued

"Become a scientist only if you cannot imagine yourself doing anything else. It is hard, and only gets harder." - David Baltimore



Kawaljit Kaur

Mentor: Dr. Roberto N. De Guzman

My name is Kawaljit Kaur and I am currently a Ph.D. candidate in the Department of Molecular

Biosciences at The University of Kansas. Pursuing my passion for biological sciences, I started undergraduate studies in 2006 majoring in biophysics at Panjab University in my hometown of Chandigarh, India. I graduated with honors and was awarded a merit scholarship for academic achievements. In the fall of 2010, I began my graduate studies at KU. Although my initial plan was to do research in the field of computational biology, I realized my strong inclination toward biochemistry during my rotation in the laboratory of Dr. De Guzman. Thus, I joined the doctoral program in biochemistry & biophysics in the Department of Molecular Biosciences in 2011 and started working with Dr. De Guzman.

My research is focused on proteins that are important in bacterial pathogenesis. I am studying the bacterial type III secretion system (T3SS), which is a complex protein injection machinery utilized by many pathogens, such as *Shigella*, *Salmonella*, and *Yersinia*, to cause infectious diseases in humans. The needle apparatus of the T3SS resembles a nanoscale molecular syringe and bacteria use this syringe to inject virulence proteins into human cells. My goal is to elucidate in atomic detail the protein-protein interactions involved in the assembly of the T3SS needle apparatus via NMR spectroscopy and other

biophysical methods. This knowledge will be important in developing new antibiotics.

Additionally, I have been fortunate to work on collaborative projects with Dr. Yoshiaki Azuma and Dr. Liang Xu to study proteins associated with cancer. Together with Dr. Azuma, I am studying the role of the enzyme PIASy, an E3 SUMO ligase, in post-translational modification by SUMO and identifying the determinants of SUMO-PIASy interaction. With Dr. Xu, I am characterizing by NMR methods the binding of RNA and small molecules to the post-transcriptional regulator protein HuR, which plays an important role in carcinogenesis.

Over the years, I have been actively presenting my research at various regional and national conferences and won several research presentation awards. Besides research, as a graduate student at KU, I have mentored multiple undergraduate researchers and spent time as a teaching assistant for undergraduate biology/biochemistry courses for which I also received a teaching excellence award. These experiences have been truly invaluable and helped me develop leadership and communication skills.

Upon completion of my degree, I plan on utilizing my skills as a biochemist and contribute to the healthcare industry by assisting in the development of innovative therapeutics. ●

Undergraduate Students



Lauren Arney

My name is Lauren Arney and I am a senior from Stilwell, KS pursuing a bachelor's of art in biology, and a minor in U.S. public policy. I love majoring in biology for many reasons, but being part of a great department tops them all. The advising is tailored toward my personal interests such as public health and a pre-med

emphasis. Also, the professors in the department are very approachable and many are very motivated to teaching younger generations. My favorite professor is Dr. Benedict who is an amazing educator. His class is always engaging and he is available outside of the classroom to help students. I also enjoy our conversations about the politics surrounding the science field in general. The rigor of my classes prepared me very well for the MCAT and future, more challenging classes. There are resources provided in each class to help students achieve. One-on-one office hours, supplemental sections, and teaching assistants make it clear that academics are the number one priority.

My name is Rachel Lietz and I'm a senior majoring in biochemistry. I am originally from Aurora, IL, which is a suburb of Chicago where I grew up in a family of teachers, doctors, and engineers. This conglomeration of careers has had a large impact on both my current work and my future career goals. Currently, I work as a peer tutor through the Academic Achievement and Access Center and as an Undergraduate Teaching Assistant with the Undergraduate Biology Program. As a tutor I have worked with groups of up to four students and individually with students with learning disabilities. I am in my eighth semester of tutoring introductory biology and chemistry and my second semester of teaching Biology 102 lab sections.

Aside from my work experiences, I have volunteered in Dr. Mario Rivera's lab and have been a part of the Biology Majors' Advisory Committee. In the lab, I helped study the iron storage mechanism utilized by *Pseudomonas aeruginosa*, which is a bacterium that commonly infects the cystic fibrosis lung. One of my projects, which involved studying how electrons move in and out of the iron storage protein known as Bacterioferritin B, was funded by the Kansas IDeA Network for Biomedical Research Excellence. In addition, I have been a member of the Biology Majors' Advisory Committee since my freshman year and am now starting my fourth semester as president of this committee. The purpose of this group is to give students the opportunity to discuss adminis-

trative issues with Dr. Gregory Burg, Director of the Undergraduate Biology Program. We work as a conduit for the program to communicate with students so that the program can continue to meet student needs.

As a senior I will be graduating this May and I am very excited about the opportunities I have been given thus far. I have already been accepted into two graduate programs, one of which is KU's own M.S./Ph.D. program in Bioengineering. This program has also chosen to nominate me for the Self Graduate Fellowship, which I hope will support me throughout my studies. In addition, I hope to use my time as a graduate student to research alternative energy sources such as algae biofuel, artificial photosynthesis, or biodiesel. After finishing my time as a graduate student I plan to use my knowledge to work with students and the general public to both raise their awareness about the issues surrounding our use of fossil fuels and to help write and implement public policy that will reduce the damage done by fossil fuels. ●

As a BioScholar, the advising and scholarships I receive help to guide and encourage me to pursue my future goals of making a difference in the world of public health and medicine. I enjoy working in the research lab of Dr. Audrey Lamb where I am studying pyruvate kinase. Currently I am working to perfect the purification protocol of the protein and to crystallize five variants. The ultimate goal is to structurally confirm the changes of the behavior of the protein. The structure of the allosteric site for pyruvate kinase could help to determine a more targeted treatment for diabetes. The scholarships I received helped me travel to the Midwest Enzyme Chemistry Conference (MECC) in Chicago, IL this past semester, where I presented a poster on my research.

I am currently working on my honors thesis for the biology department. I plan to present my research over the past two and a half years at the spring Honors Symposium. Next year I will attend the University of Kansas Medical School to pursue both a medical degree and a master's in public health. ●

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Rachel Lietz

2015 Undergraduate Biology Graduation Recognition Ceremony



Students in the Undergraduate Biology & Human Biology Programs are grateful for the support of loyal alumni and former and present faculty and staff whose generous contributions have made this event possible.



Dr. Greg Burg, Director of Undergraduate Biology



Speaker Dr. Brian Ackley



Biology departmental honors candidates



Dr. Jen Weghorst presents certificates to graduates



Dr. Kristi Neufeld and Caitlin Hilliard



Dr. Erik Lundquist



Guests enjoying recognition ceremony



Recognition ceremony 2015 audience

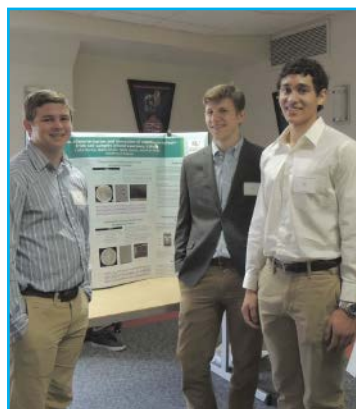
CAREER NIGHT

Each year we host Career Night – an event that connects undergraduate students with representatives from companies, government organizations, and graduate programs. The event was attended by nearly 100 biology students, ranging from freshmen who were just starting to explore to seniors looking for their next career step. Twenty-five representatives from biology institutions in the area were present to answer questions and pique students' interests in careers in science.



Center for Undergraduate Research Spring Symposium 2015

The annual Undergraduate Research Symposium celebrates the diversity of undergraduate research and creative activities on campus. Whether you are a freshman interested in exploring those opportunities or a senior looking for a venue to share the results of your scholarship, you'll find events of interest to you at the symposium.



Thank You for Your Support of KU Biology Student Research!



We are excited to announce that our campaign to raise funds for the purchase of a research-grade laboratory glassware washer was successful, and a washer has been purchased. This purchase will enable our student researchers to spend more of their time on research, and less time washing research glassware. We'd like to express our sincerest thanks to the members of the Biological Sciences Advisory Board, Alumni, Friends of KU Biology, the Undergraduate Biology Program, and the Departments of Ecology and Evolutionary Biology and Molecular Biosciences whose contributions made this purchase possible.



Contributors:

- John Howieson
- Nick Franano
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- KU Department of Molecular Biosciences
- Jenna and Brian Goodman, with a matching gift from KU Endowment
- KU Undergraduate Biology Program

2015| Honors Symposium Congratulations to the 2015 Biology Honors Students!

*The College of Liberal Arts and Sciences (CLAS)
recognizes students with achievements in
laboratory research.*



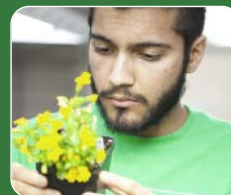
Mia Phillips

[advisor: Rafe Brown] -
Space Use in the Little Scrub Island
Ground Lizard, *Ameiva corax*



Brendan Martin

[advisor: James Thorp] -
Benthic Invertebrate Distribution
in a Seasonally Stratified Lake with
a Deep Water Algae Belt



Sukhindervir Sandhu

[advisor: Lena Hileman] -
Analysis of Differential Trichome
Production in *Mimulus guttatus*
Using Virus-Induced Gene Silencing



Matthew A. Miller

[advisor: Kristi Neufeld] -
Demonstrating a role for nuclear
Adenomatous Polyposis Coli in
intestinal epithelial cellular
differentiation



Bailey Wilkerson

[advisor: Liang Xu] -
MicroRNA Targeting of Musashi-1
in Breast Cancer



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