

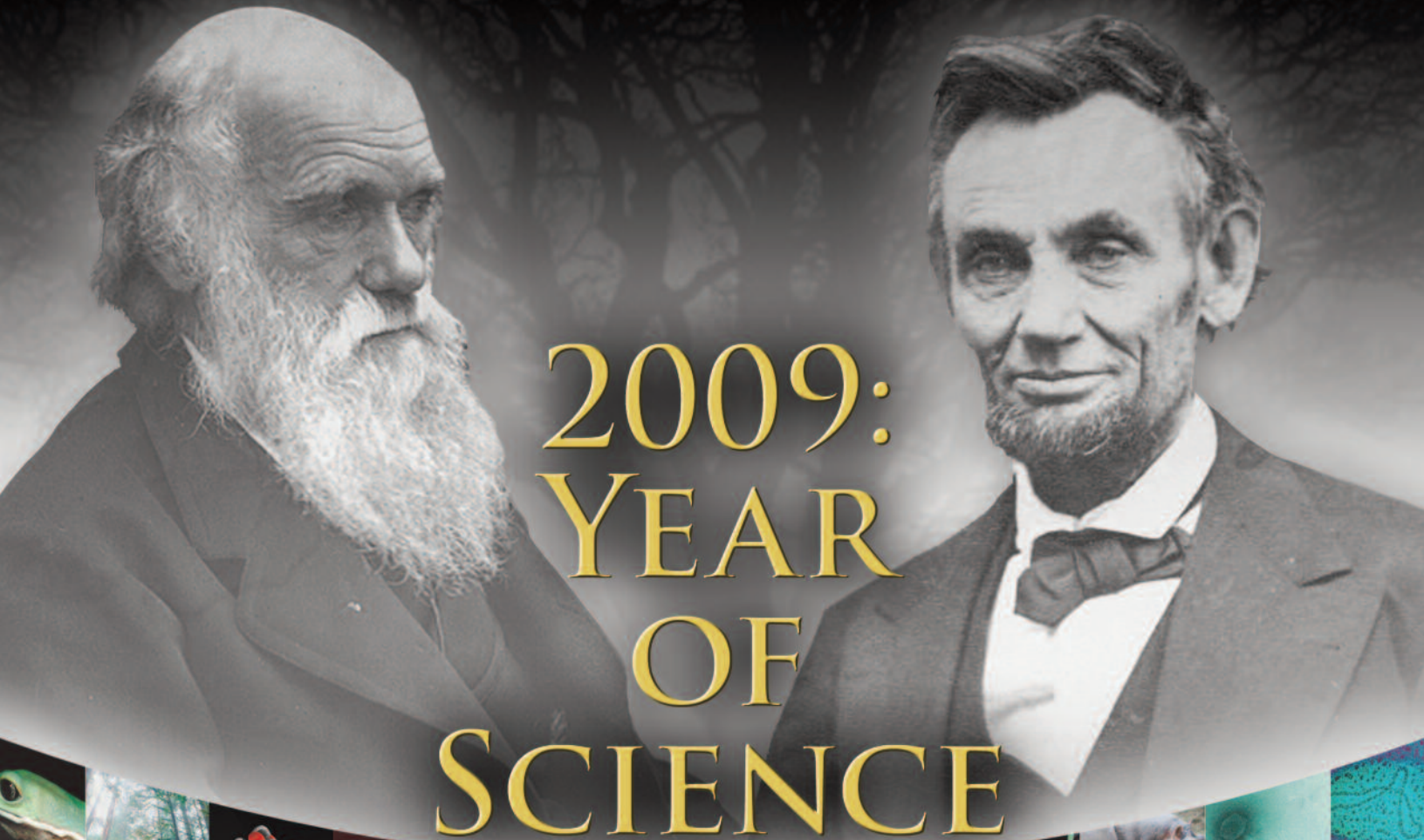


BIOLOGICAL SCIENCES - ALUMNI NEWSLETTER



# BIOHAWK

THE UNIVERSITY OF KANSAS · LAWRENCE, KANSAS · 2009



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# WELCOME LETTER

The grassroots “Coalition on the Public Understanding of Science” worked in collaboration with professional science organizations to designate 2009 as the “Year of Science.” The impetus for this celebration of scientific achievement was the shared 200th birthdays of Charles Darwin, author of “*The Origin of Species*,” and Abraham Lincoln, who founded the U.S. National Academy of Sciences on March 3rd, 1863. Darwin and Lincoln were born on the same day, 12 February 1809. Our *BioHawk* theme builds on this Year of Science celebration and shows how the KU Biological Sciences promote the public appreciation and understanding of contemporary science, and how we collectively contribute to research and education about science.

In addition to this theme, we also bring you news of major achievements at the University of Kansas and in the KU Biological Sciences. Despite the recent economic downturn, KU has sustained strong enrollments for the 2009-2010 academic year. KU was ranked number 43 in the *U.S. News and World Report* list of Best Colleges in the United States, and within the Biological Sciences, our graduate program has been ranked 30th among public universities. Moreover, the Departments of Ecology and Evolutionary Biology and Molecular Biosciences maintained strong extramural grant support during 2009.

On pages 2-8, the Director of the Undergraduate Biology Program (KUUB), and the Chairs of the Departments of Ecology and Evolutionary Biology and Molecular Biosciences highlight the events and achievements of their respective academic units. On pages 9-12, we celebrate the *Year of Science* and focus on how the Biological Sciences at KU relate to the year’s events. Linking past, present, and future, this section consists of essays written by KU graduate students who interviewed Drs. Thomas Taylor and Edward Wiley at KU and distinguished alumnus Dr. David Hillis, currently on the faculty at the University of Texas. Drs. Taylor and Hillis, both members of the U.S. National Academy of Sciences, provide perspectives on this important national resource. Dr. Wiley discusses Charles Darwin’s remarkable contributions to understanding evolutionary biology.

Highlighting excellence in graduate and undergraduate education, pages 16-18 include personal profiles of six current students. On page 20 we introduce KU’s new Chancellor, Dr. Bernadette Gray-Little, who joined the University of Kansas in August 2009.

We are especially indebted to all of the Biological Sciences contributors listed on page 21. Your thoughtful support is deeply appreciated by all of us, and we urge you to stay in touch and to return to the KU campus frequently! Our next meeting of the Biological Sciences Alumni Advisory Board is scheduled for April 9, 2010, and we will update you with new information from the Board and other alumni in the next issue of the *BioHawk*.

**Val Smith**  
Liaison & Coordinator,  
*Biological Sciences Alumni*  
Advisory Board

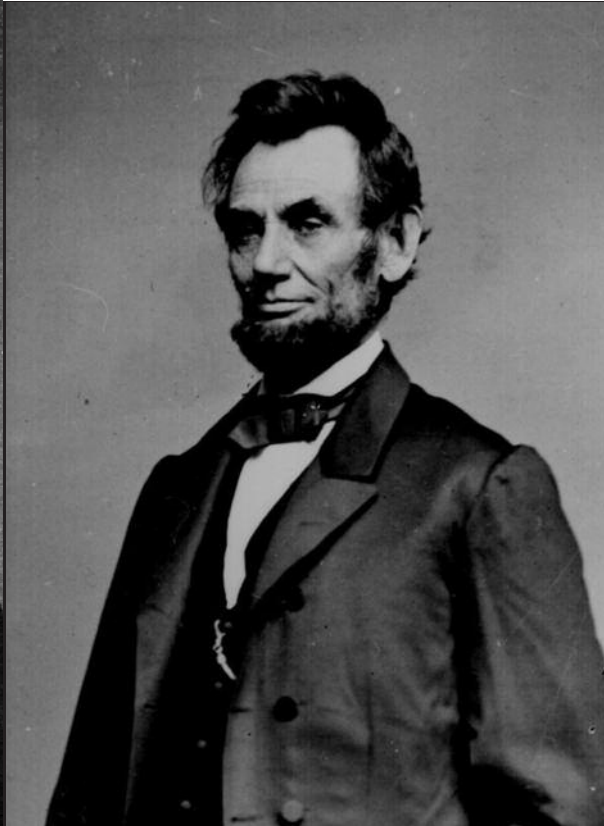
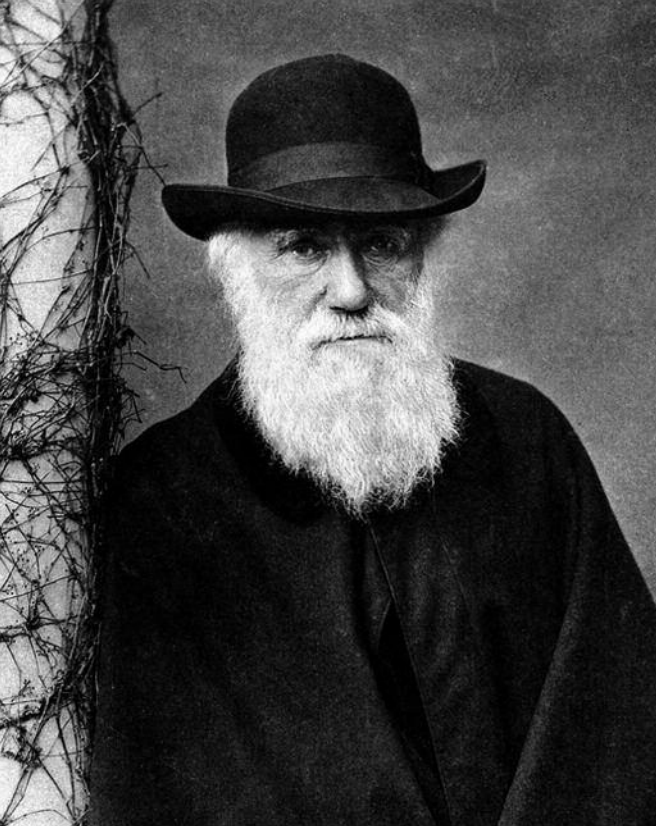
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*and Evolutionary Biology*

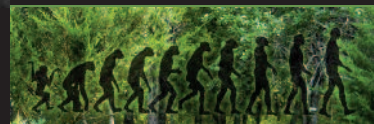
**Gregory Burg**  
Director,  
*Undergraduate Biology and*  
*Human Biology Programs*

# 2010 Calendar

- *Alumni Spring Lecture* - April 8, 2010
- *Alumni Board Meeting* - April 9, 2010
- *Recognition Ceremony* - May 15, 2010
- *Commencement* - May 16, 2010



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*by Annalise Nawrocki, David McLeod and Francine Abe*



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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.*



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## KU UNDERGRADUATE BIOLOGY



Among the many things we celebrated during 2009, one that was of particular note to biologists worldwide was the celebration of the 200th anniversary of Charles Darwin's birth and the 150th anniversary of his publication of *On the Origin of Species*, in which Darwin describes and presents evidence for natural selection as the operating force in the evolution of species. In honor of Darwin, the KU Natural History Museum threw a birthday party and the KU Libraries displayed some of its natural history holdings (including a first edition of *Origin*). There is a growing need for science education and science literacy among the American public, including increased awareness of Darwin's theory as a cornerstone of modern biology. In recognition of this demand, KU's new chancellor, Dr. Bernadette Gray-Little, was invited to the White House to take part in the "Educate to Innovate" event, which honored excellence in science, technology, engineering, and math education. Chancellor Gray-Little and three of her fellow university presidents delivered a letter from 79 universities to President Obama pledging to address the national shortage of math and science teachers. Key to KU's effort towards this goal is the Center for Science Education's UKanTeach Program, a new collaborative effort between the College of Liberal Arts and Sciences and the School of Education that prepares and supports secondary mathematics and science teachers. The UKanTeach certificate program is designed to be completed along with an approved B.S. or B.A. degree in mathematics, biology, chemistry, earth and space science, or physics. At the request of the UKanTeach Program, Undergraduate Biology developed a new B.S. Biology Major option – Teaching Biology. Starting with the Fall 2009 semester, KU students were able to declare the B.S. Teaching Biology Major. A number of students already in UKanTeach were satisfying the course requirements in anticipation of this option. We are excited about the prospects of educating a new generation of biology teachers.

As with the changing of the seasons, there are ongoing events on campus that we come to expect and look forward to--the new faces of incoming students in the Fall, the farewell to those who leave Mt. Oread in May, and the opportunity to celebrate achievements in the classroom and research laboratory. KU's Undergraduate Biology Program welcomed two new BioScholars into the class of 2013, Alex Rippberger and Daniel Simon, both from Olathe, Kansas. Alex's long-term goal is to engage in research related to human biology while Daniel hopes to pursue a career in medicine. Alex and Daniel join a growing list of BioScholars who have been successful at KU. Two BioScholars completed their KU biology requirements in May 2009-- Kyle Clifton (B.S. Biology – Organismal Biology), who is interested in pursuing graduate education in animal behavior, and Will Pass (B.S. Biology - Neurobiology), who is completing his second degree in Business at KU.

Once again Undergraduate Biology recognized the outstanding achievements of our students – those who received departmental honors and those who were awarded scholarships and awards. We recognized the following accomplishments during the 2009 Undergraduate Biology Graduation Recognition Ceremony. Receiving Biology Honors were Ashrita Abraham (advisor: Kristi Neufeld), Preston Alltizer (advisor: Kristi Neufeld), Katelyn Deckert (advisor: Yoshi Azuma), Patrick Dolan (advisor: Matthew Buechner), Julia Gutkin (advisor: Scott Hefty), Ali Nabavizadeh (advisor: Larry Martin), Rebecca Reed (advisor: Edward Auer, Jr.), Shelbi Russell (advisor: Kirsten Jensen), Thornton Thompson (advisor: David Davido), and Jason Weber (advisor: John Karanicolas).

These dedicated young scientists covered a breath of research activities including the characterization and stabilization of tumor suppressor APC in mouse embryo cells, multiple effects in HeLa S3 cells on *Chlamydia* infection, mapping a

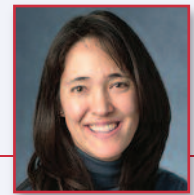
"Always bear in  
mind that your  
own resolution  
to succeed is  
more important  
than any other."

- Abraham Lincoln

## FAVORITE PROFESSOR AWARD



DR. STEPHEN  
BENEDICT



DR. PAULYN  
CARTWRIGHT

suppressor to PKD-2 in *C. elegans*, using computational methods to predict cytokine-receptor complexes, the functional analysis and role in feeding of the pre-dentary-bone articulation in duck-billed dinosaurs, the taxonomy and attachment of elasmobranch tapeworms, and the influence of visual speech information on the perception of foreign accented speech.

We also recognized the classroom and service learning success of several students with various scholarships or awards. Cassandra Lamar (Lance S. Foster Outstanding Junior in Biology), Nicole Schmidt (Ida Hyde Scholarship for women in science to study in a non-KU research lab), Brenna Barger (Pauline Kimball Prize for an outstanding woman senior in Biology), Robert Wiggin (Paul A. Kitos Award for Excellence in Undergraduate Biochemical Research), Andrew McShan (Jenna Robinson Memorial Scholarship), and Sam Eftekhari (Del & Carol Shankel Biomedical Scholarship) were all recognized at the Graduation Recognition Ceremony in May.

Thanks to the generous support of Dr. John Howieson, we are able to support travel opportunities for undergraduates to off-campus research sites or conferences. Last year we helped with travel costs for Yvonne Kamau (Biomedical Research Conference for Minority Students, Orlando, FL), Grey Gustafson (Maryland and Venezuela insect collecting trips), Karanda Hildebrand (*C. elegans* International Conference, Los Angeles, CA), and Nicole Schmidt (field work on *Alliaria petiolate*, Slovenia).

As you may recall, each year we ask graduating biology majors to nominate their favorite professor, and we are always pleased with the enthusiastic and thoughtful responses we receive. It is clear from the comments that many KU biology professors are doing an outstanding job in the classroom. Two biology professors, Drs. Deborah Smith and Audrey Lamb, each received one of only 20 University-wide Kemper Teaching Awards. The following quotes from two biology seniors nominating their favorite professor epitomizes the teaching excellence of KU's biology faculty:

*"Strongly supports students in their academic and personal endeavors, and makes a personal effort to ensure they succeed. He is passionate about his field and relays this enthusiasm. He is the perfect balance embodied by educators of highest distinction: a coach who both pushes his students hard and runs alongside them to make sure they have every element needed to thrive."*

*"She has been my mentor for several years and has always been supportive of student needs, even when she is at her most busy. She is always ready to listen to students and to explain whatever is needed; has always done a wonderful job of*

*engaging students in class and encouraging class participation. She pushes students to do well by rewarding those who truly study and prepare. I have learned more under her teaching than any other professor at KU and feel that it was those things I learned from her that will stay most steadfast in my mind." The Class of 2009's favorite professors were Dr. Stephen Benedict, Department of Molecular Biosciences, and Dr. Paulyn Cartwright, Department of Ecology & Evolutionary Biology. The comments that accompanied their nominations reflected the excellence Drs. Benedict and Cartwright bring to the classroom each and every day. Congratulations to the 2009 Biology favorite professors.*

Undergraduate Biology is beginning to grow into its new role as an independent program in partnership with the Departments of Ecology & Evolutionary Biology and Molecular Biosciences. Our successes to date are directly attributed to the diligent guidance of interim Director, Dr. Val Smith. His experience and tireless efforts on behalf of Undergraduate Biology will be reflected in our successes for years to come. Dr. Smith stepped down as interim Director on July 1, 2009. KU Undergraduate Biology owes him a debt of gratitude for his efforts during the first year of Undergraduate Biology's "independence." Dr. Smith has not entirely left the fold however. He will continue as the program's liaison to our Undergraduate Biology Alumni Advisory Board.

Finally, one area of Undergraduate Biology that does not receive deserved attention or praise is the preparation and execution of biology laboratory courses, from introductory labs for non-science majors to senior-level labs in biochemistry, physiology, and ecology (to name just a few). All told, more than 4,500 students enroll in our biology laboratory courses each year, courses that are expertly managed by our well-qualified staff members. Our lab sections would not be successful without the assistance of such dedicated individuals. 2009 saw a change in personnel in the introductory biology lab group with the departure of Erin Rogers, who left to begin her family. We wish Erin much success as she begins another chapter in her life. We were quite fortunate to welcome Robyn Grayson as an excellent replacement. Robyn completed her B.S. Biology (Ecology & Evolutionary Biology) degree at KU and has returned to assist with the operations of the BIOL 152 laboratories.

Please know that we value our alumni, we want to know what you are up to, and we would like to hear of your successes. Please keep in touch. Visit us on Facebook (KU Biological Sciences Alumni) and join our growing list of members. ♦



CHRIS HAUFLER,  
Chair of Ecology and Evolutionary Biology  
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## DEPARTMENT OF ECOLOGY & EVOLUTIONARY BIOLOGY



Throughout the past few years, the scientific community has recognized the need to reinvigorate public interest in science, especially in our country, and designated 2009 as the “Year of Science.” The Department of Ecology and Evolutionary Biology (EEB) at KU contributed to this effort through publications by students and faculty members and through community outreach. In addition, members of EEB have research and service connections to the two central celebrities of the Year of Science—Charles Darwin and Abraham Lincoln—both born on 12 February 1809. In this BioHawk, we personify these connections by profiling three individuals who demonstrate the direct links between EEB to the promotion of science as a way of knowing about the world. **Professor Edward Wiley** long has been associated with the science of evolutionary biology, and his views on Charles Darwin, through his conversation with EEB graduate student Francine Abe, are both revealing and insightful on the contributions that Darwin made to understanding how processes of evolutionary change contributed to the biodiversity of the planet. Distinguished **Professor Thomas Taylor** talked with EEB graduate student Annalise Nawrocki about his connection to the nation’s science agenda. Professor Taylor is a member of the National Science Board, a group of about 25 prominent scientists who govern the National Science Foundation and provide policy advice to the President. His views on scientific progress in the U.S. and at KU reveal the ways in which all of us can help to invigorate and contribute to the future. Professor David Hillis (KU Ph.D. in 1985) revealed in his conversation with EEB graduate student David McLeod how the work that he began at KU propelled him as a

creative “outside the box” thinker, and resulted in his appointment to the National Academy of Sciences, a group of about 2000 scientists that was initiated by Abraham Lincoln in 1863. Professor Hillis has also been active in the politics of science education in Texas, and he has contributed his time and expertise to preventing the anti-science members of the Texas State Board of Education from weakening state standards in public schools. By championing and incorporating the discoveries of Charles Darwin in their research agendas, by guiding the funding priorities of federal agencies and providing advice to political leaders, and by being part of the scientific leadership and ensuring that future generations of biologists will be well educated, EEB researchers and teachers demonstrate well the remarkable opportunities that are available for biologists (and all scientists!) to give back to the community.

Beyond those profiled in this BioHawk, faculty and students in EEB have made significant contributions to science research and education. In 2008, EEB faculty members authored more than 200 published or in-press, peer-reviewed papers, and our graduate students authored about 75 peer-reviewed papers in the course of pursuing their degrees. Faculty members also contributed about 150 papers at national and international meetings and performed research on grants in excess of \$42 million. Using the “research engagement” measure of involvement in research activities employed by the KU Center for Research, EEB was once again among the top five units at KU, meaning that a greater percentage of our faculty members and graduate students are making contributions to research than other such units on the campus.

“I have called  
this principle, by  
which each  
slight variation,  
if useful, is  
preserved, by  
the term of  
Natural  
Selection”  
- Charles Darwin

## NEW FACULTY

DR. ANDREW SHORT



In 2009, EEB faculty members were also celebrated for their work and excellence. **Joy Ward** was chosen to receive a Presidential Early Career Award for Scientists and Engineers (PECASE), the highest honor that can be bestowed upon a young scientist or engineer in the United States. She recently joined other PECASE recipients and President Obama in Washington to celebrate their awards. **Deborah Smith** received a Kemper Fellowship for Teaching Excellence, in recognition of her achievements as a KU educator, the 10th of these prestigious annual awards to be earned by members of EEB. **Orley (Chip) Taylor** was part of a team that launched monarch butterfly larvae into space, studied the effects of microgravity on their transition to adult, flying insects, and engaged nearly 600 classrooms in a simultaneous observation of monarch development. **Michael Engel** was awarded the Bicentenary Medal of the Linnean Society. The medal is awarded annually and was instituted in 1978 to mark the Bicentenary of the death of Carolus Linnaeus, the father of our current system for naming species. **Leonard Krishtalka** was elected Chair of the Global Biodiversity Information Facility Science Committee by the member nations. **Val Smith** was part of an interdisciplinary KU team that has received funding to develop sustainable methods for generating biodiesel using algae grown on effluents from the Lawrence wastewater treatment plant; this has been called the "Feedstock to Tailpipe" initiative. A consortium of interactive and cooperative faculty members, including from EEB **Ford Ballantyne**, **Sharon Billings**, **Leonard Krishtalka**, **Edward Martinko**, **Town Peterson**, and **Jorge Soberón**, contributed to the successful funding of a project involving colleagues at the University of Oklahoma, Oklahoma State University, and Kansas State University to construct a "cyberCommons" for forecasting ecological change. Emeritus Professor **Kenneth Armitage** was elected an Honorary Member of the American Society of Mammalogists, which is the highest award that the society gives, in recognition of his many contributions to the field of mammalogy. **Paulyn Cartwright** received the Louise Byrd Graduate Educator Award, for "exemplifying the kind of mentoring that allows her students to flourish." Dr. Cartwright also received a 5-year, highly competitive NSF "CAREER" award to investigate evolution in the hydrozoans, a group that includes the corals and jellyfish. These awards showcase the remarkable contributions that

EEB faculty members have made to research, teaching, and public outreach by the University of Kansas.

Our graduate students have also had impressive achievements in 2009. Seven of them received highly competitive Doctoral Dissertation Improvement Awards from the National Science Foundation: **Bastian Bentlage**, a student working with **Paulyn Cartwright**; **Matthew Davis**, working with **Edward Wiley**; **Charles Linkem**, working with **Rafe Brown**; **Julius Mojica**, working with **John Kelly**; **Annalise Nawrocki**, working with **Paulyn Cartwright**; **Andrew Schwendemann**, working with **Thomas Taylor**; and **Lisa Tiemann**, working with **Sharon Billings**. These coveted awards represent the gold standard for supporting graduate student work and demonstrate well the high quality of our graduate students and their research. In addition to these awards, **Bastian Bentlage** (working with **Paulyn Cartwright**) received a Smithsonian Institution Predoctoral Fellowship; **Cathy Collins** (working with **Bryan Foster**) received the Argersinger Dissertation Prize recognizing the high quality of her graduate work (the names of dissertation prize awardees are fixed to a plaque in the Kansas Memorial Union); **Steven Davis** (working with **Michael Engel**) received a Foreign Language Area Scholarship to support him for the academic year; **Jamie Oaks** (working with **Rafe Brown** and **Mark Holder**) received the Henri Seibert Award for best paper in Systematics/Evolution at the Joint Annual Meetings of the Herpetological Societies; **Patricia Ryberg** (working with **Edith Taylor**) received the Isabel Cookson Award for delivering the best paper in paleobotany at the annual meeting of the Botanical Society of America; **Andrew Schwendemann** (working with **Thomas Taylor**) received the J. S. Karling Graduate Student Research Award from the Botanical Society of America; and **Cameron Siler** (working with **Rafe Brown**) received a Fulbright-Hayes Doctoral Dissertation Research Abroad Fellowship. Recognizing the quality of teaching of our graduate students; and **Patricia Ryberg** (working with **Edith Taylor**) was awarded the Kenneth B. Armitage Award for Excellence in Teaching. These awards recognize not only the individual achievements of our students but also demonstrate the high quality of the graduate training program that we offer in preparing the next generation of creative scholars.

*article and photos continued on page 6*

KU and EEB have both felt the impact of the global economic downturn. We are in the midst of a faculty hiring freeze, and did not recruit new colleagues in 2009. Nonetheless, **Andrew Short** officially joined us; he earned his Ph.D. from Cornell University in 2007 and successfully competed for a position at KU in the same year. Dr. Short received support from the National Science Foundation to conduct research as a “visiting scientist” prior to officially going on the KU payroll in August 2009. His research focuses on revisionary systematics and global surveys of aquatic insects (particularly beetles) and he emphasizes developing hypotheses of evolutionary history for these groups as well as using them for water quality assessment.

In the space available, only the highlights of the achievements of the students and faculty in EEB can be shared. Our department remains the largest in the College of Liberal Arts and Sciences, and based on recognition of our “Research Engagement” by the Center for Research, we are also one of the most active units on campus. Our continued partnership with the **Biodiversity Institute** and the **Kansas Biological Survey** generates a triumvirate of even larger proportions, and expands the dimensions of EEB in productive and creative directions. Even as we face new economic challenges, we are looking at ways to enhance the research opportunities for the Department, the quality of our student body, and the interdisciplinary links we can forge in both teaching and research. Our participation with both students and faculty members in the IGERT (Integrative Graduate Education and Research Traineeship) program, a federally funded initiative that focuses on scientific and social challenges of climate change, further expands our cross-disciplinary involvement and prepares our students for a future that sees greater emphasis on the synthesis of knowledge about our planet. We hope to continue these advances and activities in 2010, and invite our alumni to visit and witness the success of our efforts. ♦



*Dr. Joy Ward was recognized at a White House ceremony for her PECASE award. She was also promoted to associate professor this year.*



*Dr. Orley (Chip) Taylor worked with a team that launched monarch butterflies into space.*



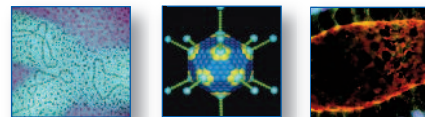
*Dr. Sharon Billings promoted to associate professor. (above)*

*Dr. Deborah Smith received the Kemper Award for 2009 and was promoted to full professor. (left)*

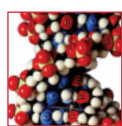




ROBERT S. COHEN,  
Acting Chair of Molecular Biosciences  
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## DEPARTMENT OF MOLECULAR BIOSCIENCES



**G**reetings from the Department of Molecular Biosciences (MB) at KU. In completing my first full year as acting chair of the department,

I am pleased to have this opportunity to update you on key events and accomplishments over the past year. I also thank the many of you who have generously donated to the department in this time of economic challenge. Your support has allowed us to continue several key programs and activities that we would be unable to do otherwise.

### Undergraduate Teaching and Research

Our undergraduate research program continues to flourish under the dedication and creativity of Drs. Yoshi Azuma and Jim Orr, as well as the many talented students and mentors who participate in the program. Last year more than 50 undergraduates were involved in research in MB faculty labs, with nearly half presenting posters at national and/or local meetings. A smaller, but equally impressive, number of students gave talks at scientific meetings and several earned authorship on research articles published in peer-reviewed journals. As you know, many of our undergraduates use their research experiences as stepping stones to pursue advanced degrees in biomedical research and/or to enroll in medical or other professional schools. Their experiences in the Undergraduate Research Programs at KU serve them well in their post-graduate studies and we take great pleasure in monitoring their (your) future successes.

For the second straight year, we sponsored a Summer Undergraduate Research Program for non-KU students. We had three students in the program this past year, but with your help would like to increase the program, which offers free room and board to all student participants, in coming summers.

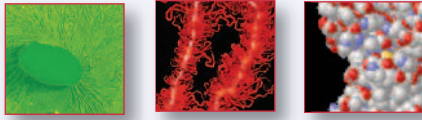
### Graduate Student Program

We also continue to enjoy the success of our Graduate Program, which currently has 63 students enrolled, including 23 who entered the program last year. Most of our graduate students are supported by grants awarded to their faculty mentors and it is largely through the student's research efforts and accomplishments that faculty are able to successfully renew their grants. Last year, most of our graduate students presented their work at one or more scientific meetings, and more than 20 had primary authorship on research articles published in peer reviewed journals. Way to go students! Graduate students who won special recognition for their achievements last year include: **Jamie Chapman** (Lundquist lab), who won the William King Candlin Memorial Fellowship and the Cassandra Ritter Memorial award; and **Fernando Estrada** (DeGuzman lab) who won the Carr Research and Paretsky travel awards. Additional travel awards went to: **Rafael Demarco** (Lundquist lab), **Kelly Grussendorf** (Buechner lab), **Adam Norris** (Lundquist lab), **Sudharsan Parthasarathy** (Kuczera lab), and **Kellen Voss** (Gamblin lab).

article continued on page 8

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

- Charles Darwin



This past year's large number of travel awards reflects a philosophical change in our administration of awards in that we are trying to use the associated funds to improve our student's training and experiences as research scientists. One of our major goals for this coming year is to find the space and resources to build lounge/conference room, where graduate students can meet informally with one another to discuss science, relax and make new colleagues and friends.

### Faculty Research

I am very pleased and proud to report that the world's economic woes did not dampen the research efforts of our faculty. Indeed, last year proved to be one of our most productive. The faculty published 58 research articles and presented their work at meetings and universities all over the world. Our faculty also submitted a record number of grants. At one point this year, 90% of our faculty had either active or pending research grants, significantly above the goals set by the Vice Provost's office of Research and Graduate Studies. **Drs. Brian Ackley, Yoshi Azuma, Matthew Buechner, David Davido, Scott Hefty, Wonpil Im, Audrey Lamb, Erik Lundquist, Stuart Macdonald, Berl Oakley, Jim Orr, Ilya Vakser, and Liang Tang** all received major new funding from extramural agencies last year and/or were awarded significant supplements to outstanding grants. I'd also like to extend congratulations to **Dr. Chris Gamblin**, who was promoted to Associate Professor with tenure and to **Dr. Susan Egan**, who was promoted to Full Professor. The dedication and resourcefulness of our faculty truly make KU a great place to study biology.

Our faculty continue to pile up awards in recognition of their outstanding accomplishments as mentors, advisors and teachers. **Dr. Matthew Buechner** won this year's HOPE award, the only award given exclusively by students recognizing teaching excellence. As many of you know, Dr. Buechner is also

a past winner of the Kemper and Mortar Board teaching awards and is truly one of the universities finest educators. **Dr. Audrey Lamb** became the Department's ninth winner of the prestigious Kemper award, and Jim Orr won an Outstanding Mentoring award from Kansas-INBR, a large NIH-sponsored program that promotes undergraduate research.

I am pleased to tell you about our newest faculty member, **Dr. Mizuki Azuma**, who comes to us from the National Institutes of Health. Although this is Dr. Azuma's first faculty appointment, she brings with her a well-developed research program that nicely complements ongoing efforts to form a bi-campus, NCI-designated center for cancer research at the University of Kansas. Mizuki's research utilizes tiny zebra fish (similar to guppies) to unravel the genetic basis of Ewing's sarcoma, the second most common form of childhood and adolescent bone cancer. Mizuki's most recent paper was recently published in the journal *Cancer Research* and was highlighted by her peers (the Faculty of 1000 Medicine group) as a "highly recommended paper." Dr. Azuma also has a strong commitment to teaching, and has already gotten involved in teaching a portion of one of the core courses in our neurobiology degree program.



*Dr. Matthew Buechner won this year's HOPE award, the only award given exclusively by students recognizing teaching excellence.*

Chuck Francee/KU University Relations

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# NEW FACULTY

DR. MIZUKI AZUMA



I am happy to report that we have two new faculty searches underway this year. The first search is for a tenure-track assistant professor in the general area of bioinformatics and computational biology. This person will have a joint appointment in the Center for Bioinformatics and MB and will join one of the most productive and rapidly expanding science communities on campus. The second search is in the area of cancer biology, broadly defined, and is targeted at mid-career scientists, who already have established high profile research programs. This position has the potential to receive significant financial backing from the Kansas Biosciences Authority.

As always, our department has experienced some turnover. Dr. Joe Steinmetz, who was both Dean of the College of Liberal Arts and Sciences and a Distinguished Professor of MB, left for Ohio State University, where he is currently serving as Executive Dean of the College of Arts and Sciences. Dr. Yang Zhang, who held a joint faculty appointment in MB and the Bioinformatics Program, took a faculty position in the Center for Computational Medicine and Bioinformatics at the University of Michigan. And finally, **Dr. Jack Brown** retired this past year after a long and distinguished career as a research scientist. Dr. Brown was also one of MB's most dedicated, respected and liked teachers. We wish all of them great success in their future endeavors and thank them for all they did while members of MB.

In closing I would again like to thank our many alumni/ae for their generosity throughout the year. In addition to the programs described above, a critical new effort will be the establishment of endowed professorships to recognize our most accomplished faculty members. You can be a major and lasting part of these traditions by your contributions, large and small. Information on how to donate is included both later in the newsletter and at our website: <http://www.molecularbiosciences.ku.edu>. Please browse the site. ♦

Zebra Fish  
studied in Dr. Mizuki Azuma's Lab

## Promoted Faculty



*Dr. Susan Egan to full professor*



*Dr. Chris Gamblin to associate professor*



*Dr. Audrey Lamb received the Kemper Award for 2009*

Anthony Mattingly/KU University Relations



Man is not  
the only animal  
who labors;  
but he is the  
only one who  
improves his  
workmanship.

- Abraham Lincoln

# Building on the Foundations of the *Past* and Meeting the Challenges of the *Future*

To celebrate 2009 as the Year of Science and link historical accomplishments, current successes, and challenges yet to come, we asked graduate students (our future generation of scholars) to interview two current KU faculty and one alumnus who have perspectives on the legacies of Charles Darwin and Abraham Lincoln. The contribution that Darwin made to modern science is obvious – his magnum opus, “On the Origin of Species,” is one of the most influential books ever written, and scientists are still testing the hypothesis of Natural Selection as a process that results in evolution. Lincoln’s contribution to the Year of Science is less celebrated – he founded the National Academy of Sciences (NAS), which today represents the core group of eminent scientific scholars and contributes valuable advice and perspectives to US citizens, educators, and politicians. We are fortunate at KU to have a member of the NAS (Distinguished Professor Thomas N. Taylor) and several scholars (such as Professor Edward Wiley) who have studied the life and works of Charles Darwin. Further, we have alumni who are NAS members, and one of them (Professor David Hillis, now on the faculty at the University of Texas) agreed to be interviewed for this BioHawk issue. What follows are pieces that were written by three graduate students after interviewing Professors Taylor, Wiley, and Hillis. Analise Nawrocki (currently a graduate student with Dr. Pauly Cartwright) spoke with Dr. Taylor, Francine Abe (a student working with Drs. Edward Wiley and Bruce Lieberman) spoke with Dr. Wiley, and David McLeod (working with Dr. Linda Trueb) interviewed Dr. Hillis. We hope that this attempt to stand on the foundations provided by Darwin and Lincoln, gain insights from the current generation of scientists, and look to the future as expressed by the next generation of scientific professionals will give you a prescient outlook on some of the science and the opinions of KU connections.

## Graduate student *Analise Nawrocki* interviews Professor Thomas N. Taylor:



This year marks the 200th birthday of both Abraham Lincoln, the 16th president of the United States, and Charles Darwin, the author of the Origin of Species. These contemporaries both had a remarkable influence on the trajectory of science in the US and beyond.

While Lincoln is best known for his role in the Civil War and emancipation, he also founded the National Academy of Sciences (NAS), an honorific society dedicated to the promotion of science and technology. This society, initiated in March of 1863, is composed of accomplished scientists and engineers from around the world. The Academy consists of 2,100 members from the USA and 380 foreign members; 200 NAS members are also Nobel Prize winners.

Since 1863, the NAS has served as an advisory board for our nation's leaders, offering advice on policy decisions that involve science and technology issues. Policy work is handled by the National

Research Council (NRC), a group within NAS created specifically for this purpose. The NRC and NAS work outside the boundaries of government, which ensures unbiased advising on issues of science, technology, and medicine.

Membership in the NAS is limited and prestigious, and an invitation for membership is considered one of the highest accomplishments for a scientist or engineer in the USA. KU's own Dr. Thomas N. Taylor, Distinguished Professor of Paleobotany in the Department of Ecology and Evolutionary Biology and Biodiversity Institute, has been a member of the NAS since 1994, and also currently serves on the National Science Board (NSB). Biohawk sat down with Dr. Taylor to hear his thoughts on scientists' involvement in policy making.

**BioHawk:** *You have been a member of the National Academy of Sciences since 1994. How does a scientist come to be a member of NAS?*

**Dr. Taylor:** The process is very complex, and you never know that you have even been nominated. Needless to say there are many more qualified people that could (should) be in the NAS than



*Character is like a tree and reputation like a shadow. The shadow is what we think of it; the tree is the real thing. - Abraham Lincoln*

*A. Lincoln*



there are spaces each year. As people are nominated, and don't get in, they get dropped off the list since there are new nominations coming forward each year. The new number of inductees each year is about 65. When you spread 65 individuals into 6 classes that may include up to 10 different sections per class (e.g., biochemistry, cellular and developmental biology, plant biology, genetics, evolutionary biology, economic science, computer and information sciences, physics, etc.) the number of new members per class is usually only one or two each year. The system operates so that not only are you voting for individuals within your discipline, broadly speaking biology and geology in my case, but also for individuals who have been nominated in mathematics, physics, etc. Obviously this also means the same process took place when you were elected. I mention this because it underscores there is a certain amount of luck involved in getting elected to the NAS. In a very real sense it means (or should mean) that there are many extraordinary individuals who do not get elected to the NAS because there are simply not enough slots in any single year.

**BioHawk:** *You are also a member of the National Science Board (NSB), a board established with the founding of the National Science Foundation in 1950, whose goal is to make recommendations for national policies on research and education in science and engineering. Did your membership in NAS position you for appointment to the NSB?*

**Dr. Taylor:** NAS membership does not necessarily qualify you for membership on the NSB. However, I suppose that because I have been doing science for a long time, and am an academic, that the "seasoning" I have had in my career does provide some perspective on policy issues that relate to science. I have also spent a lot of time on various national committees and boards of various types and those activities probably helped to expand my portfolio of science policy awareness, and was the reason I was nominated (by whom I don't know). Because appointment to the NSB is made by the President of the United

States (and conferred by Congress) there is a very lengthy process that involves FBI interviews and associations that date back to high school days!

**BioHawk:** *Straddling the line between science and politics is not easy. It has been said that no science steeped in policy is objective. As a scientist, how do you remain objective when formulating policy recommendations?*

**Dr. Taylor:** This is difficult because as a Board member you obviously have opinions about the science on the one hand, and the politics of the day on the other. The National Science Board is the largest of the PAS (Presidentially-appointed and Senate confirmed) non-advisory bodies of the Federal government. One of the very positive aspects of this is that although the work-load is extensive, the term is 6 years and 6 new members are added every two years. This results in a relatively "untouchable position" for the science board members, and thus insures that politics do not impact decisions. On the personal level, one is obviously influenced by various factors that have accumulated over an entire career. I try to remain objective, be especially intent as a listener to "another point of view," and then try to examine all issues from a community perspective, that is, science community, national community, and world community. I generally feel good about Board decisions because of the thoroughness with which we study issues and because of the incredible breadth of backgrounds, opinions, and science policy focus that is represented around the Board table. As a result any real or apparent conflict of interests get quickly diluted from the discussion. There are also a host of specific issues that relate to conflict of interest so that Board members are excused from certain deliberations and votes.

**BioHawk:** *What insight have you gained about science in the USA as a result of your participation in NAS and on NSB?*

**Dr. Taylor:**

1. We are lagging behind in the training and preparation of the next generation of

scientists and engineers, when compared to other countries in the world.

2. There must be significant attention directed to changing the public's understanding of science in the world and its impact on society.

3. To some extent the "attention grabbing" one-liners about this and that (e.g., climate change, fresh water supply, disease) result in public opinion in which it becomes commonplace to assume that there are simple solutions. These "reports" sometimes result in little appreciation of cause and effect relationships and the necessity of basic research.

4. Long term goals in science education are not achieved in a short time frame, but political implications remain a constant.

5. Attitudes about national policy in science can't always be shaped by adding more money to the equation.

6. Political expediency too often trumps scientific judgment.

7. Science innovation requires taking chances; and sometimes existing accountability measures simply don't work. This means taking chances on the "chance takers".

8. Our indicators of achievement in STEM (Science, Technology, Engineering and Mathematics) relative to the next generation of STEM innovators have not kept pace with our accountability standards that have been developed in focused, research-driven areas.

*article continued on page 12*



*Dr. Taylor collects plant fossils in the Antarctic.*

9. To a large extent US academic institutions continue to award advanced degrees based on requirements and procedures put in place 50 years ago.

10. As in most things in life, there are no quick fixes based on science policy.

11. Many departments and universities have well-thought-out research funding strategies that are designed to more effectively and efficiently garner research support—whether it be the single investigator or large collaborative proposals that span multiple disciplines and engage several institutions and/or departments. In this regard there are institutions like KU and departments like my own (EEB) that have not developed strategies to maximize science policy decisions in order to support their research agenda(s). They are simply doing business like they have for years. Like the science we all do, even in a discipline like my own (paleobotany), advancement requires new approaches, analyses, and the ability to look past the present horizon. Because these institutions continue to practice and reinvent the same science education they have for years, the impact they may have on the next generation of STEM students may produce little change in attitude, innovation, and/or the interface between science and society.

**BioHawk:** *How has your involvement in NAS changed how you do science?*

**Dr. Taylor:** Not a great deal except that as a member of the NAS I believe that I have to work harder each day to prove that I belong. In my opinion you don't do science because you are working to be rewarded, acknowledged, granted tenure, or elected into some special society, you do it because of your passion for asking and sometimes answering questions about a discipline that you truly love.

**BioHawk:** *Do you view your involvement in scientific policy making a natural extension of your role as a scientist? Should all scientists be involved in policy?*

**Dr. Taylor:** By all means yes to both questions. Regardless of the level, we all must take the time to provide opinion, expertise, and guidance both within our disciplines, but also within the wider community in which we work. Science policy is just one of these, as is serving as a reviewer or editor, an NSF panel member, or participating in some capacity on a Saturday with K-12 students about your research. As someone once noted “service is the rent we pay to be living on Earth”. I guess I would modify that slightly to read “service is your acknowledgement of having the opportunity to be engaged in science.”

**BioHawk:** *Lincoln and Darwin were contemporaries who both had strong effects on the trajectory of science research in the world. How do you think the work of scientists at KU fulfills the vision of both of these leaders?*

**Dr. Taylor:** I'm certain the Darwin scholars among us would be quick to point out that most of what we do is influenced by Darwin, certainly within our department and broadly speaking in science in general. That includes not only the research we do, but also in our roles as educators. In the absence of a National Science Foundation or the National Institutes of Health, Darwin did have resources available for his studies, including collaborators and those with interdisciplinary interests. The critical thinking that is done at KU today is not really different from the way Darwin looked at some facets of the biological world. Perhaps President Lincoln was looking past the horizon when he established the NAS as an honor society for distinguished scholars of the time. Much as Darwin's influence has continued to expand in science today (even in Kansas!), the NAS has also expanded in its role as a source of scientific and technological advice to the government. Only within an historical context are we able to judge the accomplishments of these two individuals who in hindsight were able to see around the corner—one in science and the other in policy. History will be the judge of how well any of us has fulfilled their visions. 🐧



*Dr. Hillis at his ranch, "The Double Helix"*

## Graduate student *David McLeod* interviews alumnus Professor David Hillis:

**Y**ou wouldn't necessarily expect to find a member of the National Academy of Sciences sleeping out under the stars on his own cattle ranch, but that's exactly where you might go to find Dr. David Hillis. Knowing that Hillis has a long-term interest in genetics research helps to explain the name of his ranch, The Double Helix. The Double Helix isn't your average Texas cattle ranch, but rather a working laboratory where Hillis applies his knowledge of genetics to the development and maintenance of desirable traits in his herds of Texas Longhorn cattle. I recently had the privilege of visiting with Hillis, a remarkable KU alumnus, who has had a tremendous influence in the field of evolutionary

biology and its application to topics ranging from viruses to frogs to cattle ranching.

David Hillis had the good fortune of growing up the child of scientists. Portions of David's childhood were spent living abroad as his father, an epidemiologist, conducted research in places such as Denmark (where David was born), The Democratic Republic of the Congo, and India. These experiences, especially in tropical Africa and India, exposed David to an extraordinary amount of biodiversity and introduced him to the subject of much of his work, amphibians and reptiles. Early on, David developed an interest in reptiles, particularly, snakes, that later grew into a broader interest in evolutionary biology



## Interesting Facts :

Darwin didn't invent the phrase "Survival of the Fittest". That was Herbert Spencer, a philosopher and contemporary of Charles Darwin. After reading Darwin's *On the Origin of Species*, Spencer wrote *Principles of Biology* in 1864. Darwin himself used the phrase in his 5th edition of *The Origin* and gave full credit to Spencer.

- It is interesting to note that Louis Agassiz, who helped form the NAS, is one of Hillis' academic "ancestors" (see: <http://www.zo.utexas.edu/faculty/antisense/Labphylo.html>).

and herpetology (the study of amphibians and reptiles). Though his parents weren't particularly fond of David's herpetological passions, they tolerated his snake chasing and encouraged him to pursue his interests in this field. As early as high school David was already publishing and giving talks about his research with snakes.

David completed an undergraduate degree at Baylor University, then attended KU from 1981–1985 during which time he earned two Master's degrees and a Ph.D. for his studies in evolutionary biology. His choice to attend KU was greatly influenced by former KU herpetologist Henry Fitch with whom David traveled to Central America for a semester of field research. Though Fitch was retiring at that time, he encouraged David to apply. At KU, Hillis was mentored by Drs. William (Bill) Duellman and John Frost. Duellman, a herpetologist and emeritus faculty member is still exceptionally active at KU, continuing to publish his research on neotropical amphibians. Together with former KU geneticist, Dr. John Frost, Hillis' advisors offered him opportunities to pursue research in both molecular phylogenetics and its application to amphibians and reptiles.

As a graduate student, Hillis was very forward-thinking. KU herpetologist Dr. Linda Trueb describes David as one whose ability to "think outside the box" distinguished him from his peers. In his own words, "I made some good guesses about a few things in biology as a graduate student, and that was fortunate for my career." Most notably, David was at the forefront of the field of molecular phylogenetics, that is, the use of genetic data to create hypotheses about how organisms are related to one another.

As a graduate student, David found that his ideas weren't always accepted immediately. At the time, the scientific community was wary of the application and interpretation of molecular data. Even David's advisor, though open-minded

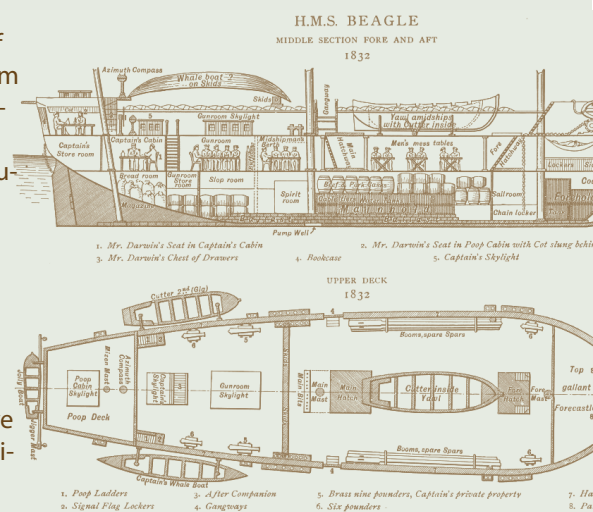
about his pursuits, was at first somewhat skeptical of the results he was getting from his molecular data. "As an example," Hillis recalls, "[Bill Duellman and I] worked together on a project on marsupial frogs in Ecuador. The lab work that I did showed some very clear divisions that did not fit Bill's initial view of how the diversity was divided into species. The species boundaries that I found did not fit the morphological characters that Bill had looked at to that point. But he looked deeper, and soon found that osteological characters fit the results I had found perfectly, and that some of the other characters that he had been relying on were highly variable even within populations."

Upon graduation, David took a position at the University of Miami for two years, then moved to the University of Texas in Austin. His research career has taken him down a variety of pathways, ranging from the evolution of asexuality to the molecular mechanisms of evolution (such as those responsible for concerted evolution of multigene families). In 1999, David received the prestigious MacArthur Fellows Award. Rather than using this unique award to simply continue research in the areas in which he had already proven himself to be successful, Hillis embarked on novel paths of exploration, citing that his "biggest successes have come from trying something new." A current project involves the development of a new approach for rapidly sequencing of a large number of homologous genes from distantly related species. Hillis commented "I think this approach will change the kinds of questions we can ask about evolution and phylogeny."

In 2008, Hillis was inducted into the National Academy of Sciences (NAS), an honorific society of scholars and researchers established by Abraham Lincoln in 1863. Members of the NAS serve as advisors to the government, serve the scientific community in various capacities, and serve their country by inspiring and influencing policies that affect our

health, welfare, and education. David has found being one of the 2100 members of the NAS to be "exciting, especially since I like service and applying my interests to the problems of the country and the world. I've become much more involved in science education issues in Texas as well as nationally. I think we can do a much better job teaching people about science, in high schools as well as in universities, and I've been working to improve the science curriculum and science education in general."

When asked about his thoughts on the future of science, Hillis foresees the advent of technology that would use genomic data to allow for identification of organisms in the field and link and this to previously published information. Technology like this will transform our approaches to research and rapidly accelerate our ability to address questions of ecology, evolution, and systematics. Having so much biological information at our fingertips might even invite increased interest in biodiversity on a global scale. As one passionate about understanding the natural world and making it known to others, the increased attention to these topics would be welcomed. "I just hope" commented Hillis, "that society remains stable enough and the world remains peaceful enough to allow this to happen, and that we start doing a better job of protecting what is left of biodiversity." 🌿



## Graduate student *Francine Abe* interviews Professor Edward Wiley:



The single illustration Charles Darwin chose to include in his seminal book was not that of iconic Galápagos turtles or fossils of an extinct giant sloth or fancy pigeons. It was a simple diagram of a branching tree.

The tree represents new lineages arising from a common ancestor, with expanding branches of diversity—some going extinct, some persisting to diverge into further branches. This depiction showed not only that all of life was descended from a common ancestor, and we were thus all related, but it was a representation of evolutionary history. The study of phylogenetics seeks to uncover this tree of relatedness, and with this information, shed light into the evolution of organisms—how they've come to speciate and processes that have pushed their divergence.

KU has been at the forefront of phylogenetic systematics studies for some 30 years and to this day remains as one of its strongholds, sculpting well-trained systematists from students. Dr. Ed Wiley, Curator of Ichthyology and a renowned authority in phylogenetics, has offered his views on the year of Darwin's bicentenary and 150 years since the publication of *On the Origin of Species*.

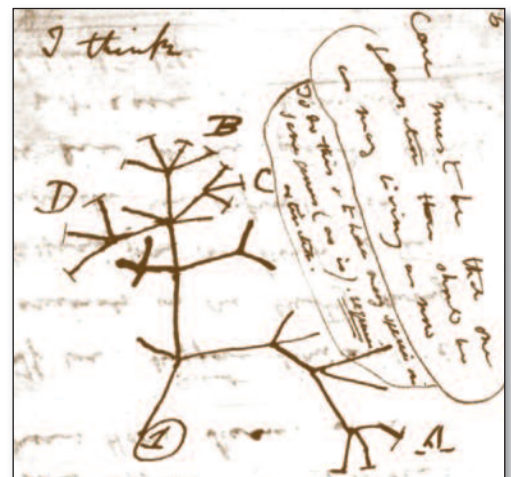
**BioHawk:** *What is your take on Darwin's main contribution to science?*

**Dr. Wiley:** Darwin is one of those transformative figures who moved science in the direction from what I call the Mythos to what I call the Logos. That is to say, by taking some significant part of nature and trying to explain it with natural mechanisms, rather than explaining it through supernatural mechanisms. So when you look back, you see various figures in history that have done this. Most people would remember Isaac Newton. Before Newton, people thought that the reason the planets didn't fly off their orbits was because God's love kept them circling around the sun. Newton suggested a natural explanation—which we now call gravity. Well in biology, Darwin did essentially the same thing. He said that there is a natural explanation, evidence that all organisms share a common ancestor and that there really is descent in a natural way between

organisms rather than through special creation. In his book, Darwin marshalled the evidence together to support evolution, and he also provided a mechanism by which things would change, which would be natural selection. He provided the evidence to convince a significant portion of the scientific community that there was a natural explanation for diversity, and that's where evolution really took off. There had been a lot evolutionary theories—Lamarck had one, Darwin's own grandfather had one—but there had been a lack of marshalling the evidence necessary to accept it, and there was a lack of a really believable mechanism by which it would occur.

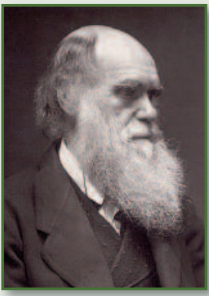
**BioHawk:** *And how did people react to "On the Origin of Species by Means of Natural Selection"?*

**Dr. Wiley:** I think there many people in Western science that read the evidence of *The Origin* and were certainly convinced that the species were mutable and evolved from other species. The interesting thing is that the mechanism of natural selection was certainly not uniformly accepted by everyone right away, in fact, probably not by most people. Instead, there was a variety of evolutionary theories that flourished during the later part of the 19th Century and early part of the 20th Century until the rise of population genetics which provided a mathematical theory of natural selection and showed mathematically how natural selection worked on populations. That is when Darwinism as we know it, Neo-Darwinism, really took off as a theory of evolution.



*From Darwin's notes used in formulating his hypotheses about evolutionary history.*





*"As buds give rise by growth to fresh buds, and these, if vigorous, branch out and overtop on all sides many a feebler branch, so by generation I believe it has been with the great Tree of Life, which fills with its dead and broken branches the crust of the earth, and covers the surface with its ever branching and beautiful ramifications." -"On the Origin of Species", 1859, Charles Darwin*

*Charles Darwin*

**BioHawk:** *And how has the study of evolution changed since then?*

**Dr. Wiley:** When you look at modern evolutionary theory there is much, much more to modern evolutionary theory than Darwin's original ideas. Yes, natural selection does occupy an important place, but we also know that random chance occupies a special place. Darwin's theories of genetics were rudimentary at best, and in fact, wrongheaded. This has been replaced by modern theories of genetics which have been integrated with other evolutionary ideas—concepts such as mutation—which form physical bases for the kinds of change that Darwin required for his theory. Then there is a whole other aspect of speciation; Darwin talked about geographic isolation giving rise to diversity. This has really been fleshed out into full-blown theories of speciation, for which we have several different kinds of mechanisms, most of which require geographic isolation for which ancestral species give rise to daughter species.

**BioHawk:** *You mention several times this notion of descent from an ancestral form.*

**Dr. Wiley:** Well, before Darwin, one of the most popular ideas was built around "the great chain of being," which is a kind of chain of perfection. In fact, back in medieval times they had very complicated diagrams that went from mud [scaling up] to angels. Instead, Darwin had a very modern concept of what evolution should look like—that is, as a branching tree—a tree arising from a single source but with many branches radiating out of that single source. There were many people that drew trees before Darwin, but the meaning of the trees was different. Darwin's trees were trees of ancestors and descendants through the process of bifurcation. It is the only illustration in the Origin, this unfolding tree. So he saw this process not of going towards one point, but as a process of going out or towards many points. Packed into that was also a concept that really affects how we do busi-

ness at the University of Kansas. If we are going to use systematics, the study of the diversity and the organization of that diversity of life, then we should base our studies on the genealogy of organisms. So, Darwin wanted to make everything as genealogical as possible, to form things like biological classification on the basis of ancestors and their descendants. Now interestingly—like many of our ideas in science—this took a hundred years to become incorporated into our normal scientific thought. So Darwin gave us these ideas in 1859, but it was not until the 1960's with the discipline known as phylogenetic systematics, fostered by the German entomologist Willi Hennig, that we were finally provided with the philosophy and the tools to actually take advantage of what Darwin had suggested. The tools we use to reconstruct genealogical relationships. The philosophy informs us of what kinds of relationships we seek when we reconstruct evolutionary history and what kinds of evidence we need to do the work. The result is that we can formulate good solid testable scientific hypotheses about that genealogy. So it's really interesting it took over a hundred years before Darwin's original ideas finally became the normal course of science.

**BioHawk:** *How is phylogenetics related to KU?*

**Dr. Wiley:** KU played a very important role in developing formal methods to do this kind of research. For example, we have methods called parsimony algorithms. And with those, you ask the question, "What is the minimum number of steps that you need to produce a phylogenetic tree?" Well, one of the first of those algorithms was actually produced by Bob Sokal and Joe Camin at KU in the 60's. Parsimony methods became the first generation of computer algorithms to solve phylogenetic problems. Before that, we had to solve phylogenetic problems with pencil and paper, which is how I did my thesis. But with the development of more sophisticated methods, more and

more complicated problems were able to be solved. One of the first places in which that was done, was at KU. Not the only place, but one of the first places.

**BioHawk:** *Why would modern day evolutionary biologists be interested in these trees?*

**Dr. Wiley:** The answer is that these trees provide very powerful ways of studying the evolutionary process itself. Evolution is an unfolding of diversity, and all the processes that result in diversity are highly correlated with the tree of descent of the species. And so, if we ask a question, for example, do mutations speed up in some groups or slow down in some groups? Is the evolution of genes mostly neutral over time or is there some selection pressure? These are questions you can study by looking at a phylogeny—a tree of relationships. If you look back fifty years ago, evolutionary biology didn't use trees, and the reason is because there really weren't any reliable trees. Most trees were completely made up, which is not to say that they were wrong, but they were not empirically testable. Nowadays, evolutionary biologists use trees in almost every aspect of their research. With the ideas laid down by Darwin, the philosophy laid down by Hennig, and the hard work of modern phylogeneticists, we have ways of analyzing data that result in reliable evolutionary trees. →



*Dr. Edward Wiley at the Museum of Natural History.*

# next generation

## of graduate students



### D. Fernando Estrada

Mentor: Dr. Roberto DeGuzman

I completed a B.S. in Biochemistry from Kansas State University in 1999 before accepting a commission into the U.S. Army, where I spent the next seven years. In 2006, I took the opportunity to continue my studies in the Molecular Biosciences Department at the University of Kansas.

Going from a career in the military to a career in research has had its unique challenges. Overall, things couldn't have turned out better. So far I've been able to acquire new techniques, develop professionally as a scientist, and even start a family all while contributing research of my own.

Since joining the lab of Dr. Roberto DeGuzman in 2007 I've been involved in researching the structural biology of Hantaviruses. We're interested in answering basic questions about the virus life cycle: specifically how do Hantaviruses assemble? What are the molecular recognition sites that allow the virus to form? How does the virus manage to evade the host cell immune system? Among the biophysical tools we

use, perhaps the most powerful is Nuclear Magnetic Resonance (NMR). This technique uses MRI technology to help us piece together the three dimensional structure of viral proteins. My long term goal is to use the techniques I've learned here and the techniques I will learn as a post-doctoral researcher to work for the Department of Defense as a researcher on infectious pathogens.

A major step to my professional development has been my involvement in the Madison and Lila Self Graduate Fellowship. The Self fellowship helps its members develop leadership, communication and entrepreneurship skills while providing an environment where we can network with other PhD students from very different backgrounds.

Even though my coursework, my thesis project and a family keeps me busy, I've been lucky to find time on the weekends to work with an organization called the Kansas City Kansas Urban Academy. The academy organizes a "Saturday Science Academy" that gives minority students an opportunity to conduct hands-on science experiments in preparation for college. The academy has a near 100% high school graduation rate and a 90% college enrollment rate. I'm very proud of the work the people do in this organization. 🗨



### Laci Gerhart

Mentor: Dr. Joy Ward

Born in Hutchinson, KS, I was always interested in science. As a child, my interests ranged from meteorology to archeology and everything in between. I graduated from Hutchinson High School in 2002, and then attended KU on a Watkins

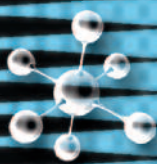
Berger Scholarship. In 2006, I earned a B.S. degree in Ecology and Evolutionary Biology (EEB). Following graduation, I took some time off from school, working as an administrative associate for the Institute for Educational Research and Public Service (housed in the School of Education at KU) managing payroll, invoices and other fiscal matters for numerous federal and state funded research grants.

In the fall of 2007, I began my Ph.D. program in EEB, working with Dr. Joy Ward. In my first year of the program, I was nominated for and awarded a Self Graduate Fellowship. During my second year, I also became a fellow in KU's first NSF IGERT (Integrative Graduate Education and Research Traineeship) program named *C-Change: Climate Change, Humans and Nature in the Global Environment*. This interdisciplinary program brings together students from diverse fields

that all have interests in how climate change is influencing our world, our society, and our future.

My research focuses on the effects of historic changes in atmospheric CO<sub>2</sub> concentrations on plant physiology. For this work, I have the unique opportunity to analyze fossil remains of Juniper trees preserved in the Rancho La Brea tar pits in Los Angeles, CA and Kauri trees preserved in peat bogs in New Zealand, some of which are over 50,000 years old. Tissues preserved in these fossils provide evidence of the concentrations of CO<sub>2</sub> in ancient atmospheres that can be tracked over time and can be compared to current conditions. In addition to research and coursework, I am also a science educator for Discover Technology and Career Horizons, summer programs for area middle school students run by Talent Search.

Upon completing my degree, I plan to become involved in policy work, possibly through a Science and Technology Policy Fellowship from the American Association for the Advancement of Science. Through this program, I would be able to use my scientific expertise to inform policymakers on science-related issues. My long-term goals include developing a non-profit research organization that focuses on climate change and emphasizes public education on scientific issues as well as involvement in the research process. 🗨





## Peter Hosner

Mentor: Dr. Robert Moyle

I began my research career as a naturalist, learning to identify organisms that could be found around me in my native Michigan. I pursued this interest and went to Cornell University. The opportunities there led me to field studies from upstate New York, to the Canadian arctic, to Uruguay. My interests focused on the

diversity and geography of birds, and after I graduated with a degree in Environmental Science I spent four years preparing myself by continuing field studies. I spent springs and summers working temporary research jobs on breeding birds in the Rocky Mountains and along the lower Colorado River. In the off-season, I grabbed a backpack, binoculars, a bird song recorder, and traveled to South America. On several trips I visited Ecuador, Peru, Bolivia, and Argentina, working with researchers and conservation groups. I also went on one trip to Borneo, where I had my first opportunity to work with my current advisor, Rob Moyle, and gain my first research experience in Asia.

Since joining the KU Division of Ornithology, I have continued field work on collecting expeditions to Mongolia, Peru, and the Philippines. The University of Kansas Biodiversity Institute has an ongoing collaboration with the Philippine National Museum to conduct biodiversity surveys throughout the country. One striking observation through our work is how grossly underestimated the bird diversity is in current taxonomy in the Philippines. Our research suggests that most widespread "species" of birds are actually composed of many different forms that are distinct in morphology, behavior, and genetics. This paradigm shift is critical to the conservation of Philippine bird life, as several range-restricted, independent lineages are more challenging to protect than single widespread lineages, and habitat loss in the Philippines has been extreme.

The Philippine archipelago is a natural laboratory to study how isolation of lineages leads to diversification. My dissertation focuses on using modern molecular techniques to study patterns of speciation and fine scale phylogeography of co-distributed lineages of birds in the Philippines. After gaining my Ph.D. with KU/EEB, I plan on continuing my career in a tenure-track position at a research University. 🗨️



## Maged Zein El-Din

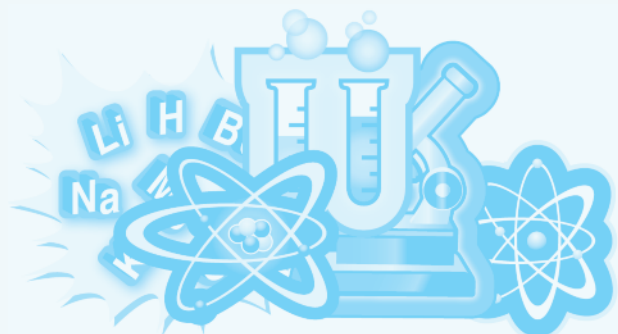
Mentor: Dr. Kristi Neufeld

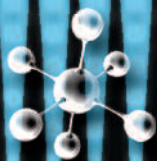
In 2006, I received a scholarship from the Ford Foundation for PhD studies in the Department of Molecular Biosciences. I have a varied background and experiences. I obtained a medical degree from Alexandria University, Egypt. I worked as a family doctor for 2 years

and as a medical geneticist for 6 years. Before coming to the University of Kansas, I earned a Master's degree in Human Genetics and 2 post-graduate diplomas in Information Technology and Eastern Studies. Although, my plan was to do research in Human Genetics, after working 8 weeks as a rotation student in Dr. Neufeld's laboratory, I decided to study cancer cell biology.

Uncontrolled cellular proliferation is one of the hallmarks of cancer. Many tumor suppressor proteins function to inhibit cellular proliferation and thereby prevent carcinogenesis. In Dr. Neufeld's lab, we study a tumor suppressor protein called Adenomatous Polyposis Coli (APC). APC plays a critical role in preventing colon cancer, the second deadliest cancer in the USA. Mutation of the APC gene is an early step in the development of the majority of colon cancers. In my doctorate dissertation studies, I study both colon cancer cells and mouse models to determine how the level of APC is maintained in cells. My aim is to find a safe way to increase cellular APC levels as a prevention strategy for colon cancer.

I have found that APC levels increase in response to cellular stress. I have also found that some potential anti-cancer drugs can increase APC levels by inducing cellular stress. Our collaborator, Dr. Brian Blagg from the KU Department of Medicinal Chemistry focuses on design and synthesis of drugs that affect cellular stress response. One drug he designed induces cellular stress response with no toxicity to cells. I have tested this drug and found that it increases the level of APC in both cancer cells and mice. Another KU collaborator, Dr. Roger Rajewski at HBC has already demonstrated in rodent models that this drug can be taken orally, is nontoxic, and has prolonged induction of a cellular stress response lasting 2-3 weeks. Currently, I am determining the best dose of this drug to safely increase APC levels. I am also testing the efficacy of this drug in colon cancer prevention using various mouse models. 🗨️





# undergrads



## Sai Folmsbee

From when I first enrolled at KU, science was my passion. I first began my research career as a sophomore under the mentorship of Dr. Yoshiaki Azuma. He provided me with the raw materials and investigative insight to guide me as I struggled to be relevant in an academic field so utterly foreign to me. At the time, I had only taken a single biology class, but Dr. Azuma provided to me the intellectual tools I needed to overcome this challenge. He taught me how meticulous, unrelenting, and focused investigation was a key attribute of a good scientist. I learned how to work as a team in the laboratory, and how each person's project fits like a jigsaw puzzle piece in sculpting a larger, more significant reflection of the essential biological processes being investigated.

It was during my time in Dr. Azuma's lab when I settled on majoring in Neurobiology. The degree itself was new, but what really appealed to me was its diversity of biological coursework. Through the years, I have been able to pursue my natural fascination with the beauty and diversity of life that inhabits the planet. I have

taken courses that have shown me the history of life on earth, the diversity of plants, animals, bacteria, and more, and how the delicate balance of cellular and biochemical interactions maintain our own very existence.

But I wanted to expand my involvement beyond laboratory research. Due to the inherent complexities of biological research, it has become increasingly difficult for scientists to communicate with the general public. To bridge that gap, I became a science columnist for the KU newspaper, the University Daily Kansan. I have written on many topics, from NASA and embryonic stem cells to evolution and the American health care system, illustrating the frontiers and controversies of science and their universal impacts. I have learned that scientists have an obligation to share the value of scientific reasoning and research with the rest of society.

Now, as I now work under Dr. Mizuki Azuma, attempting to better understand the nature of the bone cancer Ewing's sarcoma, I find my passion for science only stronger and more refined. I intend to enter an M.D./Ph.D. program after I graduate, not soon forgetting the lessons that KU has provided both in the classroom and in the laboratory. 🗨️



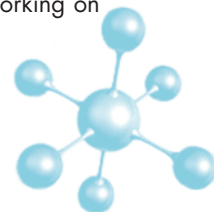
## Ryan Kuster

I grew up near Lawrence in the small town of De Soto, KS romping through the woods and drawing comic books. I remember reading the children's magazines Ranger Rick and Your Big Backyard; however, beyond those magazines I had surprisingly little exposure to biology or the topic of evolution, even during high school. Thus, I began my education at KU with an emphasis in the fine arts. It wasn't until my second semester in an introductory biology course that I learned the importance and intrigue of studying life from an evolutionary perspective. I've spent the last four years attempting to fine-tune my area of study and my primary interests are in systematics and honeybees.

My first research experience at KU was an attempt to reanalyze the current understanding of arachnid orders. Under the direction of Dr. Mark Holder I used statistical software to combine both molecular and morphological studies on the major groups within Arachnida. This independent research stemmed from questions I'd encountered in my Biology of Spiders course. The project was a great opportunity for me to expand on my experiences in the classroom and I gained practical application of modern systematic approaches.

My introduction to working with honeybees took place last summer during a NSF research program at the University of North Carolina at Greensboro. There I observed worker bee behavior in the presence and absence of queens to produce a model of worker aging and mortality. This required individual tagging and daily observation of several thousand worker bees. Aside from gluing tags to reluctant bees, the project was a lot of fun. It also led to my first trip to the Entomological Society of America's Annual Meeting where I presented a poster that received an award in its category.

As I'm tying up my loose ends at KU and preparing for graduate school, I've also been fortunate enough to be dragged along to Thailand as a research assistant. I'm currently working in Chiang Mai with Dr. Deborah Smith as well as UNCG's Dr. Olav Rueppell to study reproductive suppression of Varroa mites by the Asian honeybee, *Apis cerana*. The project aims to understand the genetics underlying the close geographic association between distinct haplotypes of *Varroa jacobsoni* and their bee hosts. I'm thankful to be involved and hope to continue working on the project when I return home. 🗨️



# UNIVERSITY OF KANSAS UNDERGRADUATE BIOLOGY

# GRADUATION RECOGNITION CEREMONY 2009





## New Chancellor Bernadette Gray-Little

A highly regarded scholar, teacher and university leader, Bernadette Gray-Little began her tenure as the 17th chancellor of the University of Kansas on August 15, 2009. As KU chancellor, Gray-Little is the chief executive officer of the university, overseeing campuses in Lawrence, Kansas City, Overland Park and Wichita in addition to research and educational centers in Topeka, Hutchinson, Parsons and elsewhere in the state. She succeeds Robert Hemenway, who served as KU chancellor for 14 years.

Chancellor Gray-Little previously was executive vice chancellor and provost from 2006 to 2009 at the University of North Carolina at Chapel Hill. A professor of psychology, Gray-Little rose to the post of UNC's chief academic officer after successive administrative appointments, including dean of the College of Arts and Sciences, executive associate provost, senior associate dean for undergraduate education for the college, and chair of the Department of Psychology. In these roles, she earned a reputation as a superb fundraiser, a relationship builder, a strong advocate for faculty and for research, and a champion for the highest quality educational experience for students.

A native of eastern North Carolina, Gray-Little received her bachelor's degree from Marywood College in Scranton, Pa., and her master's and doctoral degrees in psychology from Saint Louis University. Her postdoctoral research in cross-cultural psychology was funded by a fellowship from the Fulbright Foundation for study in Denmark. She has also been a Social Science Research Council Fellow and a recipient of a Ford Foundation Senior Scholar Fellowship through the National Research Council. Gray-Little has identified enhancing undergraduate education, raising KU's already high scholarly profile, and securing the resources needed for students and the university to succeed as three of her initial goals for KU.



Chancellor Gray-Little and three other leaders of public research universities hand deliver a pledge to address shortage of Math & Science teachers to President Obama.

# Contributors TO THE BIOLOGICAL SCIENCES

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