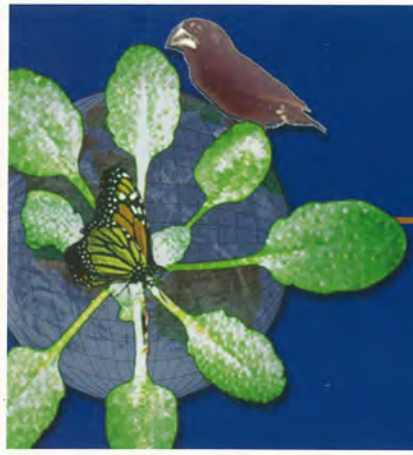


School of Integrative Biology
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
news winter 2006

Forty years on the ice

At the closing ceremony of the Accademia Nazionale dei Lincei on June 16, 2005, it was announced that **Arthur L. DeVries**, professor of Animal Biology, was awarded the Premio Internazionale 'Felice Ippolito.' This international prize is awarded by the National Antarctic Programme and the Accademia to an Italian or foreign scientist who has significantly contributed to the development of Antarctic research. The prize is in memory of Prof. Felice Ippolito, former deputy chairman of the Italian Committee for Antarctic Research.

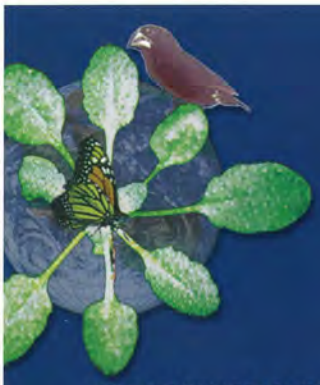
Art DeVries (left) and assistant drilling a fishing hole through the ice near McMurdo Sound, Antarctica.

This prize recognizes more than 40 years of work by DeVries in the Antarctic and his discovery of antifreeze proteins in Antarctic fish. DeVries first came to McMurdo Sound field station in 1961 as a graduate student and stayed almost a year. He returned in 1963 with his own National Science Foundation-funded grant, and has returned almost every year since.

Antarctica is a place like no other on earth. The Antaractic Ocean represents the world's coldest marine environment, with its near-shore waters perennially at the freezing point of seawater (about -2°C) year round and laden with ice crystals. The blood of marine fishes is less salty than that of seawater, and they should readily freeze into a solid block of ice at about -1°C. So how do these fish avoid freezing at -2°C?

DeVries solved this mystery in the late 1960's when he found that some fish produce an antifreeze glycoprotein (AFGP). Fish antifreeze isn't like the antifreeze in your car. AFGP doesn't lower the thermodynamic freezing point of the fish's blood. Instead, fish antifreeze molecules bind to minute ice crystals that enter the fish's system and, thus, prevent the ice crystals from growing any larger.

continued on page 6



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An adage common in the business world is that organizations that do not change do not survive. This may not be quite true of universities, but certainly those that do not change do not prosper. With the recent selection of a new President, a new Chancellor, a new Provost, and a new Dean of the College of Liberal Arts and Science, the University of Illinois is in no immediate danger of being stagnant. Indeed, our new President has assured that we will not be static by mandating development of a strategic plan for all three campuses.

How does this impact the School of Integrative Biology? Like every other academic unit on our campus, we have been required to think about our strengths and weaknesses, our visions for the future, and how we might move from where we are to where we want to be. A recurring theme that emerged from our discussions is our desire to offer an undergraduate major that a significant number of students will find compellingly attractive, as well as one that will lead them toward their career goals. This is not to say that we don't have a worthwhile major now, but there are always opportunities for improvement.

We have already taken two actions to bring about this improvement. First, pending final administrative approval (expected this spring), we will offer an Integrative Biology Honors concentration within our major starting in fall 2006. The concentration, which will feature three courses dedicated exclusively to students admitted to it, should attract some of the very best students entering the University with an interest in the biological sciences. Our Honors concentration is modeled after the highly successful Biology Honors major that was previously offered by the School of Life Sciences. Like it, our concentration will feature small classes and a high degree of faculty involvement. We expect that our Honors concentration in Integrative Biology will quickly garner the kind of positive attention and reputation that made Biology Honors such a jewel for the campus.

Second, we are reexamining our entire undergraduate program of study, from our introductory course for prospective majors (IB 150, *Organismal and Evolutionary Biology*) to our advanced courses. During the course of two faculty retreats we discussed our teaching objectives for students and how well our courses and their content help us meet these objectives. Later this spring and next fall, faculty groups will discuss particular courses with the objective of recommending changes we might make in content and instructional approach that will make the courses more meaningful and valuable for our majors.

Of course we can't forget our faculty. We could discuss improvements to our courses forever, but without outstanding faculty to deliver them and to serve as mentors for our talented undergraduates who want to participate in research, we would never be able to achieve our goals. You can read in this newsletter about some of our faculty, those who have recently achieved significant recognition and those who are new.

As always, your support is valued and appreciated,

Fred Delcomyn

Fred Delcomyn, Director

State-of-the-art bee lab opened

Gene Robinson and **Charles Whitfield**, Department of Entomology, hosted the opening of a new million-dollar state-of-the-art bee lab with a symposium and reception in September 2005. Both Robinson and Whitfield use the lab facility in their research programs.

The Bee Research Facility, part of the relocation of the University's South Farms, will provide much needed space for research studies designed to shed light on the roles of genes in social behavior. The former bee lab was a small retrofitted pole barn.

The new 4,000 square-foot building, located on Lincoln Avenue Extended, south of Windsor Road, includes a 500 square-foot indoor flight chamber, which Robinson characterizes as the finest of its kind in the world. There is room for 50 hives of Western honey bees, a lab for artifically inseminating queen bees, a honey-extracting room, and general research space. Two 2,000 square-foot screened outdoor enclosures can be used for experiments and to maintain colonies of bees in warmer weather.

Moving the bees presented some interesting challenges. Robinson noted that bees have an "exquisite sense of place" and "spatial memory" that allows them to keep track of where their hives are located when they are foraging for food.

"The bees learn where they live by landmarks," said Robinson. "If they are moved within their home range (approximately 2 miles), they get confused." Since the new lab is within 2 miles of the old facility, they moved the bees to locations further away in Champaign County until the bees "forgot" where the old hives were.

This project was about 2 years in the planning. Although planned separately, this new facility enhances the research program of the Institute for Genomic Biology (IGB). Robinson is co-leading a project for IGB, called BeeSpace, in an effort to analyze which genes are "on" and "off" during the normal behavior of the bee.

May Berenbaum, head of Entomology (left) and Gene Robinson (center) with alumni and guests at the recent open house in the new bee lab. Photo by J. Waite.

in the news

Carla Cáceres, assistant professor of Animal Biology, has been named a 2006-2007 Helen Corley Petit Scholar by the College of Liberal Arts and Sciences. Mrs. Petit, an alumna of LAS who passed away 4 years ago, provided an endowment to develop scholarship and teaching of young faculty members in the College.

Evan DeLucia, professor and head of Plant Biology, was awarded the distinction of Fellow by the American Association for the Advancement of Science in 2005. Election is an honor bestowed by peers. DeLucia was selected for fundamental contributions toward understanding impacts of global climate change on photosynthesis, carbon allocation, and ecological relationship of forest and agricultural ecosystems.

Feng Sheng Hu, associate professor of Plant Biology, was one of six University faculty named University Scholar. It "is the highest honor we bestow upon our young faculty," said Chet Gardner, vice president for Academic Affairs. Recipients are nominated and chosen by their peers. Hu is recognized internationally for his research in global change biology and ecosystem science.

Kim Hughes was promoted to associate professor of Animal Biology in August 2005.

Robinson elected to National Academy

Two University of Illinois faculty members were among the 72 scientists elected to membership in the National Academy of Sciences in 2005 in recognition of distinguished research and continuing achievements. They are David H. Baker, a professor emeritus of animal sciences and internal medicine, and **Gene E. Robinson**, professor of Entomology, the G. William Arends Professor of Integrative Biology, and director of the Neuroscience Program.

Election to membership in the National Academy is considered one of the highest honors that can be accorded a U.S. scientist or engineer. Those elected bring the total number of active members to 1,976.

"This recognition and prestigious honor is yet one more indication of the valuable contributions both of these outstanding researchers have made to their respective fields," said Chancellor Richard Herman. "We are extremely proud of their accomplishments, which are emblematic of the tradition of excellence at this great university."

Robinson has made a wide range of fundamental advances in elucidating the endocrine, neural, and genetic regulation of behavior at the individual and colony levels in social insects. He has significantly advanced the understanding of the role of genes, hormones, and neurochemicals in the evolution of social behavior.

Other School of Integrative Biology faculty accorded this recognition are May R. Berenbaum, Swanlund professor and head, Department of Entomology, and Tom L. Phillips, professor emeritus, Department of Plant Biology. Berenbaum was elected in 1994 for contributions to understanding the role of chemistry in interactions between plants and herbivorous insects. Phillips, elected in 1999, was cited for changing the way we study complex biodiversity patterns in Pennsylvanian-age wetland plant communities.

The National Academy of Sciences was signed into being by President Abraham Lincoln on March 3, 1863. As mandated in its Act of Incorporation, it has served to "investigate, examine, experiment, and report upon any subject of science or art" whenever called upon to do so by any department of the government.

The artful lodger

Many insects enter the U.S. accidentally, as hitchhikers on various plants imported in commerce, but how many really stay? Conventional thinking says the answer is in the numbers of insects and times they enter, but **Andrew V. Suarez**, assistant professor of Animal Biology and Entomology, suggests that opportunity alone is no guarantee of a successful invasion.

Of 232 species of ants that entered U.S. ports uninvited from 1927 to 1985, 28 species (12%) now occur as established non-native species, scientists from three universities report in the *Proceedings of the National Academy of Science*. An important factor in the ants' success, they say, was nesting preferences.

"There are a huge number of species being moved around that don't become established, so opportunity alone isn't sufficient," said Suarez. "This makes sense, because many of these species have specific biological characteristics that prevent them from becoming established in a new environment."

Ants that stuck around were either ground-nesting species or arboreal species that did not depend solely on specific types of trees common to their native lands. "This kind of information is important, because it's going to help us identify the characteristics that may promote the success of non-native organisms. Eventually, we can use this information to keep the new wave of invaders from becoming established."

Suarez primarily studies Argentine ants, an aggressive species that has caused problems in Southern California since arriving in 1905 and successfully establishing large colonies that overwhelm native food webs.

His work led him to the Smithsonian Institution's National Museum of Natural History, where he found a gold mine of untapped ant history. In numerous containers were mostly unidentified ants that the U.S. Department of Agriculture had captured at quarantine sites around the country. Each container was labeled with a port of departure and a port of entry. The ants had been collected before any of them had a chance to become established.

Suarez, then a postdoctoral student, and colleague Phillip S. Ward, a professor at the University of California at Davis, spent years identifying 232 species from the 394 records stored at the museum. Suarez and Ward then teamed with David A. Holway, a professor of biology at the University of California at San Diego, to analyze nest-site preferences. Of the 156 species for which they determined nest-site preferences, slightly more than half were tree-nesting ants, and only 14% of these arboreal ants (four species) became established in the U.S., probably because they weren't dependent on specific kinds of trees.

This National Science Foundation-funded study provides a rare look at "failed introductions for an important group of unintentionally introduced insects," Holway said. The three researchers also noted the vital role that museums play in advancing scientific inquiry, and they urged a new quarantine program to curate intercepted material.

Story excerpted, with permission, from *Inside Illinois* article written by Jim Barlow, Dec. 1, 2005. Photo, courtesy of Chadwick V. Tillberg, of Suarez digging up a *Paratrechina* nest, Ocampo, Argentina, 2005.

Forty years...

(continued from page 1)

Art DeVries and Carlo A. Ricci, Presidente, Commissione Scientifica Nazionale per l'Antartide, at the presentation of the Premio Internazionale 'Felice Ippolito' in Rome in October 2005.

This discovery has taken DeVries' research team in a range of different directions, from studying paleoclimatic history to molecular evolution. The study of freezing avoidance in Antarctic fishes is truly an integrative one. It has considered the severity of the freezing marine environment, the fishes biochemical and physiological responses to the ice that enters their bodies, and the molecular mechanisms of antifreeze inhibition of ice growth. It also considers the origin and evolution of the antifreeze glycoproteins within the context of the glacial and geological history of Antarctica.

Antifreeze proteins are one of the National Science Foundation's "nifty50" (NSF-funded inventions, innovations, and discoveries that have become commonplace). Private companies are exploring the use of antifreeze proteins in a variety of ways—from increasing freeze tolerance of commercial plants to improving cryosurgery.

Phillips honored with symposium

Tom L. Phillips, professor of Plant Biology and Geology, University of Illinois, was honored at a symposium on Paleobotany and Paleoecology in April 2005 on the occasion of his retirement after 44 years of service at the University of Illinois.

Phillips is recognized internationally for his visionary research into the evolution of land plants and the ecology of plant communities from the Devonian through the Pennsylvanian. By integrating American and European fossil collections he established the evolutionary trajectory of the ferns and their relatives spanning 35 millions years. Phillips' pioneering research also revealed the ecological relationships of ancient plant communities—what actually grew in the swamps of the Carboniferous and how the plants and insects interacted.

His papers, published in biological and geological journals, have deeply influenced the scholarly community. As part of his research and educational activities, Phillips developed and curates the Paleobotanical Herbarium at the University of Illinois, where he manages over 40,000 coal-ball specimens.

In recognition of exceptional research accomplishments, Phillips was a Guggenheim Fellow, NAS Exchange Scientist to the U.S.S.R., and Gilbert H. Cady Awardee (Coal Geology). He was invited to join the National Academy of Sciences in 1999.

By engaging students in courses on paleoecology, comparative morphology, and evolution and through graduate training, Phillips spawned a generation of scholars, many of whom now hold leading positions at universities and research institutes.

Phillips served as Head of the Department of Plant Biology and University Senator. He has been granted emeritus status, and most days you can find him in the lab or his office by 7:30 AM.

Climate change and food production

In looking at climate change, scientists have described carbon dioxide as both villain and hero. The broad consensus of scientists is that global warming, forced by higher concentrations of this greenhouse gas, will reduce crop yields, notably by higher temperatures and more frequent drought. But many believe that augmented carbon dioxide in the atmosphere will, at the same time, "fertilize" plants, negating the harm caused by warming. Some even predict that increased carbon dioxide may lead to bumper harvests.

Stephen P. Long, Robert Emerson professor of Plant Biology and Crop Sciences, considers such optimism unfounded. "We need to seriously reexamine our predictions of future global food production," said Long, at a recent meeting of the Royal Society in London. U.S. production is "likely to be far lower than previously estimated."

Long reported the findings of five studies that tested crops in open fields, rather than in gas chambers or small greenhouses. The Free-Air-Concentration Enrichment (FACE) experiments pipe gases, such as carbon dioxide and ozone, into the air around plants. Like a thermostat keeping temperatures constant, sensors in the field monitor the gases, allowing researchers to control their concentration over 300 square-meter plots. Researchers use this technology to simulate expected climate conditions in 2050.

Long added a new variable to the experiments—ozone. One of the studies, to be published in *New Phytologist*, showed that a 20% increase in ground ozone would slash soybean yields by 20%.

The other experiment, to be published in *Global Change Biology*, indicates that an atmospheric increase to 550 parts-per-million of carbon dioxide would boost soybean yields by about 15%, or a third less benefit than seen in previous studies. And the harm from increased ozone could cancel out this benefit.

The results of these studies are consistent with other open-field studies of corn, rice, and wheat, which suggest that by 2050, the increase in yield due to rising carbon dioxide will only be half that anticipated. As a result, the net effect of global change will be lower yields.

"These results are very serious," said Julia Slingo, professor at the University of Reading, U.K., and Fellow of the Royal Society, who attended the meeting in London. "Food security is much more insecure than we had thought."

This research is supported by the U.S. Department of Agriculture, the U.S. Department of Energy, Argonne National Laboratory, Illinois Council on Food and Agricultural Research, Pioneer, ADM, and the University of Illinois.

A FACE ring in a field at the University of Illinois' south farms. Photo by S. Long.

Fuller joins Animal Biology

new faculty

Rebecca C. Fuller joined the Department of Animal Biology in August 2005 as an assistant professor. Fuller earned her Ph.D. from Florida State University in 2003 in evolutionary ecology, and then was a post-doctoral associate in their School of Computational Science.

One research question that Fuller is addressing is to what extent do complex genetics and/or complex neurophysiology act as constraints on the evolution of behavior, particularly on the evolution of female mating preferences?

This line of questioning focuses on the sensory bias model of sexual selection. It posits that males evolve traits to match the underlying neurobiology of the female sensory system, which, in contrast, does not evolve via sexual selection.

Although sensory bias appears well accepted in evolutionary biology, many of its critical features are untested. This paradox arises from the fact that sensory bias has been used to explain two different phenomena: signal design (which types of traits males should evolve) and the evolution of female preference itself. Fuller's research focuses on this second facet. Sensory bias predicts that female sensory systems (and, therefore mating preferences) evolve as a correlated response to natural selection on other behaviors that share a common sensory system.

She compared the vision physiology of individual bluefin killifish (*Lucania goodei*) from two habitats with fundamentally different lighting environments and found evidence for variable sensory systems. In breeding experiments, Fuller found both environmental and genetic variation within populations in sensory systems. These results indicate that sensory systems are readily evolvable traits that should respond to both natural and sexual selection. The next questions are: do differences in sensory system physiology actually lead to differences in animal behavior? How strong is natural and sexual selection on sensory system physiology?

Currently, she is working on whether mating preferences can evolve via natural selection. Under the sensory bias hypothesis, strong natural selection on sensory systems creates a correlated response in mating behavior. The simple observation that animals have to do many things with their sensory systems has led to the suggestion that selection on one task (*e.g.*, foraging) can result in a correlated response in mating preference. Fuller is exerting various types of selection on simulated sensory systems via selection on two behaviors, mating and foraging. Preliminary results indicate that foraging and mating behaviors are independent traits despite the fact that they share a common sensory system. This research will point to conditions under which sensory bias should play a large role in the evolution of male secondary sex traits and will point to critical tests that can be applied to real systems.

Ming newest Plant Biology faculty

Ray R. Ming joined the faculty as an associate professor in Plant Biology and the Institute for Genomic Biology in August 2005. Ming came from the Hawaii Agriculture Research Center (HARC), Aiea, where he was a plant molecular geneticist for the last 7 years. He earned his Ph.D. from the University of Hawaii at Manoa in 1995 and was a postdoctoral associate at Texas A&M University, College Station.

His research approach applies cutting-edge genomic and molecular technologies to traditional plant breeding. He has worked on a variety of crops, including maize, sugarcane, papaya, coffee, macadamia, and pineapple.

An important crop in Hawaii is papaya. There are male, female, and hermaphrodite papaya plants, and it's important to be able to tell them apart since hermaphrodites yield the preferred pear-shaped, sweet, succulent, nutrient-rich fruit people love to eat. The problem has been that the sex of the plant couldn't be determined until it blooms, which can take 4-6 months. Farmers then rip out male and female plants, leaving only the hermaphrodites. Crop production could be enhanced if the sex of the papaya could be determined from the seed. Ming's research group initiated the papaya genomics program at HARC and they are currently constructing a physical map of the papaya genome and sequencing the expressed genes from flower buds. The results of this research will provide the first genome of an edible fruit and will open broad horizons to genetically improve papaya.

While attempting to clone the papaya sex determination gene, Ming and his team discovered that papaya has a primitive Y chromosome. Sex chromosomes in animals are ancient–about 300 million years old. Flowering plants appeared about 130-200 million years ago and plant sex chromosomes evolved more recently. The recently discovered Y chromosome in papaya appears to be the youngest Y chromosome known to date and has typical features of an incipient Y chromosome as predicted by evolutionary biologists.

Results of this groundbreaking study were published in *Nature* in 2004 and Ming and his co-investigators recently received a multi-million dollar grant to completely sequence the male specific region of the Y chromosome and the corresponding region of the X chromosome and to study the evolution of the Y chromosome in the Family Caricaceae.

The primitive Y chromosome provides a unique opportunity to study the early events of sex chromosome evolution. Unraveling plant sex determination processes will have direct applications in production of crop plants such as papaya, asparagus, spinach, black pepper, yam, and pistachio and will provide important new insights into the mechanisms that may be common in the evolution of both plant and animal sex chromosomes.

donors

Pessises endow fellowship in Animal Biology

Alumnus **Dr. Dennis A. Pessis**, and his wife **Amy** of Highland Park, IL, have generously endowed a new fellowship fund. The Dr. Dennis A. and Amy Pessis Fellowship Fund will provide graduate student fellowships in the Department of Animal Biology. Ken Paige, professor and head of the department, said that this fellowship "will in no small way have a significant impact on our ability to recruit and train graduate students who will undoubtedly go on to do extraordinary things in life."

Dr. Pessis attended the University, earning a B.S. degree in biology in 1969. While an undergraduate, he was a member of the Marching Illini, the Second Regimental Band, and Omega Beta Pi. He earned his M.D. from the University of Health Sciences, The Chicago Medical School in North Chicago in 1973, and completed his internship and residency in urology at Rush Presbyterian-St. Luke's Medical Center.

Dr. Pessis is a practicing urologist with Affiliated Urologists, Ltd. and at Rush Presbyterian-St. Luke's Medical Center, where he is also a professor and associate chair of the department of urology.

Amy teaches 7th grade in the special education department at Elm Place Middle School in Highland Park. Dennis and Amy have four children, three of whom are also Illinois alums. They are also proud grandparents.

SIB Enhancement Awards for 2005-06

made possible through the generous gifts of alumni and friends to the SIB Annual Fund

Emily Kluger, doctoral student in Entomology—tuition for class at the Organization for Tropical Studies, Costa Rica

Carolina Calviño, visting scholar in Plant Biology—to present "Major clades within Apiaceae subfamilies Saniculoideae and basal Apioideae: implications for evolution of the woody habit" at the International Botanical Congress and "Relationships within Apiaceae subfamilies Saniculoideae and Apioideae based on phylogenetic analyses of cpDNA rps16 intron sequences" at the Apiales V Symposium, Vienna, Austria.

Victoria Wittig, doctoral student in Plant Biology—to present "A meta-analysis of tropospheric ozone and the biomass accumulation of trees" at the 90th Annual Meeting of the Ecological Society of America in Montreal, Quebec.

Ingrid Hogge, undergraduate student in Integrative Biology—tuition and travel to participate in the Organization for Tropical Studies' study abroad program in Africa.

Lisa Knolhoff, doctoral student in Entomology—registration fee to attend W.M. Keck Center workshop on microarrays. Will be using microarray analysis to study rotation resistance in the western corn rootworm.

Below-ground diversity may control above-ground diversity in tropical forests

Tropical rain forests are the most complex, species-rich ecosystems on earth. How is such high diversity maintained? A large body of evidence suggests competition for limiting resources allows species to coexist. Species evolve different strategies to compete for light, water, and nutrients. These differences in competitive abilities, along with spatial variation in resource availability, make it difficult to predict when, where, and how a species will out-compete others.

Daniel Janzen and Joseph Connell hypothesized 35 years ago that diversity may also be maintained through population regulation of species by their host-specific pests and pathogens. While spatial patterns of negative density-dependent mortality have been detected, the identities of the "pests and pathogens" have been largely unexamined.

By combining experiments measuring seed demography in the field with molecular tools to identify fungi associated with live and dead seeds, doctoral student **Rachel E. Gallery** and **James W. Dalling**, assistant professor of Plant Biology, are identifying fungal seed pathogens in the lowland tropical forest at Barro Colorado Island, Panamá. Their goal is to determine the role that fungal pathogens play in limiting recruitment and establishment of tropical trees. When pathogens limit a species from establishing in a certain place, other species are better able to successfully colonize that area. So, if pathogens show preferences for certain species and are patchily distributed in soil, they may be partially responsible for maintaining biodiversity in tropical forests.

Gallery

Focusing on the genus *Cecropia*, which represents an ecologically important guild of species that rely on seed banks for recruitment into tree fall gaps, Gallery and Dalling examined fresh seeds for evidence of fungal infection, buried seeds for 5 months in common gardens in the forest, and subsequently measured seed survival and fungal infection of inviable seeds.

In collaboration with A. Elizabeth Arnold at the University of Arizona, they sequenced the internal transcribed spacer (ITS) regions of fungi cultured from seeds and extracted DNA from finely ground seeds to include fungi that do not emerge in culture. Their database currently includes 800 successfully sequenced fungi.

These results, published in a special issue of *Ecology* highlighting tropical microbial communities (2006), reveal differences in seed survival among species that correlate with high fungal diversity and fine-scale spatial heterogeneity of seed-infecting fungal communities. Further, they indicate the potential for host-specificity of seed-infecting fungi, which could contribute to the maintenance of diversity by preventing the establishment of certain species in a given area.

This project is funded by the National Science Foundation, Smithsonian Tropical Research Institute, and Illinois' Program in Ecology and Evolutionary Biology.

students

'Desperate Housewives' in the avian world


Cavey

Writers of the popular television program "Desperate Housewives" could borrow some plot twists from the familiar American robin (*Turdus migratorius*), a bird that is providing Illinois researchers with some unique insight into the complexity of avian mating behavior.

Using a combination of behavioral observations and genetic paternity analyses, doctoral student **Karen M. Cavey** and **Patrick J. Weatherhead**, professor of Animal Biology, are using robins to investigate how behavioral interactions between males and females influence levels of extra-pair mating.

Recent molecular work has shown that most bird species engage in extra-pair mating behavior. Robins appear to be one of the most promiscuous species, with almost two-thirds of all females producing at least one offspring sired by a male other than her mate.

For the males that are cuckolded, the loss of paternity is expensive in the competition to leave the most descendants. One way for males to prevent cuckoldry is to guard their mate by remaining close to them during their fertile period.

Robins are unusual, however, because by having multiple, overlapping broods in a single breeding season, it is difficult for males to guard their mates as they start second nests—the males are still busy caring for young from the first nests.

So are males more likely to be cuckolded in later nests? "Actually, no," said Cavey. "For robins, the opportunity for males to mate guard does not appear to influence patterns of paternity allocation."

Cavey and Weatherhead hypothesized that females may alter their propensity to copulate with other males depending on whether their mates are good providers at the first nest. "If females see that their mates are good fathers early in the season, they may be less likely to 'cheat' later in the season, suggesting that females adjust their mating strategy based on an assessment of male parental quality." This hypothesis challenges the idea that it is predominately male behavior that determines which male sires the young in a nest.

The next step was to manipulate males into being poor providers and see how females responded to their low quality. If the hypothesis is correct, then these poor quality males will suffer from high levels of cuckoldry. However this experiment turns out, the sex life of robins is proving to be just as intriguing as that of humans as portrayed on television.

Funding for this project was provided by Illinois' Program in Ecology and Evolutionary Biology, the American Ornithologists' Union, the Animal Behavior Society, and the American Museum of Natural History.

2005 Students Awards

Undergraduate Student Award

Integrative Biology Distinction Award—Daniel M. Person

Graduate Student Awards

Robert Emerson Memorial Grant—Kevin C. Rowe

Procter and Gamble Company Doctoral Student Research Award—Lynn L. Anderson

Francis M. and Harlie M. Clark Summer Grant—Eloisa Lasso

Francis M. and Harlie M. Clark Research Support Grant—Lynn L. Anderson, Tiffany S. Bone, Karen M. Cavey, Carrie E. DeJaco, Mary Ann E. Feist, Paul D. Henne, Josephine J. Rodriguez, Elizabeth A. Ruedi, Eli R. Saetnan, Christopher R. Smith, Daniela M. Takiya, James N. Zahniser

John G. and Evelyn Hartman Heiligenstein Outstanding Teaching Assistants:
Integrative Biology 150/151—Elizabeth A. Ruedi
Integrative Biology 201—S. Casey Funderburk
Integrative Biology 202—Catherine E. Bermudez
Integrative Biology 203—Eli R. Saetnan

Edwin M. Banks Memorial Award—Amy L. Toth

Herbert Holdsworth Ross Memorial Fund Award—Jonathan C. Banks, Mary Ann E. Feist, Mathys J. Meyer, Daniela M. Takiya, James N. Zahniser

Philip W. Smith Memorial Fund Award—Molly B. McNicoll

Ellis MacLeod/DuPont Award for Outstanding Teaching by a Graduate Student in the Department of Entomology—Terry L. Harrison

Harold C. and Sonja L. Labinsky Award—Lynn L. Anderson, Orla C. Dermody

John R. Laughnan Award—Tiffany S. Bone, Carolina Calviño

Award for Outstanding Teaching in Plant Biology—Clark A. Danderson, Huzefa A. Raja

Program in Ecology and Evolutionary Biology Summer Research Grant—Michael R. Allen, Kelly M. Andersen, Carrie E. DeJaco, Paul D. Henne, Eloisa Lasso, J. Dylan Maddox, David M. Nelson, Christine M. Payne, Elizabeth A. Ruedi, Christopher R. Smith, Sigrid D.P. Smith

Program in Ecology and Evolutionary Biology Travel Grant—Michael R. Allen, Traci L. Barkley, Brandon L. Barthel, Gerardo L.F. Carfagno, Karen M. Cavey, Charles P. Chen, Carrie E. DeJaco, Orla C. Dermody, Eloisa Lasso, J. Dylan Maddox, Ann M. Readel, Elizabeth A. Ruedi, Scott R. Schlossberg

Program in Ecology and Evolutionary Biology Symposium Awards:
Best Overall Presentation—Paul D. Henne
Best Doctoral Presentation—Gerardo L.F. Carfagno
Best Master's Presentation—David H. Zimmermann

Bridget O'Neill, doctoral student in Entomology, received the President's Prize for the Student Poster Competition (Section Cd. Behavior and Ecology) at the Entomological Society of America meetings in Salt Lake City, UT, November 2005.

Emerson Lacey, doctoral student in Entomology, received the Normand R. DuBois Memorial Scholarship at the Entomological Society of America meetings in Salt Lake City, UT, November 2005. The award, sponsored by Valent Biosciences Corporation, "encourages research by graduate students directed toward biologically-based technologies to protect and preserve forests in an environmentally acceptable manner." His research involves the chemical ecology and behavior of longhorned beetles.

Eli Saetnan, doctoral student in Ecology and Evolutionary Biology, received a Graduate College Dissertation Travel Grant in 2005.

Charles Kurlikus, an undergraduate majoring in Integrative Biology, received a 2005-2006 Avery Brundage Scholarship. These scholarships are awarded to individuals "who are both gifted students and exceptional athletes, for their combined physical and mental development." He competes in track and field.

Paul Henne, doctoral student in Ecology and Evolutionary Biology, was awarded a Dissertation Completion Fellowship for the 2005-06 academic year by the Graduate College. This fellowship, one of only 13 awarded on campus, allows him to devote full time to his dissertation.

Kevin Rowe, who graduated in May 2005 with a Ph.D. in Animal Biology, received the Elmer C. Birney Award at the American Society of Mammalogists meeting for his paper "Surviving the ice: northern refugia and post-glacial colonization." He was also invited to a workshop on phylogeographic approaches to paleoecology at the 2005 Ecological Society of America meeting in Montreal, Quebec.

alumni updates

Keep in touch. Please let us know about your news, achievements, honors, career, etc. Also, include your degree, department or program, and year. Mail your news to Alumni News, School of Integrative Biology, University of Illinois, 286 Morrill Hall, 505 S. Goodwin Ave., Urbana, IL 61801; fax it to 217/ 244-1224; or email jwaite@life.uiuc.edu. We look forward to hearing from you.

Mark Lackner (B.S. Honors Biology 1989, M.S. Biology/EEE 1991) earned a Ph.D. in developmental biology from Stanford University in 1997. After a postdoctoral position at the University of California-Berkeley, he is a research scientist at Genentech. His lab focuses on identifying predictive biomarkers for targeted oncology therapeutics. Mark lives in the San Francisco Bay Area with his wife, Elaine, and son, Ethan.

Sam Volchenboum (B.S. Honors Biology and Biochemistry 1991) finished his fellowship in pediatric hematology/oncology at Boston Children's Hospital and the Dana-Farber Cancer Institute in 2005. He is now on staff at Dana-Farber, an attending physican at the Children's Hospital, and an instructor at Harvard Medical School. Sam lives in Dedham, MA, with his wife Julie (Spengler) and their four children. His email address is sam@bostonhemeonc.org.

The University of Illinois' Urbana-Champaign campus is one of the nation's top 10 "best values" among America's public colleges and universities, according to the 2006 analysis by Kiplinger's Personal Finance magazine.

The Urbana campus was ranked eighth best value in public higher education, and has consistently been ranked among the top 10 public institutions since Kiplinger's began conducting the surveys in 1998.

Deaths

Zane B. Carothers, emeritus professor of Plant Biology, died February 3, 2005. He was born in Philadelphia in 1924 and served in the U.S. Army Air Force from 1943 to 1946. Carothers earned B.S. and M.S. degrees from Temple University, and then a Ph.D. in Botany from the University of Michigan in 1958. He served as an instructor at the University of Kentucky from 1957 until 1959, and then joined the Illinois faculty. He retired and was granted emeritus status in 1991.

Carothers was a remarkable anatomist and electron microscopist, who developed an interest in the ultrastructure of bryophytes. He taught plant anatomy and general plant morphology, as well as introductory courses in botany. He was co-author of the 4th and 5th editions of *The Plant World*, which was widely used as a textbook in the 1960s and 1970s.

He is fondly remembered by his students as one who shared his passion for science in an unselfish manner. He opened his lab to all who showed an interest in his work and shared freely his techniques.

He is survived by his wife Diane. A Zane B. Carothers Memorial Fund has been established at the Montgomery Botanical Center in Coral Gables, Florida.

Richard F. Koehler, 52, died January 14, 2005. He graduated from Eisenhower High School, Blue Island, in 1970. H received his B.S. in Microbiology from the University of Illinois, his M.S. degree in Biochemistry from Eastern Illinois University, and his Ph.D. in Genetics and Development from Illinois.

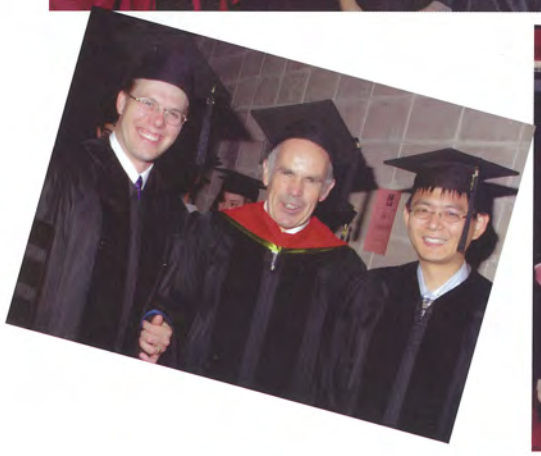
He taught for 3 years at the University of Illinois, at Millikin University for a year, and at St. Ambrose University, Davenport, IA, for the past 10 years.

He is survived by his wife, Gwendolyn, two sons, two daughters, and a grandchild.

commencement 2005

The inaugural convocation of the School of Integrative Biology was held May 14, 2005 in the Tyron Festival Theatre of Krannert Center for the Performing Arts.

Led by Fred Delcomyn, Director of the School, and Deanna Raineri,



Associate Dean of the College of Liberal Arts and Sciences, the faculty of the School proudly presented Doctor of Philosophy, Master of Science, and Bachelor of Science graduates to family and friends.

Photos courtesy of Heart of America/Chappell

in this issue

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