ECOLOGY & EVOLUTIONARY BIOLOGY

Explorations

eeb.bio.utk.edu

FALL 2016 NEWSLETTER

EEB Community Continues to Grow

It has been an exciting year in the Department of Ecology & Evolutionary Biology (EEB). Our department has grown on many fronts. First, we have recruited lots of great new people. I'd like to extend a warm welcome to the five new faculty who are joining us during the 2016-17 academic year: Associate Professor Nina Fefferman and Assistant Professors Jessica Budke, Kimberly Sheldon, Mona Papes, and Xingli Giam. Jessica Budke is also the new director of the Tennessee Herbarium (TENN), stepping in as Gene Wofford retires after 40 excellent years at the helm of TENN. Jim Drake has also retired after 29 years of service to the university. Enhancements to the greenhouse facilities at Hesler and Senter Halls also include a new management team. I welcome Jeff Martin who serves as the greenhouse manager with assistance from Benny Crain, our new lecturer.

The remarkable community of EEB scientists and scholars continues to shine and impress. Our faculty received university, regional, and international awards including Beth Schussler's UT Alumni Outstanding Teacher Award, Paul Armsworth's Cox Professorship, Susan Riechert's 2016 SEC Faculty Achievement Award, and the International Biogeographic Society Board's Alfred Russel Wallace Award to Dan Simberloff. Postdoc Mason Heberling received a highly competitive two-year NSF postdoctoral fellowship.

EEB grad and undergraduate students are amazing! One quarter of our 56 grad students are self-funded and were awarded over $300,000 in fellowship support last year alone. They published more than 80 papers in scientific journals, presented 50 talks and seminars at meetings, and shared their enthusiasm for science through outreach to the community. Jess Welch was one of six to receive the Ecological Society of America's Graduate Student Policy Award. EEB undergraduate alumna Kenna Rewcastle ('15) was awarded a Fulbright US Student Program Grant for 2016–17 to conduct research on climate change impacts on the reindeer herds' food sources managed by the Sami indigenous people of Sweden.

On the pages of this *Explorations* newsletter, you can learn more about the amazing achievements of our EEB students.

On a personal level, I have been delighted, charmed, and inspired by my colleagues in EEB and across the university and their culture of inclusion. I have enjoyed exploring the Scruffy City, the beautiful East Tennessee and Smoky Mountains landscape, and experiencing the glorious biodiversity showcased by the Spring Wildflower Pilgrimage. I can hardly believe I have only been at UT for one year!

Warm regards,
Susan Kalisz
Professor and Department Head

Pictured: Dominique Hatton (EEB), Mallory Ladd (Bredesen Center and Pipeline: Vols for Women Chair), Kate Purple (Biomedical and Diagnostic Sciences), Fatemeh Sepehr (Chemical Engineering), Christine Ajinjeru (Bredesen Center), and Susan Kalisz (EEB Department Head and Faculty Advisor of Pipeline: Vols for Women).

Working to Fix the Leaky Pipeline

A diverse group of graduate and undergraduate students are committed to enhancing the status and representation of women in science, technology, engineering, and math (STEM). Pipeline: Vols for Women in STEM, a committee of the Commission for Women, is named for the sociological term, "leaky pipeline," which refers to women having an early academic interest in STEM fields, yet fewer women than men end up obtaining STEM degrees or moving on to well-paying STEM careers.

Pipeline aims to help students develop their careers and provide them with access to a multidisciplinary mentoring program, professional and social networking events, a topical monthly lecture series, and opportunities for community outreach. Pipeline's new WiSTAR3 subcommittee (Women in STEM Advancing Research, Readiness, and Retention) provides professional development, support, and networking events for STEM faculty and graduate students.

The largest and most significant event organized by Pipeline is the annual Women in STEM Research Symposium, which uniquely spotlights academic research conducted by women.

This year, the UT Division of Student Life recognized the important work of Pipeline: Vols for Women in STEM and honored the group with two awards: New Organization of the Year and Innovative Program of the Year, for the research symposium.

Contributed by Alannie-Grace Grant, Kalisz Lab

what's inside:

Budke Excited to Expand Scope and Reach of UT Herbarium

"Plants are my passion," says Assistant ProfessorJessica Budke, whose research focus is on the development and evolution of mosses. As the new director of the UT Herbarium, she is proud to carry on the strong tradition of bryological research at UT, which began in 1934 with A. J. (Jack) Sharp.

The herbarium, UT's plant library, is one of the largest in the Southeast with over 600,000 specimens from across the state of Tennessee and beyond. This biodiversity collection serves as a resource for researchers studying global climate change, biological invasions, and species relationships.

"Our research abilities and the increasing usefulness of biodiversity collections for the study of our living planet will continue to expand as we look to the future," says Budke.

The herbarium is located in Temple Hall. Budke and her team are planning renovations to enhance the space and increase visiting researcher capacity. They are also expanding the herbarium team to include undergraduate students to participate in ongoing mounting and databasing projects. The continuing support of the L. R. Hesler Endowment, which annually funds a graduate student research assistantship in the herbarium, provides EEB graduate students with the opportunity to gain advanced training in biodiversity research and specimen curation. The assistantship prepares them to be the next wave of successful scientists. Additionally, Budke is expanding the herbarium team to include adult volunteers. Interested in contributing? Contact Jessica Budke at jbudke@utk.edu.

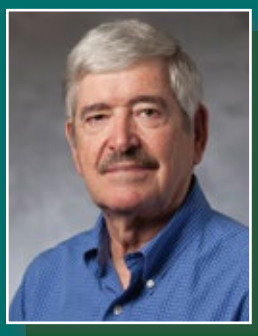
"I am excited to be joining an EEB department with a strong track record of botanical excellence," says Budke. "It is an energetic and stimulating time to be joining the department. I look forward to engaging in collaborative projects with other EEB members that increase our botanical knowledge within the state of Tennessee and beyond."

Stay in touch with the UT Herbarium!

- Facebook Page: **UTKHerbarium**
- Twitter: **@UTKHerbarium**
- Learn more about the herbarium online. **tenn.bio.utk.edu**

Alumni Spotlight

Field of Constructed Wetlands Born Because of Work by UT Alum



In 1972, UT was one of two universities offering a PhD in ecology. Curt Richardson (PhD '72) was the second person to ever graduate from UT with a PhD in ecology.

"No question UT put me on the path to a remarkable career," says Richardson, who was hired as assistant professor of ecology in the School of Natural Resources at the University of Michigan after completing his degree. During his time at the University of Michigan, he worked on one of the first major studies in the United States on the ecological and biogeochemical effects of waste water additions to wetlands at Houghton Lake.

"I am proud to say my research showed that wetlands cannot efficiently remove phosphorus from the water and that the natural wetland communities were greatly altered by the invasion of cattails," says Richardson, whose research stopped EPA from approving the use of natural wetlands for wastewater treatment. "Thus, the field of constructed wetlands was born."

Richardson accepted a position as head of the ecology program in the Duke School of Forestry and Environmental Studies, which later became the Nicholas School of the Environment at Duke University. In the 38 years since, Richardson has worn many hats from ecology program chairman to acting dean of the school.

"However," says Richardson, "my first love is teaching and research." As professor of resource ecology, he has mentored hundreds of students and founded the Duke University Wetland Center in 1989.

Throughout his career, he has directed research on some of the most important wetland and water issues of our time. He is the author or co-author of over 200 peer-reviewed papers, written several books, received numerous national awards, and has been listed in Who's Who in Science each year since 1989.

"These career achievements cannot outshine the real value of having the opportunity to work with great students and people over the past four decades."

We love to hear from our alumni ...

eeb.bio.utk.edu/news-events/alumni-news

Please share with us what is happening in your life using the Google Form link at the top of the webpage and your story may end up on our website, social media platforms, or in our newsletter!

Prepared for Life After Undergrad

For the past year, **Patrick Mckenzie**, a senior in the EEB program, worked in the Armsworth Lab on his undergraduate research project based on data collected throughout southern Appalachia by fellow and former lab members.

The data, which were collected from areas protected by The Nature Conservancy, includes information about individual trees across nine states. In his project, Mckenzie tests whether the elevation range within a given site does a good job of explaining tree diversity within that site.

He's received lots of feedback and support for the project and credits faculty within EEB for helping prepare him for life after undergrad.

"I hope to attend graduate school after I get my degree, and the personal attention from professors within the department has helped guide the early stages of my application process," says Mckenzie. "The connections I've made and the research I've done as an undergrad in EEB have helped me approach graduate school confidently and to feel like part of the broader EEB community."

In May, Mckenzie received the EEB Undergraduate Award for Professional Promise at the annual departmental awards ceremony. He also received an honorable mention in the national Goldwater Scholarship program, which is the most prestigious undergraduate scholarship in the natural sciences, mathematics, and engineering in America.

"Patrick is as good as any undergraduate that I have encountered in the EEB major program to date," says Paul Armsworth, professor and director of the Armsworth Lab. "He is right up there with our very, very best."

Geckos, Salamanders, and Salmonella Research

Jacob Wessels, an undergraduate in EEB working in the Fitzpatrick Lab, is focused on the population ecology of the nonnative Mediterranean geckos, which have established populations throughout much of the southern United States.

Recently, a population was discovered in Knoxville. Wessels and a fellow student observed the population size and trend and monitored it to see if they would survive the winter. Using pattern recognition software and the unique dorsal patterns of individual geckos, Wessels established an encounter history. The geckos survived the winter and successfully reproduced, and the model results indicate the population size likely increased.

"During my time at UT, I was fortunate to have opportunities to take part in many other research projects on topics such as salmonella in wildlife around an urban creek, physiology of tiger salamanders, and cave bioinventories, as well as opportunities through the Naturalist Club," says Wessels, who received the EEB Outstanding Undergraduate Award at the department awards ceremony in May. "In the future, I hope to gain a variety of field experience and to later attend graduate school."

Simplifying Ecological Complexity

Every day, biologists face the challenge of interpreting the patterns and processes of highly complex systems such as genomes, trait complexes, or communities. **Zachary Marion**, a graduate student in the Fitzpatrick Lab, is tackling the question of how biologists can reduce the diversity and complexity of these systems in a meaningful and understandable way in his study system of North American fireflies.

"Most people are unaware that fireflies deter predators with a diverse, toxic cocktail of over 850 compounds," says Marion. "Much of the variation in toxin profiles can be explained by species identity and mate-signaling strategy."

Marion developed a novel and intuitive statistical framework to describe phenotypic diversity. He looked at the average chemical diversity within a mate-signaling strategy and the effective number of distinct chemical cocktails present within a species.

One genus of fireflies, for example, does not make toxins themselves. Called femmes fatales, *Photuris* fireflies mimic the flashes of other species. When suitors approach in hopes of mating, they are eaten and their chemical defenses are stolen.

Using the method described above, Marion learned that the average femme fatale possesses few compounds relative to other fireflies, but are quite different from one another, most likely due to random sampling of their prey.

Marion received several awards during the EEB awards ceremony this spring. In addition to the Fite Award, he received the Outstanding Publication by a Graduate Student award and the Thomas G. Hallam Appreciation Award, which is awarded by graduate students to an individual for outstanding contributions towards improvement of the graduate experience.

FACULTY NEWS & UPDATES

Wofford Leaves Behind True Legacy at UT

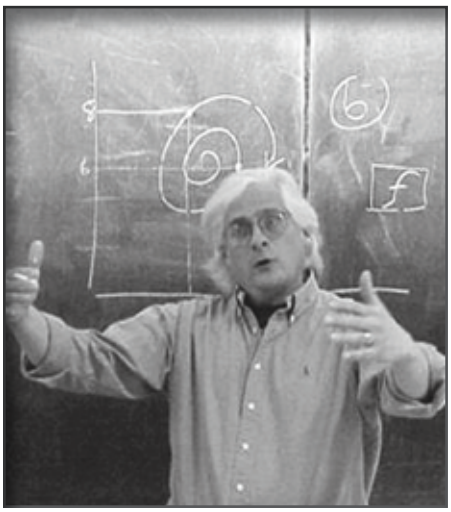
The cotyledons of a tulip tree (*Liriodendron tulipifera*) emerging from east Tennessee soil in 1970 would have by now produced an imposing tree, approaching a half century in age. Nineteen-seventy also would see a young PhD candidate from middle Tennessee arrive on the University of Tennessee campus and begin his studies in the botany department. This past summer that young graduate student, Research Associate Professor B. Eugene Wofford (Gene), stepped down as full time director of the University of Tennessee Herbarium, leaving a legacy as one of the most accomplished botanists to graduate, teach, and conduct his research through the UT Department of Botany, (now the Department of Ecology & Evolutionary Biology).

Few can retire knowing they left a true legacy, but one only has to look at all the UT graduates Wofford taught and mentored who now continue the legacy of Tennessee botany as professors, researchers, and environmental professionals throughout the greater Southeast to recognize his lasting legacy.

Wofford also leaves his mark through his leadership of the Spring Wildflower Pilgrimage, the Association of Southeastern Biologists, and the Southern Appalachian Botanical Society, which honored him with their most prestigious award, the Elizabeth Ann Bartholomew Award, in 2004.

Thank you, Gene Wofford, for your stewardship of Tennessee botany and the collections housed in the UT Herbarium.

Contributed by W. Michael Dennis (PhD Botany, '76)



Founding EEB Department Member Jim Drake Retires

Jim Drake, who recently retired from EEB, began his career as an assistant professor in the Department of Zoology and the ecology graduate program beginning in 1986 and was a founding member of the EEB department when it was formed in 1992.

Drake's interests centered on the assembly and structure of ecological communities. He helped organize the international program of the Scientific Committee on Problems of the Environment, which triggered the new field of invasion biology. Drake also edited the two highly influential books from that program: *Ecology of Biological Invasions of Hawaii and North America* (1986) and *Biological Invasions: A Global Perspective* (1989).

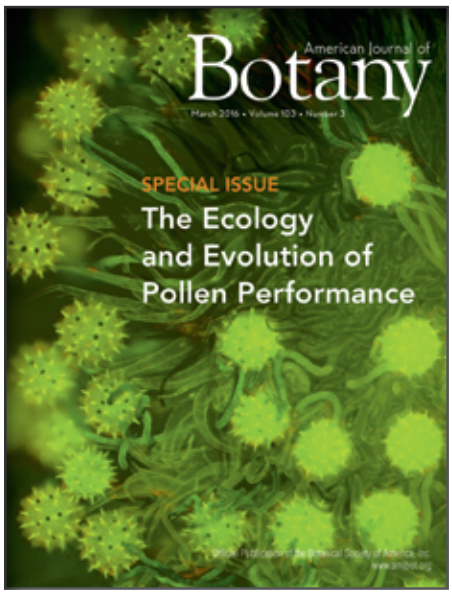
Professor Drake and his students performed many experiments on community assembly in aquatic systems. His research on theoretical aspects of community structure and assembly is well known and includes some of the pioneering work on emergent properties of complex ecological systems and on the relationship of food web topological complexity to stability.

Drake left a lasting imprint on EEB and on the fields of invasion biology and community ecology. The EEB students he guided are scattered among leading institutions worldwide and continue to make strong contributions in these fields.

Contributed by Gore Hunger Professor of Environmental Science Dan Simberloff

"Professor Drake could be one of the most interesting people I have ever met. The man is awesome and a dying breed of professors. He doesn't want you to just memorize facts. He wants you to think, to hypothesize, and to be a scientist."

- RateMyProfessor.com



Williams Explores the History of Plant Life Histories

As an undergraduate, Joe Williams became fascinated by the often bizarre ways plants have sex.

"Who would have thought that the Ginkgo tree shedding pollen in the back yard was actually sending out tiny plants inside its pollen grains?" says Williams, professor of plant evolutionary biology and chair of graduate affairs in EEB.

As a student, Williams realized the complexity of reproduction in flowering plants might cause evolution to happen faster.

"Pollen competes for access to eggs, and competition is much more intense in flowering plants than in other seed plants like the Ginkgo, because plants with flowers are so often insect-pollinated," says Williams. "Each insect visit brings a lot of pollen grains to a flower, which all start the race to the egg at the same time."

Williams has worked over the past 15 years reconstructing ancient aspects of pollen performance in flowering plants. Because scientists are unable to study pollen competitive ability in the fossil record, Williams focused on living proxies within ancient extant lineages of flowering plants.

"If I could choose one word to describe the performance of pollen from these species, it would be slow!" says Williams. Now, Williams is interested in the role of pollen in how the big winners in flowering plant evolution – weeds and annuals – evolved their exceptionally rapid life histories.

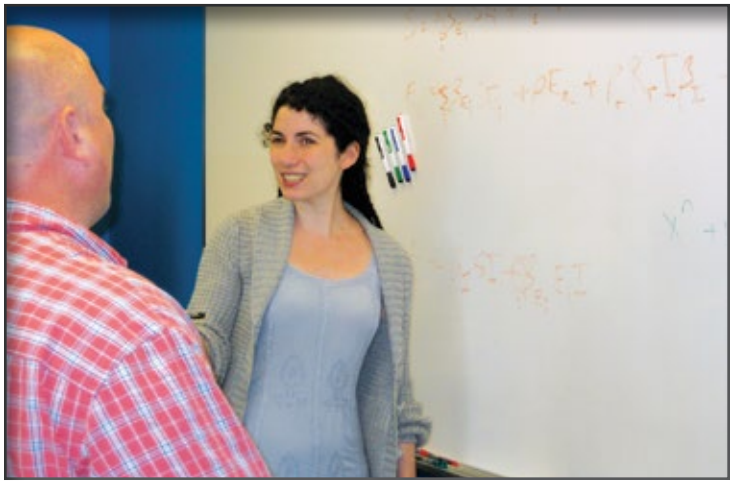
Dung Beetle Research Helps Predict Human Impacts on Ecological Communities

A desire to understand the patterns and processes that determine the distribution of species and to use this information to predict impacts of anthropogenic change on species and ecological communities is what motivates Kimberly Sheldon's research.

"I work primarily with dung beetles, a fascinating group that use dung as a food resource and for breeding purposes," says Sheldon, a new assistant professor in the department. "By integrating the fields of ecology, physiology, and evolution, I have shown that dung beetles in the tropics have a narrower range of temperatures they can handle compared to dung beetles in temperate areas, which makes the tropical species more vulnerable to temperature change."

Sheldon is excited to join the department because of the breadth and depth of research being conducted by EEB faculty and students and the opportunities for collaborative research. She has received a warm welcome from members of the EEB administration, as well as staff in the college and university. Additionally, she is impressed with the number of bright, highly motived undergraduate students in the EEB program.

"For an ecologist like myself, the Smokies offer exceptional biological diversity – including several species of dung beetle – close to home," says Sheldon. "I am also excited for football season and the energy it brings to campus! Go Vols!"



Investigating Evolution, Individual, and Group Behaviors

Fascinated with the idea that huge and complicated tasks can be accomplished by groups that could not individually observe or understand the broader goal, much less design it, Nina Fefferman, associate professor, developed her research focus on how evolution can shape individual behaviors that only work when performed as part of a group.

"I study what types of images can be created by letting jigsaw puzzle pieces run around and attach themselves whenever they find another piece that fits," says Fefferman, who recently joined EEB from a faculty position at Rutgers University.

Fefferman loves how many different aspects of nature and society are shaped by self-organizing, complex adaptive systems. In her research, she jumps from system to system, constantly learning new things with new, wonderful collaborators and students, while still being able to advance scientific understanding. With her lab collaborators, she has worked on everything from how to prepare for pandemics, to how real estate markets work, to how the evolution of bees can help design more secure internet systems.

"I'm really excited to be joining the department here in Knoxville," says Fefferman. "There are so many amazing colleagues exploring a wide diversity of research questions at the interface of EEB and mathematics. I'm going to love being able to share my excitement and exchange ideas about both math AND biology rather than having to choose only one half of my soul, depending on the company!"

DONOR PROFILE

Art and Science Working in Harmony in the Halls of Hesler

The halls of Hesler look more like an art museum than the plant biology section of a science building thanks to a generous donation from Michael A. Mouron in honor of his father, Alfred Mouron, a graduate of the UT engineering program ('41). But art and science work in harmony, reminding the next generation of botanists of the natural beauty of their subjects, even when they are working in the lab.

W. Graham Arader III facilitated the donation of dozens of fine, hand-colored engravings to the McClung Museum of Natural History and Culture. Some of the works are on loan to EEB so they can be displayed on the second and third floors of Hesler for all to view and appreciate. The collection includes works by Pierre-Joseph Redouté, Robert John Thornton, and Johann Wilhelm Weinmann. Most of the works depict an individual species, but some show small thematic groups of plants (e.g. American bog plants), and there is even a portrait of Carl Linnaeus, the father of modern taxonomy.

Other donations facilitated by Arader are installed in the Burchfiel Geography Building and Ayres Hall. Arader's mission is to bring the art and science of natural history illustration to the next generation.

AWARD SPOTLIGHT

Congrats to current EEB students and alumni on their awards!

Michael Van Nuland received a Doctoral Dissertation Improvement Grant from NSF for his project "How do plant genetics, soil microbes, and the environment determine plant and soil function across global change gradients?"

Rachel Wooliver won the 2016 Francis and Evelyn Clark Soil Biology Scholarship from the Soil Science Society of America for her work "Understanding plant responses to nitrogen deposition through coevolved interactions with soil fungi."

Ian Ware received a $5,000 grant from the Lewis and Clark Fund for Exploration and Field Research and a $9,500 Center for Tree Science Graduate Research Fellowship with the Morton Arboretum.

Rachel Fovargue received a 2016-2017 Yates Dissertation Fellowship, which provides recognition and financial support to outstanding doctoral students in any field of study at UT during the dissertation process.

Kim Bush ('73) was honored as a Distinguished Alumnus at the Alumni Board Awards dinner for his lifetime devotion to the advancement of global health.

Social Shout-Outs

You don't have to wait until the fall newsletter to find out what's going on in EEB.

Check out the news blog on our website at **eeb.bio.utk.edu/news-events.**

For Facebook, follow us at **facebook.com/EEBatUTK.**

If you prefer Twitter, we're **@UTK_EEB.**

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UT Alum Joins EEB as Greenhouse Manger

Earlier this year, **Jeff Martin** began as the new greenhouse and garden facility manager for EEB. A native of South Carolina, Jeff received his BS in horticulture from Clemson University and his MS in crop science from UT. His greenhouse experience ranges from ornamental propagation, organic vegetable production, and maintaining and expanding tropical plant collections.

The greenhouses, currently under renovation, help sustain UT as a renowned research institution by providing research opportunities and facilities for faculty and students. Greenhouses are a great place for students to observe and experiment with a wide range of plant families. The diverse collection in the EEB greenhouses reflects plants from tropical, temperate, and arid climates from around the planet. Donations also help to support the greenhouses and outdoor gardens.

Gift funds can be donated to the **Ken McFarland Fund** (greenhouses) and the **Walter Herndon Garden Fund** (outdoor gardens).

Supporting EEB

We have several departmental funds to support our vision of excellence in science education.

ECOLOGY AND EVOLUTIONARY BIOLOGY ENRICHMENT FUND

This is our primary fund and supports instructional and academic programs within the department, including:

- Undergraduate and graduate research
- Travel funds for students to participate in meetings and workshops
- Departmental activities in need of support

If you have specific philanthropic goals, you may wish to consider one of our other funds:

- **Mulholland Post-Doctoral Fellowship in Environmental Sciences**
- **Graduate Research in Ecology and Evolution Fund**
- **H. R. DeSelm Graduate Award Fund**
- **D. Etnier Ichthyology Collection Fund**
- **L. R. Hesler Herbarium Support Fund**
- **Field Botany Fund** *(also supports ecological field work)*

If you would like more information about any of these funds, or if you wish to support a fund not shown here, please contact the EEB office at 865-974-3065 or the College of Arts and Sciences at 865-974-2365. To mail a contribution to EEB, please make your check payable to The UT Foundation and indicate the fund to which you would like to contribute on the memo line.

Thank you for your support of ecology and evolutionary biology at UT!

Explorations
ECOLOGY AND EVOLUTIONARY BIOLOGY FALL NEWSLETTER