

Biology@Memphis

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Department of Biological Sciences

creating leaders in research, education and service

College of Arts & Sciences

THE UNIVERSITY OF
MEMPHIS
Dreamers. Thinkers. Doers.



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From the Communications Committee

Welcome to the Fall issue of Biology@Memphis, the Department of Biological Sciences Newsletter. In this issue we talk with Dr. Karyl Buddington, whose frequent trips between the Animal Facilities on campus lead her to establish the award-winning Tiger Initiative for Gardens in Urban Settings (TIGUrS). We also visit with Dr. Randall Bayer, Department Chair and botanist since childhood. Graduate alumna Dr. Diana Outlaw returns to the Department to discuss her research on the evolution of malaria while Ph.D. candidates Christian Vlauten

and Lyndsay Saunders talk about their travels. Our faculty were presenting invited talks at national and international meetings, mentoring high school students and providing service to journals and granting agencies. Our graduate students continue to win awards, receive fellowships to support their work, travel to present their research at national meetings and defend their graduate theses and dissertation. Remember, you can keep up with the Department by following us on [Facebook](#) and let us know what you're doing by emailing your news to us at bionews@memphis.edu.

IN FOCUS: Tiger Initiative for Gardens in Urban Settings (TIGUrS)

Winner of the [Governor's Environmental Stewardship Award for Excellence in Environmental Education and Outreach \(Schools\)](#), TIGUrS serves as a model for responsible, affordable, and sustainable environmental stewardship



The Tiger Initiative for Gardening in Urban Settings (TIGUrS) is the brain child of Dr. Karyl Buddington, Director of the University of Memphis Animal Facilities and Associate Professor of Biological Science. In her capacity as the University of Memphis veterinarian, Dr. Buddington oversees two animal care facilities on opposite sides of the campus and spends part of each day traveling between the two. During these trips, she often saw grounds keepers rotating flowers in and out of bed around the campus. In 2009, when President Raines asked for proposals for Green Projects on campus, Dr. Buddington, in conjunction with Landscaping, Campus Planning, Biological Sciences and Health and Sports Sciences, submitted a proposal that would utilize campus gardens for food rather than for the flowers that were removed every season. The proposal was funded and the area just east of Elma Roane Fieldhouse was identified as the Oasis garden site. With the assistance of Landscaping, Physical Plant, and a dedicated group of undergraduate and graduate student gardeners directed by Art Johnson, Garden Coordinator, the garden was planned, built, seeded and tended starting in 2009. The garden is now maintained by five undergraduates, Kenny Latta, a graduate student in Anthropology, Art Johnson and a host of volunteers. It also boasts a gardening shed and golf cart for moving garden produce, people and sundries from place to place



Dr. Karyl Buddington

The garden provides a number of opportunities to the campus and the surrounding community. First, there's nothing like eating fresh all-organic produce, including peas (Lincoln and sugar snap), tomatoes (roma and wine pink), peppers, (jalepino, sweet banana, and salsa), eggplants (fairy tale and black beauty), squash (summer, zucchini, crookneck), basil (cinnamon, purple ruffle, and boxwood), mint (chocolate, spearmint, and apple), carrots, radishes, and much, much more. Faculty, staff, and students can visit the garden at any time to pick vegetables that are in season. While you might think people take more than they need, most visitors pick only what they can use. Second, it's a great teaching tool. Students from area schools are learning that their veggies are coming from gardens not the grocery stores. In addition, Earth Day celebrations were held there in April. Last year the staff planted an historical Native American garden where "Three Sisters" (corn, peas and beans) were planted on the same mound of dirt with the cornstalks serving as supports for the peas and beans. When the plants were removed, fish were placed in the mound to fertilize for the next year. In addition, people can gather ideas for planting a garden in a small place. Third, the presence of flowers, benches and a solar-powered water fountain make it a place where people can sit and relax for a few minutes (or longer) during a busy day. And finally, you chance upon people you would otherwise never meet. Dr. Buddington was in the garden one day when two women here for a volleyball tourna-



Peering under the Turi tunnel, a structural experiment in the TIGUrS Garden.



Pictured left to right: The Oasis in early fall, Brandywine pink heirloom tomatoes and seating for stress reduction.

ment stopped to asked her about the garden because they had never seen anything like it on an urban college campus.

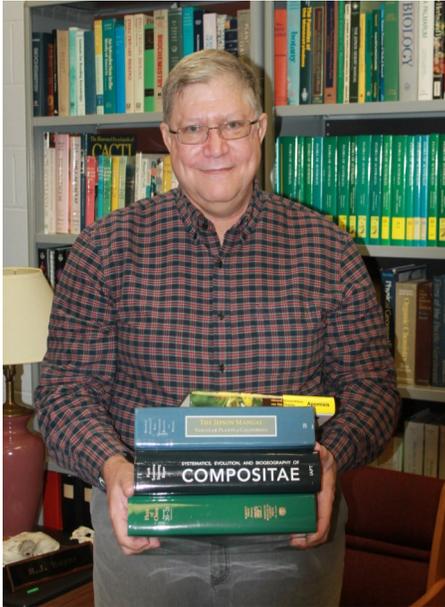
The garden project was started as a sustainability initiative to get students more involved with growing their own food. Several harvest days are held each year, and faculty, staff and students can visit the garden at any time to pick vegetables that are in season. The garden sites around campus include: **Urban Oasis**, on the south side of the Elma Roane Fieldhouse between the Zach Curlin parking garage and the track, **Clement garden**, behind Clement Hall on the northwest side of the building in a concrete raised bed, **Victory garden**, on the southwest corner of Jones Hall, surrounded by a short white-picket fence, **Physical Plant garden**, inside the fence on the west side of the Ray L. Herzog Building (access available during business hours only) and the **Wilder Tower garden**, with crops within the landscaping surrounding the clock on the east side of John S. Wilder Tower.

It was late October when we talked with Dr. Buddington. The summer crops were finished, the sweet potatoes had been dug several weeks earlier and the remaining plant material had been turned into the soil to provide fertilizer for next year. Winter crops have been planted in some beds; radishes and greens in some, nitrogen-fixing winter wheat, peas and red and white clover in others. Planning what will be planted in the beds begins six months in advance and suggestions are always welcome – so are contributions of seeds and seedlings. When asked how many people use the gardens, Dr. Buddington replied “100s”. When asked how much produce is harvested she said “We have no idea”.

For more information Tiger Initiative for Gardens in Urban Settings visit the visit the garden's [facebook page](#) or contact [Dr. Buddington](#) . To read about the Governor's Environmental Stewardship Awards visit <http://news.tn.gov/node/9119>



FACULTY FOCUS: *Dr. Randall Bayer has turned his love of plants into a career in research and education in three countries on two continents.*



Pictured: Dr. Randall Bayer with several of his recent textbook contributions.

As the last bits of color from the fall foliage brighten up the University of Memphis campus, it seemed an opportune time to talk with Dr. Randall Bayer, Professor and Chair of the Department of Biological Sciences and life-long plant lover. He began his career in botany by starting seedlings in the the family greenhouse that he and his father later used in their vegetable gardens in East Aurora, NY. When it came time to pick a major in college there was no question – botany. And not just any aspect of botany, he decided to major in plant breeding. He attended Cornell University, one of the few universities in the United States that offered such a program. In his senior year, he became interested in plant taxonomy as a means for identifying wild relatives of cultivated plants -- wild relatives which might then be used to produce hybrids more resistant to disease, more tolerant of drought, or with larger or more flavorful fruits. After finishing his Bachelor's degree, he obtained a Master's and Ph.D. in Systematic Botany at Ohio State University, then moved north of the border to begin his academic career at University of Windsor, Windsor, Ontario, Canada. In addition to his position as an Assistant Professor of Biology, he served as Curator of the Benedict Herbarium. After a move to Edmonton, Alberta, he was promoted to Associate, and later Professor of Botany and Curator of the Vascular Plant Herbarium. He relocated to Canberra, Australia in 1997 where he became a Senior Principal Research Scientist with the Commonwealth Scientific and Industrial Research Organisation (CSIRO; Australia's national science agency) Division of Plant Industry working at the Australian National Herbarium (CANB). Dr. Bayer returned to the United States in 2007 to become Professor and Chair of the Department of Biological Sciences.

While at the University of Alberta Dr. Bayer began evolutionary studies in members of the sunflower family *Antennaria* (Asteraceae) and contributed taxonomic revisions of this genus to a number of North American floras (Bayer, R.J. and G.L. Stebbins. 1982. *A revised classification of Antennaria (Asteraceae: Inuleae) of the eastern United States*. Syst. Bot. 7: 300-313). In the course of his studies in *Antennaria*, he paid special attention to their characteristics of polyploidy and apomixis (a type of asexual reproduction). Apomictic plants are genetically identical to one another (i.e. clones) and give scientists a potential tool for producing hybrids that will yield generations of genetically identical plants. In addition, introducing apomictic genes into sexually reproducing food crops like corn results in hybrids that retain their hybrid vigor indefinitely. Dr. Bayer indicates that while apomictic plants are potentially genetic "dead ends", *Antennaria* are able to switch back and forth between asexual and sexual reproduction with sexual reproduction allowing for the production of new asexual clones. His work was directed towards identifying asexually and sexually reproducing individuals and determining if their mechanisms of reproduction are fixed or environmentally determined.

After his move to CSIRO, Dr. Bayer began his work on the taxonomy and molecular phylogeny of the *Aurantioideae*, the technical term for flowering plants in the citrus subfamily in the family *Rutaceae*. The flowers of citrus trees have 5 white petals, numerous stamens and are often strongly scented. The fruit has a leathery rind, a white pith, and segments containing the juice vesicles which produce a product of great economic importance, citrus fruit juice. While citrus is believed to have originated in Southeast Asia, no one has actually identified wild citrus. One possibility is



Citrus limonum Risso

One possibility is the pomelo which is still found in the wild in Southeast Asia. In addition, many species, including oranges, grapefruits, lemons, and limes are actually hybrids; thus planting the seed of a lemon will not produce a lemon tree like the original parent plant. Efforts to develop new varieties of citrus require an understanding of “who is related to whom” as more related citrus are easier to cross. Dr. Bayer reasoned that analyzing the genetic markers of hybrid citrus would help determine the wild parents and assist in process of developing new citrus. His research led to a paper describing the molecular phylogeny of the orange subfamily of citrus ([American Journal of Botany 96:668, 2009](#)). Most citrus are grafted onto root stock in order to propagate fruits that might otherwise not breed true from seed. Since the rootstock can influence the graft (scion), Dr. Bayer’s current research involves identifying new root stock for citrus production that will enhance fruit production, disease resistance, and drought tolerance. He also continues looking at the evolutionary consequences of sexual vs. asexual reproduction in *Antennaria*.



Buddha's Hand citron (Citrus medica); a weird cultivar grown exclusively for its unusual fruit, a

To learn more about citrus and his work on the evolution of polyploidy and apomixis in *Antennaria*, Dr. Bayer suggests the following:

- Bayer, R.J., K. Ritland and B.G. Purdy. 1990. Evidence of partial apomixis in *Antennaria media* (Asteraceae: Inuleae) detected by the segregation of genetic markers. *Amer. J. Bot.* 77:1078-1083.
- Bayer, R.J., D.E. Soltis, and P.S. Soltis. 1996. Phylogenetic inferences in *Antennaria* (Asteraceae: Inuleae: Gnaphaliinae) based on sequences from the nuclear ribosomal DNA internal transcribed spacers (ITS). *Amer. J. Bot.* 83: 516-527.
- Bayer, R.J. 1997. *Antennaria rosea* (Asteraceae) - A model group for the study of the evolution of polyploid agamic complexes. *Opera Botanica* 132:53-65.
- Bayer, R. J. and G. T. Chandler. 2007. Evolution of polyploid agamic complexes: A case study using the Catipes group of *Antennaria*, including the *A. rosea* complex (Asteraceae: Gnaphalieae). In: Grossniklaus, U., Hörandl, E., Sharbel, T. & P. van Dijk (eds.) *Apomixis: Evolution, Mechanisms and Perspectives*. *Regnum Vegetabile* vol. 147. pgs. 317-336.
- Bayer, R. J., Mabberley, D. J., Morton, C., Miller, C., Sharma, I., Pfeil, B., Rich, S., Hitchcock, R. and S. Sykes. 2009. A molecular phylogeny of the orange subfamily (Rutaceae: Aurantioideae) using nine cpDNA sequences. *Amer. J. Bot.* 96(3): 668-685.
- Swingle, W. T. and P. C. Reece. 1967. The Botany of Citrus and its wild relatives of the Orange subfamily. In W. Reuther, H. J. Webber, and L. D. Batchelor, *The Citrus Industry*. Revised 2nd Ed., Vol. 1: History, World Distribution, Botany, and Varieties. Revised edition. University of California, Berkeley. Pgs. 190-430.



FACULTY NEWS: Awards, Invited Talks, Presentations, Service and Outreach, Post-doctoral Fellows

Grants

Drs. Thomas Sutter and **Carrie Hayes Sutter** received a grant from General Electric to support *Mechanism of Human Skin Responses to PCBs*, a study designed to understand the mechanistic basis for the lower sensitivity of human skin to polychlorinated biphenol 126 (PCB126) in comparison to 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD).

Dr. Thomas Sutter, Director of the W. Harry Feinstone Center for Genomic Research received a grant from the [Memphis Research Consortium](#) to support Next Generation Sequencing. Next Gen sequencing enables rapid high throughput sequencing of large stretches of DNA base pairs spanning entire genomes. The latest technology and instrumentation is capable of producing gigabases of data in a single sequencing run.

Awards

Dr. Duane McKenna, Assistant Professor of Biological Sciences, has been named an associate editor for the [European Journal of Entomology](#). The European Journal of Entomology was founded in 1904 as *Acta Societatis Entomologicae Bohemiae* a journal of the Czech Entomological Society and is today a well-established international journal covering general, experimental, systematic and applied entomology. Dr. McKenna also accepted an invitation to join the editorial board/panel of the internet journal [Zookeys](#), "a peer-reviewed, open-access, online and print, rapidly produced journal launched to support free exchange of ideas and information in systematic zoology, phylogeny and biogeography."

Dr. Stanley "Ed" Stevens Director, Edward J. Meehan Biological Station was inducted in the M Club Hall of Fame on October 19, 2012. The M Club is an organization of, by, and for former student-athletes who earned a letter in their sport. He was also honored with the Ralph Hatley Silver M Award which is given "For Outstanding Service to the University of Memphis Athletic Department". Dr. Stevens, who received his BA and MA in Microbiology and a Ph.D. in Botany at the University of Texas-Austin, was a visiting scientist at Los Alamos National Laboratory and a faculty member and Associate Director of the Biotechnology Institute at The Pennsylvania State University. In 1988, he was appointed to the Chair of Excellence in Molecular Biology at the University of Memphis (then Memphis State University). He has chaired two departments,



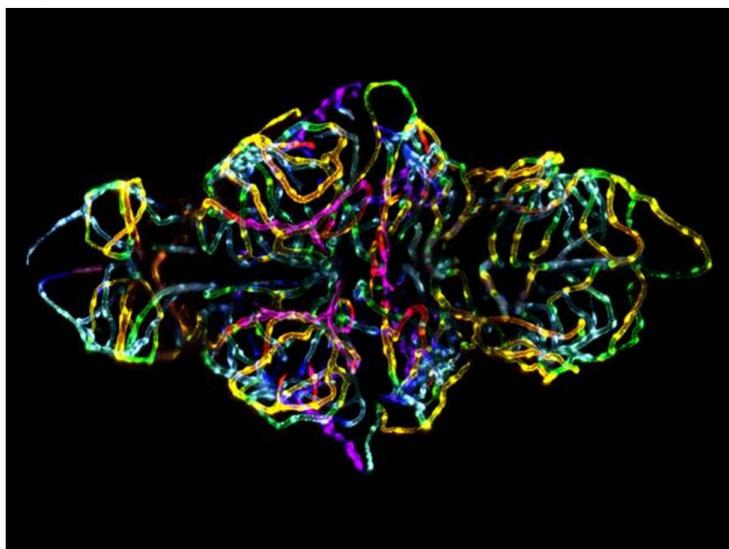
Pictured: Dr. Stanley "Ed" Stevens (center) with Athletic Director Tom Bowen (left) and Dwight Boyd, M Club Director.

and has served as President of the University of Memphis Faculty Senate and as a member of The Tennessee Board of Regents. He is currently the Faculty Athletic Representative (FAR) to the Athletic Department and serves as the President's representative to the Athletics Department, the Conference, and the NCAA. FARs also serve an oversight function in the academic success of student-athletes, student-athlete well-being and development, compliance with University, conference, and NCAA rules.



FACULTY NEWS: *continued*

Dr. Charles Lessman, who works on zebrafish, took a recent sabbatical leave in the lab of **Dr. Michael Taylor**, Adjunct Professor of Biological Sciences and Assistant Member, Chemical Biology & Therapeutics at St. Jude Children's Research Hospital. Dr. Taylor and his colleague Dr. Jennifer Peters won 1st Place in the 2012 Nikon Small World Photomicrography Competition for imaging the blood-brain barrier of live larval zebrafish. Dr. Taylor indicated that "We used fluorescent proteins to look at the brain endothelial cells and watched the blood-brain barrier develop in real-time. We then took a three-dimensional snapshot under a confocal microscope, stacked the images, and compressed them into one, pseudo-coloring them in rainbow to illustrate depth."



The blood-brain barrier in a live zebrafish embryo (20x)

Invited Talks

Dr. Omar Skalli, Director of the Integrated Microscopy Center gave an invited presentation at the GORDON RESEARCH CONFERENCE ON INTERMEDIATE FILAMENTS, June 17-22, 2012 at Bates College in Lewiston, ME. His talk was entitled *Cytoskeletal and Nucleoskeletal Filaments in Normal and Diseased Cells*.

Dr. Duane McKenna attended the INTERNATIONAL CONGRESS OF ENTOMOLOGY (held every 4 years) in Daegu, South Korea from August 18-26, funded by a competitively-awarded travel grant from the Entomological Society of America. At the meeting he presented five invited talks, including *Phylogenetics of Weevils (superfamily Curculionoidea)* and *Reconstructing the beetle tree of life* in the Symposium on the Phylogeny and Evolution of the Coleoptera, *Timing the diversification of beetles* at the Symposium on Dates and Rates: diversification and dating methods and their applica-

tions to entomology. *Whole genomes help resolve the subordinal phylogeny of beetles* at The Phylogenomics and the Evolution of Insects Symposium, *Phylogeny and Evolution of Chrysomeloidea (leaf beetles and long-horned beetles)* at the Symposium on Biology of Chrysomelidae. He also co-authored two contributed talks; *The Phylogeny of Tenebrionoidea (Cucujiformia) inferred from molecular data* and *The phylogeny of the holometabolous insect orders inferred from transcriptomic, genomic, and morphological data* at the Symposium on Phylogeny and Evolution of the Coleoptera.

Dr. Stephan Schoech traveled to the University of South Florida in March 2012 to present *Stress, personality, and life history: Corticosterone and behavioral phenotype in Florida scrub-jays* to the labs of L.B. Martin and J.R. Rohr and in April 2012 presented *Stress, personality, and life history: Corticosterone and behavioral phenotype in Florida scrub-jays* to the Department of Neurobiology and Behavior and Cornell Laboratory of Ornithology at Cornell University. He also gave an invited oral presentation entitled *Stress, personality, and success: Intriguing links between corticosterone and behavioral phenotype in Florida scrub-jays* to the Symposium on Glucocorticoids and Fitness at the 10th INTERNATIONAL SYMPOSIUM ON AVIAN ENDOCRINOLOGY, Gifu, Japan, June 2012. In October 2012, Dr. Schoech presented *Physiological and behavioral phenotypes in Florida scrub-jays: underlying causes and long-term implications* to the Department of Biological Sciences, University of Memphis.

Dr. Thomas Sutter, Director of the W. Harry Feinstone Center for Genomic Research presented *EGF Receptor Regulation of Epidermal Barrier Function* to the Department of Pharmaceutical Sciences at St. Jude Children's Research Hospital in March 2012 and presented *Integrated Omic Approaches Identify the Mechanism by which Dioxin Accelerates Keratinocyte Differentiation* in the Bortree Lectures Series at Penn State University, Department of Veterinary and Biomedical Sciences, Center for Molecular Toxicology in April 2012. Dr. Sutter traveled to North Carolina in May 2012 to present *EGF Receptor Regulation of Epidermal Barrier Function* at the SOCIETY OF INVESTIGATIVE DERMATOLOGY. He also presented a seminar entitled *Integrated Omic Approaches Identify the Mechanism by which Dioxin Accelerates Keratinocyte Differentiation* at Johns Hopkins School of Public Health Department of Environmental Sciences in July 2012 and traveled to Cairns, Australia to present the invited talk *Integrated Omic Approaches Identify the Mechanism by which Dioxin*

FACULTY NEWS: *continued*

Affects Keratinocyte Differentiation at the Session on Mechanisms and Pathways of Toxicity at DIOXIN 2012.

Meetings and Presentations

Dr. Charles Biggers attended the HUMAN ANATOMY AND PHYSIOLOGY SOCIETY (HAPS) conference at the University of Tulsa in May of 2012.

Dr. Stephan Schoech chaired a session entitled Breeding Biology and attended the Mentor-student lunch at the NORTH AMERICAN ORNITHOLOGICAL CONFERENCE in August 2012.

Dr. Andrew Liu took his lab to the 13th Biennial Meeting of the SOCIETY FOR RESEARCH ON BIOLOGICAL RHYTHMS, held at Destin, Florida, during May 19-23, 2012.



The Liu lab attends SRBR in Destin, FL. Pictured (left-right) Chidambaram Ramanathan, Andrew Liu, Nimish Kathale and Sanjoy Khan

Outreach and Service



Pictured: CRESH participants Chloe Skalli (left) and Monika Jain (right). photo by O. Skalli

During the summer, **Dr. Omar Skalli** hosted and supervised the projects of two high school student who participated in the CRESH program (COLLEGE RESEARCH EXPERIENCE FOR STUDENTS IN HIGH SCHOOL) organized by Dr. Firouzeh Sabri from the Physics Department. Their projects investigated the effects of effects of withaferin A on (1) motility and proliferation and (2) cytoskeletal organization of astrocytoma cells. At the end of their project, they presented posters to a panel of

judges from different departments. Dr. Skalli's student Monika Jain won 1st prize for *Effects of Withaferin A (WFA) on the Malignant Behavior and Survival of Glioblastoma (GBM) Cells* and his student Chloe Skalli won 2nd prize for *Effect of Withaferin A (WFA) on the Cytoskeleton of Glioblastoma (GBM) Cells*.

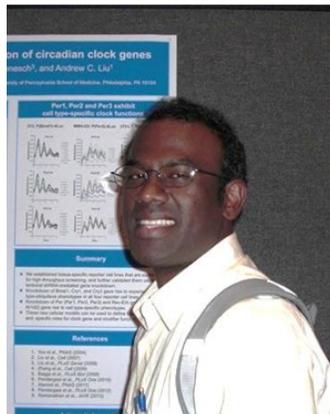
In April 2012 **Dr. Stephan Schoech** evaluated funding proposals to the National Fellowships Committee for Sigma Delta Epsilon, Graduate Women and the Louis Aggasiz Fuertes grant applications for the Wilson Ornithological Society. He also successfully nominated Dr. Ellen Ketterson to be the Howard A. Bern Lecturer at the January 2013 annual meeting of the SOCIETY FOR INTEGRATIVE AND COMPARATIVE BIOLOGY

The **Ecological Research Center** under the direction of **Drs. Michael Kennedy** and **Bill Simco** sponsored a poster entitled *Urban and Peri-Urban Hydroponics Crop Production: Project for the Socially Disadvantaged Growers* at the 6th NATIONAL SMALL FARMS CONFERENCE. The ERC hosted workshops for Memphis residents interested in establishing community gardens, provided equipment and supplies, and assisted a nearby community garden using hydroponics to produce vegetables. The project was overseen by Dr. Dharmalingam Pitchay in the College of Agriculture at Tennessee State University. The ERC anticipates that this venture will lead to expanding its work on community gardens in areas in Memphis designated as Food Deserts.



Dr. Michael Kennedy, co-director of the Ecological Research Center, presented *Bats-The Ultimate Mosquito Eaters* at the MEMPHIS BOTANIC GARDENS' GARDEN WILDLIFE SERIES on October 23, 2012.

Post-Doctoral Fellows



Dr. Chidambaram Ramanathan (pictured in front of his poster, left) a post-doctoral fellow in Dr. Andrew Liu's lab, presented *Genetic characterization of novel cellular clock models reveals tissue-specific function of circadian clock genes* at the 13th Biennial Meeting of the SOCIETY FOR RESEARCH ON BIOLOGICAL RHYTHMS, Destin, Florida, May 2012.



GRADUATE STUDENT NEWS: Defenses, Grants, Fellowships, Awards, and Presentations

Master's and Doctoral Defenses

Mariah S. Martell defended her Master's thesis entitled *Conditioning channel catfish fingerlings *Ictalurus punctatus* to acute low-water stress and comparison of metomidate and MS-222 in modulating the short-term stress response* on July 3, 2012. Ms. Martell performed her Master's research in the laboratory of Dr. Bill Simco.

On July 6, 2012 **Mee Yoon Choo** defended her Master's thesis entitled *Spatial/ Landscape Genetics of Native Plant Species in Arches & Canyonlands National Parks*. Ms Choo performed her Master's work in the laboratory of Dr. Takuya Nakazato.

Jerad Henson presented his defense of his Master's thesis entitled *Seasonal Regulation of Reproduction: Mechanisms Regulating the RFamides, Kisspeptin and Gonadotropin Inhibitory Hormone in Siberian Hamsters* on July 11, 2012. Mr. Henson performed his Master's work in the laboratory of Dr. David Freeman.

On July 12, 2012, **Rebecca Heiss** defended her doctoral dissertation entitled *Oxidative Status and Life History Trade-Offs in the Cooperatively Breeding Florida Scrub-Jay*. Dr. Heiss did her doctoral work in the laboratory of Dr. Stephan Schoech.

Donald Baud defended his dissertation entitled *Leaf and Root Responses of Three Wetland Tree Species to Anthropogenic-Generated Stressors* on September

21, 2012. Dr. Baud did his dissertation work in the laboratory of Dr. S. Reza Pezeshki.

On October 5, 2012, **Melissa Koontz** defended her dissertation entitled *Hydrologic Pulses of Agricultural Waters: Effects on Wetland Plants and Soils in the Greenhouse, Constructed Drainage Ditches, and Bottomland Hardwood Forests*. Dr. Koontz did her dissertation work with Dr. S. Reza Pezeshki.



Top, left to right: Ms. Mariah Martell, Ms. Mee Yoon Choo, and Mr. Jerad Henson. Bottom, left to right; Dr. Rebecca Heiss, Dr. Donald Baud and Dr. Melissa Koontz.

GRADUATE STUDENT NEWS: *continued...*

Master's and Doctoral Defenses, continued...

Forrest Brem presented the defense of his dissertation entitled *Factors affecting pathogenicity and infectivity of *Batrachochytrium dendrobatidis* in amphibian* on October 26, 2012. Dr. Brem did his dissertation work with Dr. Matthew Parris.

On November 6, 2012, **Sanjoy Khan** defended his dissertation entitled *Differential functions of Cryptochrome 1 and 2 in the mammalian circadian clock: a genetic and biochemical dissection*. Dr. Khan performed his dissertation research with Dr. Andrew Liu.

On November 12, 2012, **Emily Elderbrock** successfully defended her Master's thesis entitled *Effects of corticosterone and food supplementation on begging behavior in Florida scrub-jay (*Aphelocoma coerulescens*) nestlings*. Ms. Elderbrock did her thesis work in the lab of Dr. Stephan Schoech.

John Hisey presented the defense of his dissertation entitled *Genetic and demographic patterns of the raccoon (*Procyon lotor*) across extended spatio-temporal scales* on November 14, 2012. Dr. Hisey performed his dissertation work with Dr. Michael Kennedy.

Sara Carter successfully defended her Master's thesis entitled *The role of the gonads and incest avoidance in the regulation of sexual behavior in Damaraland mole-rats (*Fukomys damarensis*)* on November 16, 2012. Ms. Carter did her thesis work in the lab of Dr. David Freeman.



*Pictured: Blake Jones (left) and Sara Bebus (right) holding merlins (*Falco columbarius*) on Block Island. Photo courtesy of B Jones.*

Grants

Shane Hanlon, a Ph.D. candidate in Dr. Matthew Parris' lab received a *Grant-In-Aid of Research* from the University of Memphis Ecological Research Center for his project entitled *Assembling the Pieces: The Impacts of a Fungicide and Amphibian Pathogen on Amphibian Health*.

Blake Jones, a Ph.D. candidate in Dr. Stephan Schoech's lab, received The Nature Conservancy Bayrose Endowment Research Grant for his work on merlins (the small falcon *Falco columbarius*) on Block Island, RI.

Awards and Presentations

Shane Hanlon, a Ph.D. candidate in Dr. Matthew Parris' lab received travel awards from the University of Memphis College of Arts and Sciences to present *The pesticide enigma: Varying effects of a fungicide and chytrid fungus on Southern Leopard frogs* at INTEGRATED RESEARCH CHALLENGES IN ENVIRONMENTAL BIOLOGY at Arizona State University, Tempe, AZ. In addition, Shane received a University of Memphis Travel Award to present *The pesticide enigma: Varying effects of a fungicide and chytrid fungus on Southern Leopard frogs* at the 97th Annual Meeting of THE ECOLOGICAL SOCIETY OF AMERICA in Portland, OR August, 2012. Shane also presented *Taking the good with the bad: Varying effects of Roundup® on amphibian health* at the 18th Annual Meeting of THE TENNESSEE HERPETOLOGICAL SOCIETY, Martin TN, September 2012.



Top, left to right: Dr. Forrest Brem, Dr. Sanjoy Khan, and Ms. Emily Elderbrock. Bottom, left to right: Dr. John Hisey and Ms. Sara Carter.

GRADUATE STUDENT NEWS: *continued...*

Sanjoy Khan, a Ph.D. candidate in Dr. Andrew Liu's lab received PHI KAPPA PHI "LOVE OF LEARNING" award which helps fund post-baccalaureate studies and/or career development for active Phi Kappa Phi members. Sanjoy also presented a talk entitled *Identification of Cryptochrome differentiating domain required for feedback repression in circadian clock function* at the 13TH BIENNIAL MEETING OF THE SOCIETY FOR RESEARCH ON BIOLOGICAL RHYTHMS, Destin, Florida, May 2012. Sanjoy received THE RESEARCH MERIT AWARD from SRBR for this presentation. Sanjoy was awarded travel funds from the Department of Biological Sciences and the University of Memphis Student Government Association to present a poster entitled *CRY1-PHR(313-426): A Key Domain for Negative Feedback Repression and Circadian Clock Function in Mice* at the 25TH MOUSE MOLECULAR GENETICS MEETING Pacific Grove, CA October 2012.

Sara Bebus, a Ph.D. candidate in Dr. Stephan Schoech's lab received an AMERICAN ORNITHOLOGISTS UNION RESEARCH AWARD for her project "*Long-Term Effects of Developmental Corticosterone on Cognitive Abilities in Florida Scrub-Jays*" in April 2012. She also received the FLORIDA ORNITHOLOGICAL SOCIETY'S Cruickshank Research Award.

Sarani Ghosal, a Ph.D. candidate in Dr. Ramin Homayouni's lab, attended the 14th International EUROPEAN MOLECULAR BIOLOGY LABORATORY (MBL) PHD SYMPOSIUM in Heidelberg, Germany in October, 2012.



Sarani Ghosal in Heidelberg Germany.

The theme of the meeting was "Networks in Life Sciences: Genomics, Proteomics and Systems Biology". Sarani presented a talk entitled *Using systems genetics to deduce the gene network for a novel mitochondrial protein NIP-SNAP1*. There were 75 participants from 34 countries around the world. Sarani received travel grants from the Department of Biological

Sciences, the Bioinformatics Program, the University of Memphis Student Government Association and EMBL.

Christian Vlautin, a Ph.D. candidate in Dr. Michael Ferkin's lab received a Student Government Association grant to present *Meadow voles, *Microtus pennsylvanicus*, display a memory for the what, when, and*

where of a same-sex dyadic interaction at 97th Annual Meeting of THE ECOLOGICAL SOCIETY OF AMERICA in Portland, OR August, 2012.

Bowen, CA, **Koontz MB**, **Saunders LE**, and Pierce SC. 2012. *Flooding and wetland plants: Localized versus whole-plant response*. TENNESSEE ACADEMY OF SCIENCES COLLEGIATE DIVISION, WESTERN REGIONAL MEETING, March 31, Memphis, TN. (NB: This presentation won 3rd place in Environmental Science Section)

Pierce, SC, **Koontz MB**, **Pezeshki SR**, and Kröger R 2012. *A split-root approach to monitor responses of *Salix nigra* to spatial heterogeneity in soil redox*. 9TH INTERNATIONAL ASSOCIATION FOR ECOLOGY INTERNATIONAL WETLANDS CONFERENCE, Orlando, FL June 2012

Koontz, MB, Lundberg CJ, Lane RR, Day JW, DeLaune RD, and **Pezeshki SR**. 2012. *Aboveground net primary productivity and soil properties in forested wetlands after restored hydrology from notching of dikes on the Mississippi River near the Loosahatchie Bar*. 97th Annual Meeting of the ECOLOGICAL SOCIETY OF AMERICA, Portland, OR August 2012.

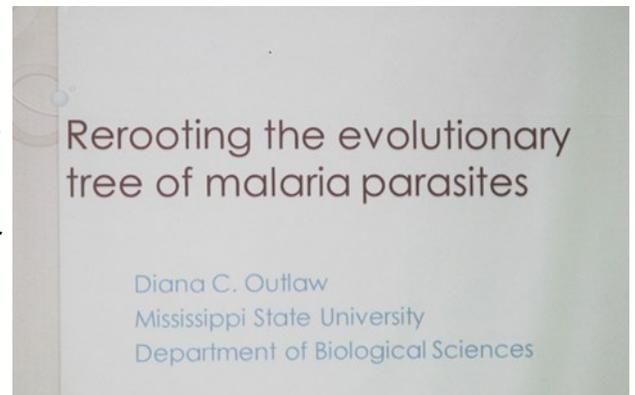
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GRADUATE ALUMNI NEWS: *Dr. Diana Outlaw returned to the Department to present a seminar on her research examining the evolution of malaria.*



On September 20th, 2012, Dr. Outlaw, who earned her Ph.D. in 2006 from the University of Memphis returned to present a talk entitled “*Rerooting the Evolutionary Tree of Malarial Parasites*”. Dr. Outlaw began her education earning Bachelor’s degree in Biology with the intent of becoming a veterinarian. However, she discovered evolutionary biology along the way and came to the University of Memphis to pursue a Ph.D. with Dr. Gary Voelker. In her doctoral dissertation entitled *The molecular systematics, historical biogeography and morphological evolution within Ficedula flycatchers*, Dr. Outlaw constructed a molecular phylogeny (the history of changes through time) of the birds. In her postdoctoral work with Dr. Robert Ricklefs, Dr. Outlaw worked on a National Science Foundation funded project to estimate the age of malarial parasite lineages. Malaria is a parasitic disease that afflicts virtually every vertebrate group including humans, bats, birds, and lizards. While malaria is not a health problem in the United States, it is a substantial problem in other parts of the world, particularly in Africa. Drs. Outlaw and Ricklefs developed malaria phylogenies using mitochondrial cytochrome b to calibrate a molecular clock. This molecular clock showed that humans have lived with malaria parasites throughout the history of modern humans. This work led to a paper in *Science* entitled *A Molecular Clock for Malaria Parasites*. Dr. Outlaw joined the Department of Biological Sciences at Mississippi State University in 2009, and the work in her lab addresses questions on the evolution and diversification in malaria parasites, and more recently on host-parasite interactions and parasite-vector diversity.



To learn more about the work in Dr. Outlaw’s lab visit her [website](#). Learn more about the evolution of malaria by reading her papers.

- RE Ricklefs and DC Outlaw. *A Molecular Clock for Malaria Parasites*. [Science . 329:226, 2010.](#)
- D. C. Outlaw, R. E. Ricklefs. *Comparative gene evolution in haemosporidian (Apicomplexa) parasites of birds and mammals*. [Mol. Biol. Evol. 27, 537 \(2010\)](#)
- D. C. Outlaw, R. E. Ricklefs. *Rerooting the evolutionary tree of malaria parasites*. [Proc. Natl. Acad. Sci 108:13183, 2010](#)



STAFF NEWS: Comings, Goings, Committees, and Service Awards



Pictured: Donna Haskins (left) and Cynthia Stephens (right)

After six years in the Department of Biological Sciences, **Donna Haskins** has moved on to new challenges as an Administrative Secretary with the Army ROTC. Word has it that she will be repelling down Smith Hall with the ROTC cadets in the Spring! The faculty, staff and particularly the graduate students past and present want to thank Donna for her outstanding service and wish her the very best in her new position. We also welcome **Cynthia Stephens**, the Department's newest staff member. She assumed the Administrative Secretary position in the Department in October. Drop by and welcome her aboard.

Chris Powless, Local Tech Support Provider II/ Webmaster in the Department of Biological Sciences, was elected as Staff Senator and is currently serving on the Executive Committee. She has also been appointed to the University Facilities and Services Committee, and Space Planning and Utilization Council. Ms. Powless was recently invited to serve as a developer for *EduPad*, a social learning application developer for learning applications for mobile devices.



STAFF SERVICE AWARDS

Several of the Department Staff members were honored for their service to the University of Memphis. **Wendlyn Williams** lab coordinator for Anatomy and Physiology for 5 years; **Chris Powless** LTS provider II for the Department of Biological Sciences for 15 years;



Pictured: E.O. Wade (left) and Chris Powless (right with Dr. Raines)

Steve Kynerd Laboratory Assistant and Ellington Hall Building manager also for 15 years and **EO Wade** laboratory technician, Microbiology labs for 20 years.



BIOLOGISTS@LARGE: *What's going on off campus?*

Ph.D. candidate lends a hand at Turpentine Creek Wildlife Refuge
by Chris Vlauten

Last August, while most of us were gearing up to go back to school, Ph.D. candidate Chris Vlautin traveled Eureka Springs, Arkansas to lend a hand at [Turpentine Creek Wildlife Refuge](#). TCWR, as it is called by its staff, is a federally licensed nonprofit facility that specializes in rescuing and caring for abandoned, abused and neglected exotic cats. That weekend, Turpentine Creek was visited by the Peter Emily International Veterinary Dental Foundation who came to donate their time and expertise to aid a few of the four-legged residents. Chris helped the TCWR staff sedate and move a few needy cats from their enclosures to allow the team of 12 veterinarians to perform a variety of procedures.

[The Peter Emily International Veterinary Dentistry Foundation](#) (PEIVDF) is a nonprofit organization of North American veterinarians that donate their time and expertise to helping needy animal facilities throughout the world. Dr. Emily is an award-winning dentist, professor and lecturer who has spent his 40-year career dedicated to improving the lives of countless animals through innovation and instruction in the field of oral and dental health. Started in 2005, PEIVDF performs dozens of missions throughout the year where they provide specialty tooth and mouth care to zoos, sanctuaries and other needy animal facilities. It is estimated that the labor and materials needed for each of these missions would normally cost nearly \$5,000. Since the foundation is nonprofit, no funds go for administration of the program and everything is used to provide care. Not only do the veterinarian dentists treat animals at these sessions, but they also educate staff and students at the facilities they visit. Additionally, PEIVDF provides grants to institutions to further their goal of improving advanced veterinary dental care and treatment to facilities which are under-funded and/or understaffed from a veterinary perspective. Dr. Emily's team spent the weekend at the Refuge and in two days performed over 12 root canals, extractions and other dental surgeries on six of TCWR's big cats including 3 tigers, 2 cougars and a leopard.

Turpentine Creek opened its 450 acre facility in 1992 and now is one of the largest open to the public facilities in the country. Currently, there are over 120 big cats as well as a variety of other rescued animals. Among the species represented are: tigers, lions, cougars, leopards, liger, serval, bobcats, bears, and a monkey. Most of the ani-



Top pictures , left to right. Magic, a 16 year old female leopard. Chris and Assistant Curator Laurie Vanderwal move sedated leopard Magic to the veterinary clinic. The animals' health is monitored carefully while they are transported to and from their enclosures to make sure everyone involved is safe. Curator Emily McCormack and Chris prep Magic the leopard for anesthesia. Anesthesiologist Dr. Ole Alcumrac decides on the best way to place her trach tube. **Bottom pictures, left to right:** Zeus, a 450 pound tiger. Chris gets hold-down duty on Zeus while assistant Curator Laurie Vanderwal checks Zeus' breathing. One of the challenging parts of performing surgery is making sure the cat is secure while still allowing the veterinarians enough space to do their jobs properly. Dr. Peter Emily (right) prepares a filling for Zeus the tiger. Zeus received 2 root canals and a good cleaning over the course of a 3-hour surgery. Photos courtesy of C. Vlauten.

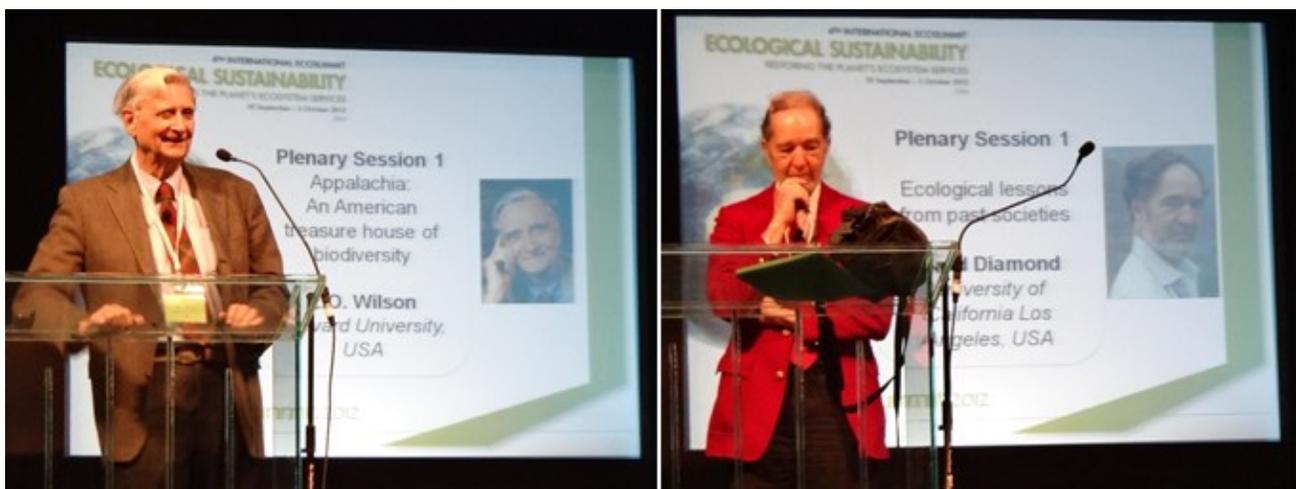
mals living at TCWR were rescued as a result of the exotic pet trade. Because of lax laws and regulations, many of the cats arrive with severe medical problems stemming from malnutrition, poor veterinary care and from being kept in squalid conditions. Typical rescues come from private owners who do not realize the danger and costs involved in raising and keeping 500lb predators in their houses. It is the mission of Turpentine Creek to be able to give each of their animals safe permanent homes. To do this, they spend most of their donations building large enclosures and habitats to allow the cats and other critters ample space to run around and enjoy their lives. In order to keep these animals happy and healthy, there is a dedicated staff of keepers, Biologists as well as managerial and support staff. Additionally, Turpentine Creek offers a paid internship program where twelve applicants are invited to live and work at the Refuge for 6-month terms. These internships are highly competitive and offer recent graduates in the fields of Biology and Zoology training in exotic animal husbandry. There have been over 100 interns since the program's inception and most have gone on to work in zoos or to become veterinarians or graduate students. While TCWR takes in as many casts as they possibly can, they have to turn down dozens of requests a year due to lack of space. Because of this, they are actively involved in community outreach and educational programs to attempt to teach the public about the plight of exotic animals in captivity, the thoughtlessness of private exotic ownership, and the horrors of the exotic pet trade.

Chris earned a B.S. in Biology from the University of Syracuse in 2002. He was accepted into the 2003 Spring/Summer internship group, moved to TCWR and was subsequently was hired as a full-time staff Biologist. He stayed until 2008 at which point he came to the University of Memphis to work on his Doctorate. When his schedule allows, Chris returns to Arkansas to help out and to contribute to their animal enrichment program. After he graduates, he hopes to continue working with the staff and adapt some of the behavioral work he has done in Dr. Michael Ferkin's lab for use at the Refuge. More pictures of the inhabitants of TCWR and the procedures performed during the Emily Foundation's visit can be found at [Turpentine Creek's website](#). Visit [The Peter Emily International Veterinary Dentistry Foundation](#) for more information. For any UofM Undergraduate interested in more information about the internship program, email [Chris Vlauten](#)

EcoSummit 2012 - Ecological Sustainability: Restoring the Planet's Ecosystem Services

The 4th International EcoSUMMIT took place September 30 - October 5, 2012 in Columbus, Ohio. The Department of Biological Sciences was represented by Ph.D. candidate Lyndsay Saunders from the lab of Dr. Reza Pezeshki. As an EcoSummit 2012 delegate, Saunders joined 1600 scientists, practitioners, and decision-makers from 76 countries for five days of plenary talks, presentations, forums, and symposia on aspects of the conference's theme "Ecological Sustainability – restoring the planet's ecosystem services." EcoSummit 2012 was co-hosted by The Ohio State University, the Ecological Society of America (ESA), the International Association for Ecology (INTECOL), the Society for Ecological Restoration International (SER), and the Mid-Ohio Regional Planning Commission. This conference was the first time the United States has hosted EcoSummit. The first EcoSummit was held in 1996 in Copenhagen, Denmark, and the subsequent locations were Halifax, Nova Scotia, Canada in 2000 and Beijing, China in 2007, while EcoSummit 2016 will be take place in Montpellier, France.

The plenary program included Lester Brown (Earth Policy Institute, Washington DC), Robert Costanza (Portland State University, Portland, OR), Jared Diamond (UCLA, Los Angeles, CA), Olafur R. Grimsson (President, Republic of Iceland), Sven Jørgensen (University of Copenhagen, Copenhagen, Denmark), Wolfgang



*Pictured: E.O. Wilson (left), biologist, naturalist, conservationist and world-renown ant researcher gave a plenary talk on biodiversity in Appalachia. Jared Diamond (right), best known for his books *The Third Chimpanzee*, *Guns, Germs, and Steel*, and *Collapse: How Societies Choose to Fail or Succeed*, gave a talk on the Ecological lessons from past societies. Photos courtesy of Lyndsay Saunders.*

Junk (Max Planck Institute for Evolutionary Biology, Plön, Germany), Rattan Lal (The Ohio State University, Columbus, OH), Simon A. Levin (Princeton University, Princeton, NJ), William J. Mitsch (The Ohio State University, Columbus, OH), and E.O. Wilson (Harvard University, Cambridge, MA). Highlights of the historic event included; a Memorial Plenary Forum honoring Nobel Prize laureate Elinor Ostrom who passed away before the conference; a forum celebrating the “Lessons from *Silent Spring* at 50.” The book *Silent Spring*, written by Rachel Carson, documented the detrimental effects of pesticides in the environment and is largely credited with helping to launch the environmental movement. Also, a forum titled “Food Security and Climate Change” was extremely informative. A field trip touring the Olentangy River Wetlands Research Park at The Ohio State University was of particular interest to Saunders, whose research interest is wetland ecology. The facility is directed by the Conference Chair, William J. Mitsch, Distinguished Professor of Environment, Natural Resources, and Ecological Engineering at The Ohio State University and was recognized as a Wetland of International Importance by Ramsar in 2008.

The Columbus Declaration by the EcoSummit 2012 Scientific Committee, made at the conference’s closing ceremony, was titled “Harmonization of Societal Needs with the EcoSphere in the Anthropocene Era.” The declaration called for a four-point strategy to “ensure our planet remains habitable” of 1) promoting a paradigm of global systems, 2) embracing a policy of harmonization, 3) investing in innovation, and 4) promoting environmental education and values of life-long learning, environmental literacy and ethics, and cultural appreciation. The impact of collected knowledge shared at EcoSummit 2012 will be felt long into the future. The scientific program from EcoSummit 2012 will be presented in 11 special issues of several journals, including Ecological Complexity, Ecological Engineering, Ecological Indicators, Ecological Modelling, Ecosystem Services, Journal of Arid Lands, and Landscape Ecology. The website for the conference continues to host digital versions of the all oral and poster presentation abstracts and the entire conference program booklet at www.ecosummit2012.org. For the University of Memphis delegate Lyndsay Saunders the experience was “an incredible blessing and one of the most significant experiences of my graduate career.”



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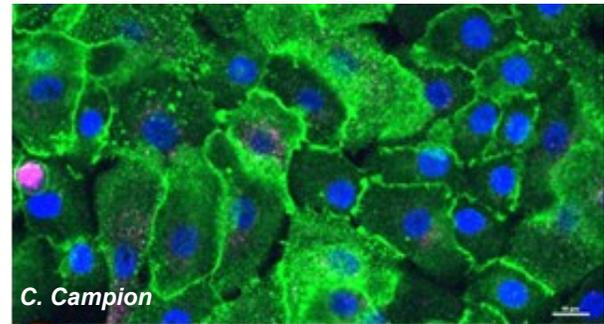
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In the Next Issue

IN FOCUS: The BARC

Under the direction of **Dr. Anna Bess Sorin**, The *B*iology *A*dvising and *R*esource *C*enter guides undergraduates along the path to graduation.

FACULTY FOCUS

The Department welcomes **Dr. Amy Abell** as its newest faculty member

Information links for this issue

Tiger Initiative for Gardens in Urban Settings
<http://www.facebook.com/tigursurbangarden>

Dr. Karyl Buddington
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Turpentine Creek Wildlife Refuge
www.turpentinecreek.org

Peter Emily International Veterinary Dental Foundation
www.peteremilyfoundation.org

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