

Biological Sciences

MARCH 2016



EAST TENNESSEE STATE
UNIVERSITY

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NOTE FROM THE SCHOOL OF GRADUATE STUDIES DEAN



Cecilia A. McIntosh, Dean, School of Graduate Studies
Photo: ETSU Photographic Services

One of the hallmarks of a good university is strength in graduate programs and the opportunity for advanced study. The synergy between research and graduate education is strong and productivity in this area helps define an institution of higher learning. In a recent Departmental Newsletter issue, ETSU Provost, Dr. Bert C. Bach, discussed the strength of the undergraduate and graduate academic programs offered by the Department of Biological Sciences (May 2015).

The M.S. Biology graduate program is a strong program that emphasizes research ensuring development of scientific expertise while still providing for a breadth of exposure to cutting edge investigative approaches. This is done through a solid core of courses and requirements and a significant opportunity for elective courses. A formal research prospectus also is required as are thesis committee meetings each semester, a comprehensive written exam, two formal oral research presentations, a thesis, and a formal public defense of the thesis. Of the formal oral research presentations, one is a departmental-wide ceremony and the other is at a professional conference (regional, national, and/or international). Financial support for graduate students attending conferences comes from the department itself as well as travel grants from the ETSU Graduate and Professional Student Association, a faculty member's research grant, and sometimes from the society sponsoring the conference. The experience of giving a professional presentation along with the opportunity to network with other scientists contributes greatly to professional growth.

In addition to the academic aspects of a graduate program are the value-added experiences that contribute to a graduate student's development and maturation into an independent professional. The department of Biological Sciences has three endowed research awards for graduate students that are awarded annually. They also have a strong Supervised Experience in Teaching program for graduate students holding Graduate Assistantships or Scholarships that involve teaching undergraduates. The ETSU School of Graduate Studies has several professional development offerings in place that complement the efforts of the Department of Biological Sciences and other departments offering graduate degrees. Some come in the form of professional development courses such as GRAD 5110 Teaching Pedagogy for the Graduate Assistant, GRAD 5107 Responsible Conduct of Research, GRAD 5001 The Art of Self-Marketing, GRAD 5003 Career Planning, GRAD 5008 Interpersonal Interactions for Professionals, and GRAD 5009 Leadership for Professionals. There are also courses offered for faculty professional development.

With respect to grants and awards, the School of Graduate Studies has been offering thesis/dissertation research grants for 10 years; of the 102 awards made to date, 24 have been to students in the M.S. biology program. This speaks to the culture of research in the program and to the mentoring students receive that encourages writing for grants. Of the six Service for the Public Good awards to date, two have been awarded to M.S. biology students. The School of Graduate Studies and Graduate Council also sponsor Outstanding Thesis awards. There have been 10 Awardees for Outstanding Thesis in Science, Technology and Computer Sciences of which six have gone to students in the M.S. biology program. ETSU was one of the first universities to house theses and dissertations in electronic format. This enhances accessibility of graduate research results worldwide. For example, in the past year there have been over 24,000 full text M.S. Biology theses downloads from the total 360,000 downloads of ETSU electronic theses and dissertations, underscoring the interest in the research conducted by our graduate students!

story continued: page 2





Looking forward to 2016



Joe Bidwell, Chair

Photo: ETSU Photographic Services

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Biomedical Communications

Fall is always an exciting time as we welcome new students to the Department of Biological Sciences and welcome back those already in the program. During the fall semester of 2015, we continued as one of the strongest units in the College of Arts and Sciences with 359 undergraduate majors, 35 graduate students and 743 non-majors enrolled in our courses. As always, congratulations are in order for the undergraduate and graduate students who had their degrees in biology conferred during the 2015 Fall commencement—we wish you all the best in your future endeavors!

Other highlights from the fall semester include our receiving approval to hire a plant ecologist to replace Dr. Frosty Levy who retired last year. We had an outstanding response to the position announcement and the search committee had a challenging task to sort through many strong applications. Interviews for the position will commence in early 2016.

We recently finalized a series of “Career Pathways” that provide suggested course sequences for different employment areas in the biological sciences. At present, pathways have been developed for the pre-health area, vertebrate zoology and botany. A link to these pathways can be found on the Department of Biological Sciences webpage (<http://www.etsu.edu/cas/biology/>). We hope our students find this a useful resource to help them meet their career goals.

In other news, the department has decided to establish an external advisory board that will be comprised of alumni and other supporters of the department. This board will meet twice yearly to provide input on areas such as strategic planning and curriculum development. It will also help establish a contact network for our students. A formal charter for the board was approved by the faculty in November and we will begin extending invitations to potential board members during the spring semester of 2016.

Finally, as further covered in this newsletter, the EagleCam project is well on its way to becoming a reality that will allow the public to watch two pairs of Bald Eagles in different nests rear their young during the upcoming breeding season. In addition to the EagleCam, the department has a number of student scholarship and research endowments that rely on the valued support of donors. A donor form that can be mailed to the department is available on the last page of the newsletter. Alternatively, online donations can be made through the “Give Now” link on the department webpage (<http://www.etsu.edu/cas/biology/>). We greatly appreciate the support of all who gave in 2015!

Best wishes for 2016 and keep in mind that we always enjoy hearing from students, alumni, and other friends of the department. Please e-mail me directly at bidwell@etsu.edu.

Joe Bidwell,
Professor and Chair of Biological Sciences

continued: cover story **Note from the School of Graduate Studies Dean**



Cecilia A. McIntosh, Dean, School of Graduate Studies
Photo: ETSU Photographic Services

In summary, it is clear that the faculty and students in this program are engaged in the full experience with strong research, mentoring, and development of M.S. students into independent scientists and educators. Participation of the department in the Ph.D. program in Biomedical Sciences further enhances the breadth of interactions. As a faculty member housed in that department, I am thrilled that we are able to offer such a strong program and appreciate my interactions with research students. As the Dean of the School of Graduate Studies at ETSU, we are proud of this excellent program.

Cecilia A. McIntosh,
Dean, School of Graduate Studies



EagleCam PROJECT

IN NOVEMBER 2015,

the Department of Biological Sciences set up live streaming cameras focused on two active nests of Bald Eagles, our national bird. Two cameras focus on two separate mated pairs of Bald Eagles, both on private property. One nest is located in Bluff City, and the other is in Johnson City. These cameras will provide a novel perspective into the lives and habits of these beautiful birds. Bald Eagles are long-lived birds of prey that have high nest site fidelity and will reuse the same structure for years. As part of the courtship behavior, mated pairs of Bald Eagles will bring new twigs and branches to the pre-existing nest each breeding season which results in a massive structure that can be well over one ton in weight! Eggs were laid in early 2016, and the public may view these splendid birds from the comfort of a home computer through ETSU's website or Facebook page until the young have fledged and move away from the nest. This is a prime opportunity to observe these iconic birds in their natural habitat, undisturbed.

The EagleCam project will be a valuable high-profile educational public service hosted by ETSU. In fact, ETSU will be the only higher education facility in Tennessee with two live-streaming EagleCams. Furthermore, these EagleCams will provide much needed exposure for ETSU as evidenced by Berry College's EagleCam in Georgia that has earned upwards of 17 million views in just three years!

Dr. Fred Alsop, our resident ornithologist, has taken the lead in this project from its conception more than a year ago. The support for the project to this point has been enthusiastic; ranging from the CEOs of two major regional power companies to the private landowners whose properties host our two pairs of nesting Bald Eagles. These birds have even gained new supporters in the power company workers who have spent many hours on site installing equipment. However, we are still short of our financial goal to secure all the necessary equipment, services, and installations.

We still need your support. Volunteers to monitor the nest cameras and to maintain "Eagle-Talk" blogs will also be needed throughout the nesting season. The 2016 Eagle-Cam project is in need of financial donations in order to maintain the equipment and pay yearly technology fees for the two locations.

We will also need help in naming the birds, which will spark a bit of fun and friendly debate on the online forums. For example, the pair of birds in Bluff City have been temporarily named "E.T.," for the male, and "SU (Sue)" for the larger female by those working at the nest to install the camera.

If you wish to support this worthwhile and historic endeavor to bring the lives of these majestic birds to the attention of the world, please contact the ETSU Department of Biological Sciences at 423-439-4329 or e-mail Dr. Alsop directly at Alsopf@mail.etsu.edu, and ask how you can contribute to the EagleCam project! We thank you for your support!

Submitted by Fred Alsop and Kevin Brooks



FRIENDS OF ETSU EAGLECAM

BLUFF CITY WEBCAM

- Bristol Tennessee Essential Services (BTES)*

WINGED DEER PARK WEBCAM

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- In memory of Robin Paul Wilson
by Ms. Donna Nickerson
- Ms. Karen Lynn Sullivan
- Ms. Haley Stiltner
- In memory of Blan Thompson
by Darlene Thompson

(With much gratitude from ETSU Department of Biological Sciences to BTES for providing complete support for the Bluff City Eagle Camera)

* Sponsor

Photo: Ron Austing





Christina Turbyfill

ETSU Biology Graduate Who Loved Wolves

Christina Turbyfill—a student that Fred Alsop and I will not forget. She was a student in my Invertebrate Zoology, Marine Biology, and Coastal Biology classes and in Dr. Alsop's field classes including the Ecological Field Trip class to the Grand Canyon and other areas of the Western U.S. Dr. Alsop said, "I was always moved by her passion for wild things and wild places as I watched her learn new things that continued to unlock new pathways for her to

follow." Appearing "quiet and shy" when I first met her, I discovered that she was intelligent, dedicated, conscientious, and desired to please. She blossomed with her deep love of learning and teaching about animals, especially as a beloved volunteer in the Raptor Center and the Wolf Sanctuary at Bays Mountain Park for many years. She helped many times with the wolf pups and was very proud of being a wolf puppy parent, and was a great friend to her

fellow volunteers Teresa Epperson Daines and Rhonda Goins. An ETSU graduate, Christina received her B.S., M.S. degrees and was presently working toward her Doctorate Degree of Education when she passed away unexpectedly at the age of 38 in September. In her memory, the volunteers at Bays Mountain have erected a bench overlooking both the Raptor Center and Wolf Habitat. Working with Kingsport City Schools teaching Special Education at Jackson Elementary during the day, Christina also taught and tutored at Northeast State Community College at night.



"...You were one of the kindest, gentlest souls I have known. As volunteers at the raptor center at Bays Mountain, I saw that you were a passionate teacher."

- Samara Reese

Samara Reese, wrote:

"You were my tent-mate during our EFT trip out west in 2001. You were one of the kindest, gentlest souls I have known. As volunteers at the raptor center at Bays Mountain, I saw that you were a passionate teacher."

Donations in memory of Christina may be made to the ETSU Biology EagleCam Project.

Dr. Diane Nelson, Professor Emerita

(based on information from Cathy Rossi, Teresa Daines, Rhonda Goins, Samara Reese, and Fred Alsop).

LOW ROUNDUP HERBICIDE MIGHT MAKE SUPERWEEDS



Dr. Lok Pokhrel
Photo: Lok Pokhrel

A study involving researchers from Temple University and East Tennessee State University has found that weeds that compete with food crops can grow much bigger (with more biomass) and with greater

reproductive vigor when exposed to chronic low levels of Roundup herbicide which is typical to what can be expected to be present in soils following aerial spray events.

“Global dependence on the use of excessive pesticides to improve food production by controlling competing weeds may be counterproductive as the residual commercial herbicides in soils may not only increase

reproduction rate but can also promote biomass in weeds, making them bigger and this may have agronomic implications,” said the lead author Dr. Lok Pokhrel, who is an assistant professor of Environmental Health at Temple University’s College of Public Health.

“Our original goal in this study was to see the effects of herbicide on developmental stability. Instead of distorted sickly looking plants that were expected, we rather observed increased growth and vitality at low dose exposure in weeds,” said Dr. Istvan Karsai, who is a biology professor at East Tennessee State University and a co-author of this paper.

The authors cite the double roles Roundup can play in the environment: “... increased weed populations can lead to severe agro-economic impacts as weeds intensely compete for limited resources with food

crops, thereby affecting crop yields. On the other hand ...drifted low levels of herbicide in soils can promote plant biomass and reproduction comparable to that can be achieved applying chemical fertilizer....”

The (seven month-long study) tested Roundup on *Bryophyllum pinnatum*, an invasive succulent commonly referred to as a miracle plant by the USDA.

The authors reported their findings December 15, 2015, in an early online publication in the prominent journal, *Science of the Total Environment*. The study can be accessed through this link: <http://www.sciencedirect.com/science/article/pii/S0048969715305544>

Contribution from our former graduate student

Kilaru Receives TAASF to Attend “Moss 2015”

Dr. Aruna Kilaru, Biological Sciences, was invited by the Mexican Society of Molecular Biology to speak at the 18th annual Moss International Conference held in Cancun, Mexico, from Nov. 30-Dec. 3. She presented her research, “Discovery of anandamide, a novel lipid signaling molecule in moss and its implications.”

Several graduate and undergraduate students and a postdoctoral researcher in Kilaru’s lab, along with members of Dr. Ruth Welti’s lab at Kansas State University, contributed to this research. The group has been working with moss plants for the past four years to elucidate the mechanisms by which these early land plants tolerate drought; this project recently attracted

funding from the National Science Foundation. The conference included 19 select oral presentations and several posters contributed by more than 160 researchers representing 15 countries. The offices of the dean of the College of Arts and Sciences and the vice provost for Research and Sponsored Programs supported Kilaru’s travel through the Travel Award for Arts and Sciences Faculty program. This competitive award is given to select individuals who are invited to give presentations of major significance in an international context.

Submitted by Aruna Kilaru

(Reprinted from: http://www.etsu.edu/news/2015/12_dec/faculty_staff_activities_dec_2015.aspx)



Moss in Mexico Photo: Aruna Kilaru



NABT Begins Bridging Gaps & Aligning Practice in K-16 Biology Education



Biology Task Force
Photo courtesy of Anna Hiatt

The **National Association of Biology Teachers** annual professional development conference was held in Providence, Rhode Island, this past November. Over the last two years, Dr. Anna Hiatt has led the Introductory Biology Task Force for NABT which aims to provide support to instructors teaching introductory biology across high schools, community colleges, and universities. This past November marked the first Introductory Biology Task Force Workshop where biology educators across the nation were invited to share their expertise with fellow educators on how to “unpack” or translate guiding policies (e.g., AP Biology Framework, NGSS, and Vision & Change) into effective classroom practices that improve student science practice skills. Participants worked in heterogeneous groups of K-16 biology educators to identify commonalities between policies and they developed a matrix of practices that they could use in their classrooms. The workshop has helped to start a national conversation about the common problems biology educators in high schools, community colleges, and universities have in incorporating policies into their programs and how little communication occurs across institutions. The Hiatt Lab is investigating these problems more in depth hoping to provide some much-needed answers for today’s introductory biology faculty. Most notably, Sara Normark, a graduate student in the Hiatt Lab, is investigating differences in how high school and college faculty scaffold and teach science practice skills in their classrooms. Task Force members continue to work on developing models of faculty development and providing tools for instructors. Additional regional and national workshops are planned for 2016 and 2017 with assistance from NABT and The National Science Foundation.

Submitted by Anna Hiatt

Short News

Andrew Campbell is a Junior McNair Scholar in Dr. Kilaru’s lab and is recipient of fall 2015 Student-Faculty Collaborative grant from Honors College for his research on “*Functional Analysis of Diacylglycerol Acyltransferase Gene from Avocado.*”

Derek Stuffle is a Senior Midway Honors student also in Dr. Kilaru’s lab and is recipient of Fall 2015 Student-Faculty Collaborative grant from Honors College for his research on “*Biochemical Characterization of Fatty Acid Amide Hydrolase in Tomato.*”

William (Seth) Ratliff, an undergraduate student of Dr. Frosty Levy, Professor Emeritus, completed his Honors Thesis, graduated in December, and is co-author with Dr. Levy and Dr. Elaine Walker on a submitted manuscript, “*Demography and Disease of the Rare Shrub Buckleya distichophylla (Santalaceae) in Northeastern Tennessee.*” He will soon begin an AmeriCorps position in southwest Virginia.

Cindy Barrett, graduate student of Dr. Frosty Levy, received a grant from Friends of Roan Mountain for her work on a fungal disease of Turks Cap and Gray’s Lily. The grant was titled “*Range-wide Prevalence and Impacts of the Lily Leaf Spot Disease (Pseudocercospora sporella inconspicua) on Gray’s Lily (Lilium grayi) with an Assessment of Turk’s Cap Lily (Lilium superbum) and Michaux’s Lily (Lilium michauxii) as Disease Reservoirs.*”

Cindy is also a co-author with Dr. Levy, Russell J. Ingram and James T. Donaldson on a submitted manuscript titled “*The Historic Prevalence of Lily Leaf Spot Disease (Pseudocercospora sporella inconspicua) on Gray’s Lily (Lilium grayi) and Canada Lily (L. canadense).*” Russell Ingram is a former ETSU student who graduated with an M.S. a few years ago and Jamey Donaldson is Associate Herbarium Curator at ETSU.

Nathan Spaulding is a junior Honors Scholar conducting research in Dr. Cecilia McIntosh’s lab and a recipient of a fall 2015 Student/Faculty Collaborative Research Grant from the Honors College for his research studying the structure and function of a mutated form of a flavonol-specific glucosyltransferase from grapefruit.

Dr. Diane R. Nelson, Professor Emerita, attended the 13th International Symposium on Tardigrada, June 23–26, 2015, in Modena, Italy. In addition to being an Invited Speaker giving a talk on “*Ecology of Tardigrades: Past, Present, and Future*” and presenting the “*Young Scientist Awards*,” Dr. Nelson was honored for being one of only two tardigradologists who have attended all 13 symposia.

Dr. Diane R. Nelson, Professor Emerita, and Dr. Eugenie Clark published “*Nesting Sites and Behavior of the Deep Water Triggerfish *Canthidermis maculata**

(Balistidae) in the Solomon Islands and Thailand” in *Aqua, International Journal of Ichthyology* just before Genie passed away at age 92 in 2015. Dr. Nelson co-authored several papers with Dr. Clark, who visited ETSU to work on manuscripts, as described in Genie’s autobiography, *The Lady and the Sharks*.

Istvan Karsai was an invited keynote speaker at the Social Behaviour and Self-Regulation in Insects, Swarms and Algorithms Symposium at the 108th Annual Meeting of the German Zoological Society.

Istvan Karsai was an invited speaker for the Biological Distributed Algorithm (BDA) 2015 workshop at the Massachusetts Institute of Technology (MIT).

Dr. Jonathan Peterson (PI), Assistant Professor, Department of Health Sciences, and Aruna Kilaru (Co-PI), Assistant Professor, Department of Biological Sciences, received NIH funding (\$143,098) for two years (2015–17) to study the role of “*The novel adipokine, CTRP3, as an inhibitor of Alcoholic Fatty Liver Disease.*”

Dr. Tom Ecay (PI), Professor, Department of Biomedical Sciences, and Dr. James Stewart (Co-PI), Senior Research Scientist, Department of Biological Sciences, received ETSU Research Development Committee funding for research on “*Molecular analysis of nutrient transport pathways in amniote embryos.*”

A Balancing Act *\$10,000 grant awarded*

The East Tennessee State University Research Development Committee has awarded a \$10,000 grant to advance the study of balancing and its potential role in diagnosing diseases.

The grant's principal investigator is Dr. Istvan Karsai, professor in the Department of Biological Sciences, who is collaborating with Allison Hilbun, a Ph.D. student in Biomedical Sciences at ETSU.

"A New Diagnostic Tool and the Chaotic Properties of Balancing" is the title of the grant. The researchers are examining how a person's movements and balance relate to overall wellness. "Many symptoms of neurological diseases may be predicted and prevented by analyzing a person's involuntary movements," say the researchers.

By looking at how individuals involuntarily balance themselves, Karsai and Hilbun hope to gain a greater understanding of how small changes in the brain that affect balance may be predictors of future neurological disease.

"The practical benefits of creating an early diagnosis system for different disorders will help intervention even before major symptoms manifest," write Karsai and Hilbun. "Traditional medicine focuses on treating the symptoms, while current functional medicine tries to prevent the body from getting those symptoms in the first place."

Karsai is a computational biologist with skills in analyzing complex systems and building models. Hilbun has experience in experimental work with force plates, which are measuring instruments used in the exercise science field for creating body composition profiles. In this case, they will measure how research participants balance themselves--for example, while standing on one leg for 12 seconds.

Karsai and Hilbun say the way humans balance themselves changes over time, and those changes may be clues to the early detection of neurological disorders.

The goal of the study is to collect baseline data on groups with different health conditions and to develop mathematical models and data analyses programs for the completion of a pilot study that could result in external funding. The ETSU research will ultimately target the development of a diagnostic tool for different disorders in clinical studies.

"Our purpose thus is to develop a complete methodology for a new, fast and reliable diagnostic tool," Karsai said.

Notes from the Bidwell lab

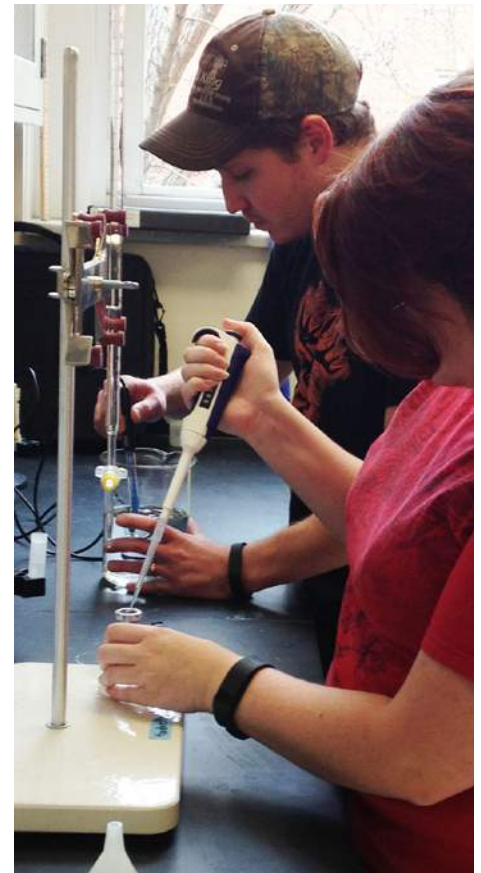
Dr. Joe Bidwell's lab aims to study anthropogenic and natural stress in aquatic systems. Currently, MS students Melissa Campbell and Trevor Chapman are hard at work on their thesis projects focusing on toxicology and respiration in aquatic organisms. The fall 2015 semester was busy with both graduate students spending a substantial amount of time collecting data in lab and travelling to distant field locations to collect organisms. The unusually warm fall weather extended the field season for both students. Melissa's project focuses on the response of Western Mosquitofish (*Gambusia affinis*) to the combined stress of copper and conspecific alarm cues. The majority of the fall session was spent conducting toxicity tests and completing preparation for upcoming oxygen consumption experiments. Trevor's project deals with the response of small crustaceans (amphipods and isopods) to the combined stress of high temperatures and predator chemical cues. His fall consisted of collecting metabolic and behavioral data for both species, as well as running preliminary toxicity trials. Both projects require intensive work, and are possible thanks to the support of dedicated undergraduates, and collaboration with others who assist in lab and field. Melissa and Trevor look forward to presenting their findings at conferences in the spring.

Submitted by Melissa Campbell

Grants awarded by the ETSU Research Development Committee support and encourage research that includes the sciences and non-sciences, including the humanities and the fine and performing arts.

Submitted by Fred W. Sauceman

Republished from ETSU news and <http://abc19.tv/etsu-funds-study-about-balance-and-its-role-in-diagnostics/>



Master's students Melissa Campbell and Trevor Chapman hard at work on their projects!

Photo courtesy of Will Ellis



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We cannot do this alone.

It is because of the support of individuals like you that enables our department to provide research, field work and preserve our enriched learning environment.

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 ETSU/Biological Sciences Eagle Camera. Please add me to the Friends of EagleCam column in the newsletter: Yes No

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