

Department of Biological Sciences East Tennessee State University

Departmental Newsletter

August 2014

Note from the President

I learned, early on, that East Tennessee State University has a world-class Department of Biological Sciences. Having been your President for over 2 ½ years now, I have taken great satisfaction in discovering even more about the teaching, research, and public service work of this outstanding department. The department's faculty, staff, students, and graduates rank among the best in the country.

Under the leadership of Dr. Joe Bidwell, the department ended last academic year on a very high note, with four faculty members winning awards from the College of Arts and Sciences for teaching, research, and service. Congratulations to Dr. Darrell Moore, Dr. Dharendra Kumar, Dr. Aruna Kilaru, and Dr. Hugh Miller. Undergraduate and graduate students in the department excelled as well, winning awards for their presentations at scientific meetings, including the Boland Undergraduate Research Symposium and the Appalachian Student Research Forum.

The department's research productivity remains among the highest on campus. In the spring of 2013, eight different proposals were submitted by Biological Sciences faculty to the National Science Foundation to be considered for funding. At that same time, 16 undergraduate students were involved in research projects, underscoring ETSU's institutional priority of involving students in research work at that level.

Dr. Bidwell tells me that during this past summer, 10 ETSU students participated in Dr. Tim McDowell's study-abroad course, "Tropical Botany in Ecuador." The group joined students from the State University of Bolívar (UEB) in Guaranda, Ecuador, for a joint course. This link between ETSU and UEB has been in existence for 20 years and represents one of a number of collaborative efforts between Biological Sciences faculty and international researchers. In addition to Ecuador, Biology faculty have active collaborations with research groups from Hungary, Australia, the United Kingdom, India, and China.



As the 2014 fall semester begins, the department serves over 350 undergraduate majors and 22 masters students. Five students are enrolled in the joint Biomedical Science Ph.D. program. Another major indication of the success and health of the department is the fact that over 150 new freshmen and transfer students will be enrolling this fall.

I applaud and endorse the department's 2014-2015 goals, including continued research activity through submission of competitive grant proposals and a continued effort to provide research opportunities for undergraduate students. Another hallmark of the department is its strong reputation for training students to enter the health fields. And as the new academic year begins, it is gratifying to me to learn of the department's initiative to highlight our strengths in field biology and our capacity to train students for careers in ecology and natural resource management.

To everyone affiliated with the Department of Biological Sciences, I offer my congratulations for being such a vibrant, energetic, and student-centered part of the ETSU experience.

Brian Noland
President of ETSU

*Greetings to all and welcome to the Department of
Biological Sciences Summer newsletter!*

While Brown Hall may be a bit quieter in summer, there was still plenty happening in the Department. A number of summer classes were on offer including three field courses (Appalachian Flora, Appalachian Fauna, and Tropical Botany in Ecuador), and both majors and non-majors biology and genetics. These summer courses provide a way for our students to stay on track for graduation and/or to advance more quickly through the program. In future, we hope to be able to offer our field courses as a “summer field school” that provides students with field experiences in the southern Appalachians and abroad.

It has been a productive summer for research as well, with three of us (myself, Dr. McIntosh and Dr. Kilaru) receiving funding from the ETSU Research Development Committee. This funding is a great way for faculty to collect baseline data that could lead to more substantial support from a federal sponsor like the National Science Foundation. These projects are detailed later in the newsletter. Dr. Liu continued his appointment as Program Director in the Sedimentary Geology & Paleobiology Program at the National Science Foundation. This is a prestigious posting that reflects very well on Dr. Liu and our department and we wish him well as he begins his second year in this role. Biology faculty also continued active research collaborations with colleagues abroad over the summer. Dr. McDowell was working in Ecuador and Dr. Karsai travelled to Hungary to visit the laboratory of Dr. George Kampis in the Department of History and Philosophy of Science at Eötvös University, Budapest. Dr. Karsai also visited The Netherlands Institute for Advanced Study (NIAS) in Holland to establish a new collaborative project on forest fires. In July, we welcomed Dr. Frank Gleason from the University of Sydney, Australia, for a brief visit to discuss his research on the role of fungi in freshwater and marine food webs.

We were very pleased that ETSU President, Dr. Brian Noland, provided a message for this issue of the newsletter and as he mentions, our enrollment numbers in both undergraduate and graduate programs look very healthy for the upcoming academic year. We will be undergoing an external review of these undergraduate and graduate biology programs in 2014-2015. This is sure to keep us busy as we prepare a “self-study” document detailing where we are as a department and where we would like to be. We will start this process with a faculty retreat at Roan Mountain in mid-August. As also highlighted in Dr. Noland’s message, our broader goals for 2014-2015 include sustained research activity and training undergraduate and graduate researchers.



We also hope to develop a series of “career tracks” that will be posted on the department webpage and that will provide students with a summary of classes they might take to achieve a particular career goal. A career in medicine or other health field is an objective for many of our students, but we also have great capacity to provide training for field-based careers in areas such as conservation biology and natural resource management. Speaking of the Department of Biological Sciences webpage, it has a new look and I thank Shannon Harr for helping with its revision over the summer! Please check it out (<http://www.etsu.edu/cas/biology/>) for updates on departmental events and news.

Finally, I would like to extend a warm welcome to Dr. Anna Hiatt who joined the department over the summer. Anna recently completed a postdoctoral position at the University of Kansas and specializes in science education research. Anna is the featured faculty member for this newsletter. Additionally, I welcome Dr. Rebecca Pyles back to the department after she stepped down from a very successful run as Dean of the Honors College. Best wishes until our next newsletter, 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*

New Faculty *Dr. Anna Hiatt*

The I'm very excited to be joining the faculty here at ETSU and am eager to start working with such an inviting group of faculty, staff, and students!

I earned my Ph.D. in Zoology from Oklahoma State University with a focus on biology education research. Science education research is a rapidly growing field of research that adjoins the theoretical foundations and research methods from the social sciences to the teaching and learning of the natural sciences. I tend to view biology education research as having three major research areas: practitioner-focused (how best can we teach biology); learner-focused (how best do students learn biology); and instrument-focused (how do we measure teaching/learning or any given construct). My primary research has dealt with developing the tools needed to be able to effectively assess student understanding of integrative concepts (instrument-focused), but I ultimately align with the practitioner-focused goals of how I can best use the tools I build to inform my own teaching practices. My current and future research goals are to continue to build evidence and tools that inform best teaching practices for both the ETSU community and educators nation-wide.

I come to ETSU immediately following a challenging postdoctoral fellowship at the University of Kansas. I was tasked with helping transform large-enrollment introductory biology courses that often held anywhere from 300 to 900 students in a single lecture section. I was also responsible for documenting and assessing the effectiveness of transformative teaching approaches implemented in these large-enrollment courses and was able to show gains in student performance and decreases in drop/fail/withdraw rates all without sacrificing the content and the rigor of the course curricula. I hope to bring what I have learned at KU to ETSU's introductory biology courses and help improve our students' preparation for upper-level courses and better their placement and success in STEM careers.

On a personal note, I'm the caretaker of three furry animals: my two elderly black labs and a bearded husband. I enjoy cooking, baking, crafting, crocheting, and various shooting sports. Oh, and feel free to ask me about all the odd-jobs I've had—like shaving cats for fun and for profit.

Above all, I'm very fortunate to be joining a group of talented researchers and educators that care so deeply about their students' success. I look forward to becoming part of such a unique and lively community!

Anna Hiatt



Upward Bound Career *Work Study Program*

Our department was fortunate enough to have the opportunity to participate in the Upward Bound Career Work Study program this summer! This program provides upcoming seniors the opportunity to gain experience in a professional career of their choice and affords them a safe and supervised environment in which to strengthen their skills and competencies. Zach Dugger, an upcoming senior at Happy Valley High School, worked in the Biology 1111 lab and also shadowed in five research labs (Jones, Stewart, Kumar, Yampolsky, Kilaru) during Summer Session I. The responsibilities given to Zach were aimed at his developing an understanding of basic laboratory procedures, developing skills relating to laboratory set-up, gaining familiarity with the use of scientific equipment, and gaining valuable research experience in a variety of fields. Zach's Career Work Study experience was such a success, he has opted to continue in our department as a volunteer. This program is truly a wonderful way in which we can reach out to upcoming seniors who are already interested in science and provide them an avenue by which to foster that interest. The thank you note we received from Zach expresses the benefits of this program much better than I.....

"Thank you for giving me this amazing opportunity. When I first heard about Career Work Study, I never thought it could be this fun or as helpful. None of this could have been possible if not for [your department], and for that I am very thankful." (Zach Dugger)

Amy Weber

Featured Faculty

Dr. Fred Alsop

The Bird Man of ETSU



Photo: Charlie Warden
ETSU Photo Lab

The World-class ornithologist Dr. Fred Alsop says, "I've been teaching for 42 years, and I'm still having a good time."

A professor in the ETSU Department of Biological Sciences, Alsop likes to tell students who take one of his classes on birds, "This class will change your life," and it does. "From then on," he points out, "those students won't notice just 'birds,' but individual species. They will hear birdsong and know who is singing. The students may go on to careers that have nothing to do with my class, but they will have knowledge and a possible hobby to carry with them throughout their lives."

A graduate of Austin Peay State University, Alsop went on to earn master's and doctoral degrees at the University of Tennessee-Knoxville before coming to ETSU, where he served nine years as department chair.

His favorite times are taking classes of students into the field. Every fall break, he takes a class to the Outer Banks of North Carolina to stay in a beach house, cook for themselves, and learn about the ecosystems from the ocean inland, across marshes, and into wooded areas.

"The greatest challenge for students is the day we go out on a boat," Alsop says. "They may have a great time viewing whales, Sargasso seaweed and birds in transit from other seas that are not seen on our coastal lands. But, many have never experienced riding in a boat on the ocean before, and some learn that their stomachs don't like the experience."

In February, Alsop takes his class in the opposite direction. "We go to Reelfoot Lake at Tennessee's western border. When we arrive at dusk, we go to a field to watch the American woodcocks, or 'timber doodles.' The males begin their mating display by giving a call and then soaring up to heights of 200 feet and spiraling back to earth, with the wind making a twittering noise through their feathers."

Later, Alsop begins his imitation of the barred owls' call, to bring the large birds close to the group, and he can hear students snicker at his attempts. However, he notes, "By the time we get into the van to go back to the house, I can hear all of them trying to master the call."

Alsop also spent years training Tennessee Wildlife Resources Agency and federal personnel about bird identification and habitat management. For this service, he was presented with the Tennessee Wildlife Federation's highest honor, the Z. Cartter Patten Award.

The author of 18 books, Alsop has been requested to compile the definitive bird book for the state of Tennessee, a three-year project with one year to go. "The book will have two formats," Alsop explains. "There will be a hard copy and an interactive DVD with color illustrations of all 400 species of birds in the state, along with vocalizations for most of the species. And, an electronic book version will be available online."

A team of ornithology experts is assisting Alsop, and acclaimed wildlife artist Ray Harm is contributing many of his bird paintings.

Of his own lifelong birding hobby, Alsop says, "There are some 10,000 species of birds in the world. I have been fortunate enough to look for them in 18 countries, often when I am leading a group of fellow bird lovers. So far, I have seen and identified 3,600 of those species."

Carol Fox



Photo: Kevin Brooks

RECENT ACTIVITY AT THE ETSU JOHN C. WARDEN HERBARIUM

ETSU John C. Warden Herbarium is a collection of some 25,000 pressed plant specimens, mainly from our local Southern Appalachian and Ridge and Valley region of northeast Tennessee. The herbarium is used for teaching and research. Current research projects by faculty and graduate students involve surveys of local plant diversity and investigate various taxonomic and ecological questions pertaining to our region and beyond. The herbarium is also involved in collaborative projects which will produce specimen images and data-bases comprising the collections of herbaria across state and southeastern US. Below we summarize our current (2014) herbarium related activities.

Research projects and collections:

Dr. Frosty Levy has been collecting specimens for a floristic survey of Rocky Fork State Park, Tennessee's newest park, and completing a study of plants in Roan Mountain State Park. With Adjunct Curator Jamey Donaldson and recent ETSU MS graduate Russell Ingram, they have used herbarium specimens borrowed from several herbaria to show that a disease of Gray's Lily was present on Roan Mountain in 1942 and infected specimens of Canada Lily in the northeast in the 1920s. A current study is using loaned specimens to examine the validity of *Phacelia* species named by John Kunkel Small (1869-1938) and Asa Gray (1810-1888).

Botanist **Becky Smucker** is completing her second year of collecting and bryophytes (mosses and liverworts) in Rocky Fork State Park. Her study has documented great diversity in these non-vascular plants in the park. She has found 230 bryophyte species, including five species on the Tennessee Natural Heritage Rare Plant List and several more listed rare for the Cherokee National Forest.

Cheyenne Peavler, herbarium technician for the past five years, will begin a graduate program in environmental psychology at ETSU this fall. Mary DuPre, who databased the bryophyte collection last year, is now working as a botanical technician for the U.S. Fish & Wildlife Service in Montana and Idaho.

MS student **Phillip Klahs** is continuing with his floristic survey and vegetation study at Steele Creek Park in Bristol, Tennessee. Over 1000 specimens have been collected from the park with an emphasis on the species-rich groups such as Asteraceae, Poaceae, and Cyperaceae. The collection has yielded nearly 200 new records for Sullivan County. This summer he has set up and sampled the vegetation at 20 permanent study plots in the park. The John C. Warden Herbarium has been assisting Steele Creek Park volunteers in the development of an on site

herbarium at the park. Klahs' research is the first floristic survey for their new herbarium.

MS student **Adam McCullough** is continuing with his floristic survey and vegetation study on Doe Mountain Tennessee in Johnson County, an 8,600 acre tract of land recently purchased by the Nature Conservancy and given to the state in 2012. The mountain is being developed for adventure tourism, which includes activities such as horse back riding, mountain bike trails and use by ATVs. At this time he has collected approximately 600 specimens, completed seven permanent plots comparing the vegetation in interior areas and along roadsides, and finally, he is growing a rare bog club moss in the genus *Lycopodiella* to investigate its phenotypic plasticity and to help correctly identify the species.

Teaching and student collections:

During May and June Adjunct curator **Jamey Donaldson** instructed the Summer course "Appalachian Flora", with 10 students. The class included daily field trips to learn plant identification techniques. Students made herbarium specimen collections and identified them using keys and reference collections. Selected student specimens will be added to the ETSU Herbarium permanent collection.

Outreach:

Dr. **Tim McDowell**, working with colleagues at the Bolívar State University (UEB) in Guaranda Ecuador, has established a new teaching herbarium at their Agronomy College, with a collection of some 600 specimens. Among their projects are a floristic survey of a local community forest reserve (San José de las Palmas), a recently completed MS Thesis by UEB student Javier Castillo, who studied woody vegetation at that forest, and the preparation of a guide to the woody plants of the cooperative town of Salinas de Guaranda. ETSU and UEB have a 20-year partnership which builds upon the Sister City relationship of our two town. McDowell conducted a joint ETSU-UEB summer course "Tropical Botany in Ecuador" during June and July, which included about 10 students from each of the two universities.

Grant support:

The ETSU Herbarium is participating in a Tennessee herbarium specimen imaging project recently funded by the NSF's Advancing Digitization of Biological Collections program. The grant, coordinated by Dr. Joey Shaw of University of Tennessee Chattanooga, provides funds for several camera-computer stations with allowances for student worker and faculty time, including \$10,551 for ETSU collection imaging. The project is scheduled to begin in the coming semester. Dr. Tim McDowell is the ETSU coordinator on this collaborative project.

HERBARIUM contd.

New herbarium equipment:

In May the herbarium received a new Zeiss Stemi 2000C stereomicroscope on boom stand, with camera adapter mount for Canon SLR camera and connection to herbarium computer. This low-power microscope provides a new capability to make low-power (to 50x) microscopic images of technical features on herbarium specimens. The ETSU Department of Biological Sciences supported this purchase.

Tropical Botany in Ecuador

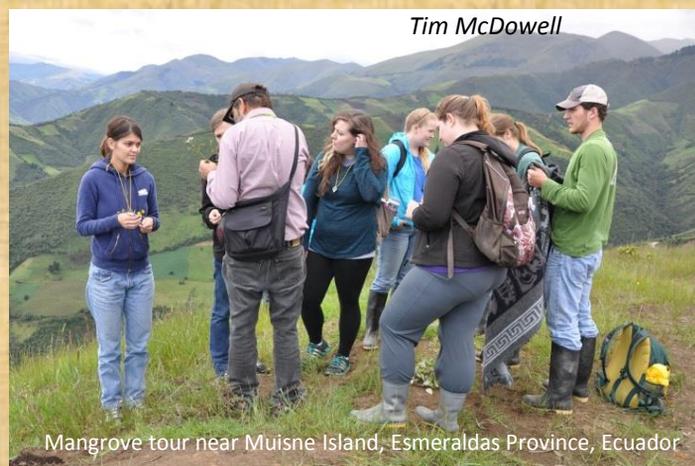
This This summer marked the fifth year for the Tropical Botany and Spanish Language study abroad courses, led by ETSU faculty Tim McDowell (Biological Sciences) and Jerome Mwinelle (Literature and Language). Thirteen ETSU undergraduates spent five weeks traveling across Ecuador by charter bus, studying plant diversity from the Amazonian rain-forest to the high-elevation dwarf paramo and the coastal mangroves, and experiencing Spanish language and Latin American culture. They were joined on the nine-city tour by ten Ecuadorian students from the Agronomy program of the Bolivar State University (UEB) located in Guaranda, Ecuador. Guaranda and Johnson City have been Sister City partners for 50 years, and our universities have cooperated in teaching and research projects for two decades.

The Tropical Botany students conducted daily field trips to botanical gardens, wildlife reserves and national parks, where the great range of flowering plants provides material for interpreting morphology of stems, leaves, flowers and fruits. Over the weeks the students learned to recognize dozens of plant families. Many of these plant families are predominantly tropical in distribution: the palms, orchids, aroids, myrtles, cacti and gingers, among others. Students were impressed by the range of plant growth forms: abundant epiphytes (plants growing on other plants) and tall tree ferns in moist forests, saltwater dwelling mangrove trees with hundreds of aerial roots along the Pacific coast, and giant sunflower relatives covering miles of cloud-bound mountainsides at elevations of 10- 15,000 feet.

The magic of the course derives from the shared friendships developed among the ETSU and UEB students who travel, study and live together for the month-long journey.



The Spanish Language-Latin American Culture course provided many interactions with students at other Ecuadorian universities, in Cuenca, the old city of art and music, in Tulcan, the chilly Andean city on the Colombian frontier, in Esmeraldas, the Afro-Ecuadorian port on the north coast of Ecuador, and elsewhere. In Guaranda the Botany course, with our UEB hosts, held a two-day symposium, with a day of talks on a range of topics by six botanists (five from Ecuador) and a day trip to a UEB biological reserve at 10,000 feet elevation. A favorite destination for the ETSU students was Baños, a hot-springs and outdoor recreation town in the eastern Andes. Our first day there included a four hour botany hike rich with flowers, ferns and tremendous vistas over a river gorge. The following day (Saturday) was free for students, and their adventures included rafting, horse-back riding, and bungee-jumping. In course review comments, the students stated that this Botany/Language study abroad trip was the "best class experience of my life", "a great experience and one that I will remember the rest of my life" and "truely a life-changing experience." McDowell and Mwinelle will offer these courses for the sixth time in summer, 2016.



About our graduate students

Olusegun Adeboye Adepoju

Congratulations to Olusegun Adeboye Adepoju who successfully defended his M.S. thesis entitled: Using site-directed mutagenesis to determine impact of amino acid substitution on substrate and regiospecificity of grapefruit flavonol 3-O-glucosyltransferase. Committee members were Dr. C.A. McIntosh (chair), Dr. A. Kilaru, and Dr. S. Devaiah. Adeboye will be presenting this work at the Annual Meeting of the Phytochemical Society of North America in Raleigh, N.C. in August. Adeboye came to ETSU in fall of 2012 after earning a B.S. in Biochemistry from the University of Lagos in Nigeria and a subsequent certificate in project management in 2009. He presented his thesis work at other regional and national/international conferences. Adeboye has been accepted into a Ph.D. program in plant science at Virginia Tech and will enter that program in August 2014.

Cecilia McIntosh

Kevin Brooks

I completed my undergraduate degree in Biology at ETSU in 2013 and am currently a Masters candidate under Dr. Fred Alsop. For my research, I get to write the next chapter in a study started in 1965 by Dr. Alsop and repeated by Dr. Tom Laughlin in 1985 and 1997. I will be conducting a breeding bird survey in the high elevation spruce/fir forest of Mt. Guyot in the Great Smoky Mountains. The endemic Fraser Fir (*Abies fraseri*) trees have been decimated by a tiny insect from Europe called the Balsam Woolly Adelgid, and we are attempting to understand how the loss of these trees affects local bird populations over time. I have already successfully completed the census for 2014, and I can see from the data that the forest today is vastly different from what was seen 47 years ago in the initial study.



Photo: Kevin Brooks

Mahbubur Rahman Receives ASPB 2014 Travel Grants Award

Md. Mahbubur Rahman joined ETSU in Fall 2012 to pursue doctoral degree in biomedical sciences under Dr. Kilaru's mentorship. Mahbub's research is focused on unraveling the regulation of rate-limiting reactions involved in triacylglycerol (TAG/oil) accumulation in plants. Specifically, he is involved in characterizing the role of two enzymes, diacylglycerol acyltransferase (DGAT1) and phospholipid: diacylglycerol acyltransferase (PDAT1), in TAG accumulation in avocado. The fleshy edible part of avocado accumulates about 60-70% oil that is highly nutritious. Mahbub's research is expected to reveal the biochemical steps that determine the healthy oil composition. Mr. Rahman spent the past couple of years to identify the full-length gene and protein sequences of the enzymes DGAT1 and PDAT1 in avocado. Currently, in collaboration with Dr. Jay Shockey, USDA, New Orleans, he is in the process of expressing these enzymes in yeast system for biochemical characterization.

Mahbub received the 2014 ETSU Graduate Council Research Grant and his research work was selected for a competitive travel award from The American Society of Plant Biologists. He presented a poster titled "Identification and Characterization of DGAT1 and PDAT1 involved in TAG biosynthesis in Avocado," at the ASPB's 2014 Annual Meeting in Portland, Oregon in July. The Department of Biology and Biomedical Sciences and ETSU Graduate and Professional Student Association provided additional travel support for him to attend this National Meeting. Mahbub also presented his research recently at the 2014 Appalachian Student Research Forum and the Annual Meeting of Southern Section ASPB.

Md. Mahbubur Rahman came to ETSU from Bangladesh; he earned his MS degree from University of Dhaka. After completing his Ph.D., Mahbub plans to pursue a career in research and teaching.

Aruna Kilaru

Larry Bowman

Our Lev Yampolsky and this summer's MS graduate Larry Bowman attended Society for Molecular Biology and Evolution meeting in San Juan, PR and Society for the Study of Evolution meeting in Raleigh, NC. Three posters were presented as well as a talk on differential gene expression / local adaptation in Lake Baikal's endemic zooplankter, *Epischura baikalensis*. Larry is moving on to a PhD program at Yale.

Lev Yampolsky

Reports from the labs

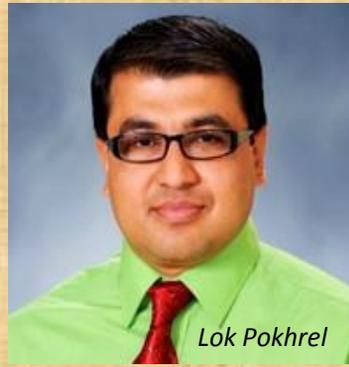
Karsai's Lab

The summer was very exciting for us in lot of ways. First of all I received many good news from my past students:

- **Emil Montano** have been accepted to LMU-DCOM and I am sure he will be an excellent doctor. He wrote to me: "I want to thank you for the wonderful research experience that you provided during my four years of undergrad. I wrote much about our research, grants, thesis, and the various forums/symposiums that I attended in my application. My research experience also came up in multiple interviews. I will take the skills that I learned working on and presenting research with me and apply it throughout the rest of my educational career and beyond."
- **Dr. Lok Pokhrel** have received his Green Card and he accepted a faculty position at Temple University Philadelphia. Besides research he will be teaching two sections of Environmental Health for undergrads.

It is always the best news when I receive these from my previous students, but we also have some good news about the current lab:

- A new student **Shiva Thapa** will join to our lab as Biomed MS student interested in computational biology.
- Everything goes really well with our common project on the mathematical and biomedical study on postural balancing, because **Allison Hilbun** is very dedicated and excellent PhD student. She wrote the IRB protocol of the study, which was accepted this summer. With the help of an RDC small grant we were able to buy several key equipment for the study. Currently we are talking to doctors to set up the studies in medical offices and we ready to collect real patient data this month. We also have been working on a paper this summer to describe the working of the wasp colony using master equations from physics.



Lok Pokhrel

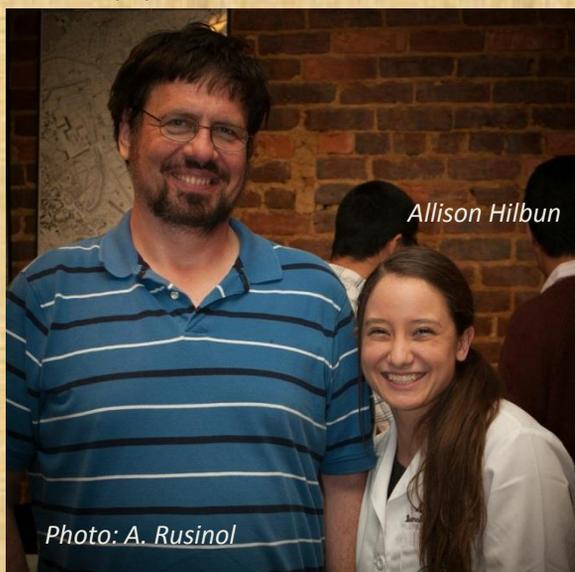


Shiva Thapa

This summer I have been invited for a collaborative research to the Netherlands Institute for Advanced Study by **George Kampis**. Professor Kampis, Head of Department of History and Philosophy of Science at Eotvos University, Hungary, is an ex-Basler Chair of ETSU and he has extensive collaboration with me. This current project we pursue wants to understand the mathematical background of forest fire distributions and how these fires effect the ecosystems in the long run. The Netherlands Institute for Advanced Study (NIAS) is a special research institute of the Royal Netherlands Academy of Arts and Sciences. The goal of the institute is to stimulate interdisciplinary scholarly co-operation in an international setting.

I was also invited to be the team and committee member of the ALIA project: <http://alia.project-amber.co.uk/team/> ALIA2014 will bring together Artificial Life and Intelligent Agent researchers to discuss the current challenges in the field and discuss the latest research. This highly interdisciplinary field has applications in many areas including robotics, creative sector and life science and is in a constant state of development.

Prof. George Kampis is looking forward collaborating with Prof. Karsai some more



Allison Hilbun

Photo: A. Rusinol

Three Biology Faculty Receive 2014-15 ETSU RDC Major Grant

Professors **Bidwell**, **Kilaru** and **McIntosh** from the Department of Biological Sciences were among the recipients of ETSU's RDC Major grants for 2014-15. The RDC major grants are awarded annually to encourage faculty initiation, development and continuation of research and scholarship projects that have the potential for enhancing productivity and for attracting external funding.

Dr. Bidwell's project on "Metal Tolerance and Energetics in an Invertebrate from a Mercury-Contaminated River," is aimed at understanding the implications of higher "cost of living" due to the energetic demands of detoxification and/or tissue repair, in aquatic insects (net-spinning caddisflies, *Hydropsyche morosa*). The study will determine the seasonal levels of mercury in caddisflies, algae, and suspended sediments, and invertebrate metabolic rates and tolerance to a reference metal stressor, in samples collected from a site of long-term mercury contamination in the North Fork of the Holston River (NFHR), Virginia. The study will establish critical baseline data for future investigations of pollution tolerance and associated ecological effects on aquatic species.

Dr. Kilaru's project is entitled "Discovery and Characterization of N-acyl ethanolamine (NAE) Metabolic Pathway and its Functional Role in Mediating Growth and Stress Responses in Tomato." Dr. Kilaru uses molecular and biochemical approaches to elucidate the mechanisms by which plants cope with stress conditions such as extreme temperature, drought and disease. NAEs are small lipid molecules that are shown to regulate such responses to stress in plants and Dr. Kilaru's team is focused on discovering the NAE metabolic pathway and its function in tomato plants. Such studies are expected to lead to developing stress-tolerant agronomic crops in the future.

Dr. McIntosh's project is on "Grapefruit Flavonol-3-O-GT Structure Elements and Substrate/Regiospecificity". The focus of this research is to study the structure and function of a flavonol-specific glucosyltransferase enzyme from grapefruit and to determine how their specificity, to add sugars only to one particular group of flavonoids, is regulated. Bioinformatics and homology modeling are used to predict candidate amino acids and change them via site-directed mutagenesis. Flavonoids are important compounds for plants and humans. Understanding the mechanism of enzyme function is expected to lead to their custom design to enhance production of desirable compounds.

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.

Istvan Karsai RDC co-chair

Team from Biological Sciences attends Southeast Regional PULSE Institute

A team from ETSU Biological Sciences attended the Southeast Regional PULSE Institute on the University of Richmond Campus from 18-21 June, 2014. The group included **Joe Bidwell**, **Cerrone Foster**, **Anna Hiatt**, **Cecilia McIntosh**, and **Rebecca Pyles**. Attendance at the Institute was by invitation only and ETSU was one of 20 institutions in the Southern Association of Colleges and Schools (out of 70 applicants) selected to participate. All teams were required to include at least two administrators and two faculty members/instructors.

The PULSE (Partnership for Undergraduate Life Sciences Education) Institute is funded by the National Science Foundation, Howard Hughes Medical Institute, and NIH's National Institute for General Medical Sciences. The goal of PULSE is to promote reform in how science is taught at the undergraduate level. Inspiration for reforms originate with a grass-roots process that began in 2007 with assistance from the American Association for the Advancement of Science. Outcomes of the process were reported in 2011 as "Vision & Change in Undergraduate Biology Education: A call to action".

The conference included plenary talks and workshops focused on topics such as embedding research into coursework, improving student metacognitive awareness, and using evidence-based pedagogies. The ETSU delegation returned home with a plan of action to initiate and encourage enhanced active learning strategies in teaching biology at all levels of the curriculum.

Joe Bidwell

Report from the Graduate Committee

Graduate program in the department of Biological sciences offers MS in Biology with concentrations in Biology, Microbiology, Paleontology and Biomedical Sciences. For the Fall 2014 semester, we received a total 31 applications for Biology and BIMS concentrations. While 14 applicants have decided to join our program, 9 other have decided not to join our program due to various reasons. Students expected to join our Ms in Biology program in Fall 2014 are from USA, Nepal, Nigeria, Ghana, Cameroon, and Zambia. Most of these applicants have been offered graduate teaching assistantship which covers full tuition and \$8000/y as stipend. Some of the applicants are only offered tuition scholarship which only covers full tuition fees. Several of our MS students have successfully graduated and moved on to join Ph.D. programs across USA or have taken up jobs in academics or industry. Some students are still trying to complete their research and are getting ready to defend their thesis.

Dhirendra Kumar