

Biological Sciences

SPRING 2016



EAST TENNESSEE STATE
UNIVERSITY

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Greetings and Welcome



Joe Bidwell, Chair Photo: ETSU Photographic Services

Another academic year has flown by! This semester once again saw the Biological Sciences faculty heavily engaged in teaching and research. Additionally, we conducted a successful search for a plant ecologist and were fortunate to receive a number of outstanding applications. The candidate selected to fill that position is Dr. Gerardo Arceo-Gomez who studies plant-pollinator communities. Gerardo will be joining us in August. The spring semester is also when our undergraduate and graduate student researchers have the opportunity to present their results at either the Boland Undergraduate Research Symposium or the Appalachian Student Research Forum. As detailed in the pages that follow, Biological Sciences was very well represented at these events, with a number of students taking home awards. Spring is also "awards season" for faculty and we were very pleased that Dr. Anna Hiatt received the New Faculty Award from the College of Arts and Sciences. This award is usually given to a faculty member who has been at ETSU for at least three years and the fact that Anna won it within two years of her arrival is a testament to her excellence in teaching and research. I was also very pleased that Amy Weber received recognition as a featured employee on the ETSU Human Resources website. Amy's dedication to the department never ceases to amaze and she, along with Executive

Aide Maria Kalis Buchanan, are two of the reasons why Biological Sciences is such a great place to work.

It was once again my great pleasure to attend the spring commencement ceremony and watch 33 graduating biology students receive their diplomas. These graduates will be going on to medical school, other graduate programs and/or entering the job market and we wish them the absolute best. On the subject of completing degree programs, this semester also included two history-making events as Allison Hilbun (supervisor Istvan Karsai) and Jennifer Price (supervisor Thomas Jones) became the first two doctoral candidates to successfully complete the program. We are very proud of both Allison and Jennifer.

As always, I would like to thank the donors who made contributions to the Department of Biological Sciences. These funds are used for student research awards and scholarships in addition to supporting such things as the Warden Herbarium, the ETSU Arboretum, and our "EagleCams." These initiatives would simply not be possible without the generosity of the friends of the department. If you are interested in making a donation, please contact me directly at bidwell@etsu.edu.

Enjoy this edition of the newsletter and have a great summer!

Joe Bidwell
Professor and Chair of Biological Sciences

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Student Awards and Recognitions



Dr. William Duncan, Vice Provost for Research and Sponsored Programs with Sangam Kandel
Photo: ETSU Photographic Services



Timothy Audam, Dr. Bidwell and Dr. Dharendra Kumar
Photo: Amy Weber



Dr. Duncan and Aubrey Sciara
Photo: ETSU Photographic Services



Dr. Bidwell, Kaitlyn Mathis and Dr. Rebecca Pyles
Photo: Amy Weber



Dr. Duncan and Jedy Chilufya
Photo: ETSU Photographic Services

In April, the department held its annual Student Recognition and Awards Luncheon at the D.B. Culp Center. This was an opportunity to recognize graduate and undergraduate students for their support of the Department of Biological Sciences. On behalf of the department Dr. Bidwell expressed appreciation for the students' capacity to balance teaching undergraduate laboratory sections, attending classes, and working with their mentors while still finding time to apply for grants and present their work.

Department of Biological Sciences Awards:

- William Harvey Fraley and Nina M. Fraley Award – Timothy N. Audam (Advisor- Dr. Dharendra Kumar)
- Dr. Denise Pav Research Award – Melissa N. Campbell (Advisor- Dr. Joe Bidwell)
- Marcia Davis Research Award – Cindy Lynn Barrett (Advisor- Dr. Frosty Levy)
- Herman O'Dell Award for Outstanding Junior – Charlotte Leonie Kaestner
- Biological Sciences Outstanding Senior Award – Kaitlyn A. Mathis

ETSU School of Graduate Studies and ETSU Graduate Council Research Grant Recipients:

- Research Award: Jedaidah Chilufya, Sangam Kandel and Rebecca Wilson
- The Outstanding Thesis Award: Preethi Sathanantham

Other Awards:

- ETSU Faculty Award for Outstanding Student in Biological Sciences: Mackenzie Davenport
- The 2016 Harold Love Outstanding Community Involvement Award, State of Tennessee Higher Education Commission: Md Mahbubur Rahman
- American Society of Plant Biology Competitive Student Travel Award: Jedaidah Chilufya
- Graduate School Representative for the Day on the Hill Presentation: Md. Mahbubur Rahman

2016 Appalachian Student Research Forum Award Winners:

Graduate, undergraduate, master candidates and doctoral candidates who presented at the 2016 Appalachian Student Research Forum

First-Place Winners: Oral Presentations

- Jedy Chilufya, ANALYSES OF ANANDAMIDE-MEDIATED GROWTH INHIBITION IN PHYSCOMITRELLA PATENS (Advisor- Dr. Aruna Kilaru)
- Aubrey Sciara, CHARACTERIZATION OF ANTI-INFLAMMATORY MICROGLIA IN ANTERIOR CINGULATE CORTEX WHITE MATTER IN AUTISM SPECTRUM DISORDER (Advisor- Dr. Gregory Ordway)

First-Place Winners: Poster Presentations

- Sangam Kandel, BIOCHEMICAL CHARACTERIZATION OF A Cp-3-O-GT MUTANT P145T AND STUDY OF THE TAGS EFFECT ON GT ACTIVITY (Advisor- Dr. Cecilia McIntosh)
- Tuqa Alkhateeb, EFFECTS OF SEPSIS ON RENAL STRUCTURE AND SYMPATHETIC INNERVATION IN MICE (Advisor- Dr. Don Hoover)
- Nathaniel Hancock, (undergrad, BEHAVIORAL EFFECTS OF SUB-LETHAL CADMIUM (Cd) EXPOSURE IN THE SPIDER ANELOSIMUS STUDIOUSUS (Advisor- Dr. Thomas Jones)

Second-Place Winners: Poster Presentations

- Melissa Campbell, EFFECTS OF PREDATION CUES ON METAL TOXICITY IN GAMBUSIA AFFINIS (Advisor- Dr. Joseph Bidwell)
- Allison Hilbun, BALANCING STRATEGY WITH PAIN (Advisor- Dr. Istvan Karsai)
- Charlotte Kaestner (undergrad), THE EFFECTS OF ANTIPSYCHOTIC TREATMENT UPON NICOTINE ASSOCIATIVE REWARD IN A NEONATAL QUINPIROLE MODEL OF SCHIZOPHRENIA (Advisor- Dr. Russell Brown)



cont. Student Awards and Recognitions

2016 Appalachian Student Research Forum Biology Student Presenters:

IDENTIFICATION AND FUNCTIONAL ANALYSIS OF AVOCADO DGAT1 AND DGAT2 EXPRESSED IN YEAST
Presented by Md. Mahbubur Rahman (Advisor- Dr. Aruna Kilaru)

BIOCHEMICAL CHARACTERIZATION OF FATTY ACID AMIDE HYDROLASE IN HYSCOMITRELLA PATENS
Presented by Swati Swati (Advisor- Dr. Aruna Kilaru)

DECONSTRUCTING SCIENCE PRACTICE SKILLS IN THE INTRODUCTORY BIOLOGY CLASSROOM: INVESTIGATING INSTRUCTOR TEACHING STRATEGIES
Presented by Sara Normark (Advisor- Dr. Anna Hiatt)

CHARACTERIZATION OF FATTY ACID AMIDE HYDROLASES IN TOMATO
Presented by Vijay Tiwari and Derek Stuffle (Advisor- Dr. Aruna Kilaru)

MODERNIZING EDUCATIONAL RESOURCES FOR AN ADVANCED ANATOMY LAB EXPERIENCE
Presented by Savannah Mattie, Amber Brooks, Rob Becker (Advisor- Dr. Thomas Kwasigroch)

STRESS SIGNALING IN A RESPONSE TO DEHYDRATION (RD22) SILENCED TRANSGENIC LINE OF NICOTIANA TABACUM
Presented by Mackenzie Davenport (Advisor- Dr. Dharendra Kumar)

IMPACT OF REDUCED CALCIUM DURING DEVELOPMENT IN SNAKES
Presented by Kaitlyn Mathis (Advisor- Dr. Rebecca Pyles)

CHARACTERIZATION OF A PUTATIVE LIPID TRANSFER PROTEIN AND ITS ROLE IN STRESS SIGNALING IN PLANTS
Presented by Audam Timothy (Advisor- Dr. Dharendra Kumar)

AFFECT OF THE MUTATION D344P ON THE REGIO AND/OR STEREOSPECIFICITY OF Cp3-O-GT
Presented by Nathan Spaulding (Advisor- Dr. Cecilia McIntosh)

PRO-INFLAMMATORY MICROGLIA PATHOLOGY IN THE ANTERIOR CINGULATE CORTEX IN ASD
Presented by Emma E. Pendola, Aubrey N. Sciara, Jessica D. Crawford (Advisor- Dr. Michelle J. Chandley)

IDENTIFYING THE ROLE OF TOBACCO GLUCOSYLTRANSFERASE SIP68 IN PLANT STRESS SIGNALING
Presented by Behzad Alinejad, Abdulkareem Odesina (Advisor- Dr. Dharendra Kumar)

FUNCTIONAL VALIDATION OF WRINKLED ORTHOLOGS IN AVOCADO OIL BIOSYNTHESIS
Presented by Shina Bhatia (Advisor- Dr. Aruna Kilaru)

SYNERGISTIC EFFECTS OF COMBINED STRESSORS IN AMPHIPODS (GAMMARUS MINUS) AND ISOPODS (ASELLUS INTERMEDIUS)
Presented by Trevor Chapman (Advisor- Dr. Joseph Bidwell)

THE EFFECTS OF RESILIENT PRODUCERS IN CONNECTED HABITATS: AN AGENT BASED MODELING APPROACH
Presented by Shiva Thapa (Advisor- Dr. Istvan Karsai)

THE COMBINED EFFECTS OF LEPTIN AND COENZYME Q10 IN AMELIORATING OBESITY- INDUCED INFERTILITY IN FEMALE RATS
Presented by Adekunle Adedeji, Effiong Otukonyong (Advisor- Dr. Jonathan Peterson)

SCAVENGER RECEPTOR A EXPRESSION IS INCREASED IN SEPTIC PATIENTS
Presented by Adam Banach, Joshua Wienczkowski, Ahmad Alalbissi (Advisor- Dr. Tammy Ozment)

CHARACTERIZATION OF SIR2 LIKE DEACETYLASE FOR ITS ROLE IN STRESS
Presented by Bal Krishana Thakuri, Mackenzie Davenport, Md. Imdadul Haq (Advisor- Dr. Dharendra Kumar)

ELUCIDATION OF THE PATHWAY BY WHICH THE MINOR PILIN OPERON NEGATIVELY REGULATES ALGZ EXPRESSION IN PSEUDOMONAS AERUGINOSA
Presented by Danielle Williams (Advisor- Dr. Christopher Pritchett)

CULTURED MILK LACTOBACILLUS RHAMNOSUS ISOLATE MODULATED THE PRODUCTION OF INFLAMMATORY CYTOKINES IN CACO-2 CELLS
Presented by Beverly Ngeny (Advisor- Dr. Edward Onyango)

ELUCIDATING THE ROLE OF N-ACYLETHANOLAMINE/ANANDAMIDE METABOLISM IN THE MOSS PHYSCOMITRELLA PATENS
Presented by Md. Imdadul Haq (Advisor- Dr. Aruna Kilaru)



EagleCam *UPDATE*

Submitted by Kevin Brooks

The ETSU Biological Sciences EagleCam Project is off to a successful start.

Both the Bluff City and Johnson City nests contain one healthy eaglet each. These birds have had to endure freezing and high temperatures as well as strong winds in order to raise their chicks. The pair at Bluff City is in its fifth nesting season and hatched its ninth chick on March 9, 2016. The Johnson City pair is in its fourth nesting season and welcomed its seventh chick on March 20, 2016. In the weeks to come, keep an eye out for developmental milestones. The chicks will begin feeding themselves and “branching” to test their wings!

As of April 21, 2016, we have had over 720,000 views on our Johnson City nest and over 266,000 on the Bluff City nest, and they have been viewed in 165 countries! From 4/11 – 4/21 there was an increase of 91,000 views total between the two cameras. The ETSU EagleCam Project has great potential for research and conservation. Please join our ETSU EagleCam’s Facebook page or follow us on LiveStream.com to participate! If you wish to help support ETSU EagleCam Project in the years to come, please visit the ETSU Biological Sciences homepage and click the blue “Give Now” arrow. **Thank you all for your support!**

Friends of ETSU Eaglecam:

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

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- Bristol Tennessee Essential Services (BTES) *

Winged Deer Park Webcam

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- Mountain Empire Oil/Roadrunner *
- Mountain Sports, Ltd. *
- Thomas Eugene and Frances Morrell
- Eddie Myers and Jane Snyder
- In honor of the Airport Pet Emergency Clinic
- CJ and Hawk Sims of BearDog Mountain
- In honor of Dr. Fred J. Alsop, III and Kevin Brooks
- 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
- Joe and Kathy Carder
- In memory of Jeff Leonard by Mrs. Sandra Leonard
- Mr. and Mrs. Mike Blevins
- In memory of Robert L. Hagan Sr. by Janice M. Hagan
- Ms. Kimberlyn K. Pruden
- In memory of Bill Newell by Chris Newell Kwasigroch
- Mr. Wayne Boys
- In memory of Sara Willis by Lowell & Laura Greene
- In honor of Jason, Rachel and Lucas Lyons by Mrs. Margaret Strickler
- Lucy and Louie Gump
- Ms. Patricia Warren
- In memory of Polly Newell by her daughter
- Mr. Huston Keith

Photo: Ron Austing



MAKING HISTORY



Allison Hilbun
Photos: ETSU Photographic Services



Jennifer Price

Allison Hilbun and Jennifer Price have successfully defended their Ph.D. dissertations, making them the first students to complete the joint doctoral program between the Departments of Biological Sciences and Biomedical Science. Allison’s successful Ph.D. defense in quantitative bioscience dissertation title is: Strategies of Balancing: Regulation of Posture as a Complex Phenomenon. Her committee members are Professors Dr. Istvan Karsai (Chair), Dr. Alok Agrawal, Dr. David Hurley, Dr. Antonio Rusinol and Dr. Lev Yampolsky. Her excellent work resulted in four first author papers (2 submitted and 2 are in their final edits) and numerous conference presentations (with a second place poster at the Appalachian Student Research Forum). She also belongs to the President’s Pride organization.

The abstract of Allison’s dissertation: The complexity of the interface between the muscular system and the nervous system is still elusive. We investigated how the neuromuscular system functions and how it is influenced by various perturbations. Postural stability was selected as the model system, because this system provides complex output, which could indicate underlying mechanisms and feedback loops of the neuromuscular system. We hypothesized that aging, physical pain, and mental and physical perturbations affect balancing strategy, and based on these observations, we constructed a model that simulates many aspects of the neuromuscular system. Our results show that aging changes the

control strategy of balancing from more chaotic to more repetitive. The chaotic elements ensure quick reactions and strong capacity to compensate for the perturbations; this adeptly reactive state changes into a less reactive, slower, probably less mechanically costly balancing strategy. Mental tasks during balancing also decreased the chaotic elements in balancing strategy, especially if the subject experienced chronic pain. Additional motoric tasks, such as tying knots while balancing, were correlated with age but unaffected by chronic pain. Our model competently predicted the experimental findings, and we proceeded to use the model with an external data set from Physionet to predict the balancing strategy of Parkinson’s patients. Our neurological model, comprised of RLC circuits, provides a mechanistic explanation for the neuromuscular system adaptations.

Another successful dissertation was given by Jennifer Bryson Price, also in our Ph.D. program with the Biomedical Sciences. Her committee members are Dr. Thomas Jones (chair), Dr. Darrell Moore, Dr. David Roane, Dr. Antonio Rusinol, and Dr. Stacy Brown. The title is: Exploring the Relationship between Behaviour and Neurochemistry in the Polyphenic Spider, *Anelosimus studiosus* (Araneae: Theridiidae).

The abstract of Jennifer’s dissertation: The importance of social behaviour is evident in human society, but there are both costs and benefits associated with cooperation and sociality throughout the animal kingdom. At what point do the benefits outweigh the costs, and when do selective pressures favour sociality and colonization over solitude and independence? To investigate these questions, we have focused on an anomalous species of spider, *Anelosimus studiosus*, also known now as the northern social spider. Throughout its broad range, *A. studiosus* is solitary and aggressive, but recently, colonies of cooperative and social individuals have been observed at northern latitudes. This leads to two research questions: 1) what characteristics differentiate the two variants behaviourally, and, 2) how are they different physiologically? Colonies and individuals were collected from multiple populations throughout the Tennessee River watershed area and maintained in a laboratory environment for quantitative and qualitative assessment of behavioural traits as well as specific neurochemical analysis by high performance liquid chromatography with electrochemical detection. I looked at the influence of factors such as age, reproductive state, nutritional state, and time of day on behaviour and neurophysiology. I found correlations between social behaviours and serotonin, aggressive behaviours and octopamine (invertebrate counterpart of norepinephrine), and several other compounds associated with an increase or decrease in aggression. These studies combine techniques from multiple disciplines to contribute to the greater understanding of the proximate control of social and aggressive behaviours as well as factors influencing the evolution of sociality.

The Department of Biological Sciences is proud to have Allison and Jennifer represent the first ever Ph.D. graduates from the department.

Submitted by Dr. Istvan Karsai and Dr. Joe Bidwell



Notes from Faculty Laboratories

View full articles in the online edition.



Pictured L-R: Dr. Jen Ward, UNC-Asheville; Dr. Anna Hiatt, ETSU; Dr. Alisa Hove, Warren Wilson College; Dr. Zach Murrell, Appalachian State University, Poster Presentation at the EnFUSE (Envisioning the Future of Undergraduate STEM Education)



Dr. Dharendra Kumar



Kailea Holbrook



Bret Coggins



Trevor Chapman

Bidwell Lab Both Trevor Chapman and Melissa Campbell presented their current data at the Appalachian Student Research Forum, and their data on different aspects of this research complemented each other to give the audience a good idea of the expected outcome of each study. Trevor's poster title was "Combined Stressors in Isopods and Amphipods: Thermal Stress and Predation", while Melissa's was "Effects of Predation Cues on Metal Toxicity in *Gambusia affinis*." Melissa took second place in Natural Sciences, Group A for her poster presentation at the forum, a very exciting accomplishment for the lab. As they both approach their final term of graduate school, their expertise in each respective area of combined stressor research is proving to be very useful in helping each other finish off their data collection so that they may begin writing their thesis by the end of the summer. Submitted by Trevor Chapman

Moore Lab In Dr. Moore's lab this semester we will be analyzing honey bees for daily patterns of circulating neurohormones. In order to see differences in levels of neurohormones, the first step will be to record the baseline levels for individual honey bees. We will be using captured foragers, newly emerged honey bees, and foragers who have not foraged. All these groups will be placed on a LD 12:12 for 7 days under constant conditions. On day 7, ten bees will be sampled from each group every three hours and analyzed using HPLC-EC for circulating neurohormones. Sampling will begin one hour after lights on day 7. Analysis should reveal the daily fluctuations of neurohormones within the individual bees. Submitted by Maren Hudson

Yampolsky Lab This past year has been a fun one in Dr. Yampolsky's lab! To start off the year, our lab attended and presented at the Southeastern Population Ecology & Evolutionary Genetics Conference (SEPEEG) down in Georgia. This past semester has been mainly focused on thesis work. I was able to successfully defend my thesis this past March, while my labmate, Bret, was also able to finish up his thesis as well! These past two years of working in Dr. Yampolsky's lab has been a fantastic experience, between meeting so many great people and continuously being challenged, and one that I will also be thankful to have had!

Submitted by Kailea Holbrook

Kumar Lab Dr. Dharendra Kumar joined the Department of Biological Sciences in 2005 as a tenure track assistant professor. Prior to coming to ETSU, Dr. Kumar worked as postdoctoral research associate at Cornell University. At ETSU, he teaches "Biochemistry of Metabolism" and "Plant Physiology" courses to both undergraduate and graduate students. Dr. Kumar was tenured and promoted to the rank of associate professor in 2011. In 2013, Dr. Kumar briefly served as the interim chairman of the Department of Biological sciences. Dr. Kumar served both as a member of departmental graduate committee and graduate coordinator. Dr. Kumar has served on a number of committees including Faculty Senate, College of Arts and Sciences Basler Chair Selection Committee, College of Arts and Sciences Awards Committee, Appalachian Students Research Forum, University level Academic Portfolio Review Committee and Biosafety and Chemical Safety Committee. He was recently honored for completing 10 years of service at ETSU. In 2015, Dr. Kumar was elected as treasurer for the "Phytochemical Society

of North America" (an international scientific society) for a three-year term.

Focus of Dr. Kumar's research at ETSU is to understand the biochemical pathways leading to disease resistance in plants. Research in Dr. Kumar's laboratory has received funding from various sources including the National Science Foundation, Research Development Committee, American Society for Plant Biologists, Sigma Xi Grant in Aid and ETSU Honors College. Since 2005, Dr. Kumar has trained a large number of undergraduate and graduate students. Currently, Dr. Kumar's laboratory has one Ph.D., two MS, and two undergraduate students. Mr. Bal Krishna Thakuri, a native of Nepal is a Ph.D. student conducting research on plant deacetylases. Plant deacetylases are increasingly becoming important in signaling due to the recent discovery of a large number of acetylated metabolic proteins. Mr. Timothy Audam, a native of Nigeria is an MS student studying lipid signaling pathway involving lipid transfer proteins in plant immunity. Timothy is expected to defend his MS thesis during summer 2016 and start his Ph.D. at the University of Louisville. Timothy received several awards and grants including a Sigma Xi grant in Aid, Travel award from the "Phytochemical Society of North America", award from the "ETSU Graduate Students Association" and the "William Harvey Fraley and Nina M. Fraley Memorial Award" from the department of Biological Sciences. Mackenzie Davenport is an undergraduate student who conducted research in Dr. Kumar's laboratory since 2014. She has presented her research findings at the "Boland Symposium" and the "Appalachian Students Research Forum". She was awarded Student-Faculty Collaborative Research Grant for the ETSU Honors College

cont.
Notes from Faculty Laboratories

to conduct research in Dr. Kumar's laboratory. She was recently offered admission to more than five top rated universities including UNC-Chapel Hill for pursuing graduate studies. Mackenzie has decided to pursue her Ph.D. in Genetics, Genomics, and Bioinformatics at the University of Alabama-Birmingham (UAB) starting in fall 2016. Submitted by Dr. Dharendra Kumar

Hiatt Lab As part of a collaborative, multi-institution NSF-funded project, Dr. Hiatt, along with her collaborators, presented the initial findings and assessment plans for instituting plant-based authentic research experiences for undergraduates. Experimental plots are being established at ETSU's Valleybrook facility and three ETSU undergraduates (Mary Barfield, Richard Miller, and Hunter Cobbler) will spend the next several months establishing phenology gardens comprised of a variety of native plant species. Undergraduate students across all four institutions will be able to address numerous research questions about the impact global climate change has on native flora in Southern Appalachia. Sara Normark will be developing and compiling assessment instruments for use in undergraduate courses that implement these plant-based research modules.

David Ford attended a training session in New Mexico on using and developing Critical Thinking Assessment Tests (CAT). David will be developing CAT assessments for Virtual Biology Lab and for plant-based research experiences.

Oluwaseun Agboola gave an oral presentation on her thesis research, the use of summative assessments as an inclusive teaching practice, at the Association of Southeastern Biologists conference in Concord, NC in April.

Submitted by Dr. Anna Hiatt

Ashley Academy Visit (Lab Rats Invade Biology Department)



Submitted by Amy Weber



Photos: Bill Hiatt

The department hosted third and fourth graders from Ashley Academy on April 7, 2016. They conducted experiments in various sciences and the students had a wonderful time. First they conducted an "Elephant Toothpaste" experiment to learn about exothermic chemical reactions and the role of a catalyst. Next the students learned more about basic anatomy and the structure and function of the human heart. Last, they were able to conduct a muscle stimulation exercise to examine the transfer of electrical impulses through muscle tissue and the application of these principles to real-life situations. A special thank you to the parents who attended in support, Ms. Ferrell (3rd) and Mr. McIlquham (4th grade) of Ashley Academy and to Bill Hiatt, all of whom helped to make their experience a great success!

ETSU grad student wins statewide service award

Submitted by Dr. Aruna Kilaru

Md. Mahbubur Rahman came from Bangladesh in 2012 to pursue a Ph.D. in Biomedical Sciences under the mentorship of Dr. Aruna Kilaru. In addition to fulfilling his academic goals, he has also been working with ETSU's Christian Student Organization to build a relationship between international students and local communities. He was particularly proactive in advocating for understanding, charity and friendship among people of different faith traditions and cultures. Mahbub was one of five students awarded the 2016 Harold Love Outstanding Community Service Award. On April 21, 2016, Mahbubur traveled to Nashville, TN, and received his award from the members of the Tennessee Higher Education Commission. See the full article here: http://www.etsu.edu/news/2016/04_apr/rahman_love_award.aspx

ETSU's Dr. Fred Alsop receives Paul Hayden Memorial Award

Reprinted with permission from Office of University Relations.

JOHNSON CITY – Dr. Fred Alsop, faculty member in East Tennessee State University's Department of Biological Sciences, is the recipient of the 2016 Paul Hayden Memorial Award given by the Tennessee Environmental Conference.

Alsop has over 50 years of experience as a field naturalist, lecturer, author and teacher. He has published over 100 articles in scientific journals and has had his wildlife photographs in *Audubon Magazine*, *National Geographic* and *Readers Digest*.

The award is named for the late Paul Hayden, a Tennessee environmental champion who was devoted to the Greene County Soil Conservation District and the Middle Nolichucky Watershed Alliance. For more information, contact Dr. Alsop at 423-439-6838 or alsopf@etsu.edu.



Spring 2016 Update

John C. Warden Herbarium



Robert Quinn, BS ETSU December 2015 and new MS student, reviews his recent collections from the Bays Mountain Park and adjacent properties at the ETSU Herbarium. Photo: Dr. Tim McDowell

The ETSU Herbarium, located on the third floor of Brown Hall, includes over 24,000 individual dried, pressed specimens of vascular plants - ferns, conifers and flowering plants. In recent years we've added many new specimens to our collections. Both student and faculty research projects have contributed many new specimens. Phil Klahs (MS ETSU December 2014) provided some 900 specimens from Steele Creek Park, Bristol TN, which he labeled and mounted, and they have been accessioned and added to the regular collection. Dr. Foster Levy has collected several thousand specimens in the past few years, from Roan Mountain, Rocky Fork and other protected areas. Robert Quinn, a new MS student working with Dr. Tim McDowell, is actively collecting from Bays Mountain Park and the adjacent Holston Armory and Laurel Run Park, in his floristic survey of these protected areas. Robert has already collected over 200 specimens for study, which will include vegetation mapping in the extended Bays Mountain area.



Makayla Payne mounts a plant specimen at the ETSU Herbarium, in her final semester as an Academic Performance Scholarship work-study. Photo: Dr. Tim McDowell

Mounting and accessioning these new collections is a lengthy task. During the past four years, work-study student Makayla Payne has mounted and accessioned many hundreds of specimens for the Herbarium. She has also been doing repairs to older specimens in our collection. This is Makayla's final semester in her undergraduate program, and she will be starting the ETSU program in Pharmacy this fall. We appreciate her conscientious work in the Herbarium. Makayla is currently mounting student plant collections from the Appalachian Flora course, which is taught each May by Adjunct Curator James T. Donaldson. Jamey's expertise in our regional flora has been crucial to the Herbarium's work for over two decades. We continue to mount and accession the thousands of specimens Jamey's contributed over the years. Additionally, he selects hundreds of student collections from the Appalachian Flora course to add to our main collections.

The herbarium supports both teaching and research at ETSU. This semester we provided herbarium tours to students in the Honors in Biology program, and used specimens for introductory biology laboratory exercises. Cindy Barrett, an MS student working with Dr. Levy, has used our collections in her field-oriented study of the rare Gray's Lily of Roan Mountain, an endemic to our southern Appalachian mountain-top balds. Cindy recently received the Marcia Davis research award for her investigation of the fungal pathogen which has infected the Gray's Lily on Roan Mountain.

The ETSU Herbarium is participating in an NSF supported project which will produce digital photographs of all of the collections from Tennessee herbaria, including the large collections of Vanderbilt University (now at the Botanical Research Institute of Texas) and of University of Tennessee-Knoxville, as well as seven smaller Tennessee herbaria. This grant, led by Drs. Joey Shaw (UT-Chattanooga) and Ashley Morris (MTSU) will run through 2017, and the imaging of ETSU's collections is planned for summer 2017.

For information on the John C. Warden Herbarium, contact Dr. Tim McDowell, at 423 439-8635 or at mcdowelt@etsu.edu. Submitted by Dr. Tim McDowell



Mackenzie Davenport



Kaitlyn Mathis



William Seth Ratliff



Nathaniel Hancock



Derek Stuffle

NOTABLE GRADUATES

Mackenzie Davenport is a senior biology major who began research within the department early her freshman year. During her time at ETSU, she has worked on research projects with both Dr. Lev Yampolsky and Dr. Dharendra Kumar. She has presented at the Boland symposium three times (2014-16) and the Appalachian Students Research Forum twice (2015-16). In addition to her research experience at ETSU, Mackenzie was selected for NSF sponsored REU summer program at the University of Kentucky. She also has been actively involved in both the Pre-Health Living Learning Community and Tri-Beta Biological Honor Society, serving in a primary leadership position in both organizations. She also created and organized the 5K Garrett's Hero Run which raises money and awareness for Duchenne Muscular Dystrophy research. By vote of our faculty, Mackenzie was selected for the University Faculty Award in the Biological Sciences. She graduated from ETSU on May 7th and we offer our best wishes as she pursues her Ph.D. in Genetics, Genomics, and Bioinformatics at the University of Alabama-Birmingham (UAB) starting in the fall 2016.

Kaitlyn Mathis is a senior biology major and an ETSU University Honors Scholar. She began working on research in biology her sophomore year with Dr. Rebecca Pyles. Kaitlyn was selected for the NSF-sponsored summer research program in "Integrative Developmental Biology" here at ETSU. Her research project concerned the impact of reduced calcium during development in the corn snake (*Pantherophis guttatus*). Using an experimental approach that reduced calcium available to developing embryos, Kaitlyn investigated the anatomical and developmental bases for resulting smaller size in hatchlings. Findings of her research add significantly to our understanding of the evolution of viviparity (live birth) in vertebrate animals. She has presented her research at the Boland

Symposium (2015, 2016), and the National Collegiate Honors Conference (2015). By vote of our faculty, Kaitlyn was selected as the 2016 Outstanding Senior in the Biological Sciences. After graduating on May 7th, Kaitlyn's next stop is Veterinary School, where we are sure that her interest in reptiles will be an asset to everyone.

William Seth Ratliff graduated in December 2015 as an ETSU Midway Honors Scholar. Seth conducted a field-based project on the complex plant-pathogen-pest system in which the hemiparasitic shrub, *Buckleya distichophylla* (piratebush) parasitizes hemlock and pine trees, both of which are subject to mortality from insect pests. Seth showed that *Buckleya* plants closest to Virginia pine trees were more likely to have the fungal pathogen, *Cronartium appalachiana*, a rust whose primary host is Virginia pine. Seth's thesis has already been published in the December 2015 issue of *Castanea*. In the fall, Seth presented the work in a poster at the National Honors meeting in Chicago in 2015.

Nathaniel Hancock graduated May 7th as an ETSU University Honors Scholar. Nathaniel got involved in research very early in his academic career. In the summers of 2013 and 2014, he had an NSF-funded fellowship with the ETSU Collaborative Research on the Arthropod Way of Life (CRAWL) project. He presented his research on that project at a national meeting and coauthored a publication. In the summer of 2015 Nathaniel was a National Parks Intern, working on stream restoration in the Great Smoky Mountains National Park. Nathaniel developed his own Honors Thesis project "Behavioral Effects of Sub-lethal Cadmium (Cd) Exposure in the Spider *Anelosimus studiosus*". His work was recognized as a runner-up at the 2015, and winner at the 2016 Appalachian Student Research Forum held at ETSU every spring. Throughout his undergraduate career, Nathaniel has been involved in conservation-related student organizations. After graduating from ETSU on May 7th, Nathaniel is going on to do graduate work in the conservation biology of fish at the University of Georgia's Warnell School of Forestry and Natural Resources.

Derek Stuffle is a Biology major with a Biochemistry concentration. He transferred to ETSU in Fall 2014 from Walters State Community College as a Midway Honors Scholar. Derek began his research under the mentorship of Dr. Aruna Kilaru, where he was involved in identification and cloning of a gene that encodes for hydrolysis of fatty acid ethanalamides in tomato. Derek was actively involved in research, writing grant proposals, and presenting his work. He received a competitive Student-Faculty Collaborative Grant (\$1200) in Fall 2015, presented his work at the 2015 and 2016 Boland Symposia, and the 2016 National Conference for Undergraduate Research, for which he received travel grant. He also was co-author on five other research presentations that were delivered regionally and nationally. Derek is an active member of Phi Kappa Phi, Golden Key, and Tri-Beta Biological Honor Society. Derek graduated Magna Cum Laude on May 7th and then will continue at ETSU to pursue a Masters in Biomedical Sciences with a graduate assistantship for support.

Submitted by Dr. Rebecca Pyles

SENIOR BIOLOGY MAJORS PARTICIPATING IN RESEARCH 2015-2016

- Brett Coggins with Dr. Lev Yampolsky
- John W. Collins with Dr. Joe Bidwell
- Mackenzie Davenport with Dr. Dharendra Kumar
- Mackenzie Guthrie with Dr. Tammy Ozment (College of Medicine)
- Nathaniel Hancock with Dr. T.J. Jones
- Kathleen King with Dr. Celia McIntosh
- Kaitlyn Mathis with Dr. Rebecca Pyles
- Richard S. Miller with Dr. Anna Hiatt
- Seth W. Ratliff with Dr. Foster Levy
- David J. Shepherd with Dr. Darrell Moore
- Derek Stuffle with Dr. Aruna Kilaru



Department News:

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Dr. Kilaru and graduate students
Photo: Dr. Aruna Kilaru



Amy Weber
Photo: ETSU Photographic Services



Dr. Anna Hiatt
Photo: Amy Weber

1 Dr. Cecilia McIntosh was an invited seminar speaker by the University of Nevada-Las Vegas School of Life Sciences on March 18, 2016. The seminar was entitled: "Structure and Function of Flavonoid Glucosyltransferases: Using a Specific Grapefruit Enzyme as a Model." She was hosted by Dr. Christy Strong, an ETSU M.S. Biology alumnus.

2 Congratulations to **Amy Weber**, Scientific Laboratory Coordinator, Department of Biological Sciences for winning April's Employee Recognition Program sponsored by Human Resources. Dr. Bidwell and the department supported the nomination in recognition of Amy's tireless work ethic and dedication to the department.

3 Dr. Cerrone Foster participated in Alpha Sigma Iota's Save A Buck Food Raiser. Dr. Foster raised the most food of all the faculty participating. For their fundraising efforts, Dr. Foster and ETSU President Dr. Noland each received a pie in the face from a lucky student. All proceeds benefited Bucky's Food Pantry, a service on campus whose goal is to diminish or end hunger for students, faculty and staff. For more information visit: <http://www.etsu.edu/foodpantry/>

4 Dr. Anna Hiatt was the College of Arts and Sciences award committee's selection to receive the ETSU's New Faculty Award. This was quite an accomplishment for someone in her second year teaching.

5 After purchasing new equipment, ETSU Biological Sciences donated the replaced and some unused equipment to Science Hill High School in Johnson City, Tennessee. The Biology teacher at Science Hill, **Thomas Bier**, sent a note of gratitude stating "Thank you, again, for the abundant supply equipment. The science teachers have had to borrow equipment from each other and now we have enough for all of the Biology lab rooms. This was a wonderful addition and thank you from all of us!"

6 Dr. Kilaru and five of her graduate students from the Department of Biological Sciences attended the 2016 annual meeting of the Southern Section of the American Society of Plant Biologists, held recently at Denton, TX. While Dr. Kilaru moderated one of the sessions at the three-day meeting, her students Mahbubur Rahman (Ph.D.), Vijay Tiwari (MS) and Jedaidah Chilufya (MS) gave oral presentations and Shina Bhatia (MS) and Imdadul Haq (Ph.D.) participated in poster presentations. The Department of Biological Sciences and Biomedical Sciences, Office of Equity and Diversity, the Graduate and Professional Student Association and National Science Foundation Grant to Kilaru provided travel funds.

Biology Department Welcomes New Postdoctoral Researcher



Dr. Suhas Shinde is a native of India, received his B.Sc. in Botany and Applied Biotechnology from the University of Pune, and M.Sc. Biotechnology from Dr. B.A.M. University, India, and Ph.D. in Biological and Environmental Science from the University College, Dublin, Ireland. For doctoral work, under the mentorship of Dr. Carl Ng, Suhas investigated the response mechanisms of an extant moss, *Physcomitrella patens*, to atmospheric conditions simulating the Triassic-Jurassic Boundary climate and elevated CO2 levels. This research revealed global transcriptome changes in moss that can mount a robust signaling to elicit reprogramming of stress tolerance to cope with catastrophic environmental conditions. He worked as a postdoctoral researcher with Dr. Paul Verslues' lab at Academia Sinica's Institute of Plant and Microbial Biology, Taipei, Taiwan. Dr. Suhas Shinde now brings his expertise to work on anandamide-mediated stress signaling in mosses, an NSF-IOS-funded project in Dr. Aruna Kilaru's lab. His wife Rupali and 19-month-old son, Kshitij, are currently in India and expected to join him shortly.

Submitted by Dr. Aruna Kilaru (Full article online)

Sneak-peek of a Zambian graduate's research experience at ETSU and beyond

When I came from Zambia, my ultimate goal was, and still is, to be a successful researcher, not just a thinker. My time at East Tennessee State University (ETSU) and outside has created a foundation for exactly that. Beyond the workbench, exposure and interaction with pioneers and experts in science through collaborative research, conferences, poster and oral presentations, to mention but a few, are critical to being a successful researcher.



Jedaidah Chilufya

Photo: Sakshi Khurana

I had the privilege to travel to Worcester, Massachusetts, during this past spring break (2016) to carry out collaborative thesis research work at Worcester Polytechnic Institute (WPI) in Dr. Vidali's laboratory. Part of my thesis study is to investigate the cellular effects of anandamide, a mammalian endocannabinoid receptor ligand in the moss *Physcomitrella patens*. Dr. Vidali's lab has developed specific and highly sensitive growth and cellular assays for moss plants.

Though I did not look forward to the cold weather, I was super-excited about this trip because it was my first visit to the northeast coast of the country. Much like Johnson City, Worcester is a small city lived by a big, highly competitive and reputable tertiary institution.

Away from the workbench, I interacted with both undergraduate and graduate students at WPI and was intrigued to see how naturally the students shared their different lab research ideas and experiences. I very much appreciated this gesture as it opened an avenue for me to be part of a larger student research community. I experienced a similar camaraderie at various regional and national seminars and conferences where I had the opportunity to present. These interactions that enable dynamic exchange of ideas have helped me evaluate and improve my research work and will undoubtedly continue to enhance my science career.

My time as a graduate student at ETSU has taught me that being a successful researcher goes beyond completing a list of experiments in the lab. In addition to bench work, one achieves more by being exposed to the progressive scientific-environment and these come in many forms. I also learned that limitation of resources within the lab or department should not deter students from looking into alternate opportunities. I discovered and utilized many avenues both at ETSU and outside that provided material and financial support. I would like to thank everyone who has rendered their support to me as a graduate student and researcher, specifically to my advisor and mentor, Dr. Aruna Kilaru, and Dr. Luis Vidali and Sakshi Khurana from WPI, as well as ETSU Biological Sciences, Graduate Studies, Graduate Professional Student Association and Office of Equity and Diversity.

With all I have learned in the U.S. I plan to have an established science research center back home in Zambia where high school and college science students get trained into great researchers using local resources to solve local problems and subsequently help improve living standards and quality of life. Submitted by Jedaidah Chilufya



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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