

Department of Biological Sciences East Tennessee State University

Departmental Newsletter

May 2015

Note from the Provost

Participating in external reviews of academic programs at the University is usually rewarding but can sometimes be humbling. On some occasions, however, one is particularly gratified to have validated a previous assumption that one has held of a department's distinctive quality. Such was the experience I had a few weeks ago on hearing two external reviewer's assessment of ETSU's Department of Biological Sciences.

The Self Study the Department had prepared for the external review team was one of the most thorough, comprehensive, and notably objective assessments I have seen. It provided an opportunity for the Department to reflect on its past, its present, its plans for the future, and its needs. It also noted clearly in separate sections its view of salient strengths the Department demonstrates, areas of greatest need for improvement over the next 5-7 years, and—particularly impressive—seven ambitious plans the Department envisions pursuing over the same time period. Asked to define what makes the Department's program "distinctive, outstanding, or unique," the Self Study eschewed routine global puffery and instead provided two clear statements—i.e., noting, first, the major strength of its faculty expertise "in a wide range of biological disciplines" that translate into "a diversity of classes and research areas at both the undergraduate and graduate level" and noting, second, the willingness of faculty "to integrate undergraduate students into their research activities."

Of course the Self Study noted the scope and distinctive curricular features of the Department's programs, impressive efforts to revise and improve pedagogy aimed at enhancing student success, growth in graduate programs, strong enrollment in undergraduate programs (averaging 403 biology majors and 75 graduates per year during the reporting period), strikingly noteworthy research productivity ("over \$8 million in total research funding generated and an average peer-reviewed publication rate of 27 per year for the reporting period"),



Photo: ETSU Photographic Services

and significant events that have taken place since the last program review. The external reviewers noted several actions for which the Department should be especially commended—which included "serious upgrade of assessment and evaluation of the Department's success (including tracking of graduates), the Department's innovations in advising and curricular options that start students early in their career tracks, the broad collaborations with other disciplines (Mathematics and Statistics, Chemistry, Microbiology, and the Biomedical Science PhD program), and the development of a capstone course that review major concepts and culminates in the completion of the ETS major field exam in Biology.

I would like to congratulate the Department for the quality of its self study, for the effort and candor reflected in its assessment, for the comprehensive depiction of its current status and plans for the future, for the exemplary evaluation it received from peers, and for the convincing case it makes for needs it describes. Everyone at ETSU should take great pride in the leadership, accomplishments, and present status of this strong department.

Bert C. Bach

Provost and Vice President for Academic Affairs



Photo: ETSU Photo Lab

Greetings to all and welcome to the Department of Biological Sciences Spring 2015 newsletter!

As highlighted in the invited article by Dr. Bert Bach, our program underwent an external review in March and we were very pleased with the outcome. The input the reviewers provided in their final report will help shape our strategic planning for the next five years. Our key objectives for this period include maintaining our strong commitment to undergraduate and graduate research, filling any open faculty positions, and completing internal review and fine-tuning of our curriculum. The success of the program review was largely the result of the "Self-study" document the department developed to provide the external reviewers with a summary of our activities over the last 7 years. The level of collegiality in this department and willingness to go the extra mile was clearly evident as the faculty worked together to compile the required information and write the narrative text to go along with it. I thank all of my colleagues for their efforts in this regard, with special thanks to Dr. Hugh Miller for his role in bringing the various sections together into a single document.

The research efforts of fourteen biology undergraduate and graduate students were highlighted in presentations at the 2015 Appalachian Student Research Forum/Boland Undergraduate Research Symposium. We were very pleased to have three students win awards for their presentations in the Natural Sciences category; Tesha Blair (Advisor- Dr. Miller) took first place and Preethi Sathanatham (Advisor- Dr. McIntosh) second place for their graduate poster presentations, and Nathaniel Hancock (Advisor- Dr. Jones) took second place for his undergraduate poster presentation.

Note from the Chair

The Department of Biological Sciences Student Awards Ceremony was held recently and we were pleased to recognize Sophia Azim as our outstanding senior and Nathaniel Hancock as the outstanding junior. Graduate student Sara Normark (Advisor- Dr. Jones) received the Denise L. Pav Research Award, Jedaidah Chilufya received the Marica Davis Award and Preethi Sathanathan received the William and Henley Frahley Awards.

Cerrone Foster: Non-Regular Faculty Award
Cecilia McIntosh: Faculty Research Award
Lev Yampolsky: Faculty Teaching Award, "Above and Beyond" Award at The Summit

- Marcia Davis Research Award: Awarded to a graduate student in the Department of Biological Sciences with a research project that contributes to greater scientific knowledge of the plants and animals of Tennessee.
- William Harvey Fraley and Nina M. Fraley Memorial Award: Awarded to a graduate student who exhibits promise in scientific research in the areas of molecular, cellular, or organismal biology.
- Denise I. Pav Scholarship: Awarded to a graduate student who is a US or Canadian citizen or a landed immigrant of either country and who is in their 2nd year of graduate research with a GPA of 3.4 and higher.

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*

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A New Multidisciplinary Center Opens at East Tennessee State University

East Tennessee State University has launched a new biomedical research center. The Center of Excellence in Inflammation, Infectious Disease and Immunity was approved for formation last summer, with the first official staff member put in place early in 2015.

“Those have been areas of strength at this college for years, but it has been a lot of individual people working on individual projects,” said Dr. David Williams, a professor of surgery at the Quillen College of Medicine and co-director of the new center. “Science today is being done by large groups of people with different areas of expertise focused on a specific problem in society. This center will serve as a catalyst and a platform for doing that here.”

“The goal is to have people with diverse backgrounds working together on this research. People from other parts of ETSU’s Academic Health Sciences Center and other parts of the university as a whole will be involved in this,” Williams said. “You’ll have all these people under one umbrella and the center will be able to help coordinate their efforts.”

The center currently consists of 34 faculty members from diverse backgrounds including Biology, Micro-Biology, Bio-medical science, Surgery, Internal Medicine and Pharmaceutical Sciences, All have a strong interest in furthering multidisciplinary and interprofessional research, education, and collaboration.

Both Williams and Moorman trained in similar multidisciplinary research centers and have continued to focus on collaborative and interdisciplinary research in their respective careers. Means, who has a long track record as a federally funded investigator, was involved with a similar translational science center at the University of Kentucky prior to taking on his role as an ETSU dean earlier this year.

While the center is just in the beginning stages, its co-directors are confident in its future success at ETSU and the impact work being done there will have on the world of health.

“The center is going to provide state-of-the-art research into diseases that affect people right here in the region and all over the world,” Moorman said. “What we are studying, this is at the core of most human disease.”

Visit the new website for the Center of Excellence in Inflammation, Infectious Disease and Immunity at: etsu.edu/com/ciidi

*Kristen Swing,
Associate Director
of University Relations*

Profs. Williams and Moorman

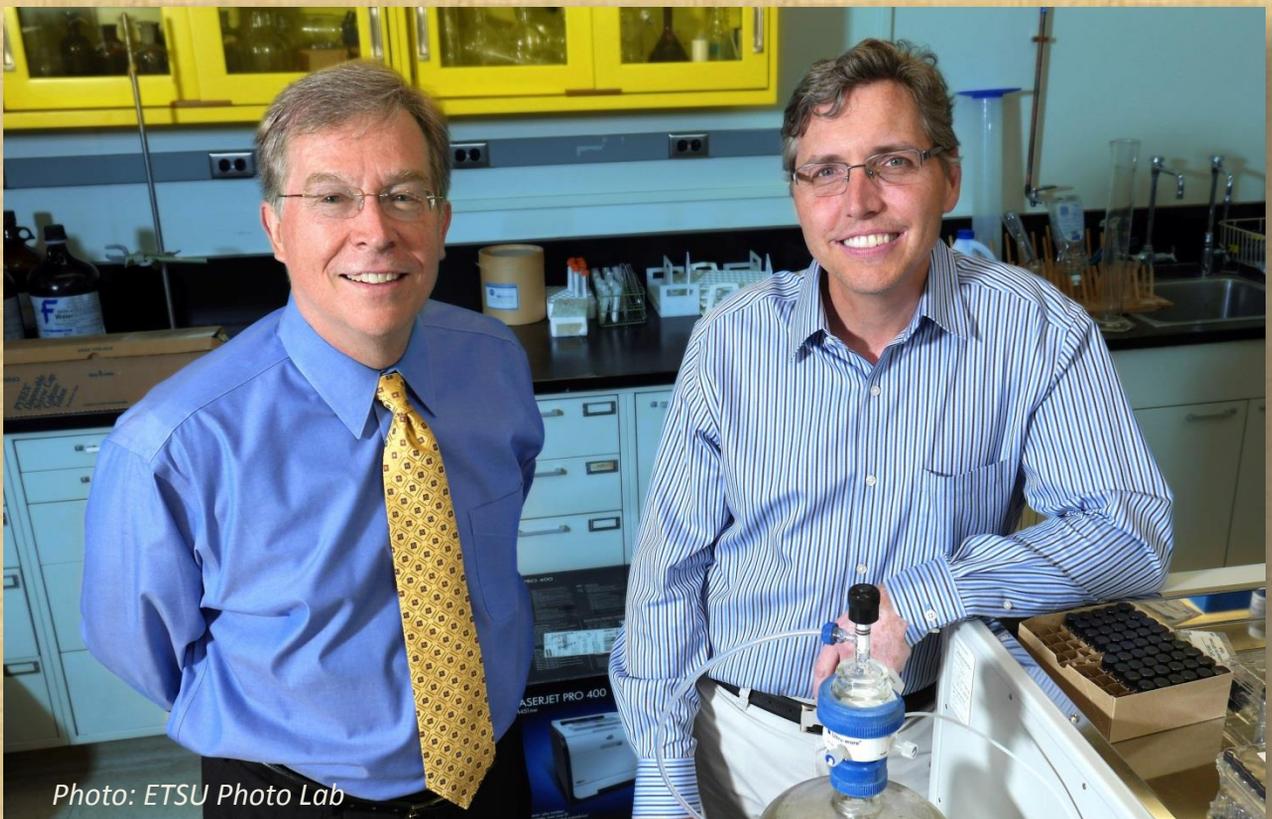


Photo: ETSU Photo Lab

Decipher the 'Why' and 'How' in Biology with Quantitative Modeling



Dr. Istvan Karsai Professor in the Biology Dept. at ETSU

What do wasp nests, your balance, and oak trees have in common? They are all complex biological systems that can be explored and explained through biological modeling. Usually, biologists tend to specialize in a particular genus or species but Dr. Karsai focuses on the complex mathematical functions taking place across the natural world. He is a biologist and ecologist by training but also has strong computational and quantitative skills that he uses to study the laws of biological pattern formation and analyzing biological data using mathematical and statistical methods.

One of the many projects Dr. Karsai is working on looks to develop a diagnostic device based on the fine sways of the body when standing. Collaborating with Allison Hilbun, a biomedical PhD student, the project is truly interdisciplinary, merging biology, medicine, physics, complexity science and mathematics to develop a diagnostic method. This method collects thousands of data points from a patient. After characterizing the data with complexity measures, such as Hurst exponents, the health state of the body can be assessed.

Computational and modeling skills are important tools to students working in biological research, but few get an opportunity to learn these skills while in school. The need for skill building in mathematical biology has been recognized by both the National Science Foundation (NSF)

and the American Association for the Advancement of Science. Dr. Karsai has responded to this need by developing a course in modeling biological systems and collaborated with two of his colleagues at the University of Maryland to assess the success of this course in gaining quantitative skills.

The course is designed to use biological processes as context for learning mathematical modeling. While there is a small lecture portion to the course, the bulk of the time is spent in lab learning to use free software to build biological models. Many students reported that the computer lab section of the course was helpful improving their biology knowledge and quantitative skills. This hands-on approach also gave students new insight into the importance of mathematics in the field of biology. It has helped students learn more about the connection between disciplines and how to communicate complex systems with audiences that are otherwise unfamiliar with their field of study such as decision makers in business and policy.

Students from all areas of biological studies can apply modeling to their work. Dr. Karsai has worked with students on projects to develop real world advanced models. Recent projects have included water flow and lake level depletion in California, the physiology of calcium flow between embryos and egg shells in reptiles, and the history of ecological and sociological tragedy of Easter Island.

Pre-medical, medical, Biology, Ecology, and Molecular Biology students have all used knowledge gained in the class to develop complex models specific to their areas of study. Many have gone on to build additional models related to their own research interests.

This course, Biol 4367/5367, will be offered ETSU during the 2015 fall semester. The only pre-requisite is completion of the biology core classes. Background knowledge in high-level math is not a prerequisite, all the computational skills needed are developed within the course.

*Samuel J. Pettyjohn
Coordinator of the Center of Excellence
for Inflammation, Infectious Disease &
Immunity
Republished from CIIDI website*

See full article here:

<http://www.etsu.edu/com/ciidi/default.aspx>

Professor Emeritus Dan Johnson

When I announced my intention to retire in 2005, many asked, “What will you do in retirement?” My flippant response was “Read Moby Dick.” I did that. For Christmas Karol Lynn gave me *The Novel 100: a Ranking of the Greatest Novels of All Time* by Daniel S. Burt (© 2004, Checkmark Books, New York, 468 pp). Moby Dick was #6, and I had only read five of those novels. I resolved to read them all—in order! I have now read #1 *Don Quixote* (1605 & 1615) by Miguel de Cervantes through #81 *Under the Volcano* (1947) by Malcomb Lowery.

It will not surprise those who know me well that I’ve kept a spreadsheet recording my reading life since retirement. That spreadsheet logs 364 books. Some were “assigned” by Sherrod Library Associates Book Discussion Group. I’ve been a regular member since Dec 2005. I also spot intriguing books reviewed in *The Atlantic* and *Science News*.

Another reason I retired early was to do family-history research—a fascination since a friend taking an anthropology course prepared a “proper” family tree for daughter Amber during my post-doc (1969-1970) at University of British Columbia. That interest intensified during evenings and weekends in Fall 1995 during “non-instructional assignment” at Dartmouth College. Library resources at Dartmouth, Portland, Me., and Boston, Mass., led to significant discoveries about Colonial New England ancestors.

I furnished a study with computer and cable connection, and joined Ancestry.com and New England Historic Genealogical Society for access to online records. Visits to Boston (NEHGS) and Portland (Maine Historical Society), and to local historical societies in Maine, Massachusetts, and New Hampshire led to records not accessible on line. (It helps that son Reid lives in Amherst, Mass., so trips to New England are justified by visiting grandchildren as well as family-history research.)

Because relatives most interested in family history are my father’s cousins, I knew they could not wait until my research was complete—such research is never complete! So, since December 2005, I have distributed an annual report about what I’ve learned to 30 family members. Those reports now amount to 68 pages. Having learned that one of my 6th-great-grandmothers was Thankful Wing who married Thomas Jones about 1727 and moved from Massachusetts to Harpswell, Maine, in 1749, I joined the Wing Family Association in 2012. I naively volunteered to edit a volume about her descendents through 5 generations. I am working with an experienced genealogist, Irene Clough Hahn, on what promises to be at least a five-year project.

Almost daily, I use online resources to prepare a draft narrative about someone’s life, send what I’ve got to Irene, and wait for her to add more. This has become a “job,” and it has interfered with other research priorities. In 2003, visiting Amber and her husband Lew Binford in Kirksville, Mo., I noticed that, as they cleaned up their woods, they had stacked sticks between trees, and commented, “That looks like something Andy Goldsworthy might have done.” Then I thought, “I have trees, and lots of sticks.” By October 2007, I had completed my first “environmental sculpture” called BIGFACE. Friends invited to view it voted 23-3 that it was art. That’s how I became an artist!

BIGFACE did not survive, but, having learned by trial & error how to construct pieces that last out of 1-m long sticks, I have now completed three sculptures that are on display in our yard: CATENARY WALL (2010-2011), VARVE (2012-2013), and BIGFOOT (2014)



Photo: Karol Lynn Johnson

Karol Lynn and I have enjoyed traveling, and visiting grandchildren in Massachusetts and Missouri.

I continue to visit Brown Hall for department seminars—when the topic interests me. And I really appreciate Chair Joe Bidwell’s including me in more department events.

Dan Johnson

Reports from the labs

Karsai's Lab

This spring semester was very exciting for us in lot of ways. First of all I received many good news from my students and **Vlad Antonov** undergraduate biology major joined to my lab. He will study he effect of stress on self-cloning marmokrebs.

Shiva Thapa is just finishing his first year and started to put together his artificial ecology simulation. We are looking forward making the system work and evolve.

Allison Hilbun became a member of the President's Pride. The President's Pride is essentially a group of undergraduate and graduate students who "serve as goodwill ambassadors for ETSU". They assist the President of the University in various tasks. Students are selected based upon academic performance, character, and leadership skills.

<http://www.etsu.edu/univrela/pride.aspx>

She also presented at the Appalachian Student Research Forum: Hilbun A. and Karsai I. (2015). Balance data as a Diagnostic Tool. Appalachian Student Research Forum. Johnson City, TN. April 9, http://www.etsu.edu/studentresearch/documents/2015_ProgramBook.pdf p 92 We also submitted two grant proposals and started to collect patients' data in David Perry Chiropractic office.

Prof. McIntosh won YWCA 2015

Tribute to Women award



Photo: ETSU Photo Lab

Dr. Cecilia McIntosh has been chosen as a recipient of a 2015 YW Tribute to Women awards in the area of education. These awards are designed to recognize the dedicated work of women in the region the positive effect of this work on the community. Presented by the Bristol YWCA, the annual awards recognize the outstanding achievements of women throughout East Tennessee and Southwest Virginia. An independent panel of judges honored 12 award winners whose work enriches the region's arts, education business and community service efforts.

In addition to her duties as dean, McIntosh is an active researcher, studying the biosynthesis of flavonoids. She examines certain enzymes found in grapefruit and can often be found in a greenhouse on campus, among a group of grapefruit trees. She has garnered over \$1.6 million in research grants since her arrival at ETSU in 1993.

McIntosh also mentors biology undergraduate and graduate students, assisting them as they learn to conduct research, and she has developed programs to allow online students to feel more included in the campus community. She also started the Graduate Student Success Specialist service for ETSU graduate students that helps put students in touch with resources needed to assure success and progress to graduation

Office of University Relations
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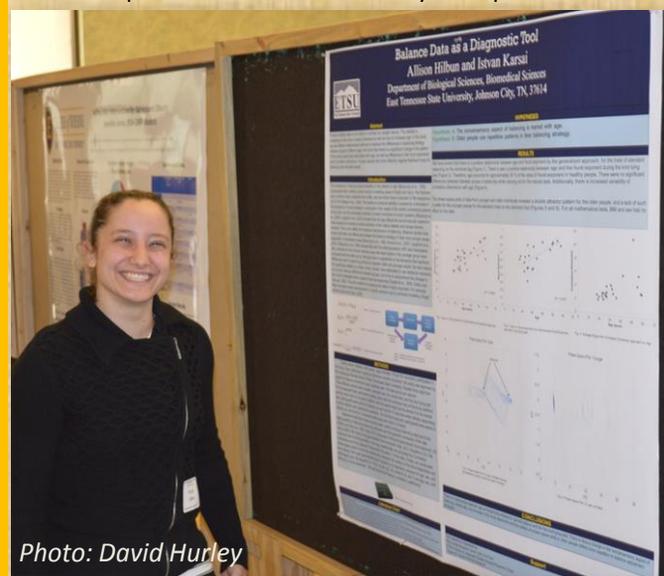


Photo: David Hurley



Photo: ETSU Photo Lab

About our graduate students

Kevin Brooks

Kevin Brooks is literally following in his mentor's footsteps with his Masters of Science research in Great Smoky Mountains National Park this summer. In June Kevin will be conducting a second summer of avian research on one of the highest mountains in the park gathering data on the breeding birds in the high elevation spruce-fir forest in order to compare the changes in the bird species diversity and abundance along with changes in the vegetation. His two seasons of work in 2014 and 2015 will be on a 60 acre plot that was initially established by Dr. Fred Alsop, his major professor, when he was doing his own MS degree research on Mt. Guyot in 1967 while a graduate student at The University of Tennessee, Knoxville. Dr. Alsop's studies on the birds and descriptions of the vegetation established the baseline data for the site prior to its subsequent disturbance by an alien insect, the balsam wooly adelgid. The adelgid has been an instrument of dynamic vegetational change in the spruce-fir forests of the Appalachian mountains and have ecologically devastated these forests.

Dr. Alsop was funded to repeat his initial study on the L-shaped plot in 1985 and again in 1997 recording his avian data and making his vegetation analysis in the same way as was done in 1967. Dr. Thomas Laughlin, now an Associate Professor in the ETSU Department of Biological Sciences, was a principal field researcher conducting the censuses in 1985 and 1997. In each of these field seasons it was noted that some species had been extirpated from the site through changes in the forest and others, new to the site, had appeared.

Kevin Brooks is also recording changes in both bird species diversity and numbers as well as the successional changes in the forest. His food, research gear and supplies to sustain him in a remote wilderness location in the park will be packed in by horses, but Kevin will be hiking the 9 miles up the mountain to get to his study site. Once there he will conduct research for 3 weeks at the peak of the birds' breeding season using his campsite as a base before returning to the university. Once again, his gear and remaining supplies will be brought out on horses while he will walk out. In the 2014 season his research was partially funded internally by the biology department. This year the research will be extramurally funded by grants from the Carlos C. Campbell Memorial Fellowships provided through Great Smoky Mountains Conservation Association, The Tennessee Ornithological Society and Roadrunner Markets, Inc.

Long-term ecological studies are unusual and are valued because of the comparative data they provide to the researcher, the scientific community and to land managers. Kevin's research, when published, will chronical more than 47 years of change to the bird populations and the plant communities of this mountaintop forest.

Fred Alsop



Photo: Dallas Brooks

Olusegun Adeboye Adepoju

Preethi Sathanantham



Photo: ETSU Photo Lab

Olusegun Adeboye Adepoju (M.S. Biology, 2014) has been selected to receive the ETSU School of Graduate Studies and Graduate Council Outstanding Thesis in Science, Math, Technology, and Computer Sciences for his thesis work entitled "Using Site-Directed Mutagenesis to Determine Impact of Amino Acid Substitution on Substrate and Regiospecificity of Grapefruit Flavonol-3-O-Glucosyltransferase." He was nominated by his thesis advisor, Dr. Cecilia McIntosh, and was chosen by a selection committee comprised of graduate faculty chaired by a member of the Graduate Council. The award includes a plaque and \$250. Mr. Adepoju is currently in a Ph.D. program at Virginia Tech University.

Cecilia McIntosh



Photo: ETSU Photo Lab

Preethi Sathanantham has been awarded the 2015 William Harvey Fraley and Nina M. Fraley Memorial Research Award for increasing knowledge in molecular, cellular, or organismal biology. Preethi's master's thesis research is entitled "Structure-function analysis of grapefruit flavonol-specific glucosyltransferase protein and identification of key amino acid residues for its rigid substrate specificity." Preethi has been working on three different double point mutations of this protein and one of these has decreased substrate specificity. The award comes with \$500 that will be used to support completion of her research. Preethi is presenting this work at the 2015 Appalachian Student Research Forum and will also present at the 2015 annual meeting of the Phytochemical Society of North America in August. Her major professor is Dr. Cecilia McIntosh and other advisory committee members are Dr. Shivakumar Devaiah and Dr. Aruna Kilaru.

Cecilia McIntosh



Photo: ETSU Photo Lab

New Newsletter from the ETSU Arboretum

An April 2015 ETSU Arboretum Newsletter has just been posted to the "Friends of the ETSU Arboretum" mailing list. The ETSU Arboretum includes the trees and shrubs of the entire main campus and the adjacent University Woods, and has been a state-certified class 4 arboretum since 2002. The current newsletter includes several updates from ETSU Arborist Travis Watson. A recent tree inventory, the relocated Dwarf Conifer Garden and the Arboretum's Facebook page are among the topics featured in this newsletter. If you'd like to receive a copy in either paper or PDF form, please contact Dr. Tim McDowell by email at mcdowelt@etsu.edu or by regular mail at the Dept. of Biological Sciences, Box 70703, ETSU, Johnson City, TN, 37614.

Tim McDowell

ETSU Arboretum
EAST TENNESSEE STATE UNIVERSITY NEWSLETTER
APRIL 2015

ARBORETUM NEWSLETTER GOING ELECTRONIC: REGISTER WITH YOUR EMAIL NOW!

The ETSU Arboretum Newsletter will be restarting in a non-printed, electronic format. Our future issues will be distributed by email. If you'd like to receive our ETSU Arboretum Newsletters please send your name, email address, and (optional) home mailing address to arboretum@etsu.edu. We plan to send three electronic newsletters per year. PLEASE SEND YOUR EMAIL ADDRESS IF YOU WANT FUTURE ARBORETUM NEWSLETTERS!

ETSU TREE INVENTORY COMPLETED

During the Summer of 2012 a complete tree inventory was completed by Bartlett Tree Experts on the main campus of ETSU. All of the trees on campus were inventoried and entered into an inventory database that is accessible on the Internet. Data were collected on the size, condition, location and overall composition of the urban forest at ETSU. The location of each tree was recorded using GPS and GIS technology and each tree or grouping was numbered with an individual tag. This project was funded through a grant from the Tennessee Department of Forestry and matching funds were provided by the Student Green Fee. A link to the searchable database, including a map with locations, as well as necessary access information, can be found under the visitor info and helpful links section on the ETSU Arboretum Facebook page <https://www.facebook.com/ETSUArboretum>.

In all, there were 1755 individual trees or groupings inventoried, including 309 different species. The top five genera represented are as follows:

1. Acer 334 trees representing 26 species of maples
2. Pinus 194 trees representing 13 species of pines
3. Quercus 139 trees representing 19 species of oaks
4. Cornus 126 trees representing 7 species of dogwoods
5. Ilex 69 trees representing 4 species of hollies

The current top five trees on campus as far as trunk diameter (DBH: Diameter at Breast Height) and estimated value are listed below. Estimated values were calculated by Bartlett Tree Experts using a modified version of the Trunk Formula Method published by the Council of Tree and

A major maple in bloom, with the giant 220+ year old White Oak and the ETSU Student Library in the background, in April 2015. The ETSU Arboretum has 260 species of maples and 18 species of oaks. (Photo: T. McDowell)

Wildflower Guide

Buffalo Mountain Park

A new printing of the "Wildflower Guide - Buffalo Mountain Park", a 32-page color guide to over 100 native wildflowers, has just been completed. This booklet was first printed in 2007 with funds provided by the Harris Fund for Washington County of the East Tennessee Foundation, and was edited by David Kirschke and Tim McDowell. To receive a complementary copy of the Wildflower Guide, please email your request to mcdowelt@etsu.edu or post your request to Dr. Tim McDowell, Dept. of Biol. Sciences, Box 70703, ETSU, 37614-1710.

Tim McDowell

Outstanding Junior

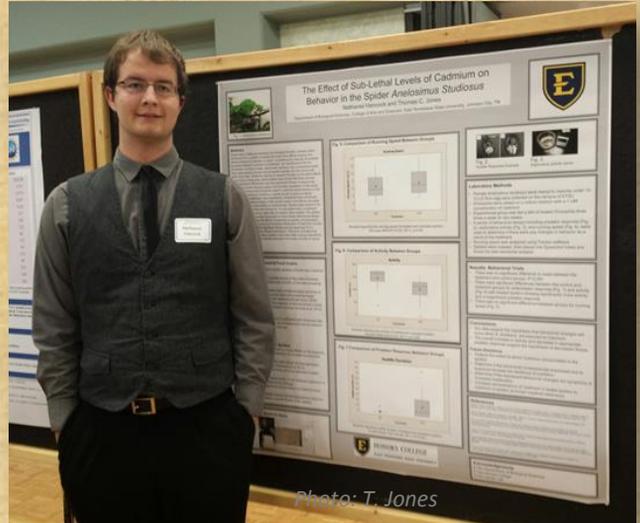


Photo: T. Jones

Nathaniel Hancock at the 2015 Appalachian Student Research Forum where he presented the runner-up poster for undergraduate research in natural sciences.

Nathaniel Hancock won this year's Biological Sciences Outstanding Junior Award. With a year to go as an undergraduate, Nathaniel's list of accomplishments is already impressive. He is a University Honors Scholar who, for the past two years, has been conducting research on spider behavior as part of the NSF-funded Collaborative Research on the Arthropod Way of Life (CRAWL) project. With his own honors thesis he is pioneering work on the role of heavy metal exposure on spider behavior and how his might facilitate movement of contaminants through the food web. He has presented his research at national and regional meetings, and has co-authored a paper in the journal Mathematical Biosciences and Engineering. Nathaniel is a member of several environmentally-focused student organizations, one of which he founded. This summer he will be conducting fisheries research as an intern with the National Park Service. Nathaniel plans to go on to study biology in graduate school, though he has not yet decided on a specific area of research.

Thomas Jones

