

BGE 2020 Newsletter



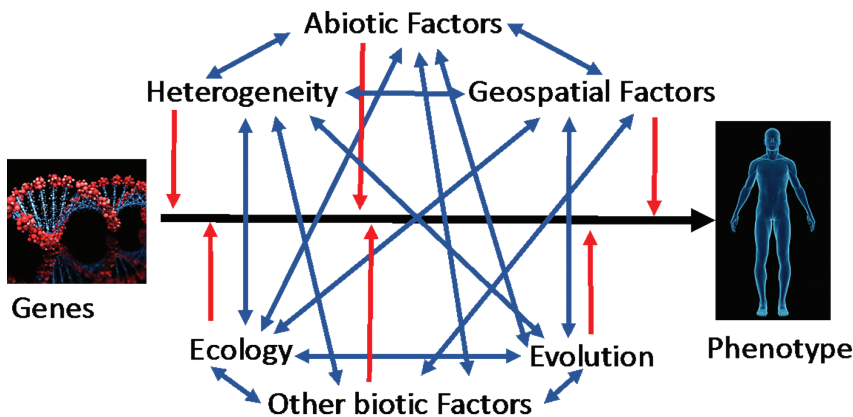
Dear Alumni, Students and Friends,

It has been an exciting year in the Department of Biology, Geology and Environmental Science! The renovation of Holt Hall is nearing completion, and our faculty and staff are now back in their renovated offices and labs. Our teaching, research and service remain extensive, and our enrollment numbers increased in fall 2019. We serve approximately 1,000 majors in our department, and we take pride in all of our students having the opportunity to participate in hands-on learning through lab, research, internship and study abroad experiences. We have been fortunate to welcome several people to our department, including Dr. Ashley Manning-Berg (Assistant Professor of Geology), Dr. Stephanie DeVries (Assistant Professor of Geology) and Ms. Monica Miles (Visiting Lecturer). We are excited about the year ahead, and we look forward inspiring and training the next generation of scientists.

We have four associate department heads to help Klug in the day-to-day management. To help keep you up-to-date on departmental happenings, we intend to have regular commentary from our associate heads to let you know about everything going on in our department.

BGE is leading in Computational Research at the University of Tennessee at Chattanooga

The University of Tennessee at Chattanooga recently prioritized research focus on different computational areas. The Department of Biology, Geology and Environmental Science (BGE) responded strongly to this call, since we can see a significant increase in faculty research involving computational aspects. BGE faculty recently awarded a large number of internal and external grants for computational research. The recent projects led by BGE faculty are summarized below.



← Development and application of computational tools to address fundamental questions in ecology and evolution with specific focus on the fundamental rules of life.

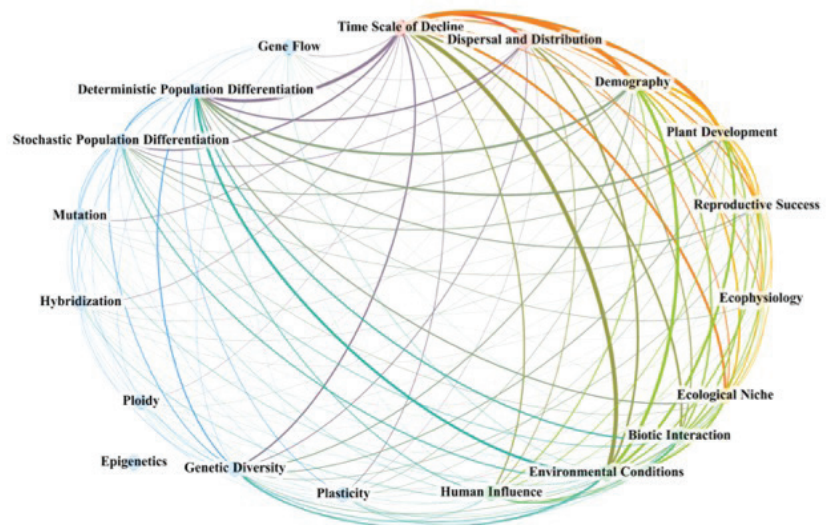
Dr. Hope Klug is leading this research in collaboration with Dr. Jennifer Boyd, Dr. Hong Qin and Dr. Azad Hossain.

GRANTS AWARDED: CEACSE 2019 AND 2018; NSF – CAREER AWARD.

Developing a computational tool (that uses mathematical graph theory) to link different concepts as a visual map – to characterize the body of research comparing rare and common plant species. →

Dr. Jennifer Boyd is leading this research in collaboration with Dr. Craig Tanis and Dr. Hope Klug.

GRANTS AWARDED: NSF.



RESEARCH

Simulating bio-environmental interactions using -omics approaches. Development and application of bioinformatics pipelines to predict microbiome biodiversity in response to environmental stressors.

Dr. Francesca Leasi is leading this research in collaboration with Dr. Jejal Bathi, Dr. Lani Gao and Dr. Hong Qin.

GRANTS AWARDED: CEACSE 2020 AND MINI-CEACSE 2019.

Combining massive parallel sequencing technologies and bioinformatics tools to create a model of incipient speciation based on the evolution of electro-communication and simulate evolutionary scenarios that could also be applied to other systems to ultimately advance our understanding of the mechanisms that drive speciation.

Dr. Fernando Alda is leading this research.

GRANTS AWARDED: MINI-CEACSE 2020.

Using computational approaches to enhance comparative studies of social evolution.

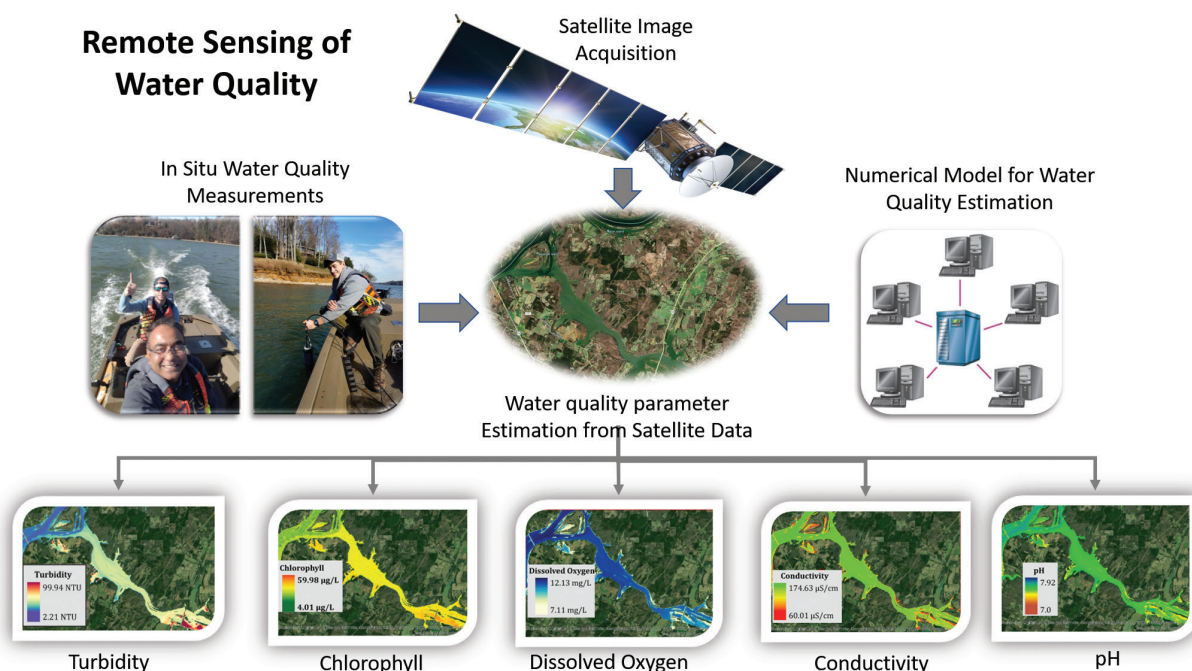
Dr. Loren Hayes is leading this research.

GRANTS AWARDED: MINI-CEACSE 2020.

The impact of membrane phospholipid remodeling on pathogen survival and persistence; waterborne infections and pathogen dynamics: modeling, experimentation and large-scale computation; a computational study of the impact of fatty acid substitutions on the vibrio cholerae outer and inner membranes.

Dr. David Giles is conducting these collaborative research projects with Dr. Bradley Harris, Dr. Jin Wang and Ethan Hereth.

GRANTS AWARDED: CEACSE 2020, 2019 AND 2018.



Integration of Satellite Observations with Numerical Watershed and Hydrodynamic Models for Surface Water Quality Studies.

Dr. Azad Hossain is leading this research in collaboration with Dr. Mark Schorr and Dr. Jejal Bathi.

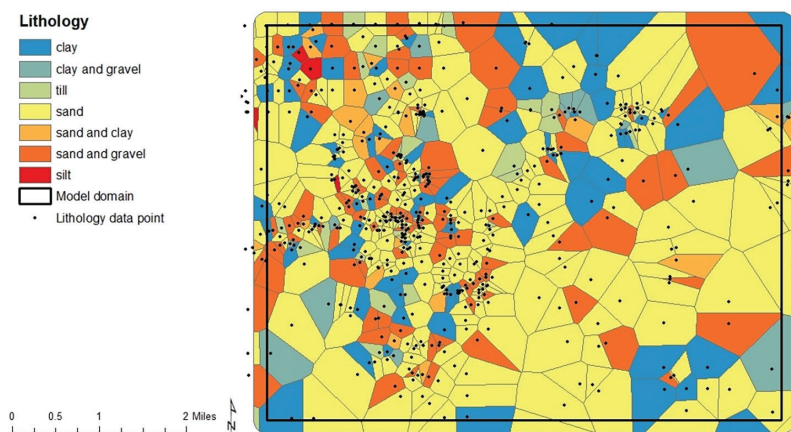
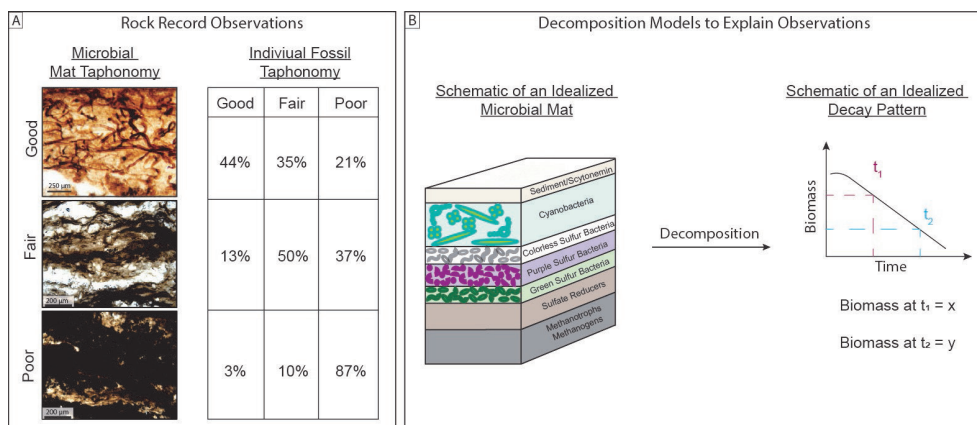
GRANTS AWARDED: CEACSE 2020.

RESEARCH

Developing a model of a microbial mat biomass accumulation to understand how the population dynamics change in a mat as the microbial communities decompose. →

Dr. Ashley Manning-Berg is leading this research.

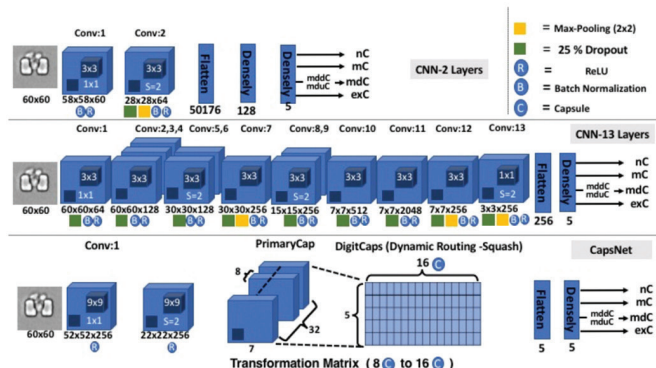
GRANTS AWARDED: MINI-CEACSE 2020.



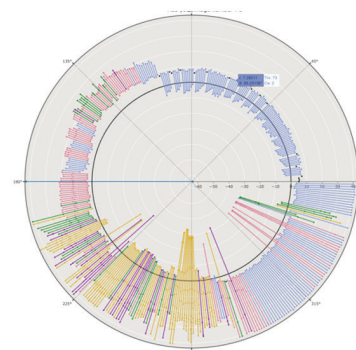
← Evaluating the application of a Thiessen Polygon-based characterization of a highly heterogeneous glacial aquifer properties for local-scale groundwater flow simulations used for the design of well-head protection plans.

Dr. Stephanie DeVries is leading this research.
GRANTS AWARDED: MINI-CEACSE 2020.

Comparison of three deep learning neural network architecture on microfluidic image classification



Circular plot of dividing yeast cells for lifespan inference



↑ Engaging Undergraduates in Interdisciplinary Computing for Biological Research (REU Site: ICompBio); Collaborative: Integrating Biological Big Data Research into Student Training and Education (Spokes: MEDIUM: SOUTH); A probabilistic gene network model of cellular aging and its application on the conserved lifespan extension mechanism of dietary restriction.

Dr. Hong Qin is leading these research efforts in collaboration with other faculty at UTC, University of West Virginia and Spelman College.

GRANTS AWARDED: NSF REU, NSF BD SPOKE AND NSF CAREER.

undergraduate

CULLEN HARRIS

WHAT ARE YOU RESEARCHING?

I work in the UTC herpetology lab under the advisement of Dr. Thomas Wilson. My research is investigating the impact of an emerging fungal pathogen *Ophidiomyces ophidiicola* (O.o.) on Tennessee snake populations. O.o. is a virulent fungal pathogen that can lead to the manifestation of snake fungal disease (SFD). SFD causes skin sores, lesions and, eventually, leads to death in snakes. The fungi can persist as a free-living saprobe in the soil or can be spread upon snake-on-snake contact. I primarily work in the field using various search methods to locate the animals, then I use hand-capture techniques and process the animal using a non-invasive skin swab. Samples are later processed through a collaborative effort with another lab. Due to the nature of disease work, biosecurity is of upmost importance when in the field so it is imperative to closely follow all proper procedures. From always handling animals with gloved hands to sterilizing all gear upon entering and exiting the field.



WHAT IS ONE THING YOU WOULD LIKE EVERYONE TO KNOW ABOUT YOUR RESEARCH?

Snakes are a very misunderstood taxonomic group, but they are incredibly important for ecosystem function due to the complex roles they play in predator/prey interactions. Many members of the general public fear these animals but, the truth is, if you leave them alone, they will leave you alone. Snakes have no interest in interacting with humans; they are best admired from a safe distance. As we continue to push this research forward, we will increase our understanding of the distribution of SFD in Tennessee, what species are being impacted and to what magnitude species are being impacted. It also will allow us to help inform conservation groups and land managers on what novel biosecurity, conservation and management practices can be implemented to minimize the spread of SFD.



WHAT IS THE FAVORITE PART OF YOUR RESEARCH?

Since I was very young, snakes have always been my favorite taxonomic group, so having the opportunity to now work with them in an official capacity is incredible. I get to constantly learn new things and make new discoveries about a group of organisms I feel extremely passionate about. As well as having the privilege of sharing findings with peers at professional conferences, it's all one big, great experience for me. However, nothing tops being in the field and finally stumbling across that rare species you've never seen or sampled before.

WHAT IS THE BIGGEST LESSON YOU LEARNED?

I've learned that when it comes to doing science, sample size can be everything. With this project, that has been somewhat of a struggle. Snakes are a cryptic organism and can be hard to find; then sometimes they can be even harder to catch. I've found that field biology can be a finicky process and you have to spend lots of time in the field searching for your target. If something can go wrong, it likely will, but you have to stay calm, collected, patient and not give up.

WHAT ARE YOUR PLANS AFTER GRADUATION?

I plan to continue this research by adapting it into a full master's thesis at UTC. I want to eventually pursue a career in herpetology and, specifically, focus on the conservation of amphibian and reptile species and the habitats they rely on to thrive.

graduate

MARY FEELY



WHAT ARE YOU RESEARCHING?

I'm researching the composition of avian species in a forest that burned in 2016 during an uncontrolled wildfire on part of the North Chickamauga Creek Conservancy in Tennessee. We wanted to know whether the fire assisted disturbance-prone species of birds, so we compared it to an unburned forest nearby. We focused

on the composition of birds in a burned and unburned forest and whether invasive plants were colonizing the regenerating forest via ornithochory (birds spreading the seeds through eating and passing them).

WHAT IS ONE THING YOU WOULD LIKE EVERYONE TO KNOW ABOUT YOUR RESEARCH?

This forest presented a unique opportunity to analyze regrowth two years after a major, uncontrolled wildfire. This has not been well-studied in eastern forests, especially changes in bird communities and their role in plant recolonization. Not a lot of people know that fire can actually be beneficial to many species. Much of our area

is historically acclimated to fire and through suppressing fire, humans decreased suitable habitats and disturbance-dependent species of animals and plants have suffered.

WHAT IS THE FAVORITE PART OF YOUR RESEARCH?

My favorite part is all of the birds I get to see, of course. I've seen a lot of species up close that I never would have otherwise. My favorites at my site have been the Yellow-breasted Chat and the Prairie Warbler. Both are disturbance species and thrive in the post-burned landscape.

WHAT IS THE BIGGEST LESSON YOU LEARNED?

I was reminded that research—much like life—does not ever go the way you plan. Even though we had perfect conditions to catch birds throughout the fall and winter, we didn't catch many at all. This meant we didn't have as much data that would have helped answer our question of whether birds were eating invasive fruits and recolonizing the burned area. This caused some anxiety, but we still had plenty of data on the other questions we wanted to answer with my thesis.

WHAT ARE YOUR PLANS AFTER GRADUATION?

I plan to continue teaching biology and environmental science and also continue learning about the ecology of birds. I also plan to continue writing as I am passionate about creative writing and hope to publish several books in the future. Lastly, I hope to be involved with other avian-focused research and have considered eventually obtaining my Ph.D.



NEW FACULTY



Stephanie DeVries
Assistant Professor of Geology,
fall 2019

WHO ARE YOU AND WHAT IS YOUR ACADEMIC BACKGROUND?

I am a hydrogeologist with a B.A. in Fine Art (Grinnell College, Grinnell, IA), an M.A.

in Geology (City College of New York, New York City), and a Ph.D. in Earth and Environmental Sciences (the CUNY Graduate Center, New York City). I currently teach introductory Physical Geology, Hydrology and Aqueous Geochemistry. I am planning at least two additional courses in the future, including Groundwater Hydrogeology and a Field Methods in Hydrology course.

RESEARCH SPECIALTY?

My research employs a combination of laboratory experiments, field sample collection and analysis and computer modeling to answer questions about the groundwater flow and quality. I am currently involved in two projects: One will use 3D groundwater modelling in a region to help characterize the most probable flow-paths of groundwater contaminants that impact the quality of residential drinking water wells. The other is testing a novel method for characterizing local-scale heterogeneity in an unconfined sand and gravel aquifer for potential application to delineation of well-head protection boundaries.

Ashley Manning-Berg
Assistant Professor of Geology, fall 2019

WHO ARE YOU AND WHAT IS YOUR ACADEMIC BACKGROUND?

I am the new sedimentologist in the department. I earned an M.S. and Ph.D. at the University of Tennessee in Knoxville, where I studied the morphologic and geochemical preservation of microfossils in chert deposits from a mesoproterozoic carbonate peritidal environment in Arctic Canada. At UTC, I will be teaching both Sedimentary Rocks and Stratigraphy and Paleontology.



RESEARCH SPECIALTY?

My research focuses on using chemical sedimentary rocks to investigate the geochemical composition of Earth surface environments and the effects of early diagenesis in these systems. Much of my research is focused on proterozoic rocks. I am interested in understanding the geochemical conditions of early Earth ecosystems and their ability to serve as analog environments for the search for potential extraterrestrial microbial life. My future research directions include the investigation of how microorganisms are silicified and what is chemistry preserved in both the microbes and the silica that preserves them, and how silicification changes through geologic time. This research will involve investigating silicified organisms preserved in the local carbonate strata and exploring carbonate geochemical questions.

in memoriam



The BGE department remembers the life of the late Dr. Robert Gary Litchford. Doc, as many people called him, was a faculty member in the department from the late 1960s through the early 2000s. A passionate scientist, colleague and friend to many, Doc made several lasting contributions to UTC. He led the

effort to create one of the nation's early, successful undergraduate Environmental Science programs and the first (and still the only) master's degree in Environmental Science program in Tennessee. He established the first Geographic Information Systems (GIS) curriculum and GIS teaching and learning laboratory at UTC and created the Joyce Litchford Memorial Scholarship to support outstanding pre-med students with financial need. Doc lived a vibrant life full of love, science, diving and motorcycle trips. His legacy is evident in the BGE department and the many students and colleagues he has influenced and supported over several decades.

Holt Hall Renovation

Holt Hall has undergone a recent facelift.

The project began in January 2017 with renovations to the west end of the building. Renovations were complete at both east and west ends of the building in May 2019.

The work brought mechanical and electrical components of the building up to code, along with aesthetic upgrades including new furniture, paint, carpeting and tile.

Teaching labs were updated with IT capabilities and named for prominent scientists such as Carl Linnaeus, Rachel Carson, Robert Koch and Rosalind Franklin (shown in the pictured nameplate).

The update has allowed Biology, Geology and Environmental Science faculty to use and occupy all of Holt Hall while providing more space for the department.



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We hope that you have enjoyed our latest version of a departmental newsletter. By providing you with a better picture of current happenings in the department, we hope that you will feel a renewed connection to the BGE department at UTC. To help you feel more connected with us, and your old friends, we hope that you will help us expand future newsletters to include a section on "Alumni Events". This new section will be devoted to you, allowing you to share key events in your lives (e.g., a new job, a marriage, or a new child) with old friends, your old faculty, and other departmental alumni. Please feel free to send us an update on you and your life post-UTC, either by email, phone, or by US mail. Photographs (as high resolution as possible) will be appreciated. In addition, should you feel an urge to help out your old department through a tax-deductible gift (as allowed by law) we would be grateful! Please contact us at 423-425-4341 or bgepr@utc.edu.