

## ALABAMA WATER INSTITUTE OFFERS WATER RESEARCH FUNDING SUPPORT THROUGH NEW BRIDGE PROGRAM

By Brock Parker

A new funding program from the Alabama Water Institute is available. The AWI Pilot Bridge program supports faculty engaged in water research who are submitting external federal grants and would benefit from institute support in order to resubmit their proposal submissions. **The deadline to apply is February 28, and application guidelines are available on the AWI website.**

Since the program's inception, AWI has approved and funded two projects.

The first, "Development of Genomic Resources to Expand Freshwater Mussel Research," is from the Department of Biological Sciences. Funding support for this project will end within the next few months, but the National Science Foundation has expressed a strong interest in it. While awaiting proposal approval and funding from the NSF, AWI awarded a grant for its continuance.

The grant covers the sequencing costs needed to generate transcriptomic and genomic sequences for four proposed model organisms. According to the proposal, mussels are "keystone species in freshwater ecosystems, serving as nutrient cyclers, habitat modifiers and natural water filters." However, they are vulnerable to climate change and habitat disturbance. The research from UA's biological sciences department will help scientists better understand and develop predictive models to identify characteristics or traits that make some mussel species more susceptible to those vulnerabilities. If the best species for dealing with them are identified, researchers can help policymakers make



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The lead PI on this project is Matthew Jenny, and the co-PIs are Jeffrey Lozier and Carla Atkinson.

The second project, "Probing the Interactions of Titanium Suboxide Nanomaterials with Waterborne Pathogens," was awarded a grant to Ruigang Wang in the Department of Metallurgical and Materials Engineering. These funds will support lab supplies, travel to research sites and a graduate student for six months to work on biological and environmental aspects of combating biological pathogens in water supplies as they are becoming



increasingly resistant to commercial disinfectants.

According to the proposal, Wang's group has developed defect-laden titanium dioxide nanotubes, which have shown to be effective at physically destroying bacteria. These nanotubes can be modified for different pathogen types, concentrations and water chemistry. Wang is currently seeking funding from the NSF and the National Institutes of Health.

**For more information about how to apply for the program and for deadlines, contact AWI Research Administrator Stefanie O'Neill at [soneill2@ua.edu](mailto:soneill2@ua.edu).**

## UA LEADS EFFORT TO UNDERSTAND IMPERILED MUSSEL BIODIVERSITY

By Adam Jones

More than 70 percent of freshwater mussels are imperiled as human development has harmed river ecosystems, yet little is known about how biodiversity within species of mussels influences their function as filters and engineers of the water.

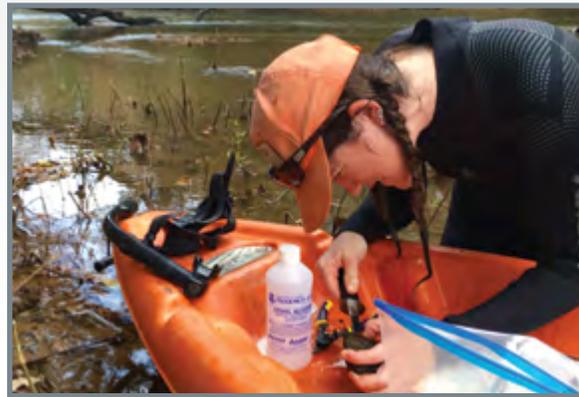
A nearly \$1.8 million project, led by The University of Alabama, hopes to identify the processes and mechanisms that underlie patterns of biodiversity in these animals. This will better arm managers of environmental resources to make informed decisions for conservation and restoration efforts that benefit the entire ecosystem.

“Freshwater mussels are critical for habitat,” said Dr. Carla Atkinson, UA assistant professor of biological sciences, who is leading the project. “We have really high biodiversity in this state, and different species do different things, so you want to have high diversity if you want to maintain those biological functions.”

Along with Atkinson, the research team includes Dr. Jeff Lozier, a UA associate professor of biological sciences, as well as two researchers from the University of Mississippi: Drs. Colin Jackson, professor of biology, and Ryan Garrick, associate professor of biology.

The project is one of 10 funded through the National Science Foundation’s Dimensions of Biodiversity program to research processes in nature and their complex interactions with climate, land use and invasive species at local, regional and continental scales.

Despite centuries of discovery, most of our planet’s biodiversity remains unknown. The scale of the unknown is especially troubling given the rapid



Dr. Carla Atkinson

and permanent loss of biodiversity across the globe. The goal of the Dimensions of Biodiversity campaign is to transform how we describe and understand the scope and role of life on Earth.

This campaign promotes novel integrative approaches to fill the most substantial gaps in our understanding of the diversity of life. It takes a broad view of biodiversity, and it focuses on the intersection of genetic, phylogenetic, and functional dimensions of biodiversity. The projects all integrate these three dimensions to understand interactions and feedbacks among them.

During the project, Atkinson’s team will study mussels from seven rivers, five in Alabama along with one in Tennessee and another in Mississippi. They seek to understand how different species of mussels in the same watershed perform different functions, seeing how environmental factors such as placement, temperature and water flow influence their roles in the river.

For instance, one spot in the Sipsey River in Greene County, Alabama, has more than 20 different species in one bend of the river. The team wants to know how the filter-feeders avoid direct competition for seemingly the same food. With data and experiments from the field, combined with experiments conducted in the laboratory, the researchers will determine the ecological functions mussels contribute to the water.

Atkinson’s work aims to examine the role these animals play in river ecosystems including their capacity to filter-feed and influence nutrient cycling in streams.

“We’re hoping to see what’s driving populations of these organisms,” Atkinson said. “We are trying to understand population ecology and the community structure of mussels because as water flows

changes in the Southeast because of water extraction, water use and global climate change, we need to know how that will influence the population of these organisms.”

Lozier, whose background is using the genetics of an animal population to answer evolutionary and ecological questions, will examine the genomes of different mussel species and populations across the study area. That information, combined with environmental data from the field and observations from mussels in the lab, can lead to understanding why different species, or even the same species in different locations, show different levels of genetic variation.

“We’re looking at how genetic variation scales with community-level estimates for mussels and their microbes,” Lozier said. “It’s very rare to have all the community-level data together with all the genetic data and ecological data, so this is a unique project.”

The University of Mississippi team will focus on different aspects of biodiversity in this system. Jackson will study the communities of gut microorganisms that inhabit different mussel populations and species, which might contribute to where mussels live and how they function in the river. Garrick will examine resolving the evolutionary history of mussels to understand how biodiversity of this group, and evolutionary interactions with their associated microbes, may have changed over time.

## ALABAMA WATER INSTITUTE RESEARCHERS PREPARE FOR DISASTERS BY STUDYING ONLINE BEHAVIOR

A group of researchers affiliated with the Alabama Water Institute is working to understand society's perspective of slow-changing weather events and create disaster response plans based on those views.

By Brock Parker

Kimberly Stowers is an assistant professor in management in The University of Alabama's Culverhouse College of Business where her primary area of research is human-technology interaction. She is collaborating with Jonghun Kam, an assistant professor in civil, construction and environmental engineering who studies surface hydrology, and Aibek Musaev, an assistant professor in computer science who researches data mining and social network analysis.

The team is currently focusing on social behaviors and drought management.

"I met Dr. Kam at my poster presentation during the 2017 Alabama Water Resources Conference," said Stowers. "During that time, we discussed the need to consider psychology and technology in water management. Through weekly meetings with Drs. Kam and Musaev, we established a joint interest in the role of technology, particularly the internet, in facilitating risk communication."

The team began by analyzing Twitter conversations during the 2011-17 drought in California. They found that public response to the onset of the drought was slow at first and impacted by changes in government policy, especially if those changes are publicized by high-profile individuals.

The group primarily analyzed behavior through social media and other online mechanisms for communicating and searching for



Pictured left to right: Aibek Musaev, Jonghun Kam and Kimberly Stowers.

information, such as the social response to wildfires. Kam and Stowers have expanded their efforts by also looking at other online sources of data, including Google, to understand social response across multiple platforms.

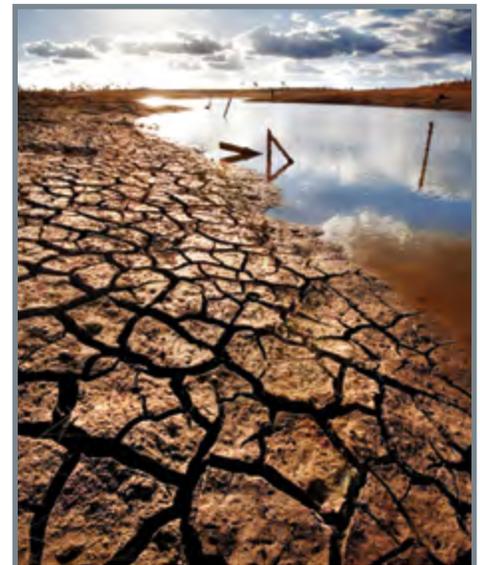
Stowers said the team hopes to better understand the risk of drought at the onset, persistence and recovery and to develop a drought response plan that takes public perception into account. They also want the plan to help manage perception before, during and after the drought.

**"Without collaboration across hydrology, psychology and computer science, it is not possible to fully understand social responses to drought and other disasters..."**

"We recognize that water management is a complex process through interactions between natural-human systems," Stowers said. "One of these factors, social response to slow-emerging water events, remains under-researched. By combining our expertise, we are able to fill this gap."

According to Stowers, these types of interdisciplinary research projects are good examples of how AWI-affiliated faculty, centers and departments can tackle new and challenging water-related problems.

"Without collaboration across hydrology, psychology and computer science, it is not possible to fully understand social responses to drought and other disasters," she said. "We hope that this project will inform us of the value of interdisciplinary collaborations on complicated water-related problems."



## AAAS COMMUNICATING SCIENCE WORKSHOP

By Brock Parker

The Alabama Water Institute and the University of Alabama's The Speaking Studio recently hosted a workshop to help graduate students, faculty and staff learn how to effectively explain their research to the public, journalists and policymakers. The sessions, facilitated by Stacey Baker from the American Association for the Advancement of Science provided several tips to help researchers learn how to inform audiences not only about their work, but how to do so in a manner which gains their respect and trust.



Stacey Baker

"Learning to communicate research takes time," said Baker. "You're not going to go from sitting on the couch to immediately running a 5k. You have to train."

According to Baker, most people learn science outside of a classroom because the average person only spends five percent of their life inside school. Researchers devote much more time experimenting and delving into subjects than can impact society as a whole. She said it's important to think about how to clearly relay their findings to a diverse audience, such as starting a gateway conversation to learn more about those gaining from the information. Once that conversation begins, both sides can mutually benefit. If the public understands the message, they can provide feedback and insights researchers may not have considered.

The workshop consisted of small groups, discussion and practice sessions. More information about AAAS' Communicating Science Workshops can be found on their website.

**UA students and faculty wanting further help in public engagement can contact The Speaking Studio by email at: [speakingstudio@ua.edu](mailto:speakingstudio@ua.edu).**



## HOW TO GET AFFILIATED WITH THE ALABAMA WATER INSTITUTE



If you have expertise that could contribute to addressing complex water issues, please register yourself on our website. All registered members are considered affiliated with AWI and have access to all AWI resources. To register, visit the AWI website: [ua.awi.edu](http://ua.awi.edu).

### Affiliated Member Information:

<http://ovpred.ua.edu/alabama-water-institute/awi-affiliated-members/>

### Eligibility Criteria:

- A faculty/staff/student appointment at the University of Alabama
- Research expertise in a water-related field
- Completion of registration form

**Questions? Please contact Stefanie O'Neill at: [soneill2@ua.edu](mailto:soneill2@ua.edu) or 205-348-9128.**

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