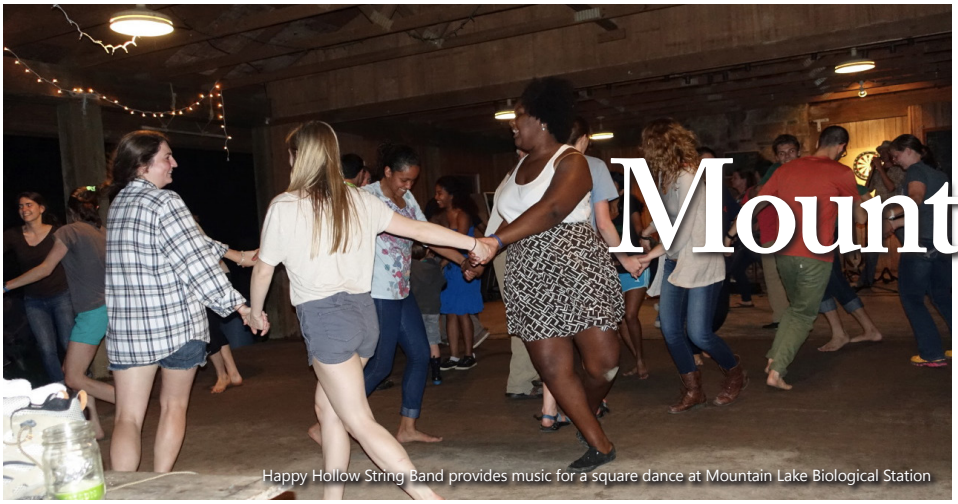

Happy Hollow String Band provides music for a square dance at Mountain Lake Biological Station

Mountain Lake Echoes

University of Virginia

Produced by the University of Virginia's Mountain Lake Biological Station **mlbs.org**

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MLBS Hosts High School Groups from Charlottesville

Researchers, undergraduates, and graduate students who spend time at MLBS are immersed in a truly unique and inspirational "academical community." This fall, high schoolers from two Charlottesville-area schools had the chance to experience that community as well. Students worked, studied, lived, and played together on the mountain, completely unfazed by the fog, mist, and rain that never let up over the course of their back-to-back visits!

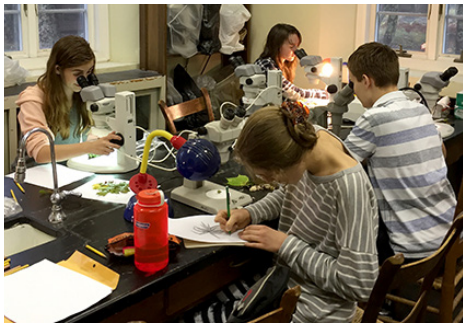
The first group hailed from the Western Albemarle High School Environmental Studies Academy (WAHS-ESA), which was recently launched by WAHS to offer an innovative, hands-on science curriculum. A partnership between Laura Galloway's lab (University of Virginia) and Adam Mulcahy (WAHS-ESA) brought 20 tenth graders to MLBS to engage them in authentic field research. On a cool Friday evening in late September, the group arrived to a foggy mountain and began their three-day experience at the Station. In the evenings, students enjoyed a night hike to search for salamanders, as well as a bonfire—a requisite part of an authentic MLBS visit. Daylight hours focused on developing research projects. UVA faculty, graduate students, and post-docs led the students on nature hikes to introduce them to MLBS research and inspire questions they could investigate with their own projects. The UVA team then facilitated a brainstorming session to generate possible research directions, which the class narrowed down to five topics to pursue in smaller groups. Trip leaders helped the budding field biologists develop hypotheses and methods, and spent several rainy hours in the field with them collecting data. By the time the students departed on Sunday afternoon, they had gained hands-on field work experience and collected data that will be analyzed, interpreted, and presented with help from the Galloway lab during follow-up class visits.

Students from WAHS experiencing fieldwork

The next day, 30 high schoolers and faculty from Renaissance School (Charlottesville, VA) arrived for their own three-day immersion in the mountains of southwestern Virginia. Their visit kicked off with nature hikes that were led by MLBS researchers and supplemented with mini-presentations by students, who had researched local organisms prior to the trip. Students also observed and sketched biota of their choice under dissecting microscopes; ventured into a chilly Riopel Pond to discover its inhabitants; and learned about the Station's research and ecology from Becky Wilbur, an MLBS researcher and Dean of Academics at Renaissance School. The next day, students split into groups and went on one of three field trips: The Beckley, WV Exhibition Coal Mine and Museum; the Pocahontas, VA Exhibition Coal Mine and Museum; or a five-hour hike exploring various ecosystems of Salt Pond Mountain. They prepared presentations summarizing their field trips that evening, and then relaxed by a bonfire. On their last morning at MLBS, students shared their field trip presentations and learned to connect concepts of ecology, Appalachian history and culture, energy policy, and climate change.

MLBS was pleased to open its doors to both of these schools, and plans to continue developing this type of collaborative programming in order to increase its capacity to serve high school audiences.

-MLBS Staff



Renaissance School students in the lab

From the Director

One of the great benefits of my job is the vicarious pride I get to feel for the accomplishments and products of so many Mountain Lakers. The September installation "A Scuttering Across The Leaves" at the Center for the Arts at Virginia Tech took things to a new level for me. This sound art-science collaboration from Stephen Vitiello and Kasey Fowler-Finn captured so many dimensions of the experience that we are driving toward at MLBS. The installation itself was a deep-dive into vibrational signals on plants and other surfaces that brought listeners into an acoustic world that they could not ever have accessed before. Produced in Virginia Tech's four-story "Cube" and delivered in 100+ channels of sound, it was like being shrunken down to the size of a beetle and immersed in the sensory world it might experience. I found the piece challenging at first, as it required a patience and attention that we as observers often skip over, assuming we can catch an event's significance in a few seconds. Instead, for the listener willing to sit through a few loops of the presentation, the work brought out the depth and complexity of another realm, complete with sounds that seemed familiar at times though they had never before been heard by humans.

The collaboration that brought this idea to reality grew out of the ArtLab program at MLBS, and epitomizes what I've hoped would emerge from that experiment - artists (Stephen) and scientists (Kasey) working independently, finding common curiosity and complementary approaches to exploring the natural world. In this case, two people with a passion for delivering unappreciated or unheard sounds brought the rest of us along for the ride. For me, at least, this opened my mind to a whole other way of experiencing Mountain Lake and the environment in general. The sounds of the mountain have not been the same to me since Stephen first visited and shared some of his recordings (if you think you know what Mountain Lake rain sounds like, just check out "Fritz Rain" (with headphones!!) at https://soundcloud.com/stephenvitiello). Kasey has helped me to think again about the social interactions of my forked fungus beetles and how different modes of communication might play into our research questions.

These influences and realizations really highlight for me the special experience that MLBS is year in and year out.

Butch Brodie

Student Corner

by Jake Nash, Oberlin College

I spent ten weeks this summer participating in Mountain Lake's NSF Research Experiences for Undergraduates program as part of Charles Kwit's lab. For my project, I studied the benefits that ant seed dispersal provides to plants. Although I am sure that this wasn't the case for many other researchers at the Station, I find it impossible to describe a "typical day" in the field. I can say that some of my favorite times were spent on my hands and knees, staring at a fallen log waiting for an ant to pass by. I would then set a seed down beside the ant and watch as it took the bait and carried it back to its nest, shortly thereafter to be followed by a small troupe on its way back for more.

It was a great privilege to be able to observe my study species so closely. Ants are special in that they don't mind if there's a goofy looking REU breathing down their necks as they go about their daily business. Other research groups were not so lucky. The group studying dark-eyed junco birds made great efforts to avoid being noticed in much of their work.

My primary research interest is in trees, so my summer studying ants may seem like a departure. However, much of what I learned was not particularly specific to my study system. The lessons that I learned about ant seed dispersal can also be applied to the seed dispersal of trees. As I have been hashing out a research project this semester to conduct over my final year at Oberlin College, many of the ideas I was introduced to over the summer have become relevant. Working alongside ecologists studying such a wide variety of organisms this summer broadened my perspective and introduced me to many new ideas that will continue to influence my life and work.

Student Writings Available Online

This summer MLBS offered a Science Writing course to students from multiple disciplines, led by Hannah Rogers of the University of Virginia. Writing is fundamental to the practice of science. We observe, think, and write about individual organisms, ecosystems, patterns, and anomalies in order to record our findings and reach broader audiences. This course aimed to help students become better writers as they communicate both inside specialist knowledge communities and with other citizens. During the course, each student wrote an article based on a personal experience, interview, or research on a Station-related topic.

Articles can be viewed at: https://sciencewritingmountain-lakeuniversityofvirginia.wordpress.com/

The Science Writing course will be offered again in 2016.

Article Topics

- Gunpowder from Guano
- Behind the Mystery of the Disappearing Mountain Lake
- The American Chestnut: An American Classic Meets American Innovation
- Students Study Bullfrogs at Mountain Lake
- Real-life Angry Birds: The Effects of Testosterone and Aggression on Dark-Eyed Junco Fitness
- House Hunters: Predicting Suitable Habitats for the American Chestnut in the Appalachia
- Snazzy Salamanders with Ranger Rick

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All donations are tax-deductible.

mlbs.org

Research Spotlight

by Jeremy Lichstein, University of Florida

The forests of eastern Asia and eastern North America were once connected and have a shared evolutionary and ecological history. These currently disjunct ecosystems were part of a vast, temperate broadleaved forest that spanned the northern high latitudes prior to climate cooling that began around 50 million years ago and that eventually led to the genetic isolation of previously-connected plant lineages. Prior to this disjunction, land bridges intermittently connected North America to Asia and Europe, maintaining gene flow throughout these temperate forests. However, by 20-30 million years ago, climate cooling had pushed these temperate forests far enough south so that gene flow was severed, leading to the evolution of disjunct plant lineages on each continent.

Despite millions of years of genetic isolation, North American and Asian forests still share many plant genera in common. Disjunct genera that evolved (and often diversified into multiple species) separately on each continent include many plants that are familiar to visitors of the Virginia mountains, including *Tsuga* (hemlock), *Carya* (hickory), *Acer* (maple), *Hamamelis* (witch-hazel), *Magnolia* (cucumber tree), and *Liriodendron* (tulip tree), to name just a few.

Processing samples on the MLBS lawn

To better understand how evolutionary history has shaped the way our ecosystems function today, researchers from the University of Florida (UF) visited MLBS in summer 2015 to study disjunct plant species and associated microbes (bacteria and fungi) that play critical roles in nutrient cycling and other ecosystem processes. The UF researchers collected soil and plant material that are now being used to characterize leaf traits related to photosynthesis and decomposition, the evolutionary relationships among plant species (using genetic material), and the microbial communities associated with different plant species – including microbes that live within leaves, on leaf surfaces, and in the plant rooting zone.

The UF project is funded by the U.S. National Science Foundation's Dimensions of Biodiversity Program, which has partnered with the Chinese National Science Foundation to fund a dual effort across this ancient biogeographic divide: each type of data and analysis will be replicated by a team of Chinese collaborators working with related plant species and microbial communities in the temperate forests of eastern China. The UF team is working at six NEON sites in the eastern U.S. (www.neoninc.org), including MLBS. The team plans to return to MLBS in summer 2016 to map their field data onto aerial images that will soon be available at MLBS and other NEON sites. These images, collected with a state-of-the-art "hyperspectral" sensor on a small airplane, include reflectance data in hundreds of different wavelength bands (most of them invisible to the human eye), each providing potential clues into canopy processes such as photosynthesis and evapotranspiration. By combining this modern remote-sensing technology with the newest molecular methods for studying plant genetics and microbial function, the UF team hopes to gain new insights into how plants and microbes affect ecosystem functioning, and how two formerly-connected ecological communities have changed over the last 20 million years!

Evolution Education Teacher Workshop

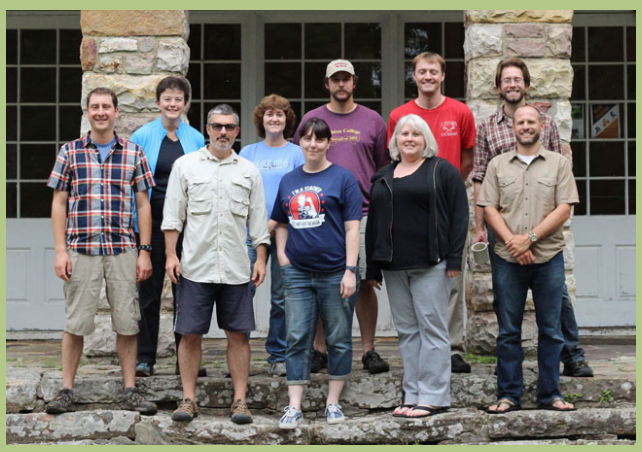
by Aaron Reedy, University of Virginia

In June, MLBS hosted the first Evolution Education Teacher Workshop. Eight teachers from Virginia, Georgia, Ohio, Texas, and Utah attended the three-day professional development course designed to strengthen the teaching of evolution in middle and high school classrooms. Participating teachers discussed current research in evolution and accompanied MLBS researchers into the field to learn more about their projects. The workshop also featured hands-on demonstrations of engaging classroom lessons designed to bring real data, organisms, and analyses into the classroom.

Developing new classroom activities

The community of researchers at MLBS gave attending teachers the opportunity to interact with biologists at all career stages. Becky Fuller, an invited guest instructor from the University of Illinois who runs a similar workshop on teaching evolution for high school teachers in Illinois, gave a special evening seminar on her own evolutionary research. Her talk also featured an interactive discussion that allowed teachers to brainstorm with MLBS undergraduates, grad students, and veteran field biologists to design evolution lesson plans for the K-12 classroom while gearing their ideas toward Next Generation Science standards.

Evolution Education (www.Evolutioned.org) was founded by UVA assistant professor Robert Cox and graduate student Aaron Reedy to improve the teaching of evolutionary biology in middle and high school classrooms while facilitating connections between science teachers and scientists. The program's core principles are that students learn science best by doing actual science, and that teachers become more effective science educators through collaboration with scientists on authentic research. Evolution Education is funded by the National Science Foundation and will return to MLBS during the summer of 2016 for the second installment of the Teacher Workshop.



Participants in the first Evolution Education Teacher Workshop

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News & Notes

Former Instructor Remembered by son, Keith Johnston

Dr. David W. Johnston
November 23, 1926- July 26, 2015

My father, Dr. David Johnston, taught courses at MLBS from the 1960s until the 1990s. From early childhood until high school (1979), I would trek with him from Florida to the Station for six weeks of adventures and I eventually brought my bride to the area for our honeymoon in 1990. A few years later, we returned with our two little ones and I plan to visit with my grown son soon.

That's me in the red circa 1969. Striped pants are back, no? I have so many fond memories of foggy soggy hikes all around the Station, playing any sort of games with the other staff kids (Riopels, Hites, Angelbergers, and Millers), swatting no-see-ums (the MLBS wave), swimming and

sailing in the pond and lake, cookouts, volleyball, bonfires, and of course the 4th of July games. I also remember the Sunday lectures and being allowed as a child to ask questions; made me feel like a grown-up college student. I can still smell the smoky, musty, lecture hall and remember every slide show ending with the "sunset." Dad recently passed away this summer and my siblings and I all chose fields other than biological, but we've all retained a deep love and appreciation for nature. I'm constantly amazed at what I remember about different flora and fauna from 40 years ago; not sure I could pass one of Dad's finals though! MLBS will always hold a special place in my heart. So, thank you MLBS and thank you Dad for giving the gift of knowledge and love of nature.

New Greenhouse

The construction of the new greenhouse was completed this spring in time for summer courses. The students enjoyed a much larger facility and all benches were occupied this summer.

Wilderness First Aid

SOLO's Wilderness First Aid training (with optional CPR/AED) was offered at MLBS August 8-9. This two-day course, which prepares participants to provide medical care in remote environments, will be offered again over the 2016 Labor Day weekend.

Open House

On July 18, MLBS held its annual Open House. Over 200 guests attended and enjoyed guided nature hikes, grounds & lab tours, nature crafts, snake viewing, the student art gallery, and more. Visitors learned about the Station's history and research. The weather was beautiful! If you are curious about what goes on at the Station, please join us next year in July.

Artwork by Amy Chan