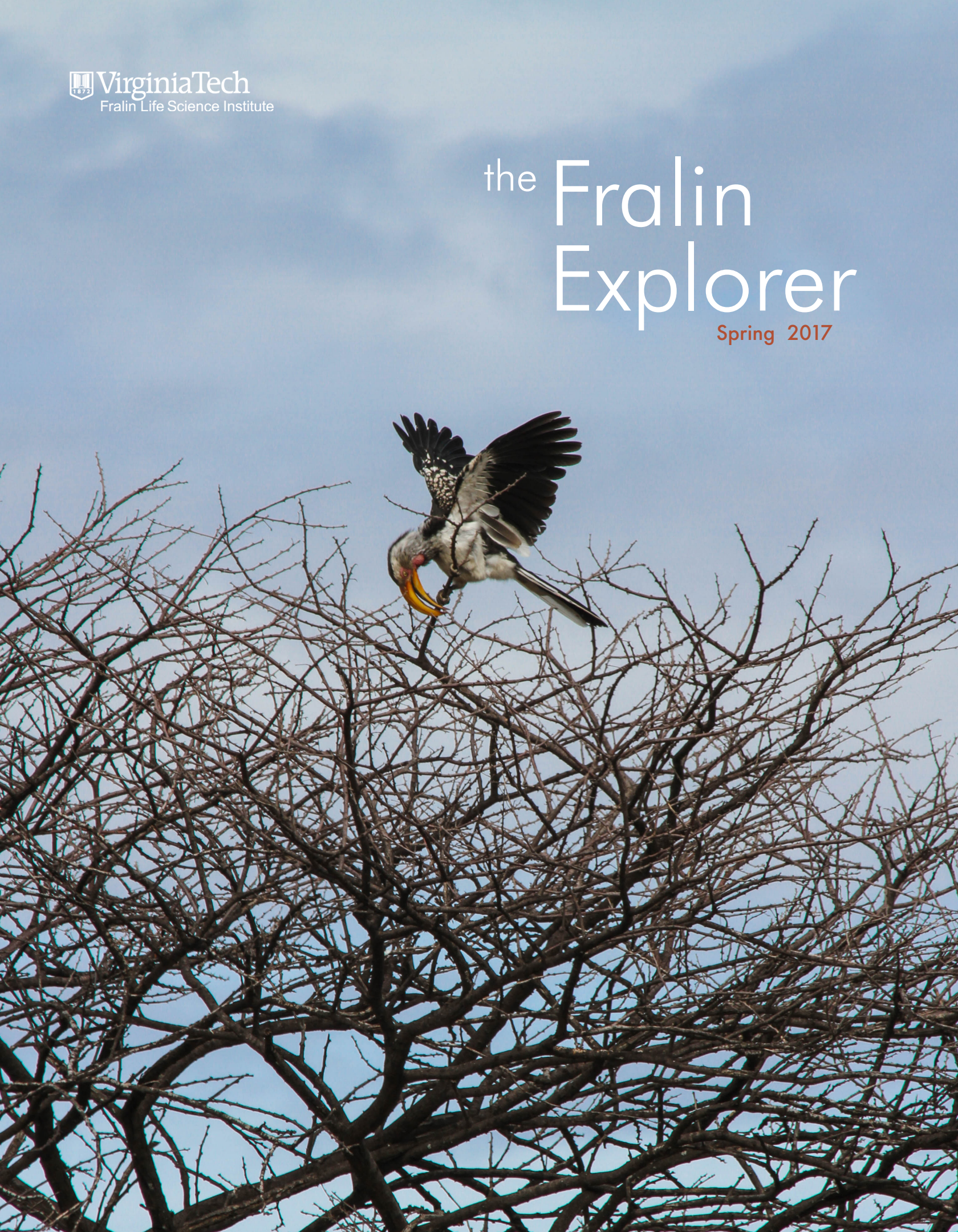
Virginia Tech
Fralin Life Science Institute

the Fralin Explorer

Spring 2017



WELCOME TO FRALIN

Dennis R. Dean
Director, Fralin Life Science Institute

Thanks for reading the Spring 2017 edition of the Fralin Explorer. Our staff has spent the last few months working on the next phase of implementation of the Global System Science (GSS) Destination Area (DA). As many of you know, the first phase involved the development of a thrust area within infectious diseases, with six faculty hires within four colleges approved, and some of those faculty searches are already complete. I hope you will stay tuned for stories on all of these newly appointed faculty in upcoming Fralin Explorer newsletters. Below, I will provide an update on the next phase and answer possible questions.

Last Winter, Provost Rikakis appointed a 19-member stakeholder group that was charged with developing a more comprehensive and integrated plan for the Global System Science Destination Area. Based on the committee's deliberations, groups were invited to submit "concept" papers to highlight areas of excellence within the GSS DA. There was a great response and 13 concepts were submitted.

Where do we go from here? At the time of this writing, the stakeholder group has evaluated the concepts and provided Deans Cyril Clarke (Veterinary Medicine), Sally Morton (Science), Paul Winistorfer (Natural Resources & Environment) and Alan Grant (Agriculture & Life Sciences) with recommendations. It is expected that the deans will select up to three concepts for further development over the next year.

Will the deans follow the initial recommendations of the stakeholders? Not necessarily. The stakeholders considered many of the concept papers suitable for implementation, but some were deemed to represent particular strengths and opportunities for growth. However, it is important that the concepts selected at this stage are in line with the strategic plans of the various colleges.

Has this outcome been worth all the effort? That depends on your point of view. My perspective is that, despite all the noise and confusion in the early stages of this process, the final outcome is going to be valuable. For example, the development of the concept approach has resulted in the coalescing of faculty members of diverse interests in a very productive way. The process has also resulted in an excellent way for faculty groups to inform the collective group of deans about possibilities for growth. Finally, the process has permitted an unprecedented level of coordination among the strategic hiring and investment plans among the colleges.

What will the concepts selected for further development receive? As a start, each group will be awarded $75K in discretionary funds to further develop their concept over the next 9 to 12 months. Fralin Life Science Institute's administrative staff will assist. Among the expected outcomes are a hiring plan for up to six faculty to be implemented over 3 to 5 years, identification of infrastructural needs, exploration of graduate and undergraduate research and instructional plans, coordination with other DAs and Strategic Growth Areas, and a commitment to improve diversity within the university community.

When will faculty be notified about which concepts were selected? By mid-June.

Will the concept papers be available? Yes, all 13 concept papers will be publicly posted in the near future for three reasons. First, there is a commitment to transparency. Second, faculty that did not participate in developing an original concept will have the opportunity to consider whether or not they would like to participate in further development. Finally, it will provide an opportunity for similar concepts to be merged for future concept submissions.

Will there be future calls for concept submissions? We anticipate, and certainly hope, that will be the case. The current plan is to have calls for submissions for at least the next two years.

I hope that this short briefing has provided some answers to possible questions. I would be pleased to hear from anyone that has other questions, would like to make comments about the current process, or has recommendations for improvement.

Have a great summer. Dennis

ABOUT US

Horace Fralin

The Fralin Life Science Institute is an investment institute committed to supporting **research, education,** and **outreach** in Virginia Tech's life sciences community. Residents of the institute's four flagship buildings are automatically considered affiliated faculty members and all other life science researchers on campus are invited to become affiliated faculty members.

Affiliated faculty members are given resources necessary to explore new, innovative science that benefits people in the New River Valley, the Commonwealth of Virginia, and the world.

Through seminars, conferences, and research group support, the institute serves as a meeting point for progressive ideas involving multidisciplinary research. It is closely aligned with Virginia Tech's other six research institutes, which include the Virginia Tech Carilion Research Institute, Virginia Tech Transportation Institute, the Institute for Critical Technology and Applied Sciences, the Biocomplexity Institute, the Institute for Society, Culture and Environment, and the Institute for Creativity, Arts and Technology.

Research initiatives within the life sciences receiving the highest priority for support include vector-borne disease, infectious disease, plant sciences, ecology and organismal biology, obesity, and cancer biology. The Fralin Life Science Institute is also actively engaged in cooperative partnerships with colleges, departments, and other institutes that support the life science community.

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EARLY DINOSAUR COUSIN HAD A CROC-LIKE LOOK

For decades, scientists have wondered what the earliest dinosaur relatives looked like. Most assumed that they would look like miniature dinosaurs, be about the size of a chicken, and walk on two legs.

A Virginia Tech paleobiologist's latest discovery of *Teleocrater rhadinus*, however, has overturned popular predictions. This carnivorous creature, unearthed in southern Tanzania, was approximately seven to 10 feet long, with a long neck and tail, and instead of walking on two legs, it walked on four crocodylian-like legs.

The finding, published in the journal Nature, fills a critical gap in the fossil record. *Teleocrater*, living more than 245 million years ago during the Triassic Period, pre-dated dinosaurs.

It shows up in the fossil record right after a large group of reptiles known as archosaurs split into a bird branch (leading to dinosaurs and eventually birds) and a crocodile branch (eventually leading to today's alligators and crocodiles). *Teleocrater* and its kin are the earliest known members of the bird branch of the archosaurs.

"The discovery of such an important new species is a once-in-a-lifetime experience," said Sterling Nesbitt, an assistant professor of geosciences in the College of Science.

He and Michelle Stocker, a co-author and also an assistant professor of geosciences in the College of Science, gave a free public talk April 13 in Derring Hall, folllowed by a fossil viewing session at the Virginia Tech Museum of Geosciences.

Teleocrater fossils were first discovered in Tanzania in 1933 by paleontologist F. Rex Parrington, and the specimens were first studied by Alan J. Charig, former Curator of Fossil Reptiles, Amphibians and Birds at the Natural History Museum of London, in the 1950s.

Largely because the first specimen lacked crucial bones, such as the ankle bones, Charig could not determine whether *Teleocrater* was more closely related to crocodylians or to dinosaurs. Unfortunately, he died before he was able to complete his studies.

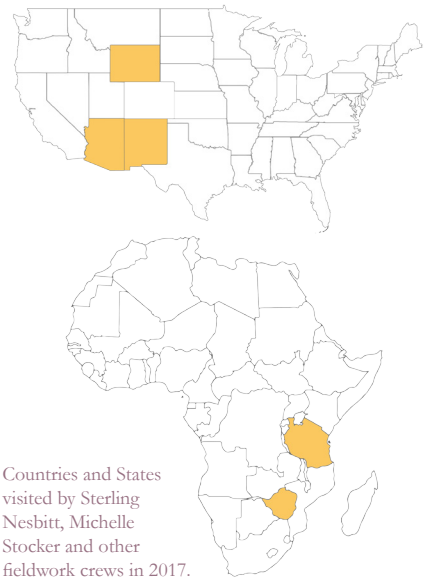
The new specimens of *Teleocrater*, found in 2015, clear those questions up. The intact ankle bones and other parts of the skeleton helped scientists determine that the species is one of the oldest members of the archosaur tree and had a crocodylian look.

Nesbitt and co-authors chose to honor Charig's original work by using the name he picked out for the animal, *Teleocrater rhadinus*, which means "slender complete basin" and refers to the animal's lean build and closed hip socket.

"The discovery of *Teleocrater* fundamentally changes our ideas about the earliest history of dinosaur relatives," said Nesbitt. "It also raises far more questions than it answers."

In the Virginia Tech Geosciences Museum, Sterling Nesbitt (center) chats with the public about his latest *Teleocrater* discovery.

Follow along on the scientists' next dig for dinosaurs at: #VTTriassicFieldwork



Countries and States visited by Sterling Nesbitt, Michelle Stocker and other fieldwork crews in 2017.

AUTISM SPECTRUM DISORDER, ANXIETY, AND ADHD IN CHILDREN

Children with autism spectrum disorder (ASD) experience internalizing and externalizing problems at higher rates than typically developing children, which could worsen social impairment, according to researchers with the Virginia Tech Center for Autism Research.

The study, published in the Journal of Autism and Developmental Disorders, compared social impairment scores in 57 children (3-17 years, 82.5 percent male) with ASD, either with or without heightened levels of internalizing (anxiety) or externalizing (attention deficit hyperactivity or ADHD) symptoms.

Children with heightened anxiety problems showed higher impairment on social cognition, social communication, social motivation, and restricted interests/repetitive behavior. Children with heightened ADHD traits showed higher impairment on social communication and social awareness.

"These findings suggest similarities and differences in how social deficits in ASD may worsen with anxiety or ADHD symptoms," said Angela Scarpa, director of the Virginia

Tech Center for Autism Research and an associate professor of psychology in the College of Science. "With co-occurring anxiety, physiological arousal dysregulation may underlie emotional problems that can heighten both social avoidance and cognitive rigidity in ASD, whereas co-occurring ADHD traits may reflect poor attentional control that diminishes social awareness."

In the paper, the researchers cite previous studies that found that approximately 40 percent of children with ASD also have anxiety, and about 38 percent have depression. A previous study also found that between 30 and 50 percent of children with ASD also have ADHD.

REFINING A MALARIA DRUG

As long as parasites continue to mount resistance to malaria drugs, scientists will be faced with the task of developing new, improved pharmaceuticals.

A research team from the Virginia Tech Center for Drug Discovery has received a $431,126 two-year grant from the National Institutes of Health to make improved versions of a promising compound called MMV008138, or 8138 for short.

The compound was first identified by Paul Carlier, a professor of chemistry in the College of Science, and Belen Cassera, a former Virginia Tech faculty member now at the University of Georgia.

Now, a team that includes Carlier, Cassera, and Daniel Slade, an assistant professor of biochemistry in the College of Agriculture and Life Sciences, is attempting to make an improved, more potent version of 8138 to test against malaria in animal models.

"Specifically, this compound targets the parasite's ability to produce isopentenyl pyrophosphate (IPP), the key chemical building block that is used to make lipids and steroid hormones, which are essential for cellular life," said Carlier. "Without IPP, the parasite will die."

A major benefit of a compound like 8138 is that side effects in humans are expected to be low. Humans need IPP, but make it through a different biochemical pathway than the parasites do, Carlier explained. Carlier will synthesize improved versions of the compound in his laboratory, and Cassera will test these potential drugs for their ability to reduce growth of the malaria parasite *Plasmodium falciparum* in blood. Meanwhile, Slade, an expert in protein crystallography, will determine X-ray crystal structures of IspD, the target enzyme of these anti-malarial compounds.

"Knowing the three-dimensional structure of the enzyme bound to inhibitors will help the chemists to design increasingly potent drugs that inhibit IPP synthesis," said Slade.

The team is also collaborating with Max Totrov, a computational biologist at Molsoft L.L.C. in San Diego, California, who will use computational methods to help improve the potency and selectivity of the drug.

"Development of new malaria therapeutics is challenging, but this talented multidisciplinary team gives us a great advantage," said Carlier.

The Virginia Tech Center for Drug Discovery was created in 2012 to bring together researchers from various departments and colleges across the university, who are interested in drug discovery and delivery. It is housed in the College of Science and partly supported by the Fralin Life Science Institute.

Dan Slade (left) and Paul Carlier are working together to refine a malaria drug. *Photo by Logan Wallace.*

RESEARCHERS HELP THE BODY PROTECT ITSELF AGAINST INFLAMMATION AND COLON CANCER

Could inflammatory bowel disease and colon cancer be prevented by changing the shape of a single protein?

There is an intimate link between uncontrolled inflammation in the gut associated with inflammatory bowel disease and the eventual development of colon cancer. This uncontrolled inflammation is associated with changes in bacterial populations in the gut, which can invade the mucosal tissue after damage to the protective cellular barrier lining the tissue.

But Virginia Tech researchers found that modifying the shape of IRAK-M, a protein that controls inflammation, can significantly reduce the clinical progression of both diseases in pre-clinical animal models.

The altered protein causes the immune system to become supercharged, clearing out the bacteria before they can do any damage. The team's findings were published in eBioMedicine.

"When we tested mice with the altered IRAK-M protein, they had less inflammation overall and remarkably less cancer," said Coy Allen, an assistant professor of inflammatory disease in the Department of Biomedical Sciences and Pathobiology in the Virginia-Maryland College of Veterinary Medicine and a Fralin Life Science Institute affiliate.

- Lindsay Key

EXCERPTS FIRST PUBLISHED ON THE VIRGINIA TECH RESEARCH BLOG

GETTING THE 'HOLE' PICTURE

CLIMATE CHANGE POSES NEW CHALLENGES FOR BIRD CONSERVATION IN NAMIA

written by Lindsay Key, captured by Jelena Djakovic

Fly into Windhoek, Namibia from Johannesburg, South Africa late at night, and you'll wonder if the plane has taken a wrong turn. There are no lights below save a few flickers that might be figments of your imagination.

Where is the big, bustling capital city of Windhoek? Will the plane literally land in the middle of the dark desert and fly away?

Luckily, after arrival, you'll find that Windhoek is in fact a real city—it's just thirty minutes away from its airport. But the sense of desolation—of vast emptiness—that you first experienced flying in will stay with you.

Namibia is an Arkansas-sized country that is home to approximately 3 million people, most of whom live in the capital city or along the Atlantic coast, where fishing is a major industry. But the rest of the country, in the expanses of ancient desert and savannah in between, belongs to the animals.

Many of the creatures that live here have adapted to the arid, dry climate and landscape. From May to November, also known as the 'dry season,' rainfall is extremely limited. The animals rely on the 'wet season,' from December to April, for nourishment. But the past few wet seasons have not brought the rain that is needed, and the country's drought is expected to intensify with the effects of climate change.

Will the animals here be able to adapt and survive? How can we help them? These are questions that we've come to explore with Virginia Tech graduate student David Millican, a Ph.D. student in the department of biological sciences at Virginia Tech, and a rising star in the field of bird conservation. He is a fellow in the university's Interfaces of Global Change program, and a crucial member of the new Global Change Center housed in the Fralin Life Science Institute. David's Virginia Tech advisor is Dr. Jeff Walters, a renowned bird biologist who specializes in studying cavity-dwelling bird species. As part of the Walters lab, David is researching cavity-dwelling species that live here in Namibia.

SEARCHING FOR CAVITIES

The sky is bright blue and a cool breeze blows across the savannah as we load into the field rover for a morning's fieldwork session. Last night's electric rain shower brought a renewed sense of prosperity to the land, and the air is thrumming with joy and thumb-sized African beetles. Like tiny helicopters, they attempt to land on our shoulders and heads, attracted to the bright colored ties we wear in our hair.

They're harmless enough, but our guide warns that the insect's nickname, 'blister beetle' is well earned for the welt it can deliver.

"Just duck, it's cool—it's like Jedi training," says David Millican, our guide and researcher extraordinaire.

We've followed him to what could be considered the middle of nowhere—just outside of Otjiwarongo, Namibia. But the truth is, despite the low human population it's quite definitely a somewhere: a beautiful rocky and sandy landscape brimming with biodiversity. Some of the world's most rare and unique animals—cheetahs, giraffes, jackals, aardwolves, leopards, hornbills, and much, much more— call this harsh climate home.

Today, we're accompanying David on a trip to check for cavities—and not the painful trip-to-the-dentist kind. We're looking for bird homes: holes and rips in tree trunks and branches that are used by bird species within the local cavity guild. While the guild consists of bird, mammal, and reptile species, we're most interested in the feathered ones.

As a bird biologist, David has a nagging question: what types of tree cavities are the birds using? By recording the species of birds that reside in different types of cavities, we can also determine who may be in competition with one another. Finding the answer to these questions will help him answer larger ones about the structure and dynamics of the guild community.

David has established 20 sites across four adjacent farms that he believes could harbor a significant amount of tree cavities. During this season's fieldwork, he will repeatedly visit the sites, which are 16 hectares, to monitor cavities he's discovered and search for new ones.

Acacia trees—which are abundant in these parts—are a favorite nesting spot. Some of the cavities we will visit were created by lightning, broken limbs, and insects or fungal decay. But others—known as excavated cavities—are pecked and created by the birds themselves. The birds that create the holes are known as primary excavators and the birds that live in the holes another bird created are known as secondary nesters, according to David.

"Some cavities can take a while to excavate, especially in live trees," says David. David's tools today are a ladder, a peeping camera, a handheld GPS system, and a notebook for recording our findings.

He uses the GPS to navigate through his seventh site— a scrubby grassland of fallen brush and thorny plants, littered with a few antelope skulls.

Using the ladder to climb up to the first cavity resting high in the tree, David sticks the long cord of the peeping camera into the hole and is able to see on his monitor what awaits inside. This time, it's nothing.

However, a few cavities later, we see signs of a former nest: feathers and grass. David's hopes are lifted.

On the way to the next cavity, a cacophony of peeps arises from a tree ahead.

"Those are alarm calls," says David, pointing in that direction. "That means there is likely a predator nearby—could be a black mamba, boomslang, or mongoose. It's best for us to go around that area."

Working our way around the commotion, we come to a beautiful old camel thorn tree with a long slivered cavity in the trunk, about eye level. David inspects the hole with delight. Part of it is caked over with a thick mud: the telltale signs of a hornbill nest.

When female hornbills are ready to nest, they will enter a cavity and caulk themselves in, closing up the hole with mud, millipede shells, grass, and other vegetation. This is to prevent predators from entering and disturbing the nest when both babies and mom are vulnerable: moms lose their wing and tail feathers when incubating eggs and cannot fly.

Carefully and quietly, David sticks his cord into the small opening that remains and watches his monitor. Three timid faces stare back at him. Nestlings! And not very old at all, judging by their pink, featherless alien bodies.

David points the cord upwards into the hole and sees a fluff of feathers that he determines to be the mother, a yellow-billed hornbill. Often the mother will move to an area with more space above the cavity floor, allowing her to climb above the cavity entrance if a predator tries to break in.

David quickly retracts the cord. We will leave this nest alone for now, tiptoeing away quietly to avoid upsetting the sweet family.

BUILD THE NEST BOX AND THEY WILL COME

David Millican has a nickname around the community he lives in when he is in Namibia: Bird Man. He's unique in that he is one of only a handful of people in the community studying birds; most are there to work with the cheetahs at the Cheetah Conservation Fund (CCF).

We arrived at CCF about a day ahead of David, who was held up in the capital city of Windhoek having repairs made to his vehicle.

"Oh you're here to hang out with Bird Man," said one CCF volunteer with a chuckle. "Although," he added, "we've decided that maybe we should start calling him Bird Boy. Because Mark is the original Bird Man."

Dr. Mark Stanback is a biology professor at Davidson College and a long-time mentor to David. He was one of the main reasons David got into birding: his enthusiasm and passion is contagious.

Mark began conducting research in Namibia in the 1990s. Two years ago, after an extended time away from Africa, he returned to launch a new set of experiments with the help of CCF and invited David to help.

Two years ago, he and David set up nest boxes around Otjiwarongo and Windhoek in hopes of attracting as many cavity nesting birds as possible so that he could study multiple aspects of their lives including mating, nest site competition and feeding habits.

But when Mark came back to monitor the boxes, he did not find birds but a disturbing new resident instead: honeybees, also known as African killer bees. The bees were highly aggressive in taking over the bird holes and also messy tenants— they left tree holes chock full of wax in their wake and birds can't nest in the used cavities.

"I was not happy– it was ruining my nest-site competition experiment," explained Mark. "But eventually, I decided to study them instead of fighting them. And it got me thinking about honeyguides."

Honeyguides are the only kind of bird that eats beeswax for a living.

"My hypothesis is that the honeyguide can act as a keystone species, having a greater impact on the community than their numbers would indicate," said Mark. "I've never seen one here, but I know that when I arrived a year ago, 25 boxes that had had bees in 2015 had been picked clean of wax. So I want to know how quickly they can find wax and how quickly they can eat it."

Mark generously invited us to go out with him to inspect next boxes. We drive down a dirt road, and get out every kilometer to check the boxes, which he has expertly tied to trees. We soon find that the African bees can't be bought—there are no hives in the boxes.

Instead, we find a much more pleasing site: hornbills.

If you're more familiar with Disney movies than exotic bird species like I am, it will help to picture Zazu from the Lion King to get a good idea of what a hornbill looks like. The birds are shockingly prehistoric-looking and beautiful, with black and white plumage and long curved beaks that are perfect for digging in the dirt and crushing lizards and millipedes.

In the first box we check, we find a mother and two half-grown nestlings. Mark predicts that they will fledge soon. The mom spends more than two months in the box, with most of that time spent incubating the eggs. When the biggest nestling is about two thirds grown, the mother breaks out, and the nestling then seals up the hole until it's ready to leave. When the oldest leaves, the next chick will seal up the hole until it's ready to leave, and so on.

About an hour later, we find another hornbill family (a mom, two babies, and an un-hatched egg) in another box. The mother seems to glower at us as we observe and record our findings. But she does not move.

In another box, we find only remnants of a hornbill nest: grass, poop, and crushed millipedes. Another project Mark is working on involves trying to determine what purpose millipedes may serve in the hornbill home.

"People have known for a long time that hornbills smash millipedes and incorporate them into their nests and nest plugs," said Mark. "And people have known for a long time that millipedes release cyanide. So people have kind of assumed that the hornbills are using the millipedes to cut down on pests in their nests. But no one has tested it."

To test this, Mark will find multiple hornbill nests, and wait until the eggs start to hatch. Then he will replace all of the nests with new nest material, with half receiving smashed millipedes as well. After the nestlings fledge, he will monitor the parasite load in the control and experimental nests to determine any positive correlation between millipedes and number of parasites.

Mark will also collect data on egg size and egg production rate in one particular species: the Monteiro hornbill.

"I have a lot of projects going on right now," says Mark with a chuckle. In addition to his own projects, he is on David's thesis committee, serving as an adjunct professor at Virginia Tech.

Together, the two "Bird Men" have their work cut out for them over the next few months.

STAYING AT THE CHEETAH CONSERVATION FUND

When David is doing his fieldwork in Namibia, which is typically from December- April, he stays at a center run by the Cheetah Conservation Fund, an organization dedicated to helping save the cheetah in the wild.

At the time of our visit, more than 30 cheetahs were staying at the center. Some are resident cheetahs that were orphaned as cubs, brought in and bottle-fed by staff members, and now live out their days at the center as vital parts of CCF's outreach program.

Other cheetahs are there for a short time to be treated for an injury such as a rotten tooth or broken leg and will be released back into the wild once they are well again. These are the cheetahs that very few people are allowed to see or interact with, in order to minimize their habituation to humans.

Most days, David eats breakfast, lunch, and dinner at The Hot Spot— a building in the middle of the center that has an indoor kitchen and outdoor seating. Workers heap up their plates with oatmeal, lasagna, chicken, salad, or spaghetti—whatever is on the menu that day—and sit side-by-side on picnic tables.

The people who work at the center come from all over the world—the United States, Europe, Asia, and of course, Africa. They are in different types of work programs, including full time staff members, working guests, volunteers, and interns. They are veterinarians, biologists, geneticists, gardeners, teachers and students.

While the cheetahs are certainly the most talked-about residents at the center, there is another resident who attracts attention from time to time. Nestled in a tree just a few yards from The Hot Spot is a hornbill family, cozied up in one of Mark's nest boxes. The female and nestlings have clogged up the hole to the box, leaving just enough space for the male to fit worms through.

The male is a constant presence at The Hot Spot, peering at the workers from his branch, making occasional visits to tables to nip at any dropped scraps. The center is teaming with other birds too—wide-eyed barn owls, red-backed shrikes, kiwi-green bee-eaters, and lilac-breasted rollers.

One evening, David points out a pair of pearl spotted owlets bravely hopping around one of the cheetah pens. It's enough to make any birder feel at home.

THE FACES OF FRALIN

DENNIS DEAN LAUNCHES NEW FELLOWSHIP PROGRAM

The Fralin Undergraduate Research Fellowship program—a new, competitive award program that is open to all Virginia Tech undergraduates—was launched during the 2016-17 school year. The goal of the program is to increase diversity in research.

Fourteen fellowships of $1,000 were awarded to individual students from eleven departments and five colleges who demonstrated academic capability and a strong interest in undergraduate research.

The fellowship enabled these students to conduct research with a Virginia Tech faculty mentor who had already agreed to mentor them, and work on an ongoing or new project mutually agreed upon between the student and mentor. Students applied to the program during late spring or summer and began their research projects in the fall.

The Fralin Fellows program was created by Dennis Dean, director of the Fralin Life Science Institute and the university's Stroobants Professor of Biotechnology, in partnership with the Office of Undergraduate Research. Dean created the program because of the value that his own undergraduate research experience at Wabash College added to the launch of his career. Although Dean is a biochemist, a key component of the program is that it is available to students interested in all types of research, even research outside of the life sciences.

Another key component of the program is Dean's desire to fund students from underrepresented groups, including, but not limited to, ethnic minorities, first generation college students, students from low-income areas, students with disabilities, and LGBTQ students. In addition to a close mentoring relationship with their primary faculty member, fellows also met with Dean throughout the program. He was available for one-on-one meetings and hosted lunches where students could meet one another and share their findings, thus creating excitement and possible interdisciplinary collaborations.

IN THE SPOTLIGHT

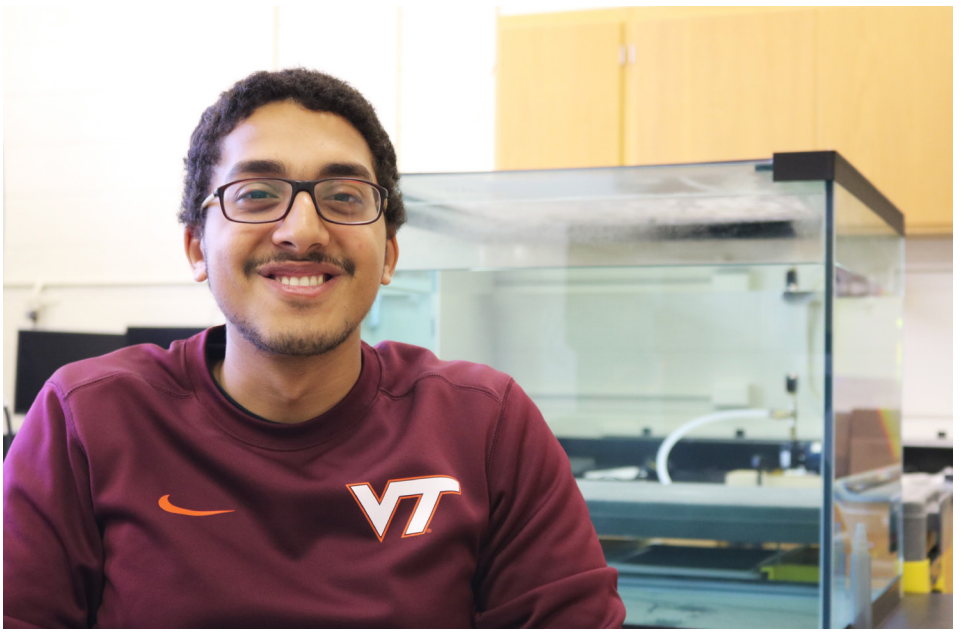
JOANNA KANIA

Blacksburg, VA
Senior, Animal and Poultry Sciences
Mentor: Sally Johnson

Kania was involved with multiple experiments designed to determine better ways to help geriatric or heavily exercised horses, such as retired racehorses, regenerate muscles. Her research in the lab paved the way for her to begin studies at the Virginia-Maryland College of Veterinary Medicine in August.

The 35-year-old worked in public safety for seven years before she returned to school to pursue her childhood dream of becoming an equine veterinarian.

"I would be sitting in my police car on the side of the road, and people probably saw me and thought I was working radar. But I was actually trying to finish up my term paper," Kania said with a laugh.



AHMED ELNAHHAS

Kuwait City, Kuwait
Junior, Mechanical Engineering
Mentor: Shima Shahab

As part of a brand new lab on campus, Elnahhas teamed up with a graduate student to study acoustic energy transfer and bubble dynamics.

"We're trying to quantify the behavior of bubbles close to different surfaces based on the mechanical properties of those surfaces," said Elnahhas. "The process can then be reversed, and the observable behavior of bubbles could be used as sensors. An example would be the behavior of bubbles close to biological tissue."

In time, acoustic waves and bubbles could distinguish healthy cells from cancerous ones since they have different properties and behave differently physically.

RACHEL HARGRAVE

Weddington, NC
Sophomore, English
Mentor: Abby Walker

For Rachel, home is connected to how we speak. In the Speech Lab at Virginia Tech, she studies southern Appalachian dialects and how certain pronunciations connect to one's sense of home and regional identity.

"When people think or talk about home, they are more likely to talk like where they are from," said Rachel. "If you're proud of where you come from, and that's your community and who you are, then you're more likely to go into that accent."

The budding linguist and creative writer ultimately hopes to use her research to disconnect assumptions and stereotypes, such as a lack of education, that are sometimes associated with certain accents.

CONNOR BROWN

Bedford, VA
Junior, Biochemistry
Mentor: Otto Schwake

Before coming to Virginia Tech, Connor received an associate's degree in science from Virginia Western Community College in Roanoke, VA. While there, he gained authentic research experience in microbiology by developing protocol, collecting data, and performing laboratory experiments as part of a collaboration between the college and Virginia Tech.

This experience ignited his interest in higher education and research, so he transferred to Virginia Tech. He now continues this work in Blacksburg, but plans to invite other community college students to participate along with him so they too can benefit from real experience.

"I would not be where I am, or going where I'm going, without it," Connor said.

COFFEE BREAK WITH A SCIENTIST

Ashley Dayer
Assistant Professor,
Human Dimensions, Department of Fish and Wildlife Conservation

What is the focus of your current research?

Having spent the last seven years before I came to Virginia Tech at the Cornell Lab of Ornithology, folks often assume I'm an ornithologist, but I'm not. My students and I focus on using social science, working with biologists and decision-makers, to study the human dimensions of wildlife (especially bird) conservation. We apply theory from social psychology, sociology, policy, and communications and implement quantitative, qualitative, and mixed methods.

How did you become interested in your line of research?

I began my career in conservation on the biological side. My first job out of college was as a field biologist, studying birds in Hawaii. It was quite sexy. Helicopters dropped us off in remote field camps at high elevations on Maui. There, we spent 6-10 days at a time, running around the rainforest, catching Hawaiian honeycreepers.

Our project was fondly called the "Po'ouli project" as this single species was our primary focus. At the time, the bird was thought to be the world's rarest bird. In 2001, it was limited to just three individual birds. To make matters worse for this bird, the three individuals never saw each other. Our task – flawed from the start – was to catch and translocate a female bird to the home range of a male, where she was to meet the new love of her life. But after weeks of tracking her down, instead, she simply flew home.

Sadly, the people of Maui (and all of the visitors from the mainland) didn't know what was going on high up on these volcanic mountain tops. They didn't even know Hawaii was the endangered species capital of the world. They were not bothered that the birds that sang to them early in the morning came from Europe or Asia, rather than their island. Yet, without human interest in conserving the native birds on the tops of the mountains of the island, pigs would continue to tear up habitat, feral cats would continue to eat chicks, and disproportionate conservation funding to the severity of the endangered species crisis would flow to Hawaii...

And the Po'ouli's eulogy would be read only by conservation biologists. The last Po'ouli was brought into captivity in 2004, where it died. When I first saw a photo of that bird as a museum specimen on a popsicle stick, I felt physically ill. It still haunts me.

Because of this experience I decided to pack up my field biologist gear and work in less idyllic, more populated locations, understanding the drivers of human behavior and how to engage people in conservation. I became a social scientist. But I did not close the doors on my biologist colleagues. Instead, I have focused my career on building meaningful bridges between biologists and social scientists to affect conservation, primarily bird conservation.

Po'ouli, 2002. *Photo by Ashley Dayer.*

Ashley Dayer holding a I'iwi.
Courtesy of Ashley Dayer.

What do you feel are some of the biggest challenges scientists face today?

Ensuring our science is used to inform decision-making and policy. I am intrigued by this "research to implementation gap" as it is often called. This term is used to describe the issue that decades of better and better ecological and conservation science, including scientific assessments of species priorities and threats, have largely failed to result in significant conservation action to reduce threats and protect species. Articles discussing this issue suggest that a new paradigm that focuses more on integrating social science and societal needs and values, as well as more engaging partnerships between researchers and practitioners (or science users), will be more successful. Not only do I try to follow these best practices in our research, I also study approaches to bridge the implementation gap in conservation (e.g., boundary organizations like Climate Science Centers).

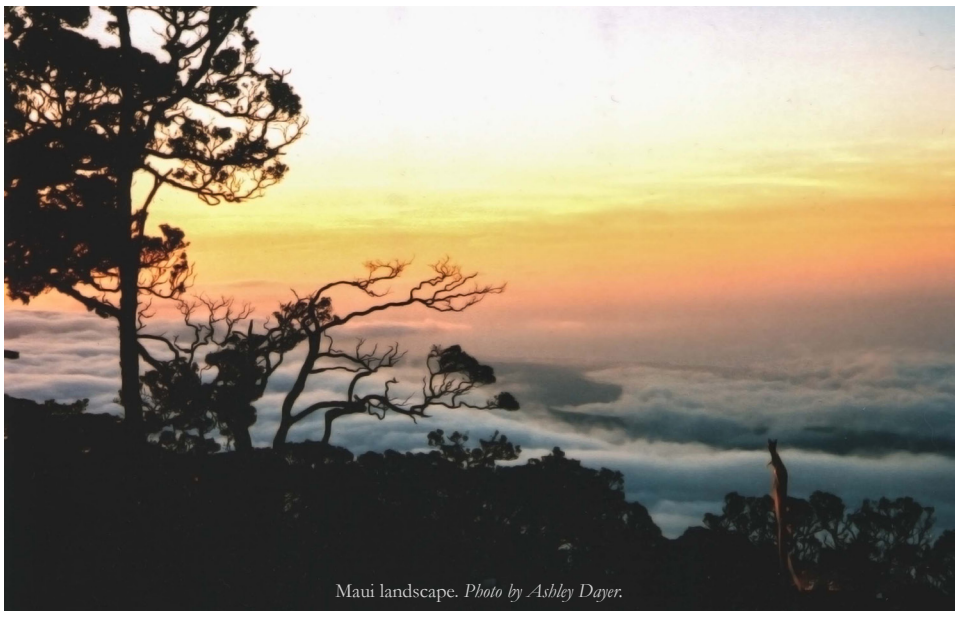
Why did you choose to continue your career at Virginia Tech?

A position as a professor of human dimensions in a fish and wildlife conservation department was just what I was looking for, particularly in a high quality program like the one at VT. I was also attracted by the department's commitment to applied or translation science; it's my passion to ensure that my science informs conservation. Additionally, I was impressed by the Global Change Center – a place where cutting edge, interdisciplinary science and collaborations were being fostered and graduate students were being trained to work as part of interdisciplinary teams.

Which aspect of your research are you most excited about right now?

That's a tough one. I'm really enjoying several of my Lab's research projects, including those on private landowners' habitat conservation behaviors (in three different regions in the U.S.), conflict over management of human disturbance of shorebirds on Atlantic coast beaches, birdwatchers' consumption of bird-friendly coffee, the research-to-implementation gap (mentioned above) and even a small study on how wildlife undergraduate degree programs across the country are integrating (or not) dimensions courses into their curriculum.

I'm also excited about a capacity-building/outreach effort in my Lab. The first-ever National Bird Conservation Social Science Coordinator, Ashley Gramza, joined our team in January. I have spent the last three years advocating and fundraising for the creation of this position, and I'm thrilled we've been able to bring it to Virginia Tech. Gramza's position is half outreach and half research, with the goal of helping the national bird conservation community more meaningfully integrate social science into their conservation efforts.



Maui landscape. *Photo by Ashley Dayer.*

Hometown:

East Aurora, New York (where I was raised but it hasn't been my "home" for 20 years). I've lived in the Finger Lakes region of New York for the last 7 years (Skaneateles and Ithaca area) before coming to Virginia Tech.

Educational Background:

Harvard University – BA, Environmental Science & Public Policy (2001); Colorado State University – M.S., Human Dimensions of Natural Resources (2006); Cornell University – Ph.D., Natural Resources (2013) – and I've learned a lot working in the conservation field. I've taken time off to work between all of my degrees (and worked throughout my PhD).

Hobbies:

Being a mom (maybe that's more of a second job), hiking, traveling, gardening (I had a stint as a co-owner of a community-supported agriculture, family farm), biking, cross-country skiing (I even got out on skis at my home in Craig County 5 times this poor-snow winter).

Favorite things to do around Blacksburg:

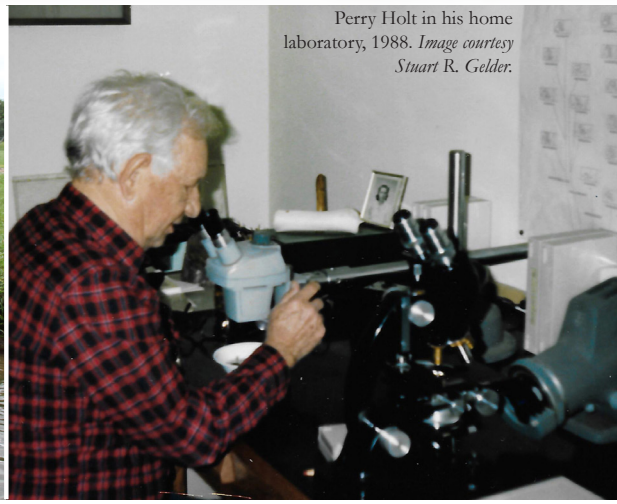
Spending Friday night at Rising Silo Brewery/Glade Road Growing with my family and friends, eating good food, enjoying the farm atmosphere, and drinking local beer. We also take home our local veggies and meat for the week.

Favorite type of music or artist:

Folk music.

LEGENDS OF THE STREAM

Brown and his team at Sinking Creek in Newport, Virginia. *Photo by Cassandra Hockman.*



Perry Holt in his home laboratory, 1988. *Image courtesy Stuart R. Gelder.*

"Ah, it's a tipulid!" Bryan Brown maneuvered his feet around a few rocks before burrowing them into sediment. He was wading calf-deep in the middle of Sinking Creek, a local Southwest Virginia stream, sifting through a handful of wet leaves. He had been trying to find larvae from crane flies, classified scientifically as tipulidae, which tend to live in freshwater leaf packs.

As larvae, these insects look like long dark brown tubes, or worms, with raised rings, like rubber bands wrapped around a pencil. As adults, they look strikingly different: they have long, spindly legs like a spider connected to a thicker middle torso. Typically shades of brown, they look a lot like small sticks or twigs. Some might see them flying about and mistake them for giant mosquitoes.

"Their metamorphosis is pretty dramatic," said Brown, an aquatic ecologist in biological sciences in the College of Science at Virginia Tech. Brown has spent many years studying stream ecology, including many of the freshwater invertebrates – such as insects and crayfish – living in and around the water.

He was first drawn to water as a kid, when he played in and around streams of the Nantahala, a river running through his parents' hometown of Andrews, North Carolina. He spent time on the water with his father, a fisherman, and built small boats out of sticks.

"I would put them in one part of the stream and obsessively watch them travel down," he said. "This is what got me interested in stream hydraulics, which became part of my Ph.D."

Before graduate school, Brown took a course in systems and community ecology as an undergraduate at the University of North Carolina at Chapel Hill. The course gave him a taste of graduate school since they spent time as a class discussing scientific papers and working on projects that included fieldwork in local streams.

"I had never done anything like this before, and it really appealed to me," he said.

On this cool spring day, Brown was out in the field with three of his own students. They were there to observe and collect crayfish, as well as the tiny worms that live on them. Together, the crayfish and worms live in a symbiotic relationship – the worms eat the buildup of algae and substrate on the crayfish, and the crayfish get clean.

Brown began studying this relationship between crayfish and their worms, known as branchiobdellidans, as a master's student at Appalachian State University in the late 1990s. After watching them in the lab for hours, he says it wasn't long before he was hooked.

Since then, he has studied this relationship as a model system for how organisms interact and depend on each other.

A little stream of history

Fifty years before, in the same stream where Brown and his team were wading, a young professor by the name of Perry Holt was on a similar mission. He and two colleagues were looking for new and recurring species of crayfish and their worms.

Holt was from Tennessee, where his family was poor. As the child of a schoolteacher, Holt appreciated his education early on, particularly in light of his family's economic status.

As a kid, Holt was curious about the natural world, and spent time outside, playing in and around streams. His interest continued as he grew up and went to college, eventually landing at the University of Virginia for graduate school. While there, he spent hours in streams in Virginia and around the country with his advisor, Horton Hobbs, Jr., who studied and identified crayfish species from around the world.

Working with Hobbs, Holt spent many summers in southwest Virginia at the Mountain Lake Biological Station, just up the road from the Mountain Lake Hotel, observing and collecting. Hobbs had spent his career identifying species in and around the area, so much so that he became known as the father of crayfish biology. As a budding invertebrate zoologist and researcher, Holt added to this work by describing around 70 new species that lived exclusively on them, where they were located, and how they were distributed. If Hobbs was the

father of crayfish systematics, then Holt was to become the father of their worms.

"Whatever advances are made in branchiobdellidan research in the next 100 years, they will owe much to the critical groundwork established through the dedicated research of Perry C. Holt," wrote Stuart Gelder, a retired expert of crayfish worms at the University of Maine at Presque Isle, in a tribute to Holt's work, published in Hydrobiologia in 2001, two years after Holt's death.

In 1956, Holt moved with his family to Blacksburg, where he was a faculty member in Virginia Tech's biology department until he retired more than 20 years later. He and Hobbs continued working together, and during the summers of 1961 through 1965, they and colleague Margaret Walton of the Mountain Lake Biological Station surveyed streams for crayfish and worm species throughout the 500-square-mile radius surrounding Blacksburg in the Mountain Lake Region, which includes the counties of Giles, Montgomery, Pulaski, and Roanoke, as well as parts of Monroe County in West Virginia.

A current in the stream

Fifty years later, Brown and his team are referencing the results from this survey, published in 1967 in the Proceedings of the United States National Museum, part of the Smithsonian Institute in Washington, D.C.

For the last few years, James Skelton, a former graduate student of Brown's who is now a research biologist at the University of Florida, led a team from Brown's lab to re-survey the same area of the Mountain Lake Region. Their goal was to see how the diversity of the worm species had changed. Surprisingly, their 2016 review showed the answer was not much. The worm species that Holt identified are pretty much where they were in the 1960s.

"This means that the crayfish communities are stable, so crayfish are staying more or less in the same place they have been historically," said Brown.

Since worms depend on the crayfish, and the crayfish on the worms, the two species stick together. But the dynamic depends on the diversity of the communities of species in the area, so if the crayfish populations change, then so may the worms. This includes when some species invade, which is the case in places like Troubles Creek, which has the highest diversity of crayfish in this area, likely due to species that have been introduced as fishing bait or that have migrated from the Ohio River.

"There's at least one invasion that has been going on for awhile," said Spencer Bell, one of Brown's current master's students. He was drawn to crayfish while doing fieldwork as an undergraduate at West Liberty University in West Virginia. Today Bell is out collecting crayfish as part of a resurveying of the same historical sites from the 1960s. His goal is to see how the crayfish communities have changed, and doing so will shed light on the specific dynamic of this symbiotic relationship since the community of the crayfish and the worms can affect whether the relationship is healthy or harmful.

Phil McElmurray, now a master's student with Brown, is also in the stream aiding in the collection. He joined the group after getting experience in modeling and simulation of biological systems. As a mathematician, he now enjoys the time outside at Sinking Creek, where he is identifying factors that influence the worm communities, how they are dispersed across different crayfish, and how the crayfish communities themselves affect the worm communities and dynamics.

"The interactions between the worms are really interesting," said McElmurray. "On the crayfish, they have their own food web. There's one species that I've seen eating another worm, and it will lay its eggs on the crayfish. Then, when the crayfish stress vomits, the worms will go nuts and actually go to protect their cocoons."

After Brown, Bell, and McElmurray return from the field, their next steps will be to look under the microscopes to identify the species. This also allows them to observe the species' behavior and compare that to the structure and behavior identified years ago by Holt, who spent much time looking carefully at the worms in order to classify them.

"The first place you have to start is to find out what species you're working with," said Brent Opell, a professor in the same department at Virginia Tech. "If you bring several species back to the lab and bunch them into one category, then your results may be illogical if one species has been known to do one thing, and another is doing something else."

Photograph of Perry Holt hanging in Brown's lab. *Photo by Cassandra Hockman.*

Cambarus appalachiensis in Sinking Creek. *Photo by Cassandra Hockman.*

Spencer Bell. *Photo by Cassandra Hockman.*

Phil McElmurray in the Brown lab in Derring Hall. *Photo by Cassandra Hockman.*

A stream trickles on

Opell, who studies spiders, was hired as the next invertebrate biologist after Holt retired. He worked with Holt on his last publication, a review of 90 worm species in Central and North America, which came out in 1993.

"I think Perry Holt would be amazed to see some of the things that Bryan has found about how intricate these interactions are," Opell said. "Thanks to Bryan, we now know the worms affect the crayfish and why they are found in certain places."

Thanks to Brown and Holt, we know a lot more about various species that exist, how they behave, and how to talk about them – a stream of knowledge, driven by curiosity and basic science that teaches us about the world and our place in it.

Back on campus, Brown has found remnants of Holt's past in and around the second floor of Derring Hall. They had communicated once through email and Brown knew of his work, but he wasn't aware that Holt had been at Virginia Tech until he came across a photo.

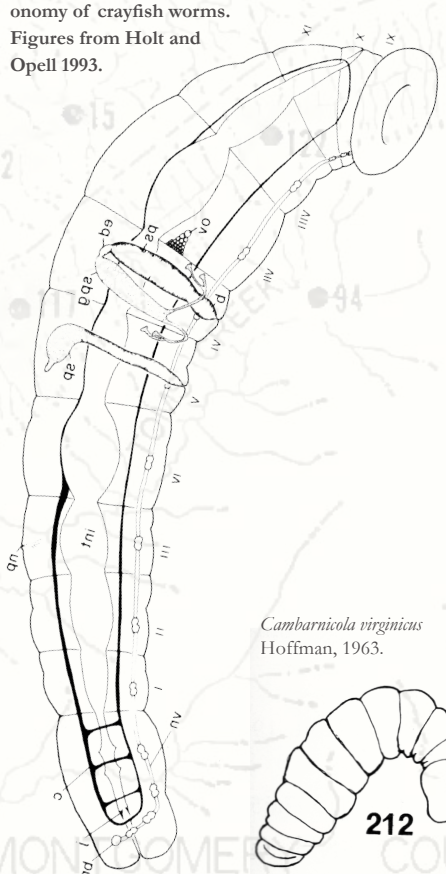
"It's strangely serendipitous to be in the same place as him," Brown said.

After realizing the picture was of Holt, Brown framed and hung it in his lab. It overlooks the microscopes, devices that Holt spent countless hours squinting through, looking for every important and consistent curvature of each worm's structure.

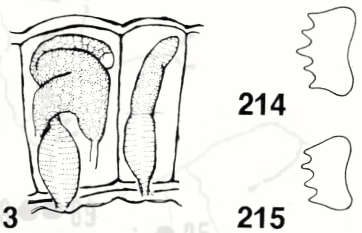
Just down from Brown's current lab is Holt's former one. After some renovations and upgrades, Brown plans to move into it.

- Cassandra Hockman

Characters and original drawings used in Holt's taxonomy of crayfish worms. Figures from Holt and Opell 1993.



Cambarnicola virginicus Hoffman, 1963.



Twin Virginia Tech Doctoral Graduates Unite to Engineer a Better Soybean

Photo courtesy of the Fedkenheuers.

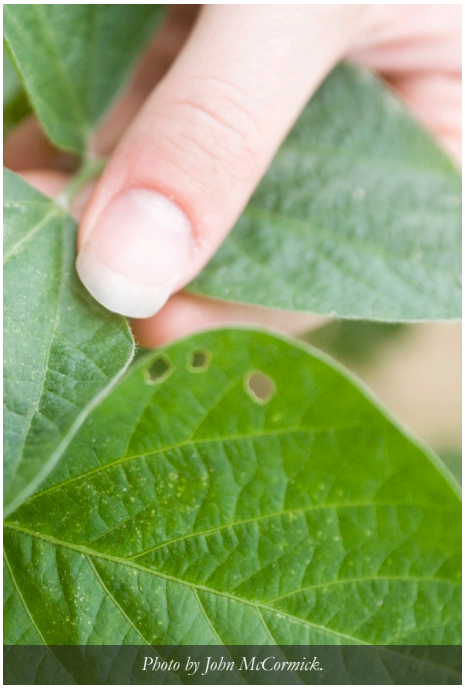


Photo by John McCormick.

Kevin Fedkenheuer can't imagine life—or science—without his twin brother, Mike.

In December 2016, the Fedkenheuer siblings graduated with doctoral degrees in plant pathology, physiology, and weed science from the College of Agriculture and Life Sciences.

Working with Virginia Tech plant pathology researcher John McDowell, their doctoral projects examined the genes responsible for the soybean plant's resistance to a pathogen that causes root and stem rot, and how they might be leveraged to produce a more disease-proof plant.

The pathogen, *Phytophthora sojae*, is a close cousin to the pathogen that caused the Irish potato famine and is responsible for billions of dollars of crop loss in the United States and worldwide. The twins' research was supported by a project funded by the USDA National Institute of Food and Agriculture to use information from *P. sojae* genomics to develop new strategies to reduce soybean crop losses associated with this disease.

Each brother brought a different skill set to the project, according to McDowell.

"In only a few months, Kevin developed a system for screening for new pathogen resistance genes in soybean. In turn, Mike was able to use his technical abilities honed in the structural biology and biochemistry fields to evaluate and test the system, and optimize it for use in a wild relative of soybean that has been under-utilized as a source of disease resistance genes. In this way, their projects were distinct but synergistic," he said.

The twin brothers' academic teamwork goes way back, to when they each received a bachelor's degree in biotechnology from James Madison University. When they first came to Virginia Tech, supported by Fralin Life Science Institute graduate student fellowships, Kevin Fedkenheuer went straight into a doctoral program with McDowell, while Mike Fedkenheuer focused on human disease, earning a master's degree in biochemistry.

However, it wasn't long after graduating with this master's degree that Mike Fedkenheuer followed his brother to McDowell's plant pathology lab.

"I couldn't think of anyone that I'd rather work with or that I could more effectively communicate with about the project we had begun to develop," Kevin Fedkenheuer said. "Mike got to hear it from me, in the exact way we understand things."

Working with McDowell, the Fedkenheuers were able to identify disease-resistance genes in cultivated soybeans as well as their wild relatives. These genes represent new tools for soybean breeders to reduce losses to root and stem rot disease.

The twins' long-term dream is to start a business together focused on the technologies they've developed.

"Our hope is that one day we could use the bioinformatics training we've also received at Virginia Tech to speed up the process of enhancing disease resistance in crop plants and distribute the technology widely," said Mike Fedkenheuer. "We really think it could save farmers a lot of stress and money."

"No matter what, we will always end up working together," he added. "It's just a matter of how."

As of May 1, 2017, Mike Fedkenheuer had accepted a research fellowship with the National Institute of Standards and Technology in Gaithersburg, Maryland. Kevin Fedkenheuer had plans to get married May 6, 2017 and look for work in the Washington, DC area soon thereafter.

- Lindsay Key

Dr. Jones and her laboratory technician, Mark Lenzi, fabricate SU-8 molds on a silicon wafer in the new clean room just opened in March 2017 in Life Sciences 1. The micropatterned mold will be used to create novel microfluidic platforms that enable visualization of protein trafficking in thousands of individual bacteria simultaneously. *Photo by Jim Stroup.*

BIOTRANS RESEARCHERS FIND THAT BACTERIA HAS SURPRISING MOVES

Whether mildly upsetting the human intestinal tract or causing a potentially fatal gangrene infection, *Clostridium perfringens* bacteria get around.

Found in soil, sediment, and water all over the world—even in Antarctica—the rod-shaped creatures are considered one of the most environmentally successful bacterial species due to their abundance.

But, strangely enough, these bacteria are missing a standard anatomical feature. They lack a curly tail called a flagellum, which propels most bacteria forward in a swimming fashion. Yet, all of their closest relatives have flagella.

When BIOTRANS microbiologist Steve Melville learned of this, he became intrigued. How, then, does *Clostridium perfringens* get around?

Melville took a closer look under the microscope and examined the DNA sequence of many strains of the bacteria and still found no flagella or genes that might code for them. What he did find, though, was an arguably more efficient strategy.

Rather than swim by using flagella, the bacteria have found other ways to be mobile.

They glide. They float. They twitch.

The movement, says Melville, depends on the environment they find themselves in. When the bacteria are first placed on a new surface, they twitch for the first 15 minutes or so because they are using pili—tiny protruding hairs all across the surface of their bodies—to attempt to stick, or find their footing.

"The pili, known as type IV pili, act like a rope with an anchor on the end," said Melville. "The bacteria throw out the ropes, the anchor attaches, and then pulling on the rope provides momentum to pull themselves toward a surface."

Once attached to a surface, the bacteria switch to a type of gliding motility where the cells line up end to end to form a filament. The filament gets longer by growth and division of the rod-shaped bacteria and the bacteria at the tip of the filament get pushed across the surface.

"The gliding motion is very smooth and movies showing it are kind of relaxing and engaging," said Melville.

The bacteria continue to move across a surface in this fashion. However, if they find themselves in a more liquefied substance, they use a combination of pili and—from what Melville can tell—gas bubbles.

The gas bubbles are generated from the bacteria's natural fermentative metabolism, which expels carbon dioxide and hydrogen gas.

"It's really remarkable," said Melville."These bacteria use their energy resources in a very

efficient way. Rather than spend energy on powering a flagella, they rely on a combination of pili and natural metabolic processes to glide, float, and twitch."

Efficient use of energy is important in the competitive microbial world where bacteria that work efficiently constantly divide and clone themselves to expand their population and, ultimately, take over and push out other species.

A DEADLY INFECTION

Understanding the mechanisms behind *Clostridium perfringens'* success is key to developing better treatments for gas gangrene, the infection that the tiny organisms cause in muscles or internal organs. Unchecked, the bacteria rapidly kill cells by releasing toxins and cutting off the blood supply to that area.

Sadly, treating these sorts of infections with intravenous antibiotics is not effective, often leaving patients with the choice of amputation or death. This tragic situation is fictionally depicted in the popular movie *Dancing with Wolves* through the character of First Lieutenant John J. Dunbar, played by Kevin Costner. Rather than face amputation of his leg due to gas gangrene, Costner epically takes a horse and rides along Confederate lines, daring the enemy to fire. It shows how difficult a decision to amputate can be.

"Despite 3,000 years of people knowing what gas gangrene is, the treatment is still pretty much the same as it was in 1,000 BC. There is a dire need for improvements," said Melville.

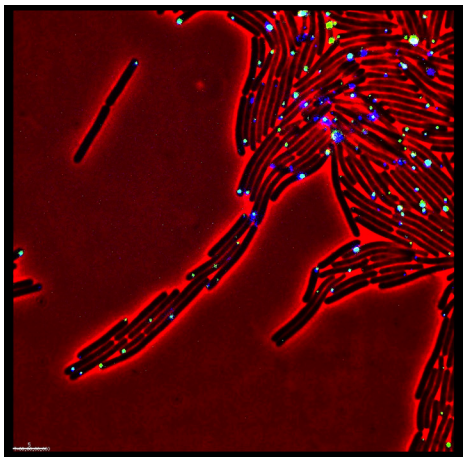
Although extremely deadly, gas gangrene research has often been overlooked and underfunded over the years because it occurs somewhat rarely and randomly. There are approximately 3,000 to 4,000 cases per year in the U.S., according to Melville.

"Despite the fact that almost every adult knows what gangrene is, it doesn't get a lot of publicity," he said.

However, at Virginia Tech, he has recruited four other faculty members to the project. Caroline Jones, an assistant professor of biological sciences in the College of Science, offers her expertise in microfluidic platforms, which are useful for examining proteins in single bacteria.

The microfluidic chambers that she designed for the project enable the team to do real-time analyses of the motility of *Clostridium perfringens* in nanoliter-sized channels and to follow fluorescent protein movement and localization.

"Microfluidics allow us to precisely control the microenvironment surrounding an array of thousands of bacteria, each housed in an individual 'room' or 'chamber' that is only slightly larger than the cell itself," said Jones. "We can flow solutions in the microchannels that induce changes in bacteria motility and protein localization in a synchronized, well-controlled manner."



Proteins involved in motility in Clostridium perfringens were fluorescently tagged (blue and yellow spots) to show their location in the bacteria (black rods). *Photo courtesy of Steve Melville.*

Dave Bevan, a professor of biochemistry in the College of Agriculture and Life Sciences, has helped with molecular dynamics modeling of the assembly of type IV pili proteins.

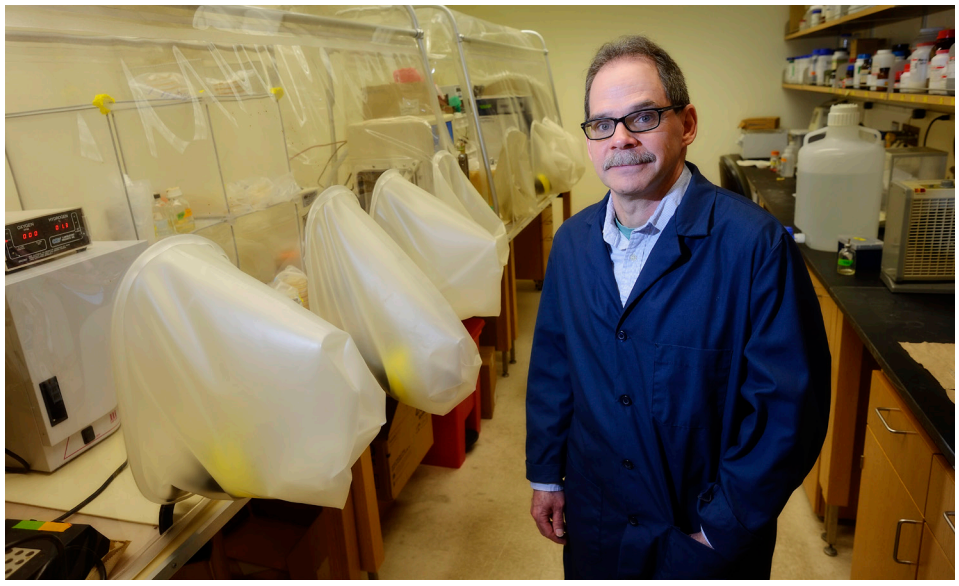
"These pili are particularly interesting because they are assemblies of one protein, pilin, that extends out of a biological membrane," said Bevan. "We were successful in developing a model of pilin in a membrane, as a first step in characterizing details of the assembly process."

Rick Jensen, a professor of biological sciences in the College of Science, helped with genome sequence analysis to identify the mechanism for why some mutants are hyper-motile when they glide.

Rich Walker, an associate professor of biological sciences, helped with analysis of the gliding bacteria several years ago.

Melville and Jones are in the process of applying for grants to expand the project, and to potentially bring a BIOTRANS student on board.

- Lindsay Key



Microbiologist Steve Melville studies how Clostridrium perfringens bacteria move in his laboratory in the Life Sciences 1 building at Virginia Tech. *Photo by Jim Stroup.*

FRALIN LIFE SCIENCE INSTITUTE HONORS BENEFACTORS AT 20TH YEAR ANNIVERSARY CELEBRATION

(Left to right) Heywood Fralin, Tracy Wilkins, Dennis Dean, Timothy Sands. *Photo by Logan Wallace.*

Decades of Virginia Tech accomplishments in life sciences research, education, and outreach can be traced back to the leadership and generosity of Tracy Wilkins and Horace Fralin.

In recognition, the Fralin Life Science Institute honored its founding director, its namesake, and their families at a 20-year anniversary celebration on Nov. 18 in Fralin Hall.

The event featured remarks by Virginia Tech President Tim Sands, Vice President of Research and Innovation Theresa Mayer, and Fralin Life Science Institute Director Dennis Dean.

Attendees also had the opportunity to learn about the institute's signature research areas: the Vector-borne Disease Research Group, Global Change Center, and the planned Center for Transformative Research on Health Behaviors.

Students, including recipients of a Fralin Summer Undergraduate Research Fellowship, presented research in fish and wildlife conservation, biochemistry, and autism.

"Everything we do at this institute is guided by the vision of our founding director Tracy Wilkins, and all of our accomplishments have been made possible by the sustaining support provided by Horace Fralin and Tracy Wilkins," said Dennis Dean, director of the Fralin Life Science Institute and the Stroobants Professor of Biotechnology at Virginia Tech.

Wilkins was the founding director of the Fralin Biotechnology Center, which has since grown into the Fralin Life Science Institute. Wilkins founded several successful biotechnology firms, including TechLab Inc., located in the Virginia Tech Corporate Research Center.

Horace Fralin established an endowment that continues to support the institute. A member of the Class of 1948 who earned his bachelor's in electrical engineering, he was a charter member of Virginia Tech's Ut Prosim Society of donors, a founding member of the Virginia Tech Corporate Research Center Board of Directors, and a president of the Virginia Tech Foundation Board of Directors.

The Virginia Tech Alumni Association recognized Fralin's leadership by honoring him with the Alumni Distinguished Service Award in 1989. In 1992, the university conferred upon him its highest honor, the William H. Ruffner Medal.

Dean presented the Fralin and Wilkins families with specially commissioned sculptures by local artists Neil Ames and Deb Weissenborn at the anniversary event.

NEIL AMES AND DEB WEISSENBORN

Neil Ames and Deb Weissenborn

Neil and Deb came to the world of art and sculpture by very different paths. Neil first started welding in the early 1980s in Minnesota, largely working on commercial projects. He was, however, more drawn to the world of horticulture and landscaping and pursued those areas, first in the Midwest and later in Virginia as the owner of Neil Ames Horticulture Services. In the early 1990s he took up the torch again, and has since produced a substantial volume of sculptural pieces, largely influenced by nature. He is the creative force of the duo, pulling images from his mind's eye and shaping copper, steel, and brass into evocative sculptures.

Deb, who came to Virginia in 1986 to finish her PhD in Biochemistry at VA Tech, is more technical than artistic. After years of directing research in the area of plant genetic engineering, she left the world of science to work with Neil on both horticultural and sculptural ventures. It is her eye for detail honed through those years of research that helps bring the sculptures to life. Together they have created pieces that have been featured in local and national magazines and newspapers and are found in homes and gardens in a dozen states.

We would like to express our appreciation for being given the opportunity to participate in the celebration of the anniversary of this marvelous institute. Thank you so very much.
Neil and Deb


Tracy and Sarah Wilkins. *Photo by Logan Wallace.*

Photo by Jim Stroup.


The Fralin Family. *Photo by Logan Wallace.*


Photo by Jim Stroup.

Entomology graduate student Jackson Means mimics his partner's moves as part of an improvisation exercise in the graduate-level course, Communicating Science (GRAD 5144). *Photo by Clare Cline.*

THE CENTER FOR COMMUNICATING SCIENCE OPENS AT VIRGINIA TECH

Looking to engage stakeholders more effectively in your next meeting? Want to motivate people about science and its role in changing critical environmental issues? Then you're in luck, because now there's a hub on campus that's working to provide support and opportunities for faculty and students who are interested in expanding their abilities to communicate and connect with others.

This spring, the Center for Communicating Science: The Art of Connecting Across Difference opened at Virginia Tech. The center, housed in the Institute for Society, Culture and Environment, offers workshops that focus on engaged listening, personal interactions, and vivid expression by using improvisational exercises based in theatre arts.

To achieve part of the center's main aim, improvisational tools and practices are used to bridge personal divisions of race, culture, religion, education, or research specialty. Doing so helps people listen deeply, interact personally, directly, spontaneously, and responsively, while also expressing themselves more vividly.

"We're at a crucial time in science, so scientists have to be able to explain the importance of their work to everyday people," said Patricia Raun, director of the new center and a professor of theatre in the School of Performing Arts in the College of Liberal Arts and Human Sciences.

After training at the Alan Alda Center for Communicating Science in Stony Brook, New York, Raun developed a graduate course (GRAD 5144) that uses theatre improv and writing exercises to help students become more effective at distilling their research and communicating it to a non-specialist audience. The course is now in its sixth year at Virginia Tech and is facilitated through the center, though offered through the Graduate School.

Jackson Means, a graduate student in entomology in the College of Agriculture and Life Sciences, took the class a couple of years ago.

"The biggest shock came during the first class, where we filmed ourselves individually giving three-minute off-the-cuff talks about our research," Means said. "I stood up there and felt like I was doing an excellent job – I explained that I worked on millipede taxonomy and systematics, which is the naming and discovery of new species, and the study of how these species all relate evolutionarily, respectively. Then I got my first question from the other students: 'What is a millipede?' Clearly I had assumed a level of understanding in my audience that they did not possess. That was a real wake up call. I had never really thought about how little some people know about these relatively obscure creatures. As a scientist this was an extremely valuable lesson, and when I presented my research in another 3-minute talk during the final class my science communication skills had markedly improved."

In the fall, a new course for non-theatre majors called Introduction to Applied Collaborative Techniques (TA 2404) will offer similar opportunities for undergraduate students. "IACT" will provide students from any discipline education in situational awareness, listening, effective improvised and scripted storytelling, conflict resolution, non-verbal signaling, and communicating across personal differences.

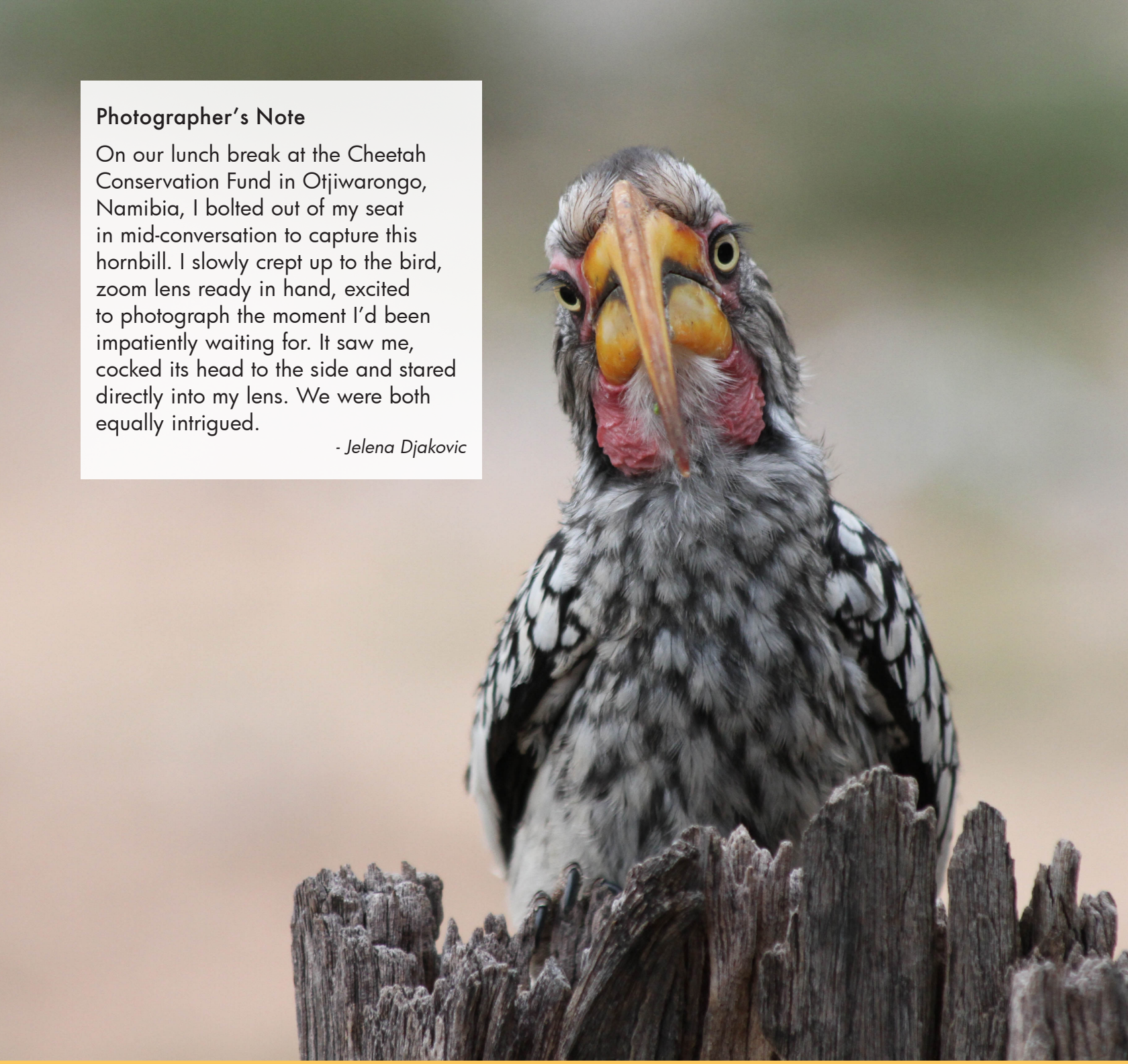
The center also offers workshops on request that can be tailored for specific groups or specializations. Some of the past workshop topics include building trust, distilling your message, the power of story, preparing for media interviews, and writing for a public audience.

As the center grows, Raun and Carolyn Kroehler, associate director of the center, work to identify more specific needs of students and faculty at all levels. If you have ideas or needs, let them know!

Learn more about the center, request a workshop, or find additional resources for engaging public audiences at www.communicatingscience.isce.vt.edu.

- Cassandra Hockman

Background photograph: Faculty and students get a theatre-arts taste in an all-out thumb war. *Photo by Clare Cline*



Photographer's Note

On our lunch break at the Cheetah Conservation Fund in Otjiwarongo, Namibia, I bolted out of my seat in mid-conversation to capture this hornbill. I slowly crept up to the bird, zoom lens ready in hand, excited to photograph the moment I'd been impatiently waiting for. It saw me, cocked its head to the side and stared directly into my lens. We were both equally intrigued.

- Jelena Djakovic

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