Virginia Tech
Fralin Life Science Institute

fall/winter 2013

the
FRALIN EXPLORER

WELCOME TO FRALIN

Dennis R. Dean
Director, Fralin Life Science Institute
and Virginia Bioinformatics Institute
Stroobants Professor of Biotechnology

Thanks for taking a moment to take a look at the Fralin News Magazine. The past year has been a busy one for the Fralin Life Science Institute and we continue to work collaboratively with a variety of other institutes, colleges, and departments.

We are particularly pleased with the launching of the Virginia Tech Center for Drug Discovery and the Fralin Translational Obesity Research Center. Both of these centers have now been officially approved by the research division and represent lively collaborative activities. This year, we have also partnered with the Virginia Bioinformatic Institute to support seed funds for genomics- and transcriptomics-based research.

These activities represent only a few aspects of what is going on within the institute. I invite you to take a look at our website to become more familiar with these and our many other activities involving research, education and outreach. If you are a faculty member that is new to Virginia Tech, we would love to get to know you and find out about your research.

There is so much going on at Virginia Tech it is hard to keep up. All of the institute directors meet regularly and enjoy a high level of interaction. Chances are that if the Fralin staff does not know the answer to your specific questions about resources and available expertise, we will know how to find the information you are looking for.

EDITOR: Lindsay Key
WRITERS: Lindsay Key, Zeke Barlow

ABOUT US

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 Virginia Bioinformatics 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.

Horace Fralin

WHAT'S INSIDE

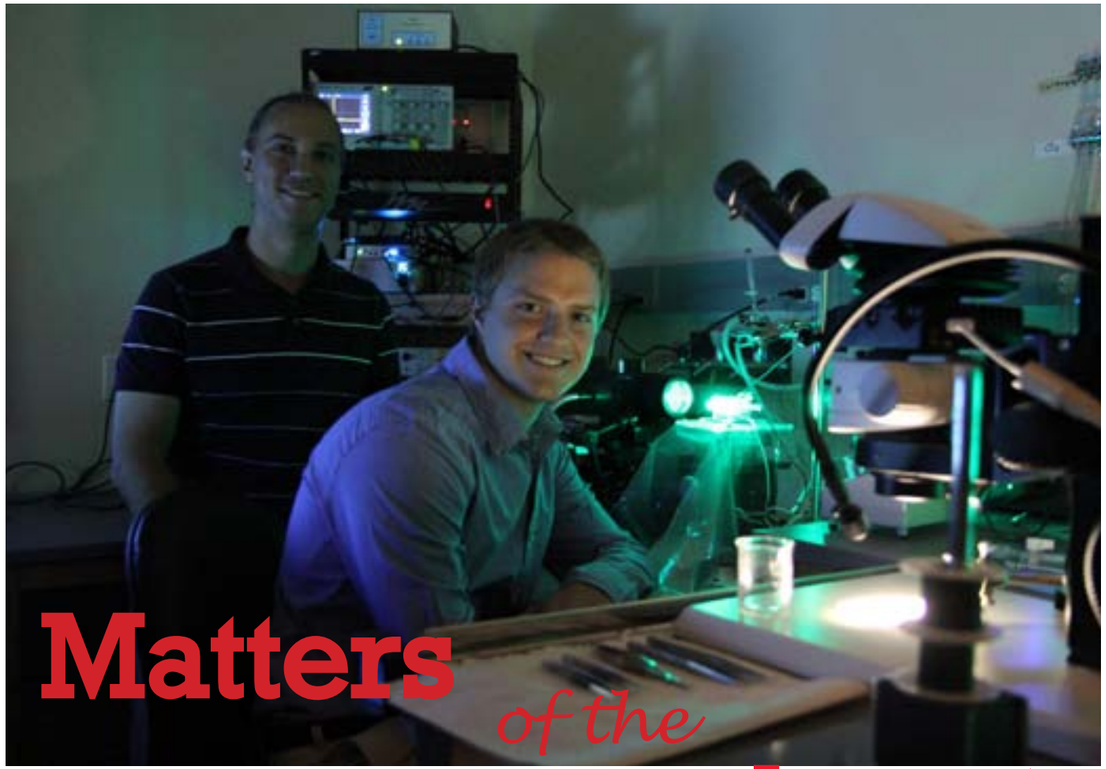


Photo by Lindsay Key

Fralin SURF student Spencer Lovegrove (seated) works with researcher Steven Poelzing to conduct cardiac arrest research in a laboratory at the Virginia Tech Carilion Research Institute.

Matters of the heart

By Lindsay Key

It's a tragic and unexpected story: A healthy 20-something-year-old runner goes out for a jog and suddenly collapses and dies. Sudden cardiac arrest results in as many as 450,000 deaths each year in the United States, and scientists are working hard to understand the complexities of why a heart stops beating.

Unlike a heart attack, which occurs when blood flow to a portion of the heart is blocked, cardiac arrest is typically caused by an electrical disturbance in the heart that disrupts pumping action, according to the Mayo Clinic. While genetics can certainly play a role in heart malfunction, scientists are also investigating contributing environmental factors to better understand these deadly combinations and to prevent future deaths.

Spencer Lovegrove of Roanoke, Va., a junior majoring in biological sciences in the College of Science, studied sudden cardiac arrest during the summer of 2013 as part of the prestigious Fralin Life Science Institute **Summer Undergraduate Research Fellowship** program.

His mentor for the project was **Steven Poelzing,** an associate professor at the Virginia Tech Carilion Research Institute and the Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences. Lovegrove has continued to work with Poelzing during the fall semester.

"We want to know why people with inflammation, either caused by diabetes, flu, or infection, are at increased risk for sudden cardiac death," Poelzing said. "One of our working hypotheses is that during inflammation there is a lot of water deposited into the tissue, one of those tissues being the heart."

The body's inflammatory response to infection, as well as some drugs that are prescribed to combat that response,

leads to increased water in the heart tissue, according to Poelzing. As a result, the person is at an increased risk for arrhythmia, or a non-standard heart beat rhythm that precipitates sudden cardiac arrest.

For his summer project, Lovegrove examined the effect that flu infection has on increased water in the heart. He examined the function of the connexin protein, which is responsible for keeping heart cells electrically hooked up to each other, in normal hearts and when the hearts experience an increased water load (edema).

Lovegrove used optical technology to monitor the electrical activity and water deposition in the hearts of mice possessing this particular protein and he compared his results with those previously collected by Poelzing's graduate students. He is continuing to work on this research project with Poelzing this year.

The research project is important to Lovegrove because his sister died of cardiac arrest when she was 18. He sought out Poelzing as a fellowship mentor because he was intrigued by his research program.

After graduation from Virginia Tech, Lovegrove says he plans to attend medical school. He currently serves as a residential advisor for West-Ambler Johnston Hall at Virginia Tech.

David Schmale named one of 2013's Brilliant Ten

By Zeke Barlow, College of Agriculture and Life Sciences

David G. Schmale III, an associate professor of plant pathology, physiology, and weed science in the College of Agriculture and Life Sciences, was named one of *Popular Science's* 2013 Brilliant Ten in the magazine's October issue on stands now.

His research using drones — also called unmanned aerial vehicles or UAVs — to explore microbial life in the atmosphere earned him a spot on the prestigious list of international scientists, engineers, and thinkers whose innovations change the world.

Schmale and colleagues use research drones to track the movement of dangerous microorganisms that surf atmospheric waves. These atmospheric waves collect, mix, and shuffle microorganisms across cities, states, and even countries. This research has deepened our understanding of the flow of life in the atmosphere, and has contributed unique tools for scientific exploration in the burgeoning field of aeroecology.

"Important pathogens of plants, domestic animals, and humans can be transported over long distances in the atmosphere. Drones are important tools to study how these pathogens travel from one location to another," said Schmale. "They can be used to help predict potential outbreaks of human and animal diseases, and even help farmers time their application of pesticides to thwart crop destruction."

Other young researchers on the Brilliant Ten list this year include a Massachusetts Institute of Technology engineer who is innovating new tools for structural design, a University of Pennsylvania researcher examining gene expression, and a California Institute of Technology scientist exploring weather patterns of far-away planets.

"This collection of 10 brilliant young researchers is our chance to honor the most promising work — and the most hardworking people — in science and technology today," said Jake Ward, editor-in-chief of *Popular Science*. "This year's winners are particularly distinguished and I'm proud to welcome them all as members of the 2013 Brilliant Ten."

Schmale, his team, and collaborators have had a number of high-impact findings since he began exploring high-flying microorganisms with drones.

"David is a tremendous innovator who is advancing our knowledge of food safety and biosecurity by using new research tools that examine previously uncharted regions," said Elizabeth Grabau, head of the Department of Plant Pathology, Physiology, and Weed Science.

He was the first to develop an autonomous drone to sample microorganisms in the lower atmosphere. This new technology was published in the *Journal of Field Robotics* in 2008.

Schmale and his collaborator Shane Ross, an associate professor of engineering science and mechanics at Virginia Tech, have discovered that important pathogens of plants, animals, and humans are transported tens to hundreds of kilometers via invisible atmospheric waves known as atmospheric transport barriers. This work was published in the journal *Chaos* in 2011.

His drones collected strains of a fungus that caused a devastating disease of wheat and produced dangerous toxins that far exceeded U.S. food safety threshold levels. This work was published in the journal *Aerobiologia* in 2012.

These discoveries have unleashed new and exciting civilian applications for drones, such as scouting for pests above crops and validating models for the spread of pathogens.

Full article published in VT News Sept. 17, 2013

STUDENT SPOTLIGHT

Kim helps tomato plants fend off sneaky, ninja-like invaders

By Lindsay Key

In the same way that a coach tirelessly reviews an offensive play made against his or her team, scientists who study parasitic plants also analyze attacks, hoping to understand what mechanisms these sneaky 'ninja-like' invaders use to conquer defenseless host plants.

Gunjune Kim of Chicago, Ill., a fourth year doctoral student in the department of plant pathology, physiology and weed science in the College of Agriculture and Life Sciences, is working with **Jim Westwood**, a professor in that department, to analyze the attack methods of **Cuscuta pentagona**, a thin weed-like weedy vine-like plant native to North America.

Photo by Lindsay Key

Gunjune Kim works with tomato plants in Dr. Jim Westwood's Latham Hall laboratory.

The parasitic plant has earned many folk names, including devil's guts, strangleweed, and witch's hair, and is commonly called dodder. It attacks common crop plants like tomatoes, potatoes and alfalfa by coiling itself around the stem and then penetrating between host cells. Once the parasitic plant has penetrated the host plant, the plants begin swapping ribonucleic acid (RNA), according to data from Westwood and Kim's study.

Jim Westwood

"We're fascinated by what our data shows," Kim said. "Our hypothesis is that both plants are sending gene transcripts to each other. This is truly a strange phenomenon."

Kim's research approach uses a new twist on next-generation sequencing. He generates millions of RNA sequences from the parasite tissue and then uses powerful computers to sort out the host and parasite RNAs. For his dissertation, he will continue to test the RNA exchange hypothesis, and examine what becomes of the RNAs once they are transferred to the other plant.

Overall, Kim and Westwood want to understand this mechanism better so that they can determine what role it plays in the parasite's interaction with the host plant. It is possible that tampering with this mechanism could stop the parasitism that is affecting food and forage crops throughout the world.

"Dodder is one of the most difficult weeds to control. Once it is established on a crop, about all you can do is plow under the plants in hopes of keeping it from spreading and reproducing," Westwood said.

Kim is also a member of the Graduate Program in Molecular Plant Sciences at Virginia Tech, an interdisciplinary program that brings together faculty and students from seven departments and three colleges to understand how plants grow and interact with their environments. He said that the program further convinced him that Virginia Tech was the right place to complete his Ph.D.

He holds a master's degree in plant sciences from Southern Illinois University and a bachelor's degree in chemistry from the University of Illinois-Chicago. After completing his doctoral degree, Kim plans to stay on with Westwood as a postdoctoral researcher.

Kendra Sewell

COFFEE BREAK WITH A SCIENTIST

Kendra Sewell, a new assistant professor of biological sciences in the College of Science and Fralin affiliate, discusses her research and why she came to Virginia Tech.

What is the focus of your current research?

Broadly, I am interested in understanding the behavioral and brain mechanisms that permit animals to cope with changing environmental conditions. To survive and successfully reproduce, animals must respond to constantly shifting and often unpredictable environmental conditions by adjusting neural and behavioral processes. For many animals, this includes responding to variable social conditions because social interactions can either exacerbate or buffer individuals from the impacts of ecological conditions.

My lab focuses on three main research questions about how animals (specifically song birds) respond to their changeable social environment. (1) How do changes in the social environment translate into changes in the brain and behavior? (2) How are individual differences in behavior explained by variation in brain function? And (3) How do developmental conditions shape brain development and behavior?

I address these questions by studying social and communication behavior in songbirds because these behaviors are easily observed and quantified, the social consequences are well established, and there is solid groundwork on the underlying neural mechanisms. Additionally, relevance to human social behavior, learning and communication is well established.

Most recently, work in the lab has focused on examining the impact of early developmental stress – specifically nutritional stress – on subsequent brain function and behavior in zebra finches. We are interested in the impact of developmental stress because conditions early in life are known to impact learning, cognition, and behavior through organizational effects on the brain. In the extreme case, developmental constraints, notably limited food availability, can impair cognition and learning ability, and may compromise communication and social behavior in adulthood.

By manipulating early nutrition in song birds and assessing the impacts on the brain, learning and communication, we can gain a better understanding of the neurophysiological constraints imposed by early nutritional deficit. Members of the lab are currently comparing the sizes of brain structures that are important for specific aspects of learning and communication, and looking for differences in neural activation in response to social interactions, in birds that were nutritionally stressed or nutritionally privileged during development.

In addition to our ongoing experiments, I have examined the scope of naturally occurring variation in communication and cognition and its relationship with brain structure in wild birds (song sparrows).

Recently, I found evidence of a trade-off between song repertoire size (a sexually selected trait) and spatial learning (an ability central to foraging and migration; Sewall et al. 2013). Because the brain regions important for spatial learning (the hippocampus) and song learning (the song control nuclei) develop during the same period early in life when resources can be limiting, brain development may mediate this trade-off between learning abilities. I plan to integrate the experimental manipulations we do in the lab with field research in wild populations by conducting comparisons between populations that differ in habitat quality and thus developmental stress.

Song sparrow, courtesy of Kendra Sewell

How did you become interested in your line of research?

I've always been interested in social interactions and communication from the human perspective. As an undergraduate I became interested in Animal Behavior through course work and, after serving with Americorps for a year at the Montana Natural History Center, I started my graduate training with the Animal Behavior program at the University of California Davis. At Davis, I had the very good fortune to fall under the unofficial mentorship of Peter Marler, a very famous researcher in the field of bird song.

My graduate work examined bird communication using behavioral techniques with the aim of understanding the social consequences of vocal learning. This work got me interested in the mechanisms underlying this adaptive behavior and, reciprocally, the potential for dysfunction in these mechanisms to generate abnormal social behavior. My postdoctoral fellowships at the University of North Carolina Chapel Hill and at Duke University provided me with training in neurobiological approaches used to examine aspects of brain function that underlie neural plasticity (e.g., immunohistochemistry and *in situ* hybridization to localize neuropeptides, neuroanatomical measurements, and HPLC to quantify neuromodulator metabolism).

In what ways would your research be considered 'basic'? In what ways would it be considered 'applied'?

I think of my work as increasing our understanding of the natural world, and therefore as basic research. However, some of my research does have relevance for understanding the brain mechanisms of communication and social behavior in other animals, including humans. Specifically, stress early in development had been implicated in the etiology of a number of human social disorders, including schizophrenia and autism, which are also marked by difficulty learning to recognize social cues.

Q&A

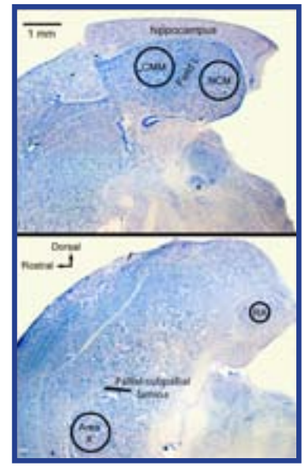
So, while the work in my lab won't lead to treatments for human conditions, understanding the mechanisms regulating social behavior and communication in song birds could inform our understanding of these traits in people. Additionally, the work I hope to start here in the Blacksburg area will compare the behavior and brain function of birds living in habitats that differ in environmental factors, such as food availably. If my lab finds that the brains and behaviors of birds living in more stressful habitats are impaired, our work may inform conservation and management efforts.

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

I became a scientist because I wanted to spend my entire life learning new things. The challenge of science now is the same as it has always been – it is a way of approaching the world that changes continually and requires us all to learn and relearn every day. It can be especially intimidating to ask a colleague or collaborator to update you on new research or a recently developed methodology, but it's also extremely rewarding.

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

Virginia Tech has an extremely strong group of researchers with parallel interests to my own and a lot of support for collaboration and integrative work. Faculty in wildlife biology, psychology, animal and poultry science, and at VTCRI are all great colleagues, in addition to the members of biological sciences with whom I share research interests. The integrative organismal biology group here at Tech is particularly strong and has been a great resource as the work in the lab has picked up speed.



Anatomical regions within the brains of Lincoln's sparrows. The "zoomed in" image shows immunohistochemical staining for arginine vasotocin (a neuropeptide). Sewall, Kendra B., Elyse C. Dankoski, and Keith W. Sockman. "Song Environment Affects Singing Effort and Vasotocin Immunoreactivity in the Forebrain of Male Lincoln's Sparrows." Hormones and Behavior 58, no. 3 (August 2010): 544–553. doi:10.1016/j.yhbeh.2010.04.002.

Fun Facts

Hometown: Orono, Maine

Hobbies: I had my son, Caleb, this past May… does changing diapers count as a hobby? When we're not catching up on chores, my husband, Brian, and I like to trail run, hike, cook and travel (like everyone else who moves to Blacksburg!)

Cats or Dogs?: Our bully mix (an affectionate term for a pit bull), Libby, rescued us about 2 years ago. She's the best running partner, child security guard, and foot warmer around.

East coast or west coast?: I was raised on the East coast but lived in Montana and California for 8 years.

Favorite quote: Einstein is attributed with a lot of great quotes. One I like is, "A person who never made a mistake never tried anything new."

Stream ecology: when symbiosis turns sour

Crayfish, Photo by James Skelton.

By Lindsay Key

Have you ever been part of a 'complicated relationship'?

Branchiobdellid worms and crayfish sure have, according to the research of **Bryan Brown**, an assistant professor of biological sciences in the College of Science, and an affiliate of the Fralin Life Science Institute.

Brown studies these critters, which live in freshwater streams, as a model for the larger question he has about community ecology: Why do we find what we find where we find it?

"The answer to this larger ecological question lies in examining the complexity of the relationships that occur in any given ecosystem, and how they are driving the entire system," Brown said. "If you have one relationship turn sour, or shift from symbiosis to parasitism and vice versa, it affects the entire ecosystem in very significant ways."

During the summer of 2013, Brown brought on several undergraduate researchers to study the worm-crayfish model as well as other unique symbiotic relationships, as part of the Fralin Life Science Institute's Summer Undergraduate Research Fellowship program.

This fall, the students are continuing in his lab as undergraduate researchers, gaining from the mentorship of Brown and **James Skelton** of Holly, Mich., a Ph.D. student in biological sciences in the College of Science who works closely with Brown.

Three students — **Nigel Temple** of Virginia Beach, Va., **Sam Doak** of Christiansburg, Va., and **Meredith Leonard** of Henrico, Va. — all majoring in biological sciences in the College of Science, examine the causes and effects of the crayfish-worm symbiotic model.

Temple's project involves monitoring 28 crayfish habitats in Sinking Creek to look for the effects of a shift from mutualism to parasitism. The worms serve as groomers or cleaners to the crayfish in exchange for nibbling on the crayfish at a rate that doesn't harm the animal. However, if the worm population becomes too dense, the symbiosis is thrown out of balance and can quickly become harmful to both species.

"We think that when mutualism switches to parasitism, the worm densities may either create a change in crayfish behavior, or create a change in crayfish diet, both of which can have a ripple effect throughout the aquatic community," Temple said.

Doak's project is to investigate the worm dispersal on crayfish hosts in eight artificial stream tanks, to determine the worms' behavior in choosing hosts.

"We thought that the worms would spread out to re-populate," Doak said. "But instead we are finding that because there are so many hosts to choose from, they select for the best host. In a tank of six crayfish, one crayfish tends to have a lot of worms on it, and the others tend to have slightly less."

Leonard looks specifically at how the crayfish recognize and respond to new worms.

"We observed that young crayfish tolerate fewer worms than their older counterparts since their high molting rates supplement the cleaning that the worms would otherwise perform," Leonard said. "Additionally, we found that worm size did not play a factor in the detection of the crayfish host."

"This system is great for early-career researchers because it emphasizes that multiple perspectives are key," Brown said. "The interaction between crayfish and branchiobdellid worms is fascinating in its own right and the students learn the importance of understanding the specifics of the system. However, we also try and keep them focused on the bigger picture — that their work is about more than just crayfish and worms. It's also about using this system as a model to answer cutting-edge questions about symbioses that apply across many types of symbiotic interactions."

Another student, **Miranda Flood** of Chesapeake, Va., a biological sciences major in the College of Science, examines the effects of the artificial water color enhancer Aquashade on zooplankton living in urban ponds. Aquashade is often used in recreational areas such as mini-golf courses.

"The SURF program gave me the opportunity to conduct research over the summer on projects that I may never have had the chance to be a part of," Flood said. "Throughout my summer research, I grew as a student and as a scientist because of the SURF program's events, research talks, research symposium, and its ability to make undergraduate research even more accessible to students than it already is at Virginia Tech. I was proud of the fact that the Brown Lab, including 3 other participating undergrads and myself, was able to serve as a large presence in the SURF program, and shine a light on ecological research."

Photo by Lindsay Key

The Brown Lab Group, (L to R): Meredith Leonard, Sam Doak, Bryan Brown, Miranda Flood, Nigel Temple, and James Skelton.

New graduate program examines effects of global change

Interfaces of Global Change Fellow Cathy Jachowski (left) takes a blood sample from a hellbender with assistance from her team: Lab technician John Hallagan (standing), lab technician Hank Vogel (seated), and undergraduate student Valentina Alaasam.

By Lindsay Key

Earth's biodiversity is like a kaleidoscope made up of distinct plants and animals; however, with each year's turn, unique and irreplaceable species disappear.

Habitat loss, invasive species, pollution, disease, and climate change are all to blame for the current rate of extinction, which is 1,000 times higher now than before human dominance, according to **Bill Hopkins**, associate professor of fish and wildlife conservation in the College of Natural Resources and Environment and a Fralin Life Science Institute affiliate.

Interfaces of Global Change, a new interdisciplinary graduate education program funded by the Virginia Tech Graduate School, directed by Hopkins, and partially supported by the Fralin Life Science Institute, confronts the problem of Earth's dwindling biodiversity with a dynamic team of faculty members and doctoral students with diverse perspectives and areas of expertise.

Incoming Ph.D. students from any department who are beginning their doctoral studies are invited to apply to the program. Currently, faculty members hail from biological sciences, fish and wildlife conservation, history, biological systems engineering, civil and environmental engineering, urban affairs and planning, entomology, forest resources and environmental conservation, geosciences, and plant pathology, physiology and weed science. Students still receive their Ph.D. degree from their home department, but will focus on global change and the science-policy interface.

"The over-arching goal is to bring a diverse group of people together to discuss how global changes such as pollution, disease, and climate interact to affect the natural world that we depend on, and how we might tackle some of the most complex environmental and societal issues today," Hopkins said. "Problem-solving depends on a diverse set of skills and perspectives, and I think the students have a chance to grow much more here than in a traditional program."

Graduate student fellows receive research assistantship funding and participate in required interdisciplinary research courses, in which they share perspectives on major environmental problems facing the world and wrestle with complex issues such as research ethics, scientific advocacy, and how science should inform society and public policy.

Fellow **Daniel Medina** of Panama City, Panama, a doctoral student in biological sciences in the College of Science, said that the program has helped him better understand and articulate his role as a scientist in society. Medina works with **Lisa Belden**, associate professor of biological sciences in the College of Science, and studies the symbiotic skin bacteria of amphibians, and how they might be used to combat a deadly fungal disease that has caused numerous amphibian population declines and extinctions.

"The interaction with peers in other fields has given me a broader perspective," Medina said. "The program has also helped me to realize how complex interactions with policymakers can be, even when we share common goals."

In 2010, the Virginia Tech Graduate School launched the Interdisciplinary Graduate Education Program initiative to promote interdisciplinary graduate education and research and offered the first four programs in fall 2011. Each of these education programs addresses a major fundamental problem or complex societal issue requiring an interdisciplinary team of scholars, according to Maura Borrego, associate dean and director of interdisciplinary programs in the Graduate School at Virginia Tech.

"The [Interdisciplinary Graduate Education Program] approach helps a university take on bigger, more complex problems," said Borrego, who has spent significant time researching the topic as part of a National Science Foundation Faculty Early Career Development (CAREER) Program. "It appeals to these newer generations of students we're getting who really want to do meaningful, important work. They're not just going to college to get a job and to get a pension and money to live on, but they really want to make a mark."

With support from the Office of the Senior Vice President for Academic Affairs and Provost and research institutes, the Graduate School currently provides funding for 14 interdisciplinary graduate education programs, which revolve around issues as diverse as water for human health and sustainable nanotechnology. Debuting this year are Interfaces of Global Change, Human Centered Design, and Bio-Inspired Buildings.

HELLBENDERS!

What could be more fun than chasing giant salamanders known as hellbenders? It turns out that it's a lot of work. Interfaces of Global Change Fellow **Cathy Jachowski**, a Ph.D student in fish and wildlife conservation in the College of Natural Resources and Environment, was on the hunt for 10 hellbenders (5 females and 5 males) during a field excursion Friday, Oct. 4, 2013. She and her team set out underwater nesting boxes in a southwest Virginia stream in hopes of attracting the salamanders.

The nesting boxes are an attractive, safe spot for the females to lay their eggs, and for males to guard the eggs. Jachowski uses scuba gear to access the boxes and pull out the salamanders by hand, a technique called 'noodling.' She then races to the shore to quickly get a blood sample from the hellbender, and to hand it over to her team for measuring, weighing, wound analysis, and general observation. The team uses the data they collect on the health of the amphibian as an indicator of overall ecosystem health. They are part of Bill Hopkins' Wildlife Ecotoxicology and Physiological Ecology Program.

Photos by Lindsay Key

Dan River Region research project could be a model to combat nation-wide obesity epidemic

Photo by Logan Wallace, Virginia Tech

Felicia Reese of Chester, Va., a human nutrition, foods, and exercise graduate student, works in one of the community gardens that were created as part of the Dan River Partnership for a Healthy Community. The gardening program targets youth in an effort to get children to think about where their food comes from and how to eat healthier.

By Zeke Barlow, College of Agriculture and Life Sciences

The Dan River Region of Virginia has the dubious distinction of being one of the most health-deficient areas of the United States.

The area that stretches along the border of North Carolina from Patrick to Halifax counties has an almost 50 percent higher rate of diabetes than the rest of the country, a 5 percent higher rate of obesity, and 17 percent of the area's residents live below the federal poverty line. One in four do not have health insurance.

Fortunately, researchers at Virginia Tech are working on a solution to improve the health of residents of the Dan River area by developing a multi-pronged program that aims to incorporate not just nutrition education, but exercise initiatives and community gardens — a multifaceted approach that could be used as a model to battle the obesity epidemic in similar communities across America.

Associate Professor **Jamie Zoellner** and Assistant Professor **Jennie Hill**, both in the Department of Human Nutrition, Foods, and Exercise in the College of Agriculture and Life Sciences, are helping lead the Dan River Partnership for a Healthy Community, a community-academic partnership between Virginia Tech, Virginia Cooperative Extension, and more than 50 local organizations including churches, government offices, grassroots organizations, and health professionals.

The mission of the group is to foster community partnerships to combat obesity in the Dan River Region by educating the community about healthy lifestyle initiatives.

The organization is working toward a solution to curb rampant obesity through a process known as community-based participatory research, which strives to engage local stakeholders in all aspects of the research process.

"We know there is no one thing that is going to solve the obesity epidemic, so we are using several strategies to approach this issue," said Hill, who along with Zoellner is a member of the Fralin Translational Obesity Research Center. "We are engaging the entire community to address this problem from the ground up."

Bryan E. Price, chairman of the organization and health and wellness program director for Danville Parks and Recreation, said members of the community jumped at the chance to improve their lives.

"In this program, locals are invested in working to break the cycle of unhealthy habits," he said. "Healthier people are happier people, and in the long run, we feel that the improved health status will lead to an overall more successful Dan River Region."

In the early stages of partnership, the community identified key areas it wanted to work in to address obesity: nutrition through community gardens, a physical activity program, and the built environment.

Many parts of the Dan River Region are classified as "food deserts," where people have limited access or no access at all to healthy, affordable foods. Outside the city limits of Danville in Pittsylvania County, there is only one grocery store within 1,110-square miles. That means that people are forced to shop at local, small convenience stores where choices are limited.

Clarice Waters of Clifton, Va,. a doctoral student in the Department of Human Nutrition, Foods, and Exercise, along with other student research assistants, fanned out across the county to do an assessment of the more than 400 food outlets in the region to measure the accessibility of healthy food.

The available food was rated on a scale of zero to 30, with zero representing unhealthy foods and 30 meaning there were a cornucopia of good options.

"The entire region had an average of six," said Hill. "It goes to show that even if people wanted to eat healthy, they don't have access to healthy food options."

This summer, expanding on a pilot project from last year, a gardening program targeting youth is being offered at six sites serving low-income youth.

"It makes a difference in their lives because the successes and failures of their garden are based on the hard work, attitudes, time, and effort that they put in," said Tadashi Totten, a 4-H and youth development Extension agent.

But instead of just planting gardens and assuming that they are inherently positive factors within the community, the researchers are measuring how much food comes out of them in order to ascertain how much of an impact the gardens will have on the area residents.

After every harvest, the children are given lessons on the nutritional value of the vegetables they grew.

"I think it's important to teach them when they are young so they know the benefits of being healthy so when they are older, they can teach it to their children, too." said **Felicia Reese** of Chester, Va., a human nutrition, foods, and exercise graduate student.

The partnership has had several sources of funding in recent years. The Virginia Foundation for Healthy Youth has provided a consistent source of monies of about $140,000 over three years. The project recently received a three-year, $1.6 million grant from the National Institutes of Health to develop and test a childhood obesity treatment program. It also got a $45,000 start-up grant from the College of Agriculture and Life Sciences for the community garden initiative. The Danville Regional Foundation-Make it Happen!, the Virginia Tech Institute for Society, Culture and Environment, and the Virginia Tech Fralin Life Science Institute have also supported the project.

Wen You, an associate professor of agricultural and applied economics, is also working on the project by providing statistical and econometric consulting as well as health economics expertise.

So far, the program has had tremendous success, which in the long run might not just help the Dan River Region, but the U.S. as a whole.

"America is in the midst of an obesity crisis and we hope that this model of academic partners such as Virginia Tech teaming up with local groups can be used to find solutions to solve the obesity epidemic around the U.S.," Zoellner said.

Quick Facts: Fralin Translational Obesity Center

- Established January 2013
- Goal: To engage a group of faculty members to span the translational research spectrum, to train new scientists in translational obesity research, and to support clinical and community organizations to bring evidence-based solutions to the public
- Co-directed by **Paul Estabrooks** and **Kevin Davy**, professors in the department of Human Nutrition, Foods, and Exercise in the College of Agriculture and Life Sciences
- Composed of approximately 17 affiliated Virginia Tech and Carilion Clinic investigators, with research backgrounds including human nutrition, psychology, cancer biology, economics, and pediatrics
- Members have earned 22 extramurally funded grants with total costs of nearly $19 million from local foundations, industry sponsors, state government, and the National Institutes of Health

around fralin

Photo: Entomology graduate studens **Phillip George** and **Jake Bova** answer insect-related questions at the 3rd annual Hokie Bugfest, held Saturday, October 19, 2013 at the Inn at Virginia Tech.

Photo: Graduate students involved with the Global Change Interdisciplinary Graduate Education Program, which is funded by the Virginia Tech Graduate School, directed by **Bill Hopkins**, and partially supported by the Fralin Life Science Institute, attend a Global Change seminar taught by Hopkins on Monday nights in Latham Hall.

Photo: Fralin Life Science Institute booth at Hokie Bugfest.

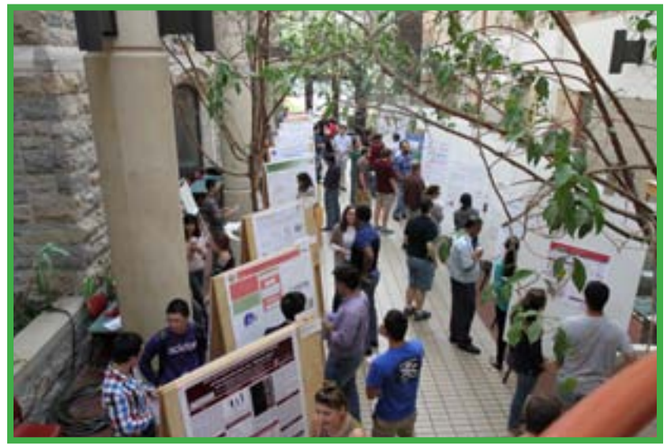


Photo: Students working in the field of drug discovery and development present their work at the first annual Virginia Tech Center for Drug Discovery poster symposium held September 20, 2013.

Photo: Dennis Dean, director of the Fralin Life Science Institute, and **John McDowell**, scientific director of Fralin Hall, address a crowd of Fralin-affiliated faculty members at the annual faculty mixer held Tuesday, September 24, 2013 at the Inn at Virginia Tech.

Photo: Christian Laourdakis, a graduate student in biochemistry, explains his poster to Joseph Merola, professor of inorganic chemistry at Virginia Tech, at the first annual Virginia Tech Center for Drug Discovery poster symposium held September 20, 2013.

VirginiaTech
Invent the Future

SURF'S UP!

Apply Now for Summer 2014

Last summer, **Emily Ronis** (left) surveyed the Eastern Shore, identifying bird species and collecting samples of sand and peat in order to better understand the behavior of migratory bird species. This one-of-a-kind research experience was made possible through Fralin's Summer Undergraduate Research Fellowship Program! The program is a paid 10-week, full-time, unforgettable research experience! Applications accepted through February 10, 2014.

Photo courtesy of Emily Ronis.

www.fralin.vt.edu

Fralin Life Science Institute
Fralin Hall
West Campus Drive
Room 101
Virginia Tech 0346
Blacksburg, VA 24061

540-231-6933 (v)
540-231-7126 (f)

Like Us On facebook

FOLLOW US ON twitter