

BIOLOGICAL SCIENCES REACHES OUT!

From Brenda Winkel, Professor and Department Head

It's fall in Blacksburg, always a great time to be a Biological Sciences Hokie!

And this fall is a particularly exciting time for Virginia Tech, with a new president and provost working with leaders across our institution to set us on course to be the premier land-grant university of the 21st century.

Within the Department of Biological Sciences, we have many exciting initiatives underway as we engage our students in world-class research addressing challenges that range from human health to global change. We hope you will enjoy learning about several of these initiatives in the pages of this newsletter.

The department is very proud of its teaching and research efforts.

This past year saw more than 14,000 students enrolled in our courses and 372 bachelor's degrees awarded, once again making us one of the two top degree-granting units on campus. We also trained more than 50 undergraduate teaching assistants for our "flipped" freshman classrooms, which focus on using class time for active learning instead of lectures.

On the research front, our students, postdocs, and faculty members published more than 120 peer-reviewed articles and book chapters, and edited several books. Research funding remained strong -- including support from federal agencies, where overall success rates are well below 10 percent -- with over \$8 million in new grants for our Blacksburg research groups, and another \$4.5 million for our groups at the Virginia Tech Carilion Research Institute in Roanoke. All told, our student-research enterprise included 188 undergraduates, 90 graduate students, and 25 postdocs. We remain among the top departments on campus in terms of research activity.

Even as we serve our students and the public through teaching and research, we also embody the spirit of *Ut Prosim* by engaging the larger community, from budding young scientists to the general public. Have you heard of the Price House Nature Center or the Massey Herbarium? Both are integral parts of the department and serve hundreds of patrons throughout the year. Our students and faculty are also heavily involved in a wide variety of other outreach activities, just a few of which are illustrated in the photos to the right.

The Department of Biological Sciences has a crucial role to play as Virginia Tech reinvents its own future in the months ahead.

With 10,000 living alumni, there is tremendous potential for former students to help advance our efforts. With the end of the year approaching, we hope you will consider making a donation to our department. Our donors provide important discretionary money that allows for scholarships, supports student research, helps fund our annual Recruitment and Research Day, and helps us attract the best new scientists to our faculty.

Currently, only about 1 percent of our alumni give back to the department. Just imagine the impact if everyone gave. With so many biological sciences alumni, any gift, no matter the amount, will be part of a combined effort to ensure our continued excellence in teaching, research, and outreach.

I hope you will find the stories inside this newsletter as exciting and inspirational as we do, and



Members of Microbiology Club presenting a hands-on exhibit at Virginia Tech's Kids' Tech University, held at Lane Stadium



The Biology Graduate Student Association volunteering at The Big Event in Blacksburg; the student-run volunteer event takes place every spring.



Biological Sciences seniors Rose Peterson and Laura Giavannoni working with primary school kids in New Zealand as part of the Hokies Abroad Program.



As part of the SEEDS Field Camp, Mike Rosenzweig brought young campers to meet Professor Brent Opell and his lab out in a campus woodlot to learn about spiders

Make an impact!

To support the Department of Biological Sciences, please visit www.biol.vt.edu and click on the "Giving to Biological Sciences" link.

Going bananas: Startup's produce may save the endangered fruit and protect other crops

(A longer version of this article, by Beth Jones, originally appeared in the January 2015 edition of Roanoke Business Magazine.)

Edward Goyette (pictured right) keeps a copy of Dan Koeppel's "Banana: The Fate of the Fruit That Changed the World" close to his desk.

Goyette, president of the Roanoke biotechnology company American Biosystems, has a lot to say about the fruit. "People don't realize how precarious the situation is," Goyette says.

Turns out, the majority of bananas sold are of a single variety: the Cavendish. Such a complete lack of diversity is bad. "The yellow bananas that we eat all the time are all genetically identical so a fungus that attacks one of them will attack all of them," he explains.

A virulent strain of Panama Disease, which is caused by a soil-borne fungus and has caused massive banana destruction in Asia, the Middle East, and Africa, has received more media attention. But Black Sigatoka, another fungal disease, has decimated Caribbean banana farms and poses another serious threat to the fruit. The two diseases have experts saying the Cavendish is fighting for survival; one newspaper dubbed the crisis Bananageddon.

One solution to fight Black Sigatoka, Goyette says, comes from down the road in Blacksburg. "I knew this product could deal with this problem," he says.



That product would be a biofungicide developed by Biological Sciences Professor **Joe Falkinham** (pictured left). "It's a naturally-derived compound that is produced by bacteria," Goyette says. "It's not genetically modified. It's just something that exists in the environment."

Goyette launched a startup called Leone BioVentures in 2013 to keep the biofungicide from languishing in Falkinham's lab. To get the ball rolling, Goyette applied for and won a grant of about \$50,000 from the Center for Innovative Technology's Commonwealth Research Commercialization Fund, a state program designed to spur economic growth in science and technology fields.

In three to four years, the biofungicide will be on the market, Goyette maintains. "People realized certain pesticides that were being used were dangerous, but when they took those off the market they needed to have new ones take their place that were much safer to work with," Goyette says. "That's where our product fits."

The development has been a long time coming for Falkinham. In 1994, the professor helped found a biotechnology company called Dominion BioSciences, which was interested in bringing natural products to agribusinesses. Around that time, Falkinham learned of a Penn State researcher who had discovered a unique microbe with special properties in the soil of a campus parking lot. "We were interested because this was a natural organism producing a natural compound, and this natural compound has a spectacular ability to kill fungus," Falkinham explains.

Dominion BioSciences licensed the product and went on to complete more than 72 trials of the biofungicide that showed the product was more effective than the chemical fungicides in regular use.

"He had a couple of very large agrochemical companies interested," Goyette says of Falkinham. But in 2000, manufacturers of a similar product removed it from the market because of concerns it could cause diseases in cystic fibrosis patients.

(continued on page 9)

We welcome comments and items of interest for future newsletters. Please contact Valerie Sutherland (vsutherl@vt.edu) via e-mail, or write to us at the Department of Biological Sciences, Mail Code 0406, 1405 Perry Street, Virginia Tech, Blacksburg, VA 24061.



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The Da Vinci Living Learning Community

Virginia Tech's Da Vinci Living Learning Community consists of biological and life science students who live and work together in Lee Hall. Da Vinci students combine curricular and co-curricular learning within a "Peer-to-Peer" learning framework, under the supervision of Biological Sciences Assistant Professor of Practice, **Lori Blanc**. Dr. Blanc specializes in high-impact educational practices, and has served as director of Da Vinci since 2013.



Da Vinci has a long history with the department of Biological Sciences. This living learning community was founded by undergraduate students in 1999 as the Biological and Life Sciences Community (BLSC) with the guidance of **Joe Cowles** and **George Simmons**. The BLSC was later directed by **Jill Sible**, **Jack Evans**, and Debbie Wilson. In 2012, under the direction of Jill Sible, the BLSC was renamed Da Vinci and became one of four STEM-based living learning communities in Lee Hall known as "inVenTs". Lee Hall now hosts an in-residence design studio with cutting edge equipment, including a 3D scanner, 3D printer, laser cutter, microscopes, and design software, and graduate students and post-docs who train undergraduates to use the equipment. Dr. Blanc became director of Da Vinci in 2013, spearheading further enhancements and joining forces with the Curie Living Learning Community, which is directed by postdoctoral research associate, Nikki Lewis, and funded by a multi-year National Science Foundation STEP grant. The most notable enhancements have been the creation of the Da Vinci and Curie "Successful Starts in Science" First Year Experience program, funded by a VT Pathways to Success, First Year Experience grant, and the Peer-to-Peer Project program, which was recognized by a 2014 Diggs Teaching Scholar Award to Dr. Blanc for its pedagogical innovation and high impact on student learning.



Da Vinci director, Lori Blanc, and students from the Da Vinci and Curie Living Learning Communities are joined by President Sands at the Virginia Science Festival.

In his 2014 installation speech, President Sands said "the residential model for undergraduate education is increasingly understood to be critical to the development of the "T" shaped student, with depth in the discipline but strength across the skills that the modern economy demands. There is a whole world out there, and learning by doing has to be part of the experience." Da Vinci and Curie are well-positioned to provide such an experience by integrating six high impact practices, combining curricular and co-curricular activities, and creating a culture of learning through a "hands-on, minds-on" approach. Da Vinci and Curie first-year students collaborate with upper-class student leaders on Peer-to-Peer Projects, which are envisioned, spearheaded, managed, and implemented by students. These projects are designed to reflect the problem-oriented, peer-run,

participatory practices of scientists, and complement academic coursework by giving students experience with (a) applying concepts from foundational coursework in hands-on projects, (b) learning cutting-edge, discipline specific technology, (c) articulating connections between coursework, activities, and leadership roles, (d) designing, evaluating and implementing strategies to achieve desired goals, (e) communicating science at conferences, (f) inspiring youth to pursue STEM-related fields through venues such as Kids' Tech University and the Virginia Science Festival, and (g) aligning co-curricular experiences with learning outcomes from academic coursework and the Division of Student Affairs "Aspirations for Student Learning." Indeed, Da Vinci demonstrates the potential for collaborations between the Divisions of Student and Academic Affairs to stimulate the very lifelong learning attitudes and skills that are prized in the classroom and transferrable to contexts beyond college graduation.

For more information about Da Vinci and Curie, visit: <http://www.inventscommunity.org/prospectivestudents/thecomunities/davinci>

New Research/Grants

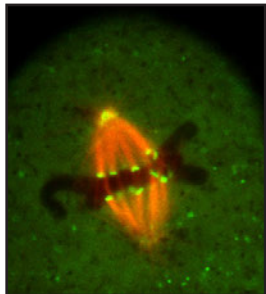
Dissecting the interplay between forces and dynamics of the mitotic apparatus and kinetochore attachments

(National Science Foundation, \$577,691, 3 years)

Principal Investigator: **Daniela Cimini** (Associate Professor of Biological Sciences)



Cell division, the process of generating two cells from one, is essential to life. A single cell undergoes consecutive cell divisions to generate a fully developed organism. Moreover, within any organism, dying cells are continuously replaced by new cells via cell division. A key process in cell division is the equal partitioning of the replicated DNA into two daughter cells, a process known as mitosis. During mitosis, the DNA condenses into chromosomes, each constituted by two sister chromatids and the cell cytoskeleton reorganizes into a structure known as the mitotic spindle. The microtubules (MTs) of the mitotic spindle interact with the chromosomes by connecting to specialized protein structures, the kinetochores (KTs) that assemble on each sister chromatid. The MTs of the mitotic spindle can produce forces that can move the chromosomes within the cell and eventually separate the sister chromatids and deliver them to opposite poles, ensuring formation of two daughter cells with correct DNA content.



Understanding the mechanisms that regulate mitotic chromosome segregation is a key aspect of our understanding of how life is maintained and propagated. This research project explores the mechanisms responsible for generation of forces within the mitotic apparatus that lead to movement of chromatids such that they are accurately separated during mitosis. The findings of this research will be communicated and disseminated broadly. Moreover, the project will offer opportunities for interdisciplinary research training and education. Finally, an outreach activity, designed for teaching children (grades 5-8) about cell division, will be developed and offered as a permanent activity at the SEEDS - Blacksburg Nature Center and to local schools (through the Biological Sciences Outreach Program).



Tunable microchip sorting of BRCA1 nuclear assemblies

(National Institutes of Health/National Cancer Institute, \$1.8m, 5 years)

Principal Investigator: **Deborah Kelly** (Assistant Professor, Virginia Tech Carilion Research Center, Biological Sciences)

Mutations in the breast cancer susceptibility protein, BRCA1, are heavily implicated in familial breast and ovarian cancers that are classified as "triple negative." Triple negative tumors lack estrogen receptors, progesterone receptors and Her2 expression that are drug targets commonly used to enhance treatment options for other forms of breast cancer. Thus, patients afflicted with triple negative cancers have limited treatment options and succumb to recurrence in less time following conventional therapy. Under normal conditions, the BRCA1 protein acts as a tumor suppressor, helping correct breaks in genomic DNA and ensure fidelity in newly synthesized mRNA. Defects in these regulatory processes lead to genomic instability and to tumor initiation. Understanding the molecular basis for triple negative breast cancer induction related to BRCA1 mutations could significantly contribute to the development of new treatment options for patients afflicted with this aggressive disease. Our overall goal is to develop a new tunable microchip-based strategy to study the structural attributes of BRCA1 protein assemblies involved in nuclear protective processes -- and to examine how defects in the BRCA1 protein can impact the formation of these essential protein assemblies. Our proposed research will provide a multi-disciplinary opportunity to bridge technologies used in cancer biology, material science, and structural biology to address long-standing questions involving the role BRCA1 in gene regulatory events.



New Grants (con't)

Defining Molecular Mechanisms of Terpene Aggregation Pheromone Biosynthesis In Stink Bugs For Engineering Pheromone Producing Trap Crops

(AFRI: Plant-Associated Insects and Nematodes Research Area, USDA, \$500,000, 4 years)

Principal Investigator: **Dorothea Tholl** (Associate Professor of Biological Sciences)

Trap cropping is an integrated pest management technique that uses properties of an economically unimportant plant to lure a pest away from a cash crop. Often these properties include the emission of volatile organic compounds such as terpenoids. The harlequin bug, *Murgantia histrionica*, a type of stink bug (Hemiptera: Pentatomidae), is a growing pest problem on crucifer crops in the United States and can be partially managed by trap cropping. In contact with a host plant, male harlequin bugs produce the bisabolene-type sesquiterpenoid aggregation/sex pheromone, murgantiol. Bisabolene-type pheromones are common in other pentatomids such as the invasive brown marmorated stink bug. We assume that these terpene pheromones are produced de novo by the insect and are not products of host plant metabolites. We hypothesize that the biosynthetic pathway in murgantiol biosynthesis consists of two steps catalyzed by a bi-functional prenyltransferase/terpene synthase and a cytochrome P450 epoxidase. Comparative next generation sequencing of male and female harlequin bug RNA has identified a putative bi-functional prenyltransferase/terpene synthase gene with a possible role in murgantiol biosynthesis. We are in the process of functionally characterizing this enzyme with the long-term goal to metabolically engineer the murgantiol biosynthetic pathway into a harlequin bug-attracting trap crop such as mustard (*Brassica juncea*). This study will also provide new insights into the mechanism and evolution of volatile terpene biosynthesis in insects in comparison to plants and other organisms.



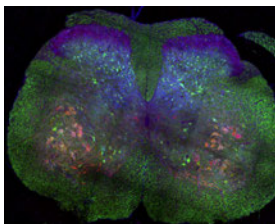
Synaptic FGFs are required and sufficient to maintain and repair aged neuromuscular junctions

(National Institutes of Health/National Institute of Aging, \$377,000, 1 year)

Principal Investigator: **Gregorio Valdez** (Assistant Professor, Virginia Tech Carilion Research Institute and Biological Sciences)



Motor function declines with aging, resulting in impaired mobility, loss of independence, and increased susceptibility to injury and disease. Many studies have sought to determine the cellular and molecular factors that contribute to aging of the neuromuscular system. Recent findings strongly suggest that structural and molecular alterations at neuromuscular junctions occur before motor neurons and skeletal muscle fibers exhibit obvious age-related pathological changes. Thus, deleterious changes at the neuromuscular junction may trigger the slow but consistent loss of motor function during aging. While it is known that muscle-derived factors are required to maintain and repair the neuromuscular junction, the identity of such factors has remained elusive. To this end, we have taken varied, yet complementary, approaches to identify muscle-derived factors that function to maintain the structural and functional integrity of neuromuscular junctions from the ravages of aging. In this regard, we have gathered preliminary data suggesting that three members of the fibroblast growth factor (FGF) signaling pathway, FGF-7/10/22, and a FGF-binding protein (FGFBP1) are promising candidate molecules for protecting neuromuscular junctions from insults emanating from normal aging, ALS-causing mutations, and injury to peripheral nerves. In mice, deletion of FGF-22 results in premature aging of the neuromuscular junction. It also delays reinnervation of skeletal muscles after injury. Similarly, a reduction in FGFBP1 accelerates age-associated changes at neuromuscular junctions and compromises motor function in young adult mice. Importantly, introducing FGFBP1 and FGF-22 into denervated muscles accelerates their reinnervation, further indicating that FGF-22 and FGFBP1 function to repair the neuromuscular junction. We strongly believe that the proposed experiments could lead to new molecular targets for developing therapeutic interventions to protect and repair the neuromuscular junction, and thus slow, prevent or even reverse aging of the motor system.



New Grants (con't)

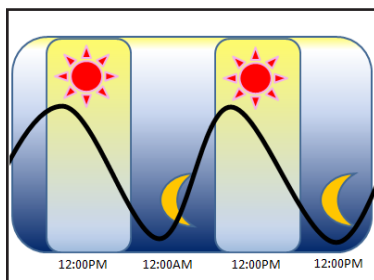
A combined mathematical and bioengineering approach to elucidate the contribution of circadian factors in the cellular response to genotoxic stress

(National Science Foundation, \$750,000, 3 years)

Principal Investigator: **Carla Finkielstein** (Associate Professor of Biological Sciences)



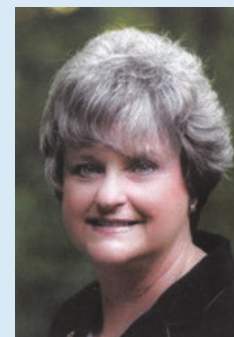
Circadian rhythms are mechanisms that measure time on a scale of about 24 hours and then adjust the body to environmental signals. Circadian clock genes produce proteins that are necessary for the generation and regulation of circadian rhythms. These proteins also regulate genes involved in either cell division or cell death. Agitation in the balance between cell division and cell death will lead to cellular dysfunction. In this project, the investigator will use an interdisciplinary approach that combines biological, mathematical, and bioengineering tools to examine the circadian factors that act as mediators in the interconnected network that controls the circadian clock. This project includes an educational component that will recruit, retain, train, and graduate a more academically-prepared student body with a global vision of interdisciplinary research and world opportunities, creating a new sense of leadership.



Deborah Koller Inducted into the COS Hall of Distinction

Induction into the **College of Science Hall of Distinction** honors those individuals who best embody the college's goal of enhancing the well-being and development of communities, the commonwealth, the nation, and the world, and who exemplify our university motto, *Ut Prosim* (That I May Serve).

Deborah A. Koller, of Chesterfield, Virginia, is one of six 2015 inductees. She earned a bachelor's degree in biology from Virginia Tech in 1976, and then went on to earn a master's degree in microbiology and a doctorate in molecular genetics, both from Virginia Commonwealth University. She retired as senior principal scientist at Atria Client Services after 32 years of dedicated service to the company.

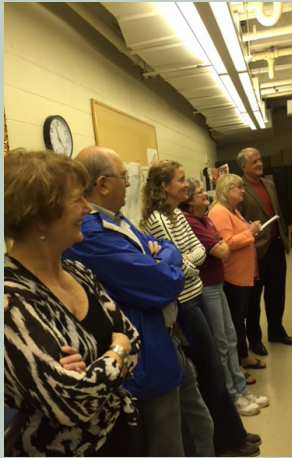


An enthusiastic Hokie, Dr. Koller has led by example through her service and philanthropy. She is active on the College of Science Dean's Roundtable Board and the **Department of Biological Sciences Alumni Advisory Board**, where she has served as chair. Previously, Dr. Koller served on the Richmond Regional Committee for the Campaign for Virginia Tech, the Women in Leadership and Philanthropy Executive Committee, and the Institute for Critical Technology and Applied Science (ICTAS) Task Force. A member of Virginia Tech's *Ut Prosim* Society and Legacy Society, she endowed the Deborah Koller Scholarship that is awarded annually to a biological sciences student who demonstrates high academic and personal achievement, as well as strong character and a love of learning. In addition, Dr. Koller established the Paul and Laverne Ayers Excellence Fund in the College of Science, along with her sisters, in honor of their parents. The fund provides critical support for the training of future educators in the science, technology, engineering, and math fields.

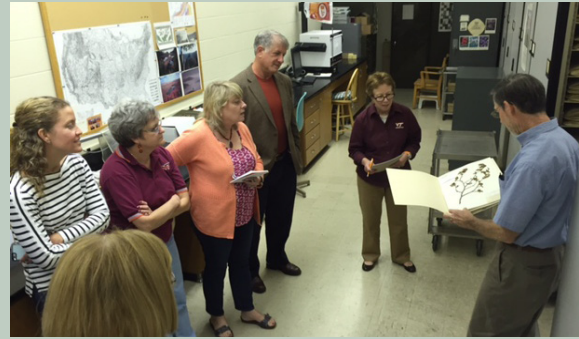
Dr. Koller has been involved with a number of civic and philanthropic organizations, including the Chesterfield County Christmas Mother Committee. A master gardener, she serves as coordinator and faculty member for Landscape for Life, a sustainable landscape initiative workshop sponsored by the Chesterfield County Extension Office.

Congratulations, Dr. Koller, on this well-deserved accolade!

Alumni Advisory Board News



The Biological Sciences Alumni Advisory Board held their Fall meeting in Derring Hall on October 10, 2015. Present were **Debbie Koller**, **Betsy Hagan**, vice-chair **Adrienne Hoffman**, **John** and **Donna Serabian**, **Jennifer Sheets**, and new board member, **Buck Cox**. They were joined by **Brenda Winkel**, Jenny Orzolek of the College of Science, **Fred Benfield**, and Curator **Tom Wieboldt**, who led a very informative tour of the Massey Herbarium, one of our department's "hidden gems." This was followed by a very productive discussion of ways to foster communications efforts and for partnering with the college on mechanisms to connect students and alumni for internship and job opportunities. The board also brainstormed possibilities for options that would help students prepare for careers with a B.S. degree in Biological Sciences. As always, the board provided invaluable insights from their vantage points in the private and public sectors. We look to following up at the Spring Board Meeting, set for April 23rd.



A Note from Alumna Julia Oxenreider Castleberry ('90)



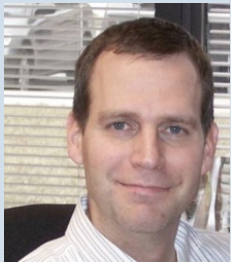
It all began at Virginia Tech! I received my B.S. in Biology in 1990. After Virginia Tech I traveled to Durham, N.C. to attend Duke University and received my M.S. in Physical Therapy in 1993. Practiced as a physical therapist for almost twenty years and decided to return to school for my doctorate and enter the world of academics. I earned my Doctor of Physical Therapy, DPT, from Virginia Commonwealth University in 2011.

In 2011 Radford University was starting its DPT program. I have been with Radford University's DPT program since the beginning and serve as an assistant professor with teaching and research concentrations in geriatrics and neurological rehabilitation. I am proud to say I am a Hokie who left and came home again. My spouse, Hal Castleberry, earned his B.S. in Physics from Virginia Tech and his Ph.D. in Materials Engineering from N.C. State, and my son, Ransom Castleberry is applying to Virginia Tech next year.

Back in Blacksburg since 2001 we raising three boys with the hopes of continuing the family tradition. Virginia Tech's Biology Department provided the foundation to achieve my goals and a place to plant the seeds of success for my family.



Alumnus Profile: Ross Zirkle ('93, '95)



Ross Zirkle (B.S. '93, Biochemistry; M.S. '95 Biology), earned his Master's degree with **Noel Krieg** in biology in 1995, developing and applying new methods for analyzing oxidative DNA damage and repair in *Escherichia coli*. Dr. Zirkle is Director of Microbial Biotechnology Division at DSM Nutritional Products in Columbia, MD, where he currently leads the R&D effort in molecular biology, engineering, and development of microalgae for the production of omega-3 fatty acids as well as the use of plant biotechnology for this purpose.

After leaving Virginia Tech, Dr. Zirkle earned his Ph.D. at North Carolina State University studying the synthesis of the antifungal polyketide soraphen A by *Sorangium cellulosum*. He then worked for six years at Syngenta in Research Triangle Park, NC, and four years at Martek Biosciences in Boulder, CO, before moving to DSM/Martek in Columbia MD in 2009. Dr. Zirkle is the co-inventor on 29 patents and has co-authored 12 peer-reviewed publications. He was the recipient of the Pete Linsert Innovation Award at Martek in 2008 and 2012. Dr. Zirkle is married to biology alumna, **Twilla Eaton Zirkle**, who earned her Master's degree in 1993 with **Joe Falkinham**. The couple currently resides in Mt. Airy, MD, with their three children.

BGSA News

The Biology Graduate Student Association (BGSA) has been very active over the summer and fall. New executive board officers were elected and include **Jason Lancaster** (President), **Ariel Leon** (Vice-President), **Jon Doubek** (Treasurer), **Tamara Fetters** (Secretary), and **Tim Arapov** and **Matt Hedin** (VT Graduate Student Association Representatives). The BGSA organized a hike to McAfee's Knob and tubing at the New River Junction over the summer, inviting students from outside the department to promote new connections and diversity. This fall's departmental picnic took place at the Hahn Pavilion in the beautiful Hahn Horticulture Gardens in early October. The pavilion provided a warm break from the fall rain! BGSA Members also carved pumpkins for Halloween and went on a pre-dawn hike up Buffalo Mountain in Floyd, VA in November. The BGSA plans to incorporate more social activities for graduate students in the future to promote interaction between the departmental research areas that are spread across campus, as well as continuing service in the department and outreach in the community.



BGSA Members atop Buffalo Mountain at dawn

The Winnower

Joshua Nicholson ('15) is a co-founder of The Winnower, an open access online scholarly publishing platform that employs open post-publication peer review. He launched the platform in 2013, with the "aim to revolutionized science by breaking down the barriers to scientific communication through cost-effective and transparent publishing for scholars."



In May 2015, he received his Ph.D. in the lab of **Daniela Cimini**, studying the role of the karyotype in cancer initiation and progression.

In a recent interview with The Ubiquitous Librarian blogger, Brian Mathews, Nicholson explained why he started The Winnower. "(The project) was borne out of my frustrations with scholarly publishing. Frustrated how costly it is (to read and publish), how slow it is, how inefficient it is, and maybe worst of all how closed it is. Really frustrated at almost every aspect of it, which may sound harsh but I think is a quite common feeling among many academics."

The Winnower is based around the idea of identifying good/bad work openly via post-publication peer review. Learn more by visiting the site at www.thewinnower.com.

Going bananas (continued from page 2)

Luckily, this was a problem with a solution. By heating the organisms, Falkinham found, he could kill the cells without damaging the antifungal properties. "So we could use the product without running any risk of infecting the cystic fibrosis patients," he explains.

After maneuvering through that obstacle, Dominion BioSciences faced more roadblocks. The company needed more capital. Then, one of the founders died. A few years later, Dominion BioSciences folded, but Falkinham refused to throw in the towel on the biofungicide.

All along, Goyette had followed Falkinham's work. The scientists knew each other through Virginia Tech, where Goyette received his bachelor's degree in microbiology in 1978 and where he now chairs the Biological Sciences alumni advisory board. "I knew Dr. Falkinham had worked so hard on this, and I want to see it come to fruition," he says. "He just wants to see his technology commercialized."

The two men have talked at length about the best use for the product. Of course, a certain fruit has been much discussed. "We got really obsessed with bananas for a while," Falkinham admits.

Only a few large companies distribute the world's bananas, and they spend a lot of money to keep fungus off their plants, Falkinham says. "We thought that would be a marvelous market." Attempts to get banana executives on board, however, haven't yet proven fruitful. "Part of that might be that they're banana producers and not really in the business of supporting and producing (products) for (fungal) treatment," Falkinham adds. "So I think we need to focus on other partners."



Bananas exhibiting the effects of Panama disease

a large variety of ways," he says. "Or you can pick an easier way that will require simpler registration and then just focus on those areas."

A decision on which route to go will be made in coming months, after Goyette receives the results from field trials on corn, cotton, soybeans, and peanuts at the Tidewater Agricultural Research and Extension Center in Suffolk. He also has an introductory meeting scheduled with the EPA.

There is reason for Goyette to be optimistic that the EPA will eventually give the green light. In 2014 Marrone Bio Innovations, a California-based provider of bio-based pest management and plant health products, gained EPA approval for a bioinsecticide. That product, according to Falkinham, is produced by "by a relative of our organism."

If Leone BioVentures decides to get the product approved for a specific use, it doesn't necessarily mean giving up on the dream of coming to the rescue of the mighty banana.

After the biofungicide proves to be successful in one arena, Falkinham says, it will get the attention of big companies. "Then with that small start we can start growing bigger and bigger," he says.



The effects of Black Sigatoka on banana plants

The goal isn't necessarily for Leone BioVentures to take the biofungicide to market itself, Goyette says. Instead, he hopes to get the product far enough along that a big agribusiness company will license it. The immediate next step, Goyette says, will be to register the product with the Environmental Protection Agency, but that requires expensive field tests.

Getting a new biopesticide to market costs between \$2 million and \$10 million, a large sum, but much less than the half a billion dollars for a chemical pesticide, according to Goyette. "Since it's a biological product that exists in the environment, there are fewer restrictions," he explains.

The cost also depends on how the biofungicide will be used. The company will take one of two routes. "You can either say it works for everything every place and then try to get it approved for a large variety of uses in

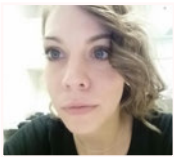
Meet Our New Department Members



Caroline Jones, Assistant Professor, joined our department in August 2015. She received her Ph.D. in Biomedical Engineering from the University of California, Davis, in 2010, then went on to conduct research at Harvard Medical School as a Research Fellow. Her current lab is a multidisciplinary research team focused on bridging cutting edge engineering disciplines with immunology to prevent, diagnose, and treat immune-related disorders.



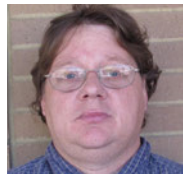
Jing Chen, Assistant Professor, is joining our department in December 2015 as part of the College of Sciences' Integrated Science Curriculum/Systems Biology program. She received her Ph.D. in Biophysics from the University of California, Berkeley, in 2010, then went on to pursue postdoctoral research at the National Heart, Lung, and Blood Institute at the National Institutes of Health. Her research focuses on mathematical modeling in cell biology.



Audriana Lamm, Fiscal and Administrative Support Assistant, joined our department in October. She has over ten years of experience providing customer service and administrative support in previous positions, and she is currently attending New River Community College. Audriana is responsible for providing support in various fiscal and administrative tasks in the Business Office.



Mark Lenzi, Research Specialist, joined our department in September. He received B. S. degrees in Biochemistry and Chemistry from Virginia Tech this past spring. His responsibilities include designing microfluidic devices to quantify host-pathogen interactions, managing equipment and supply needs, and maintaining a safe research environment in the Jones Lab.



Brian McElraft, IT Specialist, joined our department in September. He received a M.P.A. in Public Administration/Public Policy from Virginia Tech. Before joining our department, he worked at VT Outreach Information Services and the Virginia Bioinformatics Institute. He is responsible for providing support on all IT matters across our large department.



Update on the O.W.L.S.

The monthly O.W.L.S. (Older Wiser Leaders of Science) luncheon which was held in Blacksburg this October had one of the biggest turnouts ever! Back Row, L to R: **Klaus Elgert**, **Bob Benoit**, **Noel Krieg**, **Charles Rutherford**, **Don Cherry**, Carol Burger (SOC), Dick Burian (PHIL/STS) and **Anne McNabb**. Front Row, L to R: **Albert Hendricks**, Jay Stipes (HORT), **Tom Jensen**, and **Bruce Parker**. Mark Barrow (not pictured) from VT History Department was the 76th featured luncheon speaker! He gave a talk entitled "Alligator Tales: The Life and Times of a Charismatic Reptile."

Awards

John Tyson has been elected a Visiting Research Fellow of Merton College, Oxford University, for the Hilary and Trinity terms (January - July 2016). Dr. Tyson will use the fellowship to conduct research with Bela Novak, Professor of Integrative Systems Biology at Merton, with whom he has been collaborating for over 20 years on the molecular networks controlling growth and division of eukaryotic cells. Their work is currently funded by the BBSRC in the U.K. and the NIH in the U.S. Dr. Tyson has been a yearly visitor to Oxford since Dr. Novak moved there from the Technical University of Budapest in 2007, but this will be the longest visit to date.



The Department has once again received two Graduate School Dissertation Award fellowships to award. As has become our custom, the department is using these to recognize the efforts of four of our outstanding graduate students, based on the Graduate Review Committee's annual evaluations. Each will receive one semester of GRA support. This year's awardees are **Daniel Medina** (Belden Lab) and **Benjamin Webb** (Scharf Lab) for Fall 2015, and **Brett Tornwall** (Brown Lab) and **Jonathan Doubek** (Carey Lab) for Spring 2016.



Virginia Tech Corps of Cadets alumnus **Capt. Bryan Spear**, U.S. Army, who earned a degree in Biological Sciences from the College of Science and a minor in Leadership Studies from the Virginia Tech Corps of Cadets Rice Center for Leader Development in 2009 was selected as the Hokie Hero for the September 7th football game against Ohio State University.

Spear is on his second deployment to Operating Base Fenty in Jalalabad, Afghanistan, with the 101st Airborne Division. He is the company commander of a Medical Treatment Facility responsible for providing trauma care to coalition and partner forces in the eastern-most part of Afghanistan.

Spear hails from Chantilly, Virginia. While in the Corps of Cadets, he was a member of both Ranger Company in Army ROTC and the regimental band, the Highty-Tighties. He was also a proud member of the Virginia Tech Rescue Squad.

Spear sent a shout-out to his 2009 Corps buddies, the Virginia Tech Rescue Squad, and also thanked the Hokie Nation for continuously supporting military personnel who have served and are currently serving overseas. Most importantly, he thanked his wife, Audie Spear, for always standing by his side.

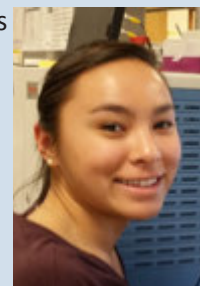


Sarah Stellwagen, (Opell Lab) who earned her Ph.D. this July, received the best student paper presentation award at this year's American Arachnological Society meeting for her paper entitled, "Intra-orb-web capture spiral adhesive droplet distributions." Co-authors on the paper were **Mary Clouse**, a Biological

Sciences undergraduate, and **Dr. Brent Opell**. In mid September, Dr. Stellwagen began an Interdisciplinary Biomaterials Postdoctoral Fellowship in the Sensors and Electron Devices Directorate of the U.S. Army Research Laboratory in Adelphi, MD.

Daniel Capelluto, **Michael Fox**, and **Konark Mukherjee** were all recently recognized as the VT Scholar of the Week by The Office of the Vice President for Research and Innovation.

Nicole Smith, a Biological Sciences senior performing undergraduate research in **Iulia Lazar's** lab, participated in the Virginia Tech Center for Drug Discovery Poster Session on Friday, November 6, and earned one of the five "best poster" prizes. The title of her presentation was "Proteomic approach for the identification of key signaling pathway components involved in aberrant cancer cell proliferation." Student co-authors included **Fumio Ikenishi**, also from Biological Sciences, and Call Scott from VTCRI.



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Department of Biological Sciences ***Annual Fund***



One person can make a big difference!

The Department of Biological Sciences has a rich history, a strong international reputation, and a bright future. The department oversees one of the two largest degree-granting programs at Virginia Tech and also provides instruction to thousands of students, both within the major and from across the college and university. Our undergraduate and graduate research-focused degree programs prepare society's future scientists, while our outstanding faculty members lead cutting-edge research that impacts society as a whole.

Your support is critical to our success. Any monetary contributions you make can be used to support deserving students, provide necessary equipment, or extend our research activities. This year we are again focusing our fundraising efforts on two important funds – The Department of Biological Sciences Research Day Fund (876105) and the Department of Biological Sciences General Fund (881317).

When you receive your College of Science Annual Fund letter or phone call, please earmark your support for the Department of Biological Sciences and one of these special funds. Simply make a notation on the gift card or let the caller know that you want to direct your donation to the Biological Sciences Department and then include the specific fund name and number. To make an immediate contribution, you may visit the university's web site at www.givingto.vt.edu or contact the Office of Gift Accounting at (800) 533-1144.

For more information about these funds or to learn more about other ways to give, please contact Jenny Orzolek, Director of Development for the College of Science, at (540) 231-5643 or jorzolek@vt.edu. We thank you in advance for your support!