



# 4-VA at JMU



## 2016 - 2017 Annual Report



# 4-VA

Advancing The Commonwealth

# What is 4-VA?



## Mission

4-VA is a collaborative partnership between six Virginia universities that is powered by 4 initiatives. Our mission is to promote collaborations that leverage the strengths of each partner university and improve efficiencies in higher education across the Commonwealth of Virginia.

We carry out this mission by advocating unprecedented partnerships between faculty and departments to generate significant, innovative solutions to educational and real-world problems. Since 4-VA's inception, we've sponsored advancements in research, pilot courses, redesigned courses, shared courses, online programs, industry-focused adult degrees, new technologies, interventions, workshops, conferences and other programs.

## History

In 2010, the presidents of George Mason University (GMU), James Madison University (JMU), the University of Virginia (UVA) and Virginia Tech (VT) combined forces with Governor Bob McDonnell, other members of Virginia's government, and Cisco Systems, Inc. to launch 4-VA in response to the Governor's Higher Education Commission and the Governor's Commission on Economic Development & Job Creation.

The focus on STEM education and innovation to "better position Virginia to create jobs and grow the economy" led to a broad challenge for the universities that continues to guide the work of the growing collaborative.

Also in 2010, 4-VA began implementing Cisco TelePresence Systems at the universities so the administrators, staff and faculty could work toward their common goals in live, virtual environments. Identical videoconferencing rooms on each campus allow for a seamless conference space that virtually matches the two halves of the room to create a cohesive learning environment and eliminate the time and fiscal costs of travel. By deconstructing barriers to collaboration, classes can take place in real time in two places with disciplinary experts working together to deliver innovative instruction.

Early growth gained momentum and 4-VA continued to expand in scope and further develop its infrastructure. In December of 2014, 4-VA welcomed Old Dominion University (ODU) as a new member. In the same year, 4-VA transferred management of the executive office to JMU in the Department of Information Technology. Most recently in June of 2017, 4-VA formally accepted Virginia Commonwealth University (VCU) as the newest 4-VA partner institution.

## The Board

4-VA's direction is set by the management board, which consists of the six university presidents. Virginia's secretary of education, the executive director of the State Council of Higher Education for Virginia (SCHEV), and a Cisco representative serve as ex officio members of the board.

## 4-VA at JMU

4-VA at JMU is housed jointly under the provost and the assistant vice president of information technology. Nick Swayne serves as the executive director and the campus coordinator and Kelsey Tate serves as the assistant director of 4-VA at JMU.



“What I didn't realize at the beginning of this project was that 4-VA would do far more than provide me with startup funds for the project. They also introduced me to the network of collaborators—most of them 4-VA grant winners themselves—that I would work with intensely over the following years.

That's what I find fascinating about 4-VA as an organization: it's not just a means of supporting faculty's research or teaching ideas through financial support. It's also an ever-growing network of like-minded researchers and teachers who are interested in collaborating with each other to try out new ideas that would be impossible otherwise. I didn't expect that when I started out on this journey, and I'm honestly not sure I'd have had the opportunity to succeed with my project without the network that 4-VA provided for me.

Dr. Seán McCarthy, grant recipient, shared course faculty member and Assistant Professor of WRTC at JMU



## 4-VA at JMU Annual Report

As a part of 4-VA, each university has developed unique programs to fulfill the initiatives based on their respective strengths and resources. The 4-VA at JMU Annual Report features 4-VA projects funded through James Madison University, where we put ideas into action by inviting innovative collaboration across disciplinary boundaries, among the Virginia system of universities, and between educational and business sectors.

The “4” in 4-VA represents our 4 initiatives:

1. Collaborative Research
2. Course Redesign
3. Course Sharing
4. Degree Completion

# Table of Contents

01	What is 4-VA?
03	Table of Contents
05	Collaborative Research
07	2016-2017 Collaborative Research Grants
09	Surface Science and Catalysis Research featuring <b>Dr. Ashleigh Baber</b>
13	Stream Acidification and Fish Species Diversity featuring <b>Dr. Christine May</b>
15	The Vernal Pool Project featuring <b>Dr. Cindy Klevickis</b> <i>Empowering students and restoring habitats</i>
19	Improving Water Quality featuring <b>Dr. Daniel Downey</b> <i>A pilot study at a state fish hatchery</i>
21	Enriching Experiences featuring <b>Dr. David Stringham</b> <i>Music technology engagement for adults with intellectual and developmental disabilities</i>
25	Digitizing an Archive featuring <b>Dr. Deborah Gleason &amp; Dr. Nena Powell</b> <i>A collaborative digitization of the Dora Cline Fechtmann archival collection</i>
29	Digital Anatomy featuring <b>Dr. Erika Kancler</b> <i>Building interactive medical images to enhance anatomical learning</i>
31	Sustainable Innovation featuring <b>Dr. Jacquelyn Nagel</b> <i>Biomimicry in engineering</i>
35	Technology for Transportation featuring <b>Dr. Samy El-Tawab</b> <i>Improving transit bus operations using low-cost technology</i>
37	2017 CGEMS Summer Workshop
39	2017 Summer Statistics Refresher Boot Camp featuring <b>Dr. S. Jeanne Horst</b>
43	Course Redesign
44	2016-2017 Course Redesign Projects
45	Biology Redesign – Boosting STEM Retention Rates <i>Developing an engaging, student-centered first year experience</i>
49	jmUDESIGN <i>An instructional design institute for faculty</i>
53	Mindfulness and Self-Care in the Helping Professions featuring <b>Dr. Michele Kielty</b> <i>A course redesign by JMU and GMU</i>

57	Course Sharing
59	2016-2017 Shared Courses
61	International Physics Experts Meet at JMU featuring <b>Dr. Adriana Banu</b> <i>Workshop at the Madison Accelerator Laboratory</i>
JMU X-Labs	
65	JMU X-Labs – Where unexpected cool stuff happens <i>Educate, Collaborate, Innovate</i>
Educate	
67	The JMU Fueled Project featuring <b>Amanda Presgraves</b> <i>Students develop healthy solutions</i>
69	H4D <i>Hacking 4 Defense™ with Stanford University</i>
75	The Virginia Drones Project
79	Augmented and Virtual Reality Design <i>A shared course with GMU</i>
81	Walking Bike Simulations featuring <b>Dr. James Sochacki</b> <i>Multidisciplinary class models and designs prototypes</i>
85	JMU X-Labs Consulting with ComSonics <i>Training for professionals</i>
Collaborate	
87	Student Leaders in Innovation at JMU X-Labs <i>An interview featuring <b>Chris Ashley</b></i> <ul style="list-style-type: none"> <li>• University Innovation Fellows</li> <li>• Bluestone Hacks</li> <li>• JMU X-Labs Pop-Up Classes</li> <li>• JMU Society of Entrepreneurs</li> </ul>
91	Establishing a STEM Pipeline <i>Local engagement supports innovative teens</i>
Innovate	
93	Governor’s Technology Award <i>JMU X-Labs awarded for innovation by Governor Terry McAuliffe</i>
94	Congressman Bob Goodlatte Visits the Award-winning JMU X-Labs
95	Drone Class at JMU X-Labs Recognized as Trendsetter <i>Listed in NMC Horizon Report</i>
96	JMU X-Labs Start-ups <i>Student ventures that began at JMU X-Labs</i>
97	<b>Richard Xu</b> Builds Giant 3D Printer
99	Degree Completion
100	2016-2017 Degree Completion Projects
101	Degree Completion
103	Facing It <i>A seminar on the work of Pulitzer prize winner Yusef Komunyakaa</i>
105	Also Inside
106	VIRTUES II Drone Conference <i>Virginia Robotics and Unmanned systems Education Summit</i>
109	Faculty and Program Contacts



# Collaborative Research



8

All 8 JMU colleges represented



26

Departments represented



11

Funding cycles since 2012



92

Unique grant recipients

**\$15,000,000+**

Applied for in external funding during 2016-2017

From organizations including the following:



**Carnegie Mellon**



## 2016-2017 Collaborative Research Grants

<b>Dr. Adriana (Leontina) Banu, Associate Professor of Physics and Astronomy</b>	<i>Workshop on the Science, Instrumentation and Education Program at the Madison Accelerator Laboratory</i> in collaboration with Dr. Kevin Giovanetti, Dr. Gabriel Niculescu, Dr. Ioana Niculescu and Scottie Pendleton at JMU and Dr. Gail Dodge at ODU
<b>Dr. Angela Smith, Associate Professor of Economics</b>	<i>Exploring Gender Effects in the Volunteer's Dilemma</i> in collaboration with Dr. Charles Holt at UVA
<b>Dr. Ashleigh Baber, Assistant Professor of Chemistry and Biochemistry</b>	<i>Harnessing TiO<sub>2</sub>/Au and Au/TiO<sub>2</sub> Catalysts for Propene Oxide Synthesis</i> in collaboration with Dr. John Morris at VT
<b>Dr. Costel Constantin, Assistant Professor of Physics and Astronomy</b>	<i>Kapitza Conductance Measurements of Metal/PEDOT:PSS Interfaces as a Function of Electrical Conductivity</i> in collaboration with Dr. Patrick Hopkins at UVA
<b>Dr. Daniel Downey, Professor of Chemistry and Biochemistry</b>	<i>Water Quality Improvement Pilot Study for Montebello Fish Culture Station</i> in collaboration with Thom Tears at the Virginia Department of Game and Inland Fisheries
<b>Dr. Elise Barrella, Assistant Professor of Engineering</b>	<i>Madison Connect HUB V2.0 Development &amp; Analysis of Collaborations</i> in collaboration with Dr. Olga Pierrakos at JMU and other 4-VA institutions
<b>Dr. Erika Kancler, Assistant Professor of Health Sciences</b>	<i>Radiology for Anatomists: Building Interactive Medical Images to Enhance Anatomical Learning</i> in collaboration with Carolyn Schubert and Kevin Hegg at JMU
<b>Dr. George Vidal, Assistant Professor of Biology</b>	<i>Understanding Neurodevelopmental Disorders Through Genome Editing of the Cerebral Cortex</i> in collaboration with Dr. Michael McConnell at UVA
<b>Dr. Giovanna Scarel, Associate Professor of Physics and Astronomy</b>	<i>Modeling charge density in infrared power generation</i> in collaboration with Dr. Ilarion Melnikov at JMU and Dr. Balsa Terzik at ODU
<b>Dr. James Herrick, Associate Professor of Biology, Dr. Steve Cresawn, Associate Professor of Biology and Dr. Ray Enke, Assistant Professor of Biology</b>	<i>Expanding the JMU Center for Genome and Metagenome Studies as a Resource for Educators in the Shenandoah Valley Region</i>
<b>Dr. S. Jeanne Horst, Associate Professor in the Center for Assessment and Research Studies; Department of Graduate Psychology</b>	<i>Increasing Stats Efficacy through Summer Stats Refresher Bootcamp</i> in collaboration with Dr. Karen A. Ford at JMU

<b>Dr. Joy Myers, Assistant Professor of Early, Elementary and Reading Education</b>	<i>In search of Effective Practices and Pedagogies in Elementary Writing Methods Courses in the Commonwealth</i> in collaboration with Dr. Judy Paulick at UVA
<b>Dr. Keigo Fukumura, Assistant Professor of Physics and Astronomy</b>	<i>A Systematic X-Ray Study for the Physical Origin of Soft Excess Luminous Galaxies</i> in collaboration with Dr. Peter Becker at GMU and Dr. Yoshiko Haba at Aichi University of Education, Nagoya, Japan
<b>Dr. Kevin Caran, Professor of Chemistry and Biochemistry</b>	<i>A Novel Multidisciplinary Approach to Combat Pathogenic Bacteria</i> in collaboration with Dr. Kyle Seifert and Dr. Klebert Feitosa at JMU
<b>Dr. Marcelo Dias, Assistant Professor of Physics and Astronomy</b>	<i>SMART Mechanics Lab: Structures, Materials and Art mechanics laboratory</i> in collaboration with Dr. James Hanna at VT
<b>Masoud Kaveh Baghbadorani, Assistant Professor of Physics and Astronomy</b>	<i>Optical Properties of Hybrid/Organic Plasmonic Nanowires Heterostructures</i> in collaboration with Oleksandr Kokhan at JMU and Dr. Chenggang Tao at VT
<b>Dr. Michael Renfroe, Professor of Biology</b>	<i>Developing Industrial Hemp Markets in Virginia: Academic and Industrial Partnerships</i> in collaboration with Dr. Samuel Morton at JMU, Dr. John Fike at VT, and Dr. Michael Timko at UVA
<b>Paul Mabrey, Speech Communication Coordinator in JMU Learning Centers, and Beth Cunningham, Faculty in Educational Foundations and Exceptionalities - Learning Centers</b>	<i>Using debate to improve student learning and faculty engagement in education and exceptional education across the commonwealth</i> in collaboration with Dr. Frederick Brigham at GMU, Kat Alves at Longwood University, and Dr. Carol Shakeshaft at VCU
<b>Dr. Roshna Wunderlich, Professor of Biology</b>	<i>Characterization of the intrinsic foot muscles using novel elastomer gel deformations and electromyography</i> in collaboration with Dr. Klebert Feitosa at JMU
<b>Dr. Samuel Morton, Associate Professor of Engineering</b>	<i>Improving Design of Integrated Photobioelectrochemical Systems for Bioenergy Recovery from Wastewater</i> in collaboration with Dr. Jason Zhen at VT
<b>Dr. Samy El-Tawab, Assistant Professor of Integrated Science and Technology</b>	<i>Implementation and Data Collection for Improving Transit Bus Operations using Low Cost WiFi Technology</i> in collaboration with Dr. Byungkyu Brian Park at UVA and <i>Development of Transit Bus Performance Monitoring System using Low Cost WiFi Technology and Cloud Computing in/out of James Madison University Campus</i> in collaboration with Dr. Byungkyu Brian Park at UVA
<b>Dr. Yonathan Admassu, Assistant Professor of Geology and Environmental Science</b>	<i>Use of unmanned aerial vehicles (UAVs) for slope stability studies</i> in collaboration with Dr. Lindsay Burden at UVA

# Surface Science and Catalysis Research

**Dr. Ashleigh Baber**  
Assistant Professor of Chemistry

**Amount Awarded**  
Spring 2016 – \$5,000  
Fall 2016 – \$10,000

In the spring of 2016, 4-VA awarded Dr. Ashleigh Baber \$5,000 to work with Dr. John Morris at VT on a grant called **Ethanol Chemistry on Titania/Gold Model Catalysts** with the aim of understanding how molecules interact with and react on catalytic surfaces to drive the rational design of new materials for catalysis. There are many industrial applications for ethanol including its use as a solvent in perfumes and essences, as a fuel and fuel additive in the automotive industry, and for the production of hydrogen to use as a direct fuel or for hydrogenation reactions. Studies of ethanol chemistry on oxygen-modified gold surfaces catalyze the oxidation of ethanol to form important chemical feedstocks as well.

*Catalysts play a key role in improving and maintaining air, water and soil quality and are central to the production of food, chemicals and pharmaceuticals. – The Langmuir Research Institute*

The research is conducted in an effort to unravel the key active sites of solid catalytic materials to better understand structure-reactivity relationships. Surface science studies of the size effects of nanoparticles contribute to the understanding of the basic chemistry of these materials related to small molecules.

The collaboration allowed JMU and VT to study the same system with a wide variety of surface science techniques that complement each other to obtain a full picture of the chemistry of ethanol on TiO<sub>2</sub>/Au surfaces. The fundamental characterization of active sites is necessary for understanding reaction pathways, leading to the synthesis and conversion of fuels and the rational design of the next generation of catalysts that can deliver the desired reactivity. Parallel collaborative experiments at the two universities allowed the team to elucidate the critical relationship between chemical reactivity and structure of relevant catalytic materials in an effort to understand the fundamental mechanisms in ethanol conversion reactions to guide the rational design of more active catalysts.

“ My presentation at the national American Chemical Society conference sparked the interest of a theoretical chemist in the audience, with whom I am now working to collaborate with. The addition of theory to my lab’s work will greatly enhance the research, our opportunities for external funding, and consideration for publication by high impact factor journals.

Dr. Ashleigh Baber



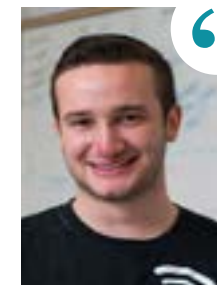
*Nick Tosti prepares to dose reactant molecules into the UHV chamber while Vivian Lam checks the position of the sample. Max Gillum and Dr. Baber analyze Auger electron spectroscopic data to monitor surface species.*



## Surface Science and Catalysis Research *Continued*

In the fall of 2016, 4-VA awarded the team \$10,000 for a grant called **Harnessing TiO<sub>2</sub>/Au and Au/TiO<sub>2</sub> Catalysts for Propene Oxide Synthesis** so they could continue to conduct surface science research using an ultrahigh vacuum (UHV) chamber. The targeted results, especially when considered in tandem, will shed light on the reaction mechanism by which propene oxidizes and the nature of the active sites necessary for efficient catalysts. New discoveries in this area hold the potential to transform the propene oxide and associated materials industry.

One manuscript was published as a result of the first 4-VA grant, and the second grant will facilitate the research necessary to continue lab productivity, resulting in more publications. Publications with first author undergraduates can help to increase their chances for success while applying to graduate school. The data obtained is used to apply for external, federal funding at the National Science Foundation and the Department of Energy.



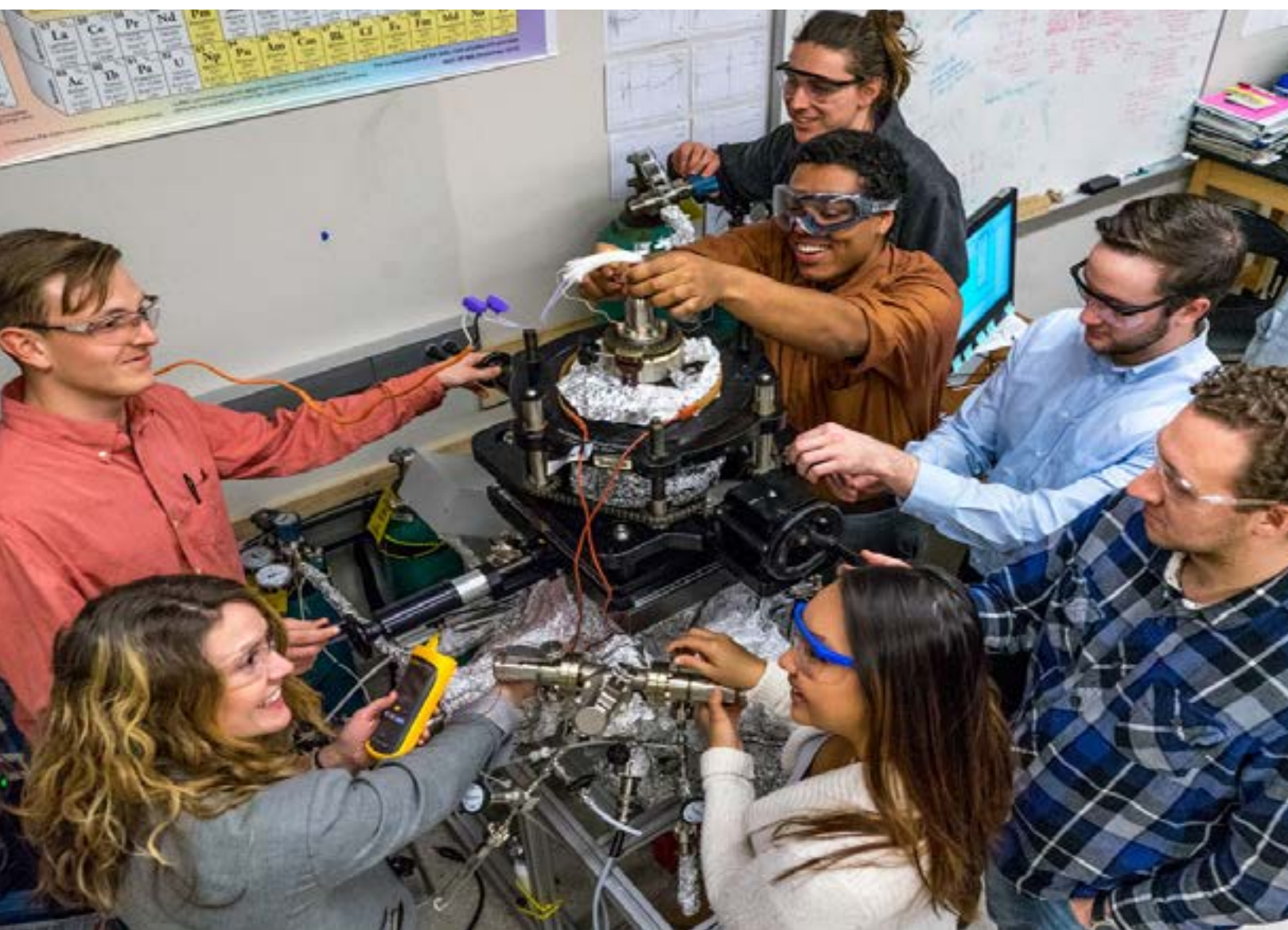
“ I have a greater appreciation for failure now than I used to. Failure is something that classes don't teach because if you fail in a class then you really set yourself back and that can cause stress or anxiety. In the research lab, failure can be plentiful but you learn to get past it. The mental strength you develop in the lab stems from your dealings with failure and it is invaluable especially in the field of science.

Jeremy Wilke



“ Working on this project in Dr. Baber's lab solidified my ambition to be a scientist and propelled me to pursue further education in chemistry. The funding from 4-VA helped make research opportunities possible, which ultimately made me competitive in graduate applications.

David Boyle



Dr. Baber, David Boyle, Nick Tosti, Max Gillum, Jeremy Wilke, Wil Andahazy and Vivian Lam all work together to prepare for a temperature programmed desorption experiment.

### Collaborators

**Dr. John Morris**  
Professor of Analytical Chemistry and Graduate Program Director



### Student Researchers

- Jeremy Wilke, Chemistry, Class of 2018
- David Boyle, Chemistry, Class of 2017

### Student Impact

- Significantly bolstered student resumes and CVs
- Work featured in high quality, peer-reviewed publications
- Made significant progress as independent scientists and critical thinkers
- Unique undergraduate access to hands-on ultrahigh vacuum (UHV) surface science research
- First publication has a JMU senior first author, who is now a Ph.D. student at Stanford University
- Rare undergraduate exposure to state-of-the-art concepts in catalysis, surface science, and surface science instrumentation

### Benefits to the Commonwealth

- ✓ Developed strong surface science collaboration across Virginia
- ✓ Obtained preliminary data for future federal funding
- ✓ Leveraged specialized chemistry resources
- ✓ Initiated statewide surface science network

### Conferences – *Undergraduates are underlined*

- **Baber, A. E., Boyle, D. T.; Andahazy, W. J.; Lam, V. H.; Schlosser, D. A.; Tosti, N.; Wilke, J. A.**, Determining optimum surface preparations to control the selectivity of ethanol chemistry over TiO<sub>2</sub>/Au(111), 253rd American Chemical Society National Meeting, San Francisco, April 6, 2017. Oral presentation.
- Boyle, D. T.; Wilke, J. A.; Lam, V. H.; Baber, A. E., Elucidating distinct Au(111) and TiO<sub>2</sub>/Au(111) surface sites for the selective oxidation of ethanol to acetaldehyde, 253rd American Chemical Society National Meeting, San Francisco, April 2, 2017. Undergraduate poster presentation.
- Wilke, J. A.; Baber, A. E., Stabilization and reaction of small molecules on TiO<sub>2</sub>/Au(111) inverse model catalysts, 253rd American Chemical Society National Meeting, San Francisco, April 2, 2017. Undergraduate poster presentation.
- **Baber, A. E., Boyle, D. T.; Andahazy, W. J.; Lam, V. H.; Schlosser, D. A.; Tosti, N.; Wilke, J. A.**, Titania/gold inverse model catalysts for acetaldehyde formation from ethanol, 63rd International American Vacuum Society Symposium & Exhibition, Nashville, TN, November 9, 2016. Oral presentation.

### Publication

- David T. Boyle, Jeremy A. Wilke, Robert M. Palomino, Vivian H. Lam, Daniel A. Schlosser, Wil J. Andahazy, Cameron Z. Stopak, Dario J. Stacchiola, Jose A. Rodriguez, and Ashleigh E. Baber, "Elucidation of Active Sites for the Reaction of Ethanol on TiO<sub>2</sub>/Au (111)". *J. Phys. Chem. C*, 121 (14), pp 7794–7802 (2017).



# Stream Acidification and Fish Species Diversity



(Left) Dr. Christine May and Pat Harmon, a graduate student in biology, use an LR-24 Electrofisher to capture fish.

**Dr. Christine May**  
Associate Professor of Biology

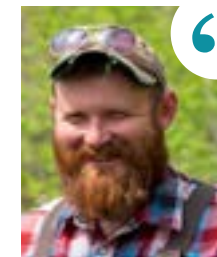
**Amount Awarded**  
October 2012 – \$5,000  
Fall 2015 – \$4,900

In 2012, 4-VA awarded Dr. Christine May \$5,000 for a grant called **Virginia Trout Streams Research Collaboration** to conduct Mountain Stream Symposium II, a one-day seminar held 10 years after UVA hosted the original Mountain Stream Symposium. The conference brought together scientists, agency representatives, policy makers and educators to provide a state-of-the-science update on mountain stream ecosystems in the central Appalachians and to formalize a research partnership focused on Virginia trout streams.

It was at the symposium that Dr. May first met Dr. Todd Scanlon from UVA. Then in 2015, 4-VA awarded Dr. May \$4,900 to work with Dr. Scanlon and Ami Riscassi on a grant called **Revealing the current relation between stream acidification and fish species richness: What is the trend after almost two decades of recovery?**

The project launched a collaboration between UVA's long-term water quality monitoring program and JMU's Department of Biology with the initial research effort assessing current status and trends in the biological health of watersheds in Shenandoah National Park. This information will aid decision makers at the local, state and federal level by providing valuable insight into the recovery trends of highly valued aquatic resources that have been impaired by acid rain.

Partnering with the Shenandoah Watershed Study & Virginia Trout Stream Sensitivity Study (SWAS-VTSSS) was an ideal opportunity for JMU to collaborate on a local and high-profile research endeavor with UVA at Shenandoah National Park. In addition to presentations and publishing the research, the team is also in the process of developing a teaching case-study for a quantitative ecology publication.



“ Apart from getting the opportunity to investigate regional impacts of air pollution on our local streams, the project presented the opportunity to work with some fantastic scientists from James Madison University, the Shenandoah Watersheds Study at the University of Virginia and from the Shenandoah National Park. The opportunity to pool resources and perspectives from these communities allowed us to approach our research from not only a biological perspective, but from the perspective of geology and chemistry.

Pat Harmon



“ Following up on a study that was conducted 20 years ago provides insight into the considerable period of time that it takes our environment to recover from detrimental human activities, but more importantly, we observed how the cessation of these harmful activities may increase fish health.

As a result of this project, I was able to spend a great deal of time immersed in the ecosystems that I am interested in, and subsequently develop questions, which led to the development of my master's thesis.

Jon Studio

“ 4-VA funding helped our project by providing initial resources that got our research project started and helped secure another mid-sized grant from the Shenandoah National Park Trust.

Dr. Christine May



## Collaborators

**Dr. Todd Scanlon**  
Associate Professor of Environmental Sciences at UVA

**Amy Riscassi**  
Projects Coordinator, SWAS-VTSSS, Department of Environmental Sciences at UVA



## Student Researchers

- Jon Studio – Graduate student in biology
- Pat Harmon – Graduate student in biology
- Sydni Reinhold – Undergraduate research student in biology

## Benefits to the Commonwealth

- ✓ Built collaborations between JMU, UVA and Shenandoah National Park

- ✓ Research publicized in regional newsletters and newspapers
- ✓ Demonstrated Virginia's impact on environmental research
- ✓ Informed sustainable land management

## External Funding

- In May of 2016, the Shenandoah National Park Trust awarded Dr. May \$12,315 to study changes in the acid neutralizing capacity of streams in the Shenandoah National Park, and assess any correlation with fish species richness.
- In March of 2017, the Virginia Department of Game and Inland Fisheries awarded Dr. May \$24,280 to quantify detection probabilities of the James Spiny Mussel and to determine the effects of flow, temperature and substrate on the surface expression of mussels.





According to naturalist Michael Hayslett, vernal pools are temporary, freshwater wetlands that contain water for a portion of the year. In Virginia, vernal pools are important habitats for salamanders, fairy shrimp, frogs, several endangered animal species and some rare wetland plant species.

[virginiavernallpools.org/educate.htm](http://virginiavernallpools.org/educate.htm)



Students prepare the ground for planting trees with Mike Long.

# The Vernal Pool Project

## *Empowering students and restoring habitats*

**Dr. Cindy Klevickis**  
Professor of Integrated Science and Technology

**Amount Awarded**  
Complementary funding – \$3,750

In 2015, 4-VA awarded Dr. Cindy Klevickis complementary funds for the project **Collaborative development of pre-service and in-service teachers to address STEM challenges through outdoor classroom learning** in partnership with Eric Fitzgerald and Pamela Pulver. The original grant was awarded at GMU to Dr. Thomas Wood for \$16,150.

Dubbed the Vernal Pool Project, the team combined funding from the 4-VA grant, a grant from the JMU Center for STEM Education and Outreach, and grants to Rockingham County Schools to enhance the environmental quality of a vernal pool at Buck Hill Camp in Mt. Solon, Virginia.



“With the help of 4-VA, we were able to take the project to a much higher level. The partnership allowed the middle school teachers to have more access to resources and materials that would otherwise not have been possible. It also gave expertise in the subject area.

Eric Fitzgerald, Director of Career and Technical Education at Rockingham County Public Schools

The Vernal Pool Project allows JMU and middle school students to engage in scientific concepts first learned in the classroom, giving students a better understanding of environmental science and how they can make a difference in creating, restoring and managing habitats. Two JMU student interns worked with Mike Long’s 8th grade agricultural leadership class at Wilbur Pence Middle School to develop and present related lessons and to plan an overnight field trip at the project site.

With other grant funds, JMU Roop Learning Community students and Rockingham County 8th grade students planted over 100 Virginia native trees to provide a buffer between the camp’s vernal pool and adjacent croplands. An ongoing project, the team is also focused on the following exciting prospects:

- Purchasing a camera capture system to record wildlife visiting the site
- Removing invasive species and cataloging native species in the area
- Purchasing educational signage
- Developing partnerships to take drone photographs of the area over time

As the team continues student research on the vernal pool habitat, they will collect species population counts, gather data from wildlife cameras and build an educational website that will be available to the public. In the fall of 2017, JMU students will help coordinate an environmental day for middle school students which will expose them to the environmental significance of vernal pools. In the spring of 2018, JMU and Rockingham County Schools will host the award-winning author Dr. David Sobel for a series of presentations and workshops about the philosophy of place-based education.



Erica Blaine from the JMU Roop Learning Community helps plant trees for The Vernal Pool Project



Janine Lorenzo gets ready to plant trees

**The Vernal Pool Project** *Continued*

“ If we want children to flourish, to become truly empowered, then let us allow them to love the earth before we ask them to save it. What’s important is that children have an opportunity to bond with the natural world, to learn to love it and feel comfortable in it, before being asked to heal its wounds.

Dr. David Sobel, Author, Core Faculty member and Director of Certificate Programs at Antioch University New England

“ I hope that this will be a first step to develop more partnerships between Rockingham County Schools and JMU. It is a win-win situation for pre-service JMU teachers to assist the schools with hands-on, place-based experiences. I hope that JMU students will help our teachers develop unique opportunities in science for school students.

Eric Fitzgerald, Director of Career and Technical Education at Rockingham County Public Schools

**Collaborators**

**Dr. Thomas Wood**

*Associate Professor of Integrative and Interdisciplinary Studies at GMU*

**Eric Fitzgerald**

*Director of Career and Technical Education at Rockingham County Public Schools*

**Pamela Pulver**

*Supervisor for Science at Fauquier County Schools*



**Student Researchers**

- Elayna Cross – Interdisciplinary Liberal Studies, Class of 2018
- Katie Scupp – Interdisciplinary Liberal Studies, Class of 2018

**Student Impact**

- Provided opportunity for college students to mentor middle school students
- Empowered students to engage in and impact the world around them

**Benefits to the Commonwealth**

- ✓ Demonstrated Virginia’s impact on environmental education
- ✓ Developed new models for teaching and learning
- ✓ Exposed students to STEAM topics at impressionable age
- ✓ Improved the local environment

# Improving Water Quality

## A pilot study at a state fish hatchery

**Dr. Daniel Downey**  
Professor of Chemistry

**Amount Awarded**  
Fall 2016 – \$4,000

In the fall of 2016, 4-VA awarded Dr. Daniel Downey \$4,000 to collaborate with the Virginia Department of Game and Inland Fisheries on a project called **Water Quality Improvement Pilot Study for Montebello Fish Culture Station**.

Dr. Downey worked with Hatchery Manager and former JMU student Thom Tears and student researcher Kolin Kulzer to set up the pilot study at the Montebello Fish Culture Station where they are enhancing the chemistry of spring water by treating it with limestone. The treated water is fed into a tub tank containing rainbow trout, which have shown better growth rates than the control group in an adjacent tank.

*Hatchery Manager Thom Tears (left), Dr. Downey and JMU student researcher Kolin Kulzer (right) examining limestone used for water chemistry research at Montebello Fish Culture Station*



*Dr. Downey removing limestone from the treatment bed for analysis back at JMU*



“As we hoped, the limestone improved the water chemistry of the spring that feeds the raceways at Montebello. The fish response was dramatic with a 10% increase in weight, better health and vitality and zero mortality. Nearly 1,000 water chemistry analyses have been done in the past 10 months to confirm that the observed changes were due to the application of limestone.

Dr. Daniel Downey



Recent studies show that recreational anglers are major powers when it comes to the strength of the economy. Virginia is home to or a destination for more than 800,000 anglers each year. Fishing alone is responsible for more than \$1.3 billion in economic impact in the state

**Virginia Department of Game & Inland Fisheries**

[dgif.virginia.gov/fishing/how-fishing-benefits-virginians](http://dgif.virginia.gov/fishing/how-fishing-benefits-virginians)

*Downey Lab students (left) Olivia Swahn, Thom Tears and Kolin Kulzer collecting field data at Paint Bank Fish Hatchery in June 2017*

**Collaborators**

- Thom Tears**  
*Hatchery Manager at the Montebello State Fish Hatchery*
- Virginia Department of Game and Inland Fisheries**

**Student Researchers**

- Kolin Kulzer – Chemistry, Class of 2017
- Kevin Pyszka – Chemistry, Class of 2017
- Olivia Swahn – Chemistry, Class of 2018
- Wolf Tears – Chemistry, Class of 2018, Liberty University

**Student Impact**

- Unique opportunity to apply analytical chemistry to a real-world problem

**Benefits to the Commonwealth**

- ✓ Demonstrated Virginia’s impact on environmental research
- ✓ Contributed to long-term health of Virginia’s \$1.3 billion inland fisheries industry
- ✓ Enhanced fish production at a key state facility

**Conference**

- Presented “Water Quality Improvement Plan for Montebello Fish Cultural Station” poster at the Southern Division of the American Fisheries Society’s **Virginia and Virginia Tech Chapter Joint Meeting 2017** “Applied Fish Health” in Lexington, Virginia

**External Funding**

- February 2017 – The Virginia Department of Game and Inland Fisheries awarded Dr. Downey \$30,000 to conduct a comprehensive lake water chemistry evaluation of several lakes in the Chesapeake Bay watershed to better estimate the amount of fertilizer for future applications to achieve fishing management goals.
- June 2017 – The USDA Forest Service awarded Dr. Downey \$8,000 to monitor stream quality.

“Part of being human is being musical. A variety of studies involving young children suggest we are born musicians. Unfortunately, many persons are not afforded opportunities to develop their musicianship throughout their lifespan. This project offers a population not typically served a chance to develop musical skills (e.g., listening, performing, creating), and provides our profession with another example of the type of work that a music educator might undertake in her or his career.

Music education is often thought of as teaching K-12 students to perform notated music in a band, choir, or orchestra, or teaching elementary school children in a general music classroom. I hope that this project helps expand conceptions of music education to include varied populations (in this case, adults with intellectual and developmental disabilities), tools (here, iPads, chimes, and other music instruments), and skills (in our project, listening to, performing, and creating music). This study provides students with a concrete example of another type of teaching they might explore as they consider what kind of music educator they want to be, as well as practical insights that can be useful for their development as teachers, regardless of population(s) with which they choose to work.

Dr. David Stringham



## Enriching Experiences

### *Music technology engagement for adults with intellectual and developmental disabilities*

**Dr. David Stringham**  
Associate Professor of Music  
Coordinator, Music and Human Services Minor

**Amount Awarded**  
Fall 2014 – \$3,000

In October of 2014, 4-VA awarded Dr. David Stringham a grant called **Music Technology Engagement for Adults with Intellectual and Developmental Disabilities** to collaborate with Dr. Paul Ackerman of JMU, Dr. Kelly Parkes (then of VT; currently at Teachers College Columbia University), The Arc of Harrisonburg and Rockingham, and two JMU undergraduate students. The project studied particular forms of musical engagement with adults with intellectual and developmental disabilities (I/DD) with the intention that future investigations could expand to other forms of music making and a variety of other populations.

Because there is a lack of research examining music achievement of students with special needs—particularly adult learners—this research sought to better understand possibilities for music engagement among adults with I/DD.

Student teacher-researchers led weekly music sessions for approximately 15 adults with I/DD where they listened to, performed, created, and responded to music. Since some people find acoustic instruments such as pianos, guitars, and drums challenging, the team also used five iPads that offered simple, user-friendly musical applications.

*The project focused on the following research questions:*

1. What type(s) of music achievement can be documented among adults with I/DD?
2. What are strengths and weaknesses of the iPad as a tool for music engagement among adults with I/DD?
3. What type(s) of development can be observed among pre-service music educators who teach music to adults with I/DD?



*The Rocktown Chimers at their Christmas concert at the Virginia Mennonite Retirement Community*





## Interview featuring Shelby Hall *Music Education, Class of 2017*

Shelby graduated from JMU in May of 2017 with a degree in music education and a minor in music and human services. She taught music to people with disabilities at The Arc of Harrisonburg and Rockingham through Dr. Stringham's project and shared her experience with 4-VA.

### 4-VA: What was your role in the project?

Shelby Hall: I led musical experiences for people with intellectual and developmental disabilities. I taught one-on-one sessions using iPads, and I also taught group music sessions using a variety of resources. Hand chimes played a large part in the group sessions, and our group performed Christmas tunes at the Virginia Mennonite Retirement Community this past December.

### 4-VA: What was the most rewarding part of participating in the project?

Shelby Hall: The relationships I formed with the people at The Arc made this project incredible. Every person there had different strengths and gifts, and it was wonderful to see them come through while participating in music. I volunteered at The Arc for about 2 years. As schedules changed, different people would come to music every semester. But there were a few who stuck with it through the 2 years, and those friendships are priceless. My last semester there, while we transitioned to a group music session, we had days where 15 or 16 people came to the sessions. It was incredible to see the number of participants grow from 6 to 16.

I also value the small but sweet moments I had with them during our music sessions. I'll never forget when one person sang harmony with a recording of The Beach Boys during a one-on-one session. I'll also never forget when another came to music for the first time after months of me asking. Another person would teach me a new word in sign language every time I came to The Arc, using her hands and a book that she constantly carried. Those sweet moments contributed to the growth of our relationships, and I will always be grateful for those moments.

### 4-VA: How do you perceive this project has impacted the adults with I/DD?

Shelby Hall: Everyone in the music room together had to work together to accomplish one goal. We developed skills pertaining to working as a team. While we were all working on skills such as playing together, singing together, and staying on beat, some had other skills to practice, such as looking up and staying focused on the task at hand. Performing in front of a large group of people sparked confidence, and I'm sure they enjoyed creating something (a musical experience) for others.

### 4-VA: How did the project impact your education and your future career?

Shelby Hall: Unfortunately, there are not many full time jobs to teach music to adults with disabilities. However I would like to do something similar to this in the future. As of now, the plan is to find a job teaching music in a public school, and then start a program similar to this experience once a week after school. There are not many opportunities for adults with disabilities, and that needs to change. Community music allows people with disabilities to experience the social interactions they desperately need.

*Afterword: Shelby Hall has been hired as the new music teacher at Maiden Choice School in Baltimore, Maryland where she will specialize in working with children 3-21 years of age who have cognitive disabilities.*

### Collaborators

Dr. Paul Ackerman of JMU

Dr. Kelly Parkes

Teachers College Columbia University

The Arc of Harrisonburg and Rockingham



### Student Impact

- Provided unique opportunity for college students to teach music
- Empowered students to engage in and impact the community

### Benefits to the Commonwealth

- ✓ Provided research examining music achievement of students with special needs
- ✓ Developed new models for teaching and learning
- ✓ Prepared music educators for teaching students with special needs

### Publications

- Parkes, Kelly A. and Stringham, David A. (in press). "Assessing Music Learning Among Adult Music Learners with Special Needs". Selected Papers from the 6th International Symposium on Assessment in Music Education. Chicago: GIA Publications, Inc.

### Conferences

- K.A. Parkes and D.A. Stringham. Spoken Paper and Poster: "Assessing Music Learning Among Adult Music Learners with Special Needs". The Sixth International Symposium on Assessment in Music Education. Birmingham, UK. April 18-21, 2017.
- K.A. Parkes and D.A. Stringham. Spoken paper: "Pre-Service Music Educators' Experiences Teaching Adults with Intellectual and Developmental Disabilities Using Technology". The 10th International Conference for Research in Music Education. Bath, UK. April 24-27, 2017.
- D.A. Stringham, K.A. Parkes, & S.E. Hall. Primary Presentation Session: "Teaching Music to Adults with Intellectual and Developmental Disabilities: How Music Teacher Educators Can Learn From One Pre-Service Music Teacher's Experiences." Society for Music Teacher Education Symposium. Minneapolis, MN. September 7-9, 2017.



# Digitizing an Archive

## *A collaborative digitization of the Dora Cline Fechtmann archival collection*

**Dr. Deborah Gleason**  
Assistant Professor of Nursing

**Dr. Nena Powell**  
Associate Professor of Nursing

**Amount Awarded**  
Spring 2016 - \$7,500

In the spring of 2016, 4-VA awarded Dr. Deborah Gleason and Dr. Nena Powell a grant called **A collaborative digitization of the Dora Cline Fechtmann archival collection at two Virginia Universities** to collaborate with Dr. Mary Gibson and Linda Hanson at UVA along with Lynn Eaton and Laura Davis at JMU.

Graduate student Caroline Hamby was instrumental in transcribing the diary (circa 1935-1937) of Dora Cline Fechtmann, who trained as a nurse at Rockingham County Memorial Hospital Nurses School. A collection of scrapbooks included Ms. Fechtmann's photographs, postcards and correspondence.

After the team digitized the photos, they were included in a module for an elective course to teach the history of nursing during World War II (WWII) and to give students the unique perspective of a local nurse. In the spring of 2017, 25 students took the course for the first time.

“Our work shows how multiple departments and schools of nursing can collaborate on digitization of an historic archival collection. Caroline Hamby was able to decipher and digitize the diary of Dora Cline Fechtmann, and we were able to digitize the entire archival collection and use the collection in an online course at JMU in the spring of 2017.

Dr. Deborah Gleason

“I appreciated the opportunity to share with students a local nurse's photos and experiences during her WWII service. This certainly added to the other information that my students learned about in the nursing and war module and allowed for some comparison of Ms. Fechtmann's service with other WWII nurses.

Dr. Nena Powell

Digitizing an Archive *Continued*

## Interview featuring Caroline Hamby *Clinical Mental Health Counseling MA/EdS*

Caroline is a graduate student in the Clinical Mental Health Counseling program at JMU and works for JMU's Innovation Services as the digital scholarship/educational technologist. She played an essential role in the transcription of Ms. Fechtmann's diary and she shared her experience with 4-VA.

### 4-VA: What was your role in the project?

Caroline Hamby: With help from a 4-VA grant, I spent part of this year working on the transcription of a diary kept by a nursing student named Dora Cline Fechtmann studying in the 1930's at Rockingham County Memorial Hospital Nurses School. I embarked on this project in order to help bring the diary and the context in which the diary was written to life for students both at JMU and at UVA.

### 4-VA: How did Dora Cline Fechtmann's story impact you?

Caroline Hamby: Dora's story impacted me a great deal. In a way, her fastidious daily entries about all aspects of her life made me feel like I was getting to know her. I think the diary communicates important things about women in the Harrisonburg community and their professional ambitions close to a century ago. Even though women's vocational choices were limited, women like Dora made a true difference for the people they served.

### 4-VA: What was the most rewarding part of participating in the project?

Caroline Hamby: I loved reading about her daily life, her dinners at her family's home, the sewing and the church picnics she attended. Dora wrote faithfully in her diary about her academic experience and her clinical experience. She clearly was devoted to her work and believed in its power. Her care for her patients is evident in the way she writes about them and listens to their life stories. This apparently continued to be true as she moved into war work and communicated with soldiers' families. Transcribing her story was a wonderful experience, and I hope that students and faculty will continue to learn from it.

### 4-VA: What impact does her story have on local nursing students and the JMU nursing program?

Caroline Hamby: Nursing faculty at both universities wished to use the diary in conjunction with other material to talk about the history of nursing. With the transcription now completed, faculty and students can benefit from the diary's extensive information about both the medical profession and daily life in that era. I see that as incredibly useful for nursing students at JMU and a unique way for faculty to contextualize the history they are teaching.

After completing the majority of the project, I learned that Dora went on to be a military nurse in WWII and post-war returned to Harrisonburg to practice for the rest of her working life, further cementing her place as an important member of the community whose experience should not be forgotten.



(Left to right) Dr. Nena Powell, Lynn Eaton, Laura Davis and Dr. Deborah Gleason meet in the Special Collections section of Carrier Library

### Collaborators

#### Dr. Mary Gibson

Assistant Director of the Eleanor Crowder Bjoring Center for Nursing Historical Inquiry at UVA

#### Lynn Eaton

Special Collections Librarian at JMU

#### Laura Davis

Digital Conversion Specialist at JMU

#### Linda Hanson

Project Coordinator of the Eleanor Crowder Bjoring Center for Nursing Historical Inquiry at UVA



# Digital Anatomy

## Building interactive medical images to enhance anatomical learning

**Dr. Erika Kancler**  
Assistant Professor of Health Sciences

**Amount Awarded**  
Spring 2013 – \$10,000  
Spring 2017 – \$7,000

In 2013, with a 4-VA grant called **Digital Anatomy Repository** and support from JMU’s Innovation Services, Dr. Erika Kancler developed special radiology images for teaching anatomy to undergraduates at JMU. Using Neatline, a tool originally intended to enhance geographical maps and timelines, Dr. Kancler created interactive and informative maps and timelines of the human body. Each detailed X-ray image is tagged with “hot spots” with annotations to identify complex and minute anatomical structures and pathologies. The images are stored in Innovation Services’ Omeka system, which is a web-publishing platform for curating digital collections of research.

In the spring of 2017, 4-VA awarded Dr. Erika Kancler a grant called **Radiology for Anatomists: Building Interactive Medical Images to Enhance Anatomical Learning** to collaborate with Carolyn Schubert and Kevin Hegg from JMU, along with Dr. Kitt Shaffer at the Boston University School of Medicine. The funding is helping the team improve the user interface and provides software for photo editing, usability testing and software development.

Undergraduate students have played a key role in the project by curating content for the system. They have spent several semesters outlining structures on x-ray images using Affinity Photo, uploading x-ray images and “layers” of anatomical structures into Neatline and Omeka, and tagging and linking the structures to make the images searchable. They presented a poster at JMU’s Teaching and Learning with Technology conference in 2016.

“Our research consists of the development of a novel online, interactive pedagogy tool for health professions students to learn anatomical structures through medical images used in “real life” scenarios.

Dr. Erika Kancler



“It is important to get the basic anatomical knowledge down, but you must be able to build on it and apply it to your profession to be successful. By annotating these images, we give students the ability to study a tool that they may not have been able to access otherwise.

It puts me at an advantage over other medical school students because I have experience looking at X-rays while most of them do not. While I’m definitely not an expert, this project has provided me with the grounding I need to be successful as a physician.

Kevin White



“This project has been quite impactful for me. I have known for some time that I wanted to become a physician assistant (PA), but this project really affirmed that for me. Dr. Erika Kancler has been inspiring to work alongside and her constant encouragement has really propelled me to develop a strong work ethic and a powerful desire to pursue my dreams. This project has really cemented my knowledge of anatomy, which has subsequently increased my confidence as I prepare to enter the grueling realm of PA school.

Mary Pegelow

### Collaborators

**Carolyn Schubert**  
Assistant Professor of Health Sciences & Nursing  
Librarian at JMU

**Kevin Hegg**  
Director of Digital Projects at JMU

**Dr. Kitt Shaffer**  
Professor of Radiology and Vice-Chairman for  
Education at the Boston University School of Medicine

### Student Researchers

- Anna Steenland – Nursing, Class of 2019
- Kevin White – Health Sciences, Class of 2017
- Kody Farrington – Health Sciences, Class of 2017
- Laura Young – Nursing, Class of 2019
- Mary Pegelow – Health Sciences, Class of 2017
- Mikayla Comer – Health Sciences, Class of 2017
- Monica Eaton – Health Sciences, Class of 2017

### Student Impact

- Provided students with a deeper understanding of anatomy
- Empowered students to build a valuable educational tool

### Benefits to the Commonwealth

- ✓ Demonstrated Virginia’s impact on STEM education
- ✓ Developed new tools for teaching and learning
- ✓ Enhanced student performance, retention and success in STEM programs

### Conferences

- Presented Poster: “Looking Underneath: Building Interactive Medical Images to Enhance Anatomical Learning”. Teaching and Learning with Technology conference at James Madison University. October 24, 2016.



# Sustainable Innovation

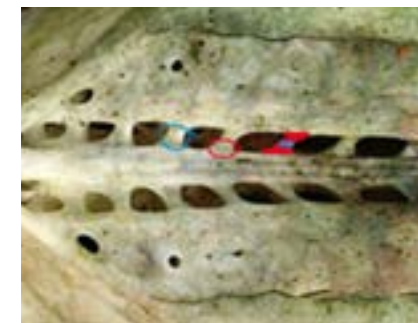
## *Biomimicry in engineering*

**Dr. Jacquelyn Nagel**  
Associate Professor of Engineering

**Amount Awarded**  
Fall 2013 – \$4,700  
Fall 2014 – \$15,000

In the fall of 2013, 4-VA awarded Dr. Jacquelyn Nagel \$4,700 to work with Brook Kennedy and Dr. Arthur Buikema at VT on a grant called **Sustainable Innovation: Integrating Teams in Biology, Design and Engineering**. In the spring of 2014 the team offered an undergraduate honors colloquium at VT called Integrating Biology and Design for Sustainable Innovation (BDSI). The course served as the platform for researching and developing bio-inspired design methodologies through a semester-long interdisciplinary team project. The course was offered to 12 undergraduate students equally representing biology, engineering and design and was taught collaboratively between Dr. Arthur Buikema and Brook Kennedy from VT with instrumental involvement from Dr. Jacquelyn Nagel at JMU. Dr. Nagel developed a similar course offered in parallel to BDSI in order take advantage of pooling resources and learning to develop courses collaboratively in the future.

In December 2014, 4-VA awarded the team with a scale-up grant called **Manufacturing Innovation through Sustainable Design** to continue researching the connection between form and function as found in nature. Integrating biological shape and form into product design minimizes material diversity and increases recyclability while still achieving the desired function.



*Bird skull*



*Redesign planning*



*3D prototype design*

In 2017, the project continues to impact students at JMU. One example is the redesign of a bicycle helmet using the delicate structure of a bird skull for inspiration. Engineering student Branden Gross researched the materials currently used in bicycle helmets to understand the function of each material. Then he compared the structure of those materials with similar biological structures, such as the skulls of birds and other vertebrates. The truss-like shapes found in bird skulls, for example, transfer any compressive load from the center to the outside of the vertebrae. After planning his helmet redesign, Branden created computer models of the bio-inspired design and ran simulations to test its effectiveness for absorbing shock.

“One of my most gratifying moments this year was working with my multidisciplinary research team (engineering, biology, and ISAT students) on the Sustainable Manufacturing and Design project. They impress me constantly! I challenge them and they deliver.

Last year I challenged them to present a poster on the research and they won best poster at ASME's AM3D Conference. This year I challenged them to write a conference paper and submit to the ASME International Design Engineering Technical Conference that I have been attending since graduate school. They got a peer-reviewed publication accepted with minor revisions! This speaks to the caliber of undergraduate research at JMU.

Dr. Jacquelyn Nagel

Sustainable Innovation *Continued*

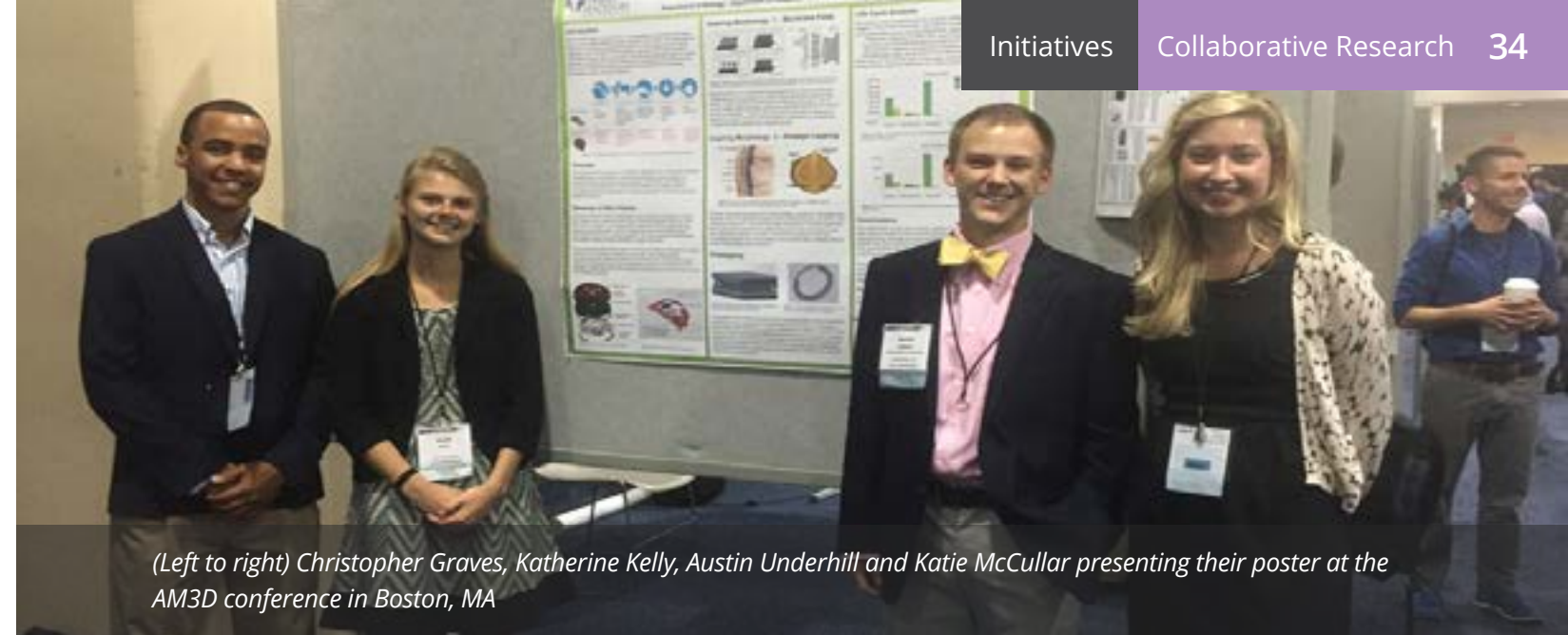
**Methodologies Incorporated**

We followed the **bio-inspired design process** by defining functions that solve our problem (multi-material products), finding biological systems that exhibit those functions, and applying what we learned from those biological systems. Specifically, we were looking at the forms, shapes, and geometries that the biological system had in order to achieve the function.

We followed **design for additive manufacturing** by considering how the redesigned, bio-inspired design could be printed.

We followed **life-cycle analysis** by considering the manufacturing method and manufacturing materials such that the energy embodied in the product could be reclaimed at the end of its life.

Dr. Nagel



(Left to right) Christopher Graves, Katherine Kelly, Austin Underhill and Katie McCullar presenting their poster at the AM3D conference in Boston, MA



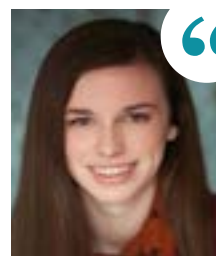
“Bio-inspired design can lead to some very interesting and useful products. Used in tandem with current modeling programs and manufacturing methods, these designs can be made very easily and can reduce the amount of waste that would sit in landfills.

Branden Gross



“The most important thing I learned from this project is that no problem can be fully addressed by looking at it from a single perspective (in my case, the biological perspective). It takes looking at a problem through multiple lenses to come up with a truly comprehensive solution. It showed me that a collaborative classroom may be what professors across disciplines should strive for to create open conversations between specialties.

Katie McCullar



“Most engineering students are only briefly introduced to the idea of bio-inspired design, whereas I’ve been involved in an entire research project focused on it. I’ve learned a lot over the course of this project, which has furthered my education at JMU. I feel like this makes me stand out to future employers, since I am more specialized in this field.

Madison Anderson

**Collaborators**

**Brook Kennedy**

Associate Professor of Industrial Design at VT

**Dr. Arthur Buikema**

Alumni Distinguished Professor of Biological Sciences at VT



**Student Researchers**

- Austin Underhill – Engineering
- Branden Gross – Engineering, Class of 2018
- Christopher Graves – Engineering, Class of 2017
- Katherine Kelly – ISAT, Class of 2016
- Katie McCullar – Biology and Psychology, Class of 2017
- Madison Anderson – Engineering, Class of 2019
- Preston Rhodes – Class of 2017

**Student Impact**

- Won best poster at The American Society of Mechanical Engineers (ASME) AM3D Conference
- Peer-reviewed publication accepted at ASME International Design Engineering Technical Conference

**Benefits to the Commonwealth**

- ✓ Maximized university resources
- ✓ Developed new models for teaching and learning
- ✓ Received recognition and funding from a national government agency
- ✓ Demonstrated Virginia's impact on improving recyclability and eliminating manufacturing waste
- ✓ Improved and enhanced student performance, retention, and success in STEM programs at Virginia universities

**Conference Presentations/Publications**

- McCullar, K., Underhill, S.A., Rhodes, P., Nagel, J.K. “Exploring the Application of Biomimicry for Sustainable Design,” Poster Presentation at the Virginia Academy of Science (VAS) Annual Meeting, Mary Washington University, May 2016.
- McCullar, K., Underhill, S.A., Rhodes, P., Nagel, J.K. (2016) “Application of Bio-Inspired Design to Minimize Material Diversity,” Proceedings of ASME IDETC/CIE 2016, DFMLC-59684, Charlotte, NC.
- Nagel, J.K., Graves, C., Underhill, S.A., McCullar, K., Kelly, K. “Application of Bio-inspired Design to Minimize Material Diversity,” Poster presentation at the ASME Additive Manufacturing and 3D Printing (AM3D) Conference and Expo, AM3D2015-1537, Boston, MA, August 2015. **\*Won best poster award.**

**External Funding**

- September 2015 – Dr. Nagel was one of a team of researchers to receive a \$48,000 grant from the National Science Foundation (NSF) to explore pedagogical models that incorporate sustainability awareness and principles in engineering education and introduce them at universities in the Americas.
- September 2015 – Dr. Nagel and Christopher Rose from the JMU Department of Biology received an NSF grant for \$128,000 to research, develop, implement, assess and disseminate instructional resources for engineering faculty to teach bio-inspired design across disciplines.

# Technology for Transportation

## Improving transit bus operations using low-cost technology

**Dr. Samy El-Tawab**  
Assistant Professor of Integrated Science and Technology (ISAT)

**Amount Awarded**  
Fall 2015 – \$7,700  
Fall 2016 – \$10,000  
Spring 2017 – \$5,000

In October 2014, Dr. Samy El-Tawab attended the NSF Workshop on Large-Scale Traffic and Driving Activity Data (DriveSense '14) in Norfolk, Virginia. Sitting next to him at the group dinner was Dr. Byungkyu "Brian" Park from UVA, who wondered out loud how many members were in the restaurant. Dr. El-Tawab suggested that they could count them by the number of cell phone signals and Dr. Park asked if the same thing could be done at a bus station. Dr. El-Tawab assured him that it could.

The chance meeting led to their first 4-VA grant of \$7,700, awarded in the fall of 2015, called **Improving Transit Bus Operations using Low Cost Bluetooth Technology**. They decided to focus on the transit bus system since it's a key component in achieving more sustainable urban transportation systems. The goal of the project was to increase bus ridership through better scheduling and route management.



(Left to right) Dr. Park, Dr. El-Tawab, John Whittier, Michael Garcia, Chris Johns and Raymond Oram at a JMU bus stop

“The collaboration between JMU and UVA had a huge impact on my students who were able to work on a real-world project and see the effect of their work on a bus system that they use on a daily basis.

Dr. Samy El-Tawab



Dr. El-Tawab holds a low-cost technology device (Raspberry Pi) at a JMU bus stop.

The study consisted of two groups—one from JMU and one from UVA—who assessed local bus operation performance, such as waiting times at bus stations, using a low cost technology system such as WiFi. As a continuation of the study, 4-VA awarded the team \$10,000 for **Implementation and Data Collection for Improving Transit Bus Operations using Low Cost WiFi Technology** in 2016 and an additional \$5,000 for **Development of Transit Bus Performance Monitoring System using Low Cost WiFi Technology and Cloud Computing in/out of James Madison University Campus** in 2017.

JMU Transportation Demand Manager Lee Eshelman and the Harrisonburg Department of Public Transportation are excited about the success of the project and would like to see data nodes installed at each bus stop across campus (18 bus stations) and near off-campus housing to improve operations at JMU.



“The project was the technical high point of my college career and is certainly the experience I value the most.

Ray Oram



“After putting this project on my resume, I saw the number of online views of my resume increase significantly, as well as the number of interviews and job offers I received. I knew that this project would give me an edge over some of my competition in the job market and I definitely attribute it to helping me to take a full time position at a very well respected telecommunications firm.

Andrew Funkhouser

### Collaborators

**Dr. Byungkyu Brian Park**  
Associate Professor of Civil and Environmental Engineering



### Student Researchers

- Ray Oram – ISAT, Class of 2016, Hired at Rosetta Stone
- Andrew Funkhouser – ISAT, Class of 2016, Hired at Jacobs Telecommunications, Inc.
- Michael Garcia – ISAT, Class of 2016, Hired at Cisco
- Chris Johns – ISAT, Class of 2016, Hired at Accenture
- Kyle Evers – Computer Science, Class of 2017
- Kevin Olsen – ISAT, Class of 2018

### Student Impact

- Provided opportunity to engage in real-world solutions
- Empowered students to visibly improve local transportation operations
- Hired by high-profile companies

### Benefits to the Commonwealth

- ✓ Improved two major university cities' transportation systems
- ✓ Developed new model for collecting data
- ✓ Leveraged technology expertise across Virginia

### Publications

- S. El-Tawab, R. Oram, M. Garcia, C. Johns and B. B. Park, "Poster: Monitoring transit systems using low cost WiFi technology," 2016 IEEE Vehicular Networking Conference (VNC), Columbus, OH, 2016, pp. 1-2.
- S. El-Tawab, R. Oram, M. Garcia, C. Johns and B. B. Park, "Data analysis of transit systems using low-cost IoT technology," 2017 IEEE International Conference on Pervasive Computing and Communications Workshops (PerCom Workshops), Kona, HI, 2017, pp. 497-502.
- K. Evers, R. Oram, S. El-Tawab, M.H. Heydari and B.B. Park, "Security Measurement on a Cloud-Based Cyber-Physical System Used for Intelligent Transportation," 2017 IEEE International Conference on Vehicular Electronics and Safety, Vienna, Austria, June 27-28, 2017.
- (Accepted): S. Choi, J. Whittier, B. B. Park and Samy El-Tawab, "Exploring the Feasibility of Bluetooth and Wi-Fi Technologies for Measuring Transit Passengers Wait-Times and Origin-Destination Travel Times," at the ITS World Congress 2017 Montreal, Canada, Oct 29, 2017 to Nov 2nd, 2017.

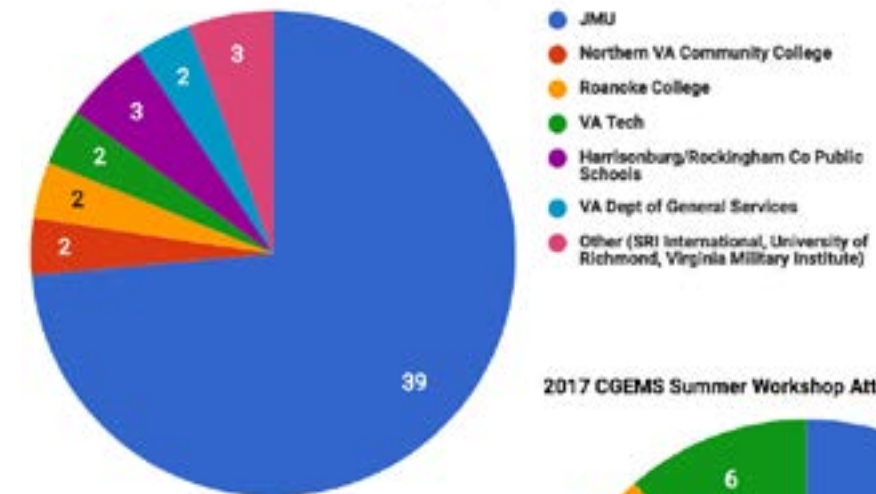
# 2017 CGEMS Summer Workshop

In July, the JMU Center for Genome & Metagenome Studies (CGEMS) offered its third annual summer workshop, the **2017 CGEMS Summer Workshop in Genomics & Bioinformatics for Beginners and Beyond**. The three-day workshop focused on genomics & bioinformatics methodologies for applications in research as well as secondary and undergraduate coursework. 4-VA sponsored the workshop, making it free for students and faculty to attend.

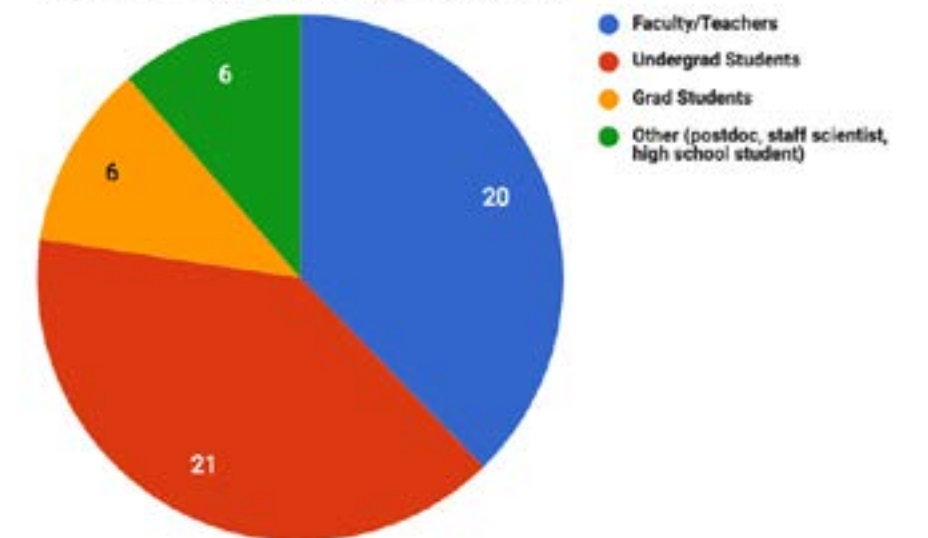


(Left) James Budnick (VT graduate student), Simin Assadi (Northern VA Community College faculty), Mia Wenzel (JMU undergraduate student), and Curtis Kapsak (JMU graduate student) prep samples for sequencing as part of the DNA barcoding workshop.

2017 CGEMS Summer Workshop Attendees (by institute)



2017 CGEMS Summer Workshop Attendees (by position)



“ Thanks again for supporting the 2017 CGEMS Summer Workshop. We had our best one yet in terms of attendance numbers and diversity with 53 total attendees from a variety of institutions around the region/state.

Dr. Ray Enke

# 2017 Summer Statistics Refresher Boot Camp

**Dr. S. Jeanne Horst**

*Associate Professor/ Associate Assessment Specialist in the Center for Assessment & Research Studies*

**Amount Awarded**  
Fall 2016 – \$4,754.63

In the fall of 2016, 4-VA awarded Dr. Jeanne Horst \$4,754.63 to collaborate with Dr. Karen Ford, Dr. Brian Leventhal and Derek Sauder on a grant called **Increasing Stats Efficacy through Summer Stats Refresher Boot Camp**. The team designed a pilot class with the potential of developing it into a shared course.

Offered in August of 2017, the boot camp was a zero-credit, three-day course designed to help students review basic statistical concepts prior to attending their required intermediate statistics courses. Thirty-four students attended the course from programs in the Department of Graduate Psychology, the School of Strategic Leadership Studies Ph.D. program, and the Department of Communication Sciences and Disorders Ph.D. program. Several JMU faculty and staff members also participated and throughout the course, students engaged in discussion-based lectures and hands-on activities.

Students' statistics knowledge, statistics self-efficacy, and statistics mindset were assessed in a pre-post design to determine the effectiveness of the boot camp. On average, students' statistics knowledge increased 2.35 points (out of 25) from pre- to post-test. Additionally, this was paired with a large increase in self-efficacy equal to roughly a one-point increase from pre- to post-test (1-6 scale.) There was no change in pre- to post-test mindset scores and the course evaluation feedback was overwhelmingly positive.



*Statistics boot camp participants complete one of many metacognitive assessments and hands-on activities.*

“ Students enter their intermediate graduate statistics class with a variety of backgrounds and levels of self-efficacy. In particular, low confidence and self-efficacy in statistics ability can interfere with students' motivation and lead to anxiety. By offering a safe yet challenging environment to refresh statistic skills, students can more comfortably enter their graduate statistics course. Large increases in self-efficacy were seen following this year's boot camp. Moreover, qualitative feedback from students supported the effectiveness of the boot camp in promoting their comfort and efficacy for their statistics course.

Dr. S. Jeanne Horst

2017 Summer Statistics Refresher Boot Camp *Continued*



Dr. Karen Ford chats with Tiffany Runion, a statistics boot camp participant.



Derek Sauder, a doctoral student in the Assessment and Measurement Ph.D program, leads a statistics boot camp session.



“ I am returning to college after a 23-year Air Force career. The boot camp was a great refresher and it gave me the confidence I needed to enter PSYC 605. I could see the hard work that was put into this program and the faculty was understanding, caring and genuine. We are lucky to have them at JMU.

John Ginnity, Ph.D. candidate in Strategic Leadership Studies



“ This boot camp (1) significantly reduced my fears of statistics, (2) made me more confident in my ability to learn statistics, and (3) reduced my overall anxiety by allowing me to meet my professors and TA’s in advance. By the end of the three-day boot camp I was excited to get going and felt well prepared for the semester.

Jay Davis, Ph.D. candidate in Combined-Integrated School and Clinical Psychology

**Collaborators**

**Derek Sauder**  
*Doctoral Teaching Assistant in the Center for Assessment & Research Studies*

**Dr. Karen Ford**  
*Director of Strategic Leadership Studies at JMU*

**Dr. Brian Leventhal**  
*Assistant Professor in the Center for Assessment & Research Studies*

**Student Impact**

- Significantly increased student confidence in learning statistics
- Improved student abilities in implementation and analysis of assessments

**Benefits to the Commonwealth**

- ✓ Developed a strong pilot class for potential shared courses across Virginia
- ✓ Improved the likelihood of student success in graduate programs
- ✓ Developed new models for teaching and learning

# Course Redesign

**0 F's or Withdraws**  
in Chemistry 131 after 1 semester of redesign

**6**  
Departments represented

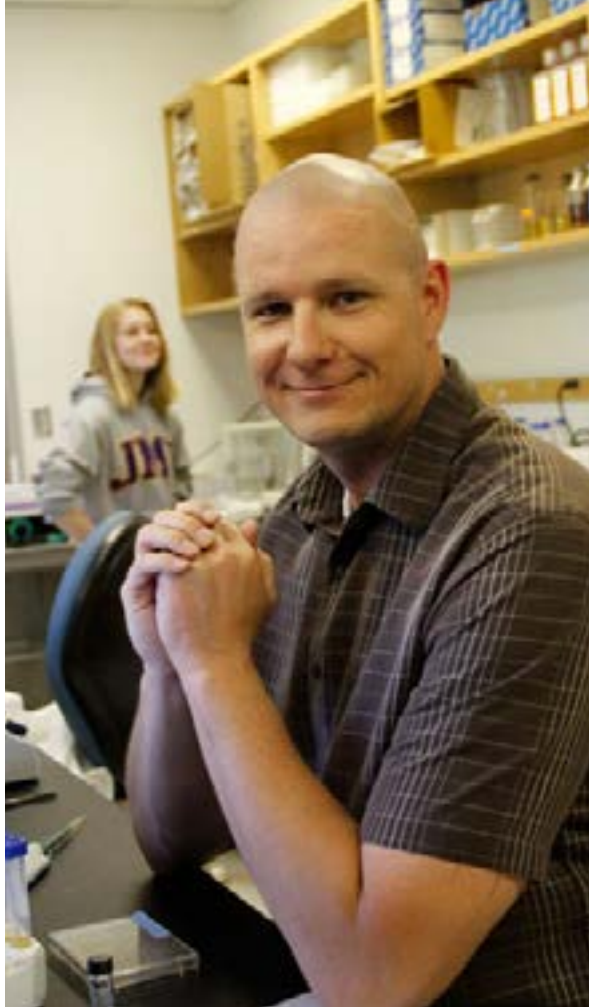
**8% more A's**  
8% Increase in "A's" of at-risk students in introductory chemistry

**+ 25**  
jmUDESIGN participants from

-  3 community colleges
-  3 4-VA universities
-  1 local private school

## 2016-2017 Course Redesign Projects

<b>Dr. Brent Cunningham, Assistant Professor of Engineering</b>	<i>Chemistry for Engineers Course Development</i> in collaboration with Dr. Rebecca Jones at GMU and Dr. Lindsay Wheeler at UVA
<b>Carissa Henriques, Assistant Professor of Art, Design and Art History</b>	<i>Course Redesign for "Social Entrepreneurship and Design for Social Impact"</i> in collaboration with Dr. Justin Henriques at JMU
<b>JMU Biology and Chemistry Curriculum Redesigns</b>	<i>Making significant changes to reduce drop, fail, withdraw rates from introductory courses and improve retention in STEM fields</i>
<b>jmUDESIGN</b>	<i>Annual Course Redesign Institute held at James Madison University through the Center for Faculty Innovation</i>
<b>Dr. Joseph Harsh, Assistant Professor of Biology</b>	<i>Development and Implementation of UTA Teaching Methods Course</i> in collaboration with Dr. Lindsay Wheeler at UVA
<b>Dr. Karim Altaï, Professor of Integrated Science and Technology</b>	<i>Redesign of Energy Fundamentals (ISAT 310)</i>
<b>Dr. Michele Kielty, Professor of Graduate Psychology</b>	<i>Mindfulness and Self-Care in the Helping Professions: A Shared Course with JMU and GMU</i>



“ This curriculum redesign could not have happened without having excellent colleagues that have devoted countless hours to provide the best learning experience for our students. Additionally the support of Joanna Mott, Department Head of Biology, was critical. She provided resources and endless support through the process. Finally, support from 4-VA allowed many faculty to work together over multiple summers.

Dr. Kyle Seifert



Students amplify DNA extracted from organisms they collected to identify them via DNA barcoding.

In 2011, with support from the National Science Foundation (NSF), the American Association for the Advancement of Science (AAAS) published *Vision and Change in Undergraduate Biology Education: A Call to Action*. The 100-page report documents recommendations that derived from an invitational conference on *Vision and Change in Undergraduate Biology* in 2009 that “sought direction on how to improve undergraduate biology education to better prepare all undergraduates for the biology-related challenges of the 21st century”.

– <http://visionandchange.org/files/2013/11/aaas-VISchange-web1113.pdf>

In addition, the 2012 *President's Council of Advisors on Science and Technology (PCAST) Report* established the following:

“**The first two years of college** are the most critical to retention and recruitment of STEM majors.”

“Research on the exodus from STEM disciplines shows that many students who transfer out of STEM majors perform well, but they describe the **teaching methods** and **atmosphere** in introductory STEM classes as **ineffective** and **uninspiring**.”

“**STEM disciplines have substantially lower rates of retention** than do the social sciences and humanities. Furthermore, many of those who leave STEM majors express **dissatisfaction with the teaching of STEM classes**. This should be seen as a **national crisis of STEM teaching**, yet many STEM faculty members believe that this “weeding out” process is in the best interest of their disciplines and the larger national interest. If many of those who leave performed well in introductory STEM courses, and many others could be helped to succeed, then it is unreasonable to conclude that this attrition represents an effective selection process that is maximally beneficial to STEM fields.”

## Biology Redesign

### Boosting STEM Retention Rates

#### *Developing an engaging, student-centered first year experience*

When the 2012 PCAST report was published, there was a large push in the scientific community to develop introductory biology curricula with authentic, open-ended research experiences that would emphasize core concepts and competencies that are required for biologists in the field.

In response to that demand, JMU charged a subcommittee with developing a new, engaging and student-centered first year experience (FYE) for students where they could easily transfer from other institutions. After three years of preparation and discussion, the subcommittee presented a preliminary proposal to faculty, who voted to support full development of the new FYE.



**Biology Redesign – Boosting STEM Retention Rates** *Continued*

The subcommittee has been meeting regularly since 2016 with 4-VA covering the costs of faculty working over the summer. In a short period of time, the group has accomplished a significant amount of work, including the following:

- Studied the *Vision and Change* document and other relevant publications to guide their work
- Exhaustively reviewed FYEs from a variety of schools, community colleges and large research universities
- Developed learning objectives for both the lab and lecture that map to both *Vision and Change* and to departmental objectives
- Investigated course-embedded undergraduate research experience (CURE) programs to present options to the faculty for discussion
- Consulted with Associate Professor of Biology Dr. Sharon Babcock to ensure that pre-professional student needs would be met with the new FYE

As a result of the redesign, JMU offered two brand new, biology major, prerequisite classes during the 2016-2017 academic year. Between the two courses, about 900 students per semester—from biology, biotechnology, health sciences and other pre-professional majors—now benefit from a refreshed first year experience. During their first year, students are already developing their own research projects and doing complex analyses, including DNA sequencing and using bioinformatics tools.

**JMU Faculty Subcommittee**

- Dr. Tim Bloss – Associate Professor of Biology
- Dr. Kerry Cresawn – Assistant Professor of Biology
- Dr. Steve Cresawn – Associate Professor of Biology
- Dr. Elizabeth Doyle – Lecturer in Biology
- Dr. Raymond Enke – Assistant Professor of Biology
- Dr. Susan Halsell – Associate Professor of Biology
- Dr. Joseph Harsh – Assistant Professor of Biology
- Dr. Oliver Hyman – Lecturer in Biology
- Dr. Patrice Ludwig – Assistant Professor of Biology
- Dr. Kyle Seifert – Associate Professor of Biology
- Dr. Kimberly Slekar – Associate Professor of Biology
- Andrea Pesce – Lecturer in Biology
- Robert Walters – Education & Finance



*Students pose with the wild mushrooms they will DNA barcode over the semester.*

Student feedback overwhelmingly pointed to the helpfulness of case studies in their first year biology classes. Here are a few student responses to the spring 2017 BIO 150 class:

“The case studies helped me understand the importance of what we were learning in a real world problem/context.”

“Working on case studies got me more engaged and able to connect it to the real world.”

“To understand the importance and effect of the surface-area-to-volume ratio (SA:V), we did an activity with dice. I never understood how important this ratio was, and this activity allowed me to understand it. Anything visual really enhanced my understanding of certain topics.”

“Being able to talk with my group and get their viewpoints and thoughts really helped my learning.”

“Case studies and metacognition helped me understand the direct impact of the topics on the world. It was really nice knowing that I can see the connection because it helped pushed my learning.”

“The finch case study really solidified the concepts of natural selection for me. I really enjoyed the case studies! It makes a huge difference to apply information learned in lecture to an activity like a case study.”



*Faculty members celebrate their first successful semester teaching the new BIO 140 labs.*



*Students collect organisms from the Edith J. Carrier Arboretum to help compile a list of the biodiversity in and around JMU and identify the organisms via DNA barcoding.*

**Student Impact**

- Significantly improved student interest in STEM subjects
- Students made substantial progress as new scientists and critical thinkers
- Unique undergraduate access to early hands-on research and analysis
- Eliminated all “F” grades among targeted at-risk students by spring of 2017

**Benefits to the Commonwealth**

- ✓ Strengthened FYE to boost STEM retention rates
- ✓ Aligned Virginia’s curricula with the needs established by the NSF, AAAS and the PCAST report
- ✓ Leveraged resources to create an optimized learning experience for Virginia students



*jmUDESIGN participants present their work during the gallery session*



“ These principles have become a direct focus of my dissertation work, which I never would have anticipated. Once you start these principles, they become intuitive and they affect how you think.

Indigo Eriksen, Assistant Professor of English at Northern Virginia Community College



“ The first year I taught a course, the DFW rate (D-grades, F-grades, or Withdrawals) was about 25% and 8 out of 14 groups never passed a single test case for that project. This means that they weren't achieving basic functionality. The year after the jmUDESIGN redesign, the DFW rate went down to 5% and every single group passed the test cases.

Dr. Michael Kirkpatrick, Assistant Professor of Computer Science at JMU

## jmUDESIGN

### *An instructional design institute for faculty*

With support from 4-VA, the Center for Faculty Innovation (CFI) at JMU hosted its seventh jmUDESIGN Institute in June 2017. This engaging five-day course, curriculum, and instructional design institute brought more than 25 participants together from JMU, Bridgewater College, George Mason University, Lord Fairfax Community College, Old Dominion University, Piedmont Virginia Community College and Thomas Nelson Community College. Participants worked in small groups on curriculum redesign using backward design principles and aligning assessments, assignments and outcomes.

Since 2012, the funding provided by 4-VA has been applied where the need is greatest. This year 4-VA provided \$14,000 which helped cover stipends for table facilitators, housing for out-of-town participants, and catering for the event.

The impact of jmUDESIGN goes beyond improved curriculum and reflective teaching practices by also offering a greater sense of belonging and morale across departments, JMU, and higher education throughout the Commonwealth of Virginia.



“ Collaborating with professors from diverse backgrounds provided different perspectives on course redesign. I value the input on how to enhance my courses at the community college level, challenge my students to think outside of the box, and know that professionals engaged in higher education face similar issues that I see at the junior college. It is refreshing to know that I am not alone and can communicate with others who have the same passion for teaching.

Beverly Nicholson, Assistant Professor of Human Services Program at Thomas Nelson Community College



Alumni panel (left to right): Elise Barrella, Michael Kirkpatrick, Liz Edwards, Indigo Eriksen and Remy Pangle



Participants discuss implementation of jmUDESIGN tools

## Interview featuring

### Indigo Eriksen

Assistant Professor of English  
Northern Virginia Community College

I first participated in jmUDESIGN in 2015 as a group facilitator and have been returning ever since, for a total of three institutes so far.

The jmUDESIGN Institute taught me a variety of practices from Just-in-Time Teaching (JiTT) to the jigsaw technique, which I've used to enrich and diversify classroom conversations. Because we modeled these teaching strategies at the institute, I was prepared to put most of the pedagogies into immediate practice without intense preparation. This is especially useful as a full-time community college English professor. I teach five courses a semester and need engaging, interactive teaching options that don't require me to spend hours planning. jmUDESIGN offered so many different ideas that I have been able to rotate different teaching interventions in all my classes so that my students stay present and excited to apply new concepts to their learning.

Several larger ideas that stay with me as a result of the institute are thinking about beautiful questions, developing activities and assessments that privilege higher order learning skills (rather than relying on memorizing), scaffolding large projects into small and understandable pieces, slowing down the learning, and trusting the process. I've learned to trust my students as learners as a result of the practices and concepts we used at jmUDESIGN.

Before jmUDESIGN I didn't realize how deeply I cared about the transformative value of critical pedagogy and student-centered learning. My first year at the institute I discovered great joy in working with faculty as they design and redesign courses in ways that spark a deeper engagement with students. Now I am in the doctoral program of Writing and Rhetoric at George Mason University, where my dissertation research centers on transformative pedagogies and faculty development. The organizers of jmUDESIGN saw something in me that I hadn't yet known.



Students learn and practice mindfulness techniques as part of a pilot course.

# Mindfulness and Self-Care in the Helping Professions

*A course redesign by JMU and GMU*

**Dr. Michele Kielty**  
Professor of Counseling

**Amount Awarded**  
Spring 2016 – \$5,000

In the spring of 2016, 4-VA awarded Dr. Michele Kielty \$5,000 to collaborate across disciplines at JMU with Dr. Tammy Gilligan and Dr. Renee Staton, as well as with Dr. Nance Lucas, Dr. Mark Thurston and Mary Lynch at GMU on a grant called **Mindfulness and Self-Care in the Helping Professions: A shared course with James Madison University and George Mason University**.

Dr. Kielty's team collaborated with the faculty at GMU to create a course curriculum that focused on topics including neuroscience and mindfulness, burnout prevention, and evidence-based mindfulness interventions for clients, students, and patients. During the summer of 2017, they offered the course—called Mindfulness for Helping Professionals—to students from various helping professions (e.g., counseling, education, and health professionals) at both universities. The team used telepresence technology to meet with GMU colleagues for planning and collaboration and to allow GMU and JMU students to meet virtually to provide peer support/peer mentorship and to compare experiences.

The project also supported mindfulness intervention field trips that exposed students to various healing modalities appropriate for their future professions. One such field trip was a visit to the White Oak Lavender Farm in Harrisonburg, where students experienced mindfulness-related interventions for individuals seeking healing from physical or emotional stress. Instructor and student feedback was positive and they hope to expand the offering of the course.



“ Because of 4-VA, we were able to employ a graduate student and adjunct faculty member to develop shared course modules, correspond virtually with the shared course participants using 4-VA technology, and attend a field trip experience with our classes.

Dr. Michele Kielty

Mindfulness and Self-Care in the Helping Professions *Continued*

“ According to evaluations, students indicated that this type of training should be required for all helping professionals.

Dr. Tammy Gilligan



“ We appreciate the opportunity to offer this specialized class for our graduate students.

Dr. A. Renee Staton



“ The most rewarding part of participating in this project was the collaboration with GMU, and 4-VA made that possible. I also deeply appreciated the opportunity to bring my experiences with contemplative (mindfulness) practices, counseling, and counselor-education together into a project that benefited students at both JMU and GMU.

As a Ph.D. student and counselor educator, this project gave me further experience in synthesizing research, course design, and professional collaboration. I hope to take the skills I practiced in this project and apply them to my work as an instructor at Eastern Mennonite University.

Michael Horst



Students learn about mindfulness practices and integrative well-being at White Oak Lavender Farm.

### Collaborators

#### Dr. Tammy Gilligan

*Professor of School Psychology and Program Director at JMU*

#### Dr. Renee Staton

*Professor of Counseling at JMU*

#### Dr. Nance Lucas

*Executive Director of the Center for the Advancement of Well-Being at GMU*

#### Dr. Mark Thurston

*Director of Educational Programs at the Center for the Advancement of Well-Being at GMU*

#### Mary Lynch

*Adjunct Faculty at GMU*



### Student Collaborator

- Michael Horst – Ph.D. student in Counselor Education and Supervision at JMU

### Student Impact

- Unique experience with mindfulness intervention techniques
- Empowered students to engage in solving problems with various healing modalities
- Exposure to topics in neuroscience and mindfulness, burnout prevention, and evidence-based mindfulness

### Benefits to the Commonwealth

- ✓ Contributed to mental health solutions
- ✓ Developed new models for teaching and learning
- ✓ Demonstrated added value of a broad telepresence network
- ✓ Developed strong collaborations in the field of psychology across Virginia

# Course Sharing



**5**  
New pilot courses in 2016-2017



**8**  
Successful returning courses in 2016-2017



**5**  
Telepresence-enabled classrooms for delivering instruction



**13+**  
Majors collaborating together



**6**  
Foreign language courses taught through 4-VA  
Arabic, Italian, Japanese, Korean, Persian, Portuguese



**800+**  
Supervised open lab hours at JMU X-Labs during 2016-2017

# 2016-2017 Shared Courses

The numbers of students enrolled include both semesters and take into account both institutions.

<b>Augmented/Virtual Reality</b>	<ul style="list-style-type: none"> <li>Faculty: James Barnes, Chris Wren (GMU), Sang Nam (GMU), Nick Swayne, Scott Martin</li> <li>Pilot course</li> <li>Spring 2017</li> <li>Students Enrolled: 25</li> </ul>
<b>Fueled – Fueling Bodies, Fueling Minds</b>	<ul style="list-style-type: none"> <li>Faculty: Mark Gabriele, Morgan Benton</li> <li>Pilot course</li> <li>Spring 2017</li> <li>Students Enrolled: 24</li> </ul>
<b>Hacking for Defense (H4D)</b>	<ul style="list-style-type: none"> <li>Partnership with Stanford University</li> <li>Faculty: John Guo, Keith Holland, Erica Lewis, Patrice Ludwig, Seán McCarthy, Nick Swayne, Debbie Pugh, James Barnes</li> <li>Pilot course</li> <li>Spring 2017</li> <li>Students Enrolled: 27</li> </ul>
<b>Italian</b>	<ul style="list-style-type: none"> <li>Faculty: Valentina Riso</li> <li>Shared with GMU</li> <li>Spring 2017</li> <li>Students Enrolled: 15</li> </ul>
<b>Korean</b>	<ul style="list-style-type: none"> <li>Faculty: Hye Young Shin</li> <li>Received from GMU</li> <li>Fall 2016</li> <li>Spring 2017</li> <li>Students Enrolled: 21</li> </ul>
<b>Mathematical Modeling of Motion</b>	<ul style="list-style-type: none"> <li>Faculty: James Sochacki</li> <li>Pilot Course</li> <li>Fall 2016</li> <li>Spring 2017</li> <li>Students Enrolled: 6</li> </ul>
<b>Math Teaching Methods</b>	<ul style="list-style-type: none"> <li>A collaboration of graduate education students and mathematics instructional strategies</li> <li>Faculty: Geoffray Estes, Laura Taalman</li> <li>Pilot Course</li> <li>Fall 2016</li> <li>Students enrolled: 12</li> </ul>
<b>Persian</b>	<ul style="list-style-type: none"> <li>Faculty: Maziar Valamotamed (GMU)</li> <li>Received from GMU</li> <li>Fall 2016</li> <li>Spring 2017</li> <li>Students Enrolled: 21</li> </ul>

<b>Portuguese</b>	<ul style="list-style-type: none"> <li>Faculty: Valnora Leister</li> <li>Shared with VT</li> <li>Fall 2016</li> <li>Spring 2017</li> <li>Students Enrolled: 23</li> </ul>
<b>Political Science</b>	<ul style="list-style-type: none"> <li>A course on global conflict and war</li> <li>Faculty: Bernie Kaussler and Yannis Stivachtis</li> <li>Shared with VT</li> <li>Spring 2017</li> <li>Students Enrolled: 37</li> </ul>
<b>Psychology</b>	<ul style="list-style-type: none"> <li>A course on mindfulness and self-care</li> <li>Faculty: Michele Kielty, Tammy Gilligan, Renee Staton</li> <li>Shared with GMU</li> <li>Summer 2017</li> <li>Students Enrolled: 12</li> </ul>
<b>Unmanned Aerial Vehicles (UAV) I</b>	<ul style="list-style-type: none"> <li>A course on the technical components of UAVs</li> <li>Faculty: Kevin Giovanetti, Asa Taylor, Thomas Alberts, Fred Briggs</li> <li>Shared with ODU</li> <li>Spring 2017</li> <li>Students Enrolled: 12</li> </ul>
<b>Unmanned Aerial Vehicles (UAV) II</b>	<ul style="list-style-type: none"> <li>A course on interdisciplinary solutions to humanitarian issues using UAVs</li> <li>Faculty: Asa Taylor, Audrey Barnes, Bo Pollett Wernick, Christine Donovan, Erica Lewis, Kenneth Rutherford, Christopher Vo, Fred Briggs, Kevin Giovanetti, Nick Swayne, Patrice Ludwig, Seán McCarthy, Thomas Alberts, Sang Nam</li> <li>Shared with ODU and GMU</li> <li>Fall 2016</li> <li>Students Enrolled: 38</li> </ul>



“Sharing courses has positively impacted the Department of Foreign Languages at JMU. Because of 4-VA, less commonly taught languages (LCTL) can be taught up to the intermediate level (two years), which allows students to fulfill the requirements for a B.A.

Dr. Giuliana Fazzion, Head of the Department of Foreign Languages, Literatures and Cultures



Attendees of the Workshop on the Science, Instrumentation and Education Program at the Madison Accelerator Laboratory

# International Physics Experts Meet at JMU

## Workshop at the Madison Accelerator Laboratory

**Dr. Adriana Banu**  
Associate Professor of Physics

**Amount Awarded**  
Spring 2017 – \$12,500

In the spring of 2017, 4-VA awarded Dr. Adriana Banu \$12,500 to organize and host a **Workshop on the Science, Instrumentation and Education Program at the Madison Accelerator Laboratory (MAL)** with Dr. Kevin Giovanetti, Dr. Gabriel Niculescu, Dr. Ioana Niculescu and Dr. Scott Pendleton at JMU and Dr. Gail Dodge at ODU.

Held in June of 2017, the two-day workshop featured 10 speakers and included experts from Greece and Turkey who have experience working with medical electron linear accelerators similar to the accelerator at the MAL. Also among the invited speakers were high-profile scientists from three major accelerator centers in the United States: the Idaho Accelerator Center, Jefferson Lab in Newport News, and the Triangle Universities Nuclear Laboratory in Durham, North Carolina. Overall, about 30 registered participants explored opportunities for using X-rays produced at the MAL for basic and applied research in a variety of fields.

The workshop also set the stage for course sharing possibilities that can leverage the new accelerator-based environment for diverse areas of study including archaeology, art history, astronomy, biology, environmental geochemistry, geology, materials science, medicine, and nuclear astrophysics.



“The outcomes of the workshop are very important for the future success of the Madison Accelerator Laboratory (MAL). Many collaborations were created on many fronts—fundamental research, interdisciplinary applied research, education and outreach. It also put MAL in the spotlight when it was featured in a Madison blog, a press release in the Daily News-Record, and a piece on the local TV station.

Dr. Adriana Banu





*Dr. Stylianos Stoulos observes the medical accelerator's so-called "treatment head" of the gantry where the X-rays are produced. Dr. Stoulos is an associate professor at Aristotle University of Thessaloniki in Greece.*

Rockingham Memorial Hospital, the original owner of the Siemens medical electron linear accelerator, sold it to JMU when they moved to their new campus in 2010. Using the original space in what is now Madison Hall, JMU built a state-of-the-art laboratory around the accelerator. The laboratory provides a wide array of opportunities for basic and applied research in nuclear physics, nuclear astrophysics, nuclear engineering and homeland security.



“ At the workshop I learned that there are many opportunities throughout Virginia in accelerator physics—even for undergraduates, which is enhanced through the cooperation between different campuses and laboratories within Virginia. It’s definitely exciting to know that there’s so much in the area for this field. The workshop has reinvigorated me in my studies, and it’s also given me more experience with lab work.

Theodore Chu

### Collaborators

**Dr. Kevin Giovanetti**  
*Professor of Physics at JMU*

**Dr. Gabriel Niculescu**  
*Professor of Physics at JMU*

**Dr. Ioana Niculescu**  
*Professor of Physics at JMU*

**Dr. Scott Pendleton**  
*Accelerator Lab Manager at JMU*

**Dr. Gail Dodge**  
*Professor of Physics at ODU*



### Student Researchers

- Jessica Mayer – Physics, Class of 2019
- Theodore Chu – Physics, Class of 2020

### Student Impact

- Exposed students to a broad spectrum of benefits of working with accelerators
- Unique undergraduate exposure to state-of-the-art concepts in basic and applied research in an accelerator-based environment and to world-class experts
- Increased student awareness of this unique platform for education and research

### Benefits to the Commonwealth

- ✓ One of the first accelerator programs in the United States to serve primarily undergraduate students
- ✓ Developed strong, international collaborations with experts in various fields such as nuclear astrophysics, nuclear engineering and accelerator physics
- ✓ Spread the word about new local access to unique research and educational facility
- ✓ Leveraged highly specialized physics resources
- ✓ Workshop featured in various publications
- ✓ Showcased Virginia’s impact on cutting-edge research



Students innovate solutions at the 2017 Bluestone Hacks 24-hour hackathon at JMU X-Labs.



## *Where unexpected cool stuff happens*

JMU X-Labs is where students, faculty and industry experts converge to develop uncommon ideas through uncommon partnerships. Bringing unique ideas from disparate disciplines, they collaborate to solve real problems in innovative ways.

### **Educate**

We host pilot classes that shift the way people think, challenge the status quo and solve complex problems.

### **Collaborate**

We help students, faculty, and industry professionals establish unprecedented partnerships across traditional barriers.

### **Innovate**

We encourage new ideas and creative solutions through divergent thinking.

“What started as a means to bring healthy, local food to students, and business to the local community has now become a university supported initiative.”  
Amanda Presgraves



Amanda Presgraves and Dr. Mark Gabriele in the Fueled food truck on JMU's campus



Joel Salatin of Polyface Farm answers the class's questions about farm operations, marketing and educating the public at JMU X-Labs.

# JMU X-Labs Educate

## The JMU Fueled Project

### Students develop healthy solutions



Students from The Fueled Project class present their projects next to the food truck.

In 2014, JMU swimmer Amanda Presgraves needed double hip surgery, which meant healing, recovery, and a lot of down time. As she started paying attention to trends in the food truck industry, local farmers' markets and student interest in healthy, sustainable food, her wheels started turning.

As a kinesiology major, Amanda didn't have a business background, so she reached out for support from the Small Business Development Center, a JMU Venture Creation class, the JMU Society of Entrepreneurship, and the JMU Center for Entrepreneurship. After two years of learning, networking and collaborating, and with the help of JMU Dining Services, Amanda and her team launched the Fueled food truck where they sell fresh, local food.

But the idea didn't end there. Momentum continued to grow and the first Fueled class was offered at JMU X-Labs in the spring of 2017. Taught by Dr. Mark Gabriele and Dr. Morgan Benton, the class brought students together from several areas of study, including biology, business management, communications and media arts & design. Multidisciplinary teams developed and built projects that incorporated concepts of nutrition, mind-body awareness, graphic design, industrial and environmental design, marketing, student education and community engagement.

## Polyface, Inc.



In the third week of class, local celebrity, author and farmer, Joel Salatin, took the students on a virtual tour of his 550-acre Polyface Farm. Mr. Salatin's lecture included a description of land healing and pasture rotation, adding emphasis to the value of science, technology and innovation in farming processes.



(Left) Nicole Carothers, Hannah Smith and Dr. Gabriele at Madison Garden



The JMU Fueled Project maintains a garden on campus for produce sold from the food truck.

4-VA funding helped the team buy supplies to get Madison Garden off the ground.

### Class Contributors

- Amanda Presgraves – Kinesiology, Class of 2016
- Edel Rimando – Media Arts & Design and Communication Studies, Class of 2018
- Hannah Smith – Biology, Class of 2018
- Dr. Mark Gabriele – Professor of Biology
- Dr. Morgan Benton – Associate Professor of Integrated Science and Technology
- Nicole Carothers – Marketing, Class of 2017

### Benefits to the Commonwealth

- ✓ Developing student-produced business ventures
- ✓ Increasing sustainability in food production and distribution
- ✓ Established partnerships between industry and academia
- ✓ Organized direct connection between small business and local food sources

### Student Impact

- Unique undergraduate experience creating, running, and maintaining a business
- Access to interdisciplinary teams outside of unique major
- Created products that directly impact peers and the community



## H4D

### *Hacking 4 Defense™ with Stanford University*

**hack** (verb) – to improvise effectively; to take things apart and repurpose them to solve problems or create new products

In 2016, JMU student Jack O'Neill listened to serial entrepreneur Steve Blank give a talk about a new program called Hacking 4 Defense (H4D) where graduate students at Stanford University solve complex U.S. Department of Defense problems. Less than a year later, with support from Stanford, 4-VA and JMU, Jack's team launched **the first undergraduate Hacking 4 Defense program in the nation** at JMU.

In the spring of 2017, the first class was held at JMU X-Labs where students formed cross-disciplinary teams of students from a broad spectrum of departments: biology, communications, computer science, engineering, history, intelligence analysis, nursing, and public policy.

One group of five students worked on a project called Deep Clearance with the objective of quickly mapping out any unknown cover—such as a cave—to determine its security before entering. The students interviewed sponsors, experts, and end users every week to explore the problem and clarify the definition of a successful solution. Key partners included the 75th Ranger Regiment, contractors from the Defense Advanced Research Projects Agency (DARPA), and the U.S. Special Operations Command (USSOCOM).

Although the team was certain that drones played a crucial role in the solution, drones lose GPS connectivity soon after entering caves. Reality set in as they also discovered the need to account for compactibility, temperature, battery life, battery weight, sensor accuracy, dust and the possibility of sound compromising the Rangers' position.

A visit to U.S. Army Fort A.P. Hill really hit home when the team met some of the soldiers firsthand. At the training center they strapped on army gear, crawled through tunnels and learned more about the people they were helping. "Saving lives is our true mission for this project," affirmed student Marshall Grimard. The 5-hour roundtrip journey solidified the connection between the students who've bonded through their work together.

Using the Lean Startup methodology—including tools like customer value proposition—all of the H4D students were steeped in intensive hands-on learning. Every week the teams presented their findings and adapted their minimal viable product (MVP) as they deepened their understanding of their problem and potential solutions.



*Hacking 4 Defense Executive Director Darren Halford from Stanford University visited JMU X-Labs to talk with students after watching their final project presentations.*





*Student teams present their solutions to faculty, sponsors and other experts.*

By week nine, the Deep Clearance MVP really took shape using swarm intelligence with six drones carrying various acoustic, seismic, video and mapping sensors and 360-degree thermal imaging cameras. The drones would communicate with each other and maintain connectivity through dispersion and dropping small “breadcrumb drones” to act as Wi-Fi hotspots that maintain transmission. Structure Sensors would provide rapid 3D mapping with the advantage of connecting directly to phones. Fat Shark headsets would offer a first-person view of the environment in real time. Existing technology from Google Tango could offer mapping and transmission abilities while run-of-the mill game controllers could provide user-friendly control options as well.

The tenth week culminated in an emotional victory, as sponsors confirmed that the MVP successfully met their needs and standards. “This is exactly what we had envisioned,” sponsors told the students. After getting the green light, the team went through the design phase. Equipped with a list of drone, sensor, and battery requirements, they put the pieces together for prototyping. They also visited local firefighters, the police force and SWAT teams to determine the solution’s validity for specific, local needs.

The takeaways from this class are incalculable, as the students gained unprecedented experience, knowledge and skills. The project had such a profound impact on the Deep Clearance team that they formed a drone technology company called Sentinel Defense Systems to apply and develop their concept for a variety of end users.



*Students and faculty watch the 2017 final H4D presentations.*

## 2017 Hacking 4 Defense Teams

- Team Slade designed a prototype that seeks out enemy drones with a projectile that drops a graphene net over the drones, incapacitating them.
- Team VITAL created a disaster relief mobile and internet app that crowdsources data from victims and first responders and permits coordination, collaboration, and information sharing.
- The Digital Overlay team established a means for battlefield commanders to visualize all aspects of a battlefield: physical, cyber, geo-spatial, electromagnetic and social.
- The Drone Detection team created a drone defense identification system capable of effectively detecting and classifying small objects in regulated airspace, jamming a drone’s GPS communications, and tracking and capturing it.
- The Deep Clearance team developed a system of autonomously directed drones designed to enter an area without GPS, detect hostiles, and map the layout of the environment including possible traps.

### JMU Hacking 4 Defense team starts drone technology company

In 2017, the Deep Clearance H4D student team launched Sentinel Defense Systems, a drone technology company that provides situational awareness in areas without GPS access for the military and local public safety teams. Using a unique, proprietary drone technology system, their mission is to save lives, both on and off the battlefield.

Most recently, in August of 2017, The MD5 Proof of Concept Center (PoCC) at the University of Southern Mississippi—which “provides digital design and manufacturing resources in support of distributed prototyping”<sup>\*†</sup>—invited the Deep Clearance team to participate in their program.

<sup>\*</sup>[en.wikipedia.org/wiki/MD5\\_National\\_Security\\_Technology\\_Accelerator](https://en.wikipedia.org/wiki/MD5_National_Security_Technology_Accelerator)

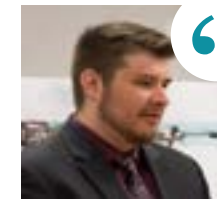
# Booz | Allen | Hamilton

During the 2017-2018 academic year, employees from Booz Allen Hamilton will act as team advisors and mentors to both Hacking 4 Defense and Hacking 4 Diplomacy students. JMU X-Labs will bring Booz Allen advisors into the lab through WebEx to participate with the whole class or through our Beam robots ([suitabletech.com](http://suitabletech.com)) to work with individual teams

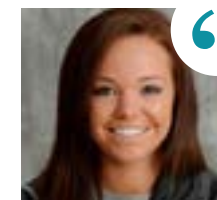


Hacking 4 Diplomacy will address issues of global unrest.

In the fall of 2017, JMU will offer its first Hacking 4 Diplomacy class where students from different disciplines learn how to apply Lean Startup principles to tackle global challenges. Hacking 4 Diplomacy is one of several sister courses scaled nationwide by Stanford University.



“ Saving lives is our true mission for this project.  
Marshall Grimard, Intelligence Analysis, Class of 2018



“ I wish education was more like this. It’s so much more rewarding.  
Cassandra Hagstoz, Computer Information Systems, Class of 2018

### Collaborators

**Dr. Erica Lewis**  
Associate Professor of Nursing

**Jack O’Neill**  
Student Director

**James Barnes**  
Facilitator & Technology Coordinator

**Dr. John Guo**  
Associate Professor of Computer Information Systems

**Dr. Keith Holland**  
Assistant Head and Associate Professor of Engineering

**Nick Swayne**  
Faculty Coordinator

**Dr. Patrice Ludwig**  
Assistant Professor of Biology

**Seán McCarthy**  
Assistant Professor of Writing, Rhetoric and Technical Communication

**Steve Blank**  
Adjunct Professor at Stanford University and Silicon Valley serial-entrepreneur

**Peter Newell**  
Managing Partner at BMNT, Visiting Senior Research Fellow at National Defense University

**Debbie Pugh**  
Digital Media Instruction Coordinator in LET

**Hacking 4 Defense**  
**Stanford University**

### Student Impact

- Significantly bolstered students’ professional experience, resumes and CVs
- Unique undergraduate access to graduate-level challenges
- Rare exposure to cutting-edge critical thinking and problem-solving
- Established at JMU by an inspired, undergraduate student

### Benefits to the Commonwealth

- ✓ First undergraduate-focused university (JMU) in the nation to offer Hacking 4 Defense class
- ✓ Demonstrates Virginia’s leadership in innovation
- ✓ Demonstrates Virginia’s impact on education in cybersecurity
- ✓ Developing new models for teaching and learning
- ✓ Improves employment opportunities in Virginia

# The Virginia Drones Project

In the spring of 2015, 4-VA at JMU offered the first undergraduate drone course in the Commonwealth of Virginia—a feat that put JMU on the map in ways never before imagined. What began as a pilot course has surged into multiple iterations of collaborative, interdisciplinary programs and events shared across the commonwealth.

In the fall of 2015, 4-VA at JMU launched an expanded and applied version of the unmanned aerial vehicle (UAV) course where teams of students from seven different majors consulted field experts while using drone technology in the JMU X-Labs to address global problems in various fields:

- Aerial imaging
- Ecology topics of pollution and riverbeds
- First response for providing medicine to remote locations
- Landmine detection and destruction

The students built working UAV prototypes and documented their efforts through an online blog called The JMU Drones Project, where they chronicled details about each team's project research and UAV development: [sites.jmu.edu/jmudroneschallenge](http://sites.jmu.edu/jmudroneschallenge).

In the fall of 2016, both ODU and GMU joined the applied UAV course through telepresence, expanding it into the Virginia Drones Project where students selected a new set of issues to tackle:

- Augmented communication
- Fire rescue
- Increasing honeybee populations
- Landmine detection
- Sea rescue
- Tidal flood monitoring
- Modeling city walls for preservation in Cartagena, Colombia

The blog for this class, called The Virginia Drones Project, is available at <http://sites.jmu.edu/vadrones/>.



At the end of the semester, students present their projects to faculty and community members.



Drone technology experts Fred Briggs and Bo Pollett Wernick teach students remotely from Nova Labs using BEAM robots and telepresence technology in the JMU X-Labs. They provide invaluable support and knowledge to students throughout the semester and are a vital part of the faculty team.



“Before this interdisciplinary class, I had only worked with people who think like me, but once I opened up to new schools of thought I found that there are easier ways to go about problems that I had never thought of before.

Nick Sipes, JMU, Physics



Students and faculty from various departments fill the JMU X-Labs on the first day of the first applied drone class.



## The Virginia Drones Project *Continued*



### Students from the Virginia Drones Project emerge as Shenandoah Valley's first aerial data company

In January 2017, 4-VA at JMU sent the city walls team to Cartagena, Colombia to generate a 3D model of an eroding historic wall using their custom-built drone. In partnership with the PhD candidate who requested the project, the team tested the UAV and sensor prototypes they built at JMU X-Labs. The project was featured in the Richmond Times-Dispatch in December of 2016: [http://www.richmond.com/news/virginia/article\\_bb41a97e-eb2e-54d9-8454-8566083f0131.htm](http://www.richmond.com/news/virginia/article_bb41a97e-eb2e-54d9-8454-8566083f0131.htm)

After graduating, students from the city walls team started a business called Canvex ([canvexllc.com](http://canvexllc.com)), which uses drones to create 3D models, realistic virtual reality content, aerial pictures, and large-scale agricultural analysis. The company aims to bring a competitive advantage to businesses in the Shenandoah Valley and beyond through the positive application of drones and by providing access to faster, more accurate, and less expensive data.

With support from JMU's Venture Creation Accelerator, Canvex is currently working with farmers in the area to develop an agricultural analysis process. They were also commissioned to create a 3D model of a historic building in downtown Harrisonburg, which was available for viewing at JMU's Duke Hall exhibition in September of 2017.



## Interview featuring

### Sarah Paynter

*Writing, Rhetoric and Technical Communication, Class of 2017*

#### 4-VA: How did you get involved in the drone class? How was it different than you expected?

Sarah Paynter: I got involved with the Virginia Drones Project seemingly as a fluke—I was looking for some credits for my writing minor and emailed the professor on a whim.

Taking the class was much different than I expected. I originally thought that my role would be blog writing, preparing presentations, and handling press. But from the moment I met my team, I perfectly fit into a much larger role. Through my experience with internal and external communication, I began handling communication with stakeholders, setting agendas and deadlines, and fostering within-team cohesion—in other words, I became the project manager. I was surprised to see how well my skills translated into a STEM setting, and it gave me confidence to learn that I had something valuable to offer in a tech setting.

#### 4-VA: How did the class and your project impact your education and/or your future/career?

This project impacted my career by showing me my passion for this field and the value my skill set can add to it. Before this class, I wanted to become a therapist, but through my time at the Virginia Drones Project, I realized that I needed to do something that allowed me to maximize my innovative and creative ability through writing, communication, product creation, and team management.

### Course Faculty/Collaborators

The faculty's unprecedented collaboration has been integral to creating a positive experience for students each semester by securing interdisciplinary courses that serve students from a wide variety of majors.

#### Asa Taylor

*Building Support Systems Manager at JMU*

#### Dr. Audrey Barnes

*Assistant Professor of Industrial Design at JMU*

#### Bo Pollett Wernick

*CEO and Chief Engineer at Theta Composites*

#### Christine Donovan

*Digital Project Specialist for Innovation Services at JMU*

#### Dr. Christopher Vo

*Co-founder & Chief Scientist at Sentien Robotics*

#### Dr. Erica Lewis

*Associate Professor of Nursing at JMU*

#### Fred Briggs

*CEO of Vektortek LLC and Director of Nova Labs*

#### Dr. Kenneth Rutherford

*Director for the Center for International Stabilization and Recovery & Professor of Political Science at JMU*

#### Dr. Kevin Giovanetti

*Professor of Physics at JMU*

#### Nick Swayne

*Executive Director of 4-VA at JMU*

#### Dr. Patrice Ludwig

*Assistant Professor of Biology at JMU*

#### Sang Nam

*Director & Graduate Coordinator of Computer Game Design at GMU*

#### Dr. Seán McCarthy

*Assistant Professor of Writing, Rhetoric and Technical Communication at JMU*

#### Dr. Thomas Alberts

*Professor of Mechanical and Aerospace Engineering at ODU*



### Student Impact

- Unique opportunity to participate in innovative, multidisciplinary, team-taught classes
- Unique access to makerspace with hands-on tools
- Rare undergraduate exposure to state-of-the-art concepts in collaboration, innovation and technology

### A Multidisciplinary Experience

With endless possibilities in innovation and teamwork, these courses prepare students across Virginia not only to work with emerging technologies that may be part of their future careers, but also to work with individuals across diverse backgrounds, undergraduate studies, and geographic locations. To date, students from nearly 20 different disciplines have participated in the Virginia Drone Projects, including the following areas of study:

- Advocacy Studies
- Astronomy
- Biology
- Computer Science
  - Computer Game Design
  - Robotics
- Engineering
  - Aerospace Engineering
  - Mechanical Engineering
  - Electrical Engineering
- Geographic Science
- Health Science
- Humanitarian Affairs
- Industrial Design
- Integrated Science and Technology
- Intelligence Analysis
- Mathematics
- National Security
- Physics
- Psychology
- Writing, Rhetoric and Technical Communication

### Benefits to the Commonwealth

- ✓ Provided solutions to global problems using emerging drone technology
- ✓ Inspired student-launched startup ventures
- ✓ Leveraged faculty resources across Virginia
- ✓ Broke down barriers to cutting-edge education models





Chris Wren teaches on the first day of class from GMU through telepresence at JMU X-Labs.



An image of the JMU campus virtual tour in development

Several students from the AR/VR design class are developing a virtual tour of JMU as a proof of concept project for the university and to potentially start a business.



# Augmented and Virtual Reality Design

## A shared course with GMU

In the spring of 2017, JMU X-Labs shared a pilot course in augmented and virtual reality (AR/VR) with GMU. Taught through telepresence by Chris Wren, Sang Nam and Scott Martin from GMU, the course was a survey of virtual and augmented reality game design and development. The class challenged its 25 students to quickly develop a working knowledge of the Unity game engine and provided them with access to the latest and the best VR equipment and computers. Students made working, meaningful VR applications and experiences for PC & mobile devices as well as AR experiences for Android devices.

Booz Allen Hamilton hired one of the students, David Speroni, immediately after he graduated in the spring, in part, because of his experience with virtual reality in this course.



“The introduction to virtual and augmented reality course at JMU gave me a leg up at my first job at Booz Allen Hamilton. I was initially brought into the firm as an IT consultant but was quickly placed on a VR project as a developer after expressing my skills I learned from the course. I think it’s really cool that JMU is spearheading a curriculum surrounding niche technologies like this because it’s those skills that give you a competitive advantage in the workplace.

David Speroni, Digital Solutions Consultant at Booz Allen Hamilton

### Collaborators

**Chris Wren**  
Associate Professor and Founding Member of Computer Game Design at GMU

**James Barnes**  
Class Coordinator at JMU

**Nick Swayne**  
Faculty Coordinator at JMU

**Sang Nam**  
Assistant Professor of Computer Game Design at GMU

**Scott Martin**  
Associate Professor and Founding Director of Computer Game Design at GMU

**Skylar Wolen**  
Class Founder and Student Director at JMU



### Student Impact

- Enriched student resumes and CVs
- Empowered students with important skills used in the VR industry
- Leveraged technology expertise across Virginia

### Benefits to the Commonwealth

- ✓ Developing curriculum for cutting-edge technology
- ✓ Contributing to innovative solutions
- ✓ Leveraging resources through nationwide collaborations
- ✓ Expanding career opportunities for students after graduation



*Dr. Sochacki and Premal Patel working on the bamboo prototype leg for the walking bicycle*

JMU X Labs Educate

# Walking Bike Simulations

*Multidisciplinary class models and designs prototypes*

**Dr. James Sochacki**  
 Professor of Mathematics  
 Co-developer of the Parker-Sochacki method

**Amount Awarded**  
 Spring 2016 – \$4,000

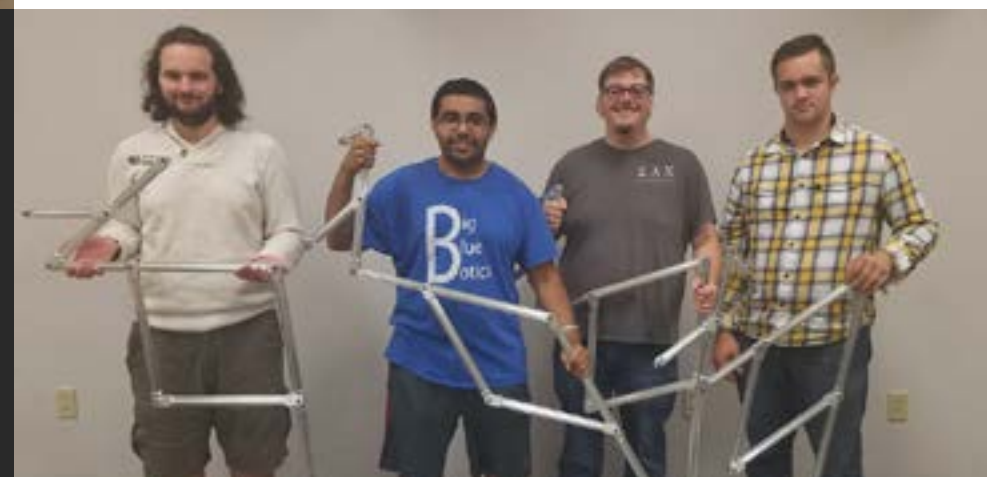
Although wheeled vehicles are by far the most popular form of transportation, they are limited to flat, even surfaces, preventing them from traversing uneven terrain. This leaves more than half of the Earth's land inaccessible to these vehicles. Legs are clearly superior to wheels when it comes to trekking the earth, but their complex structures and energy requirements have made usable replications a challenge.

Despite these complexities, Dr. James Sochacki and Dr. Roger Thelwell began a research project at JMU designing a mathematical model that would replicate the motion of each joint of a leg. Two undergraduate students worked out the mathematics and the Society for Industrial and Applied Mathematics (SIAM) published their paper in 2012.

In the spring of 2016, Dr. Sochacki taught a course in the JMU X-Labs called Walking Bike Simulations as a continuation of the original research project. Students from various departments (computer science, engineering, mathematics and physics) came together to learn how to build a mathematical model that describes a working product. Holding the class in the JMU X-Labs provided access to the technology they needed for the design of the walking bike.

“ I enjoyed this course because I had to get the students to do research, learn mathematical modeling, extend the research and then build a prototype. They were able to go through the entire process of mathematics, modeling and design.

Dr. James Sochacki



*Aaron Midkiff, Premal Patel, Kyle Wenger and Bailey Swayne holding the legs built by the JMU machine shop from their bamboo leg prototype*

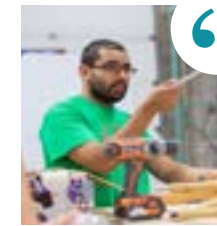


**Walking Bike Simulations** *Continued*

Once the students had a basic understanding of the mathematics involved, they studied the walking patterns of several animals, particularly horses and elephants. Using software to develop a mathematical model of a moving leg, they studied joint motion and determined how to optimize energy, power and work. They then printed a small-scale 3D prototype and used the motor from an electric-powered radio to get their 3D model to walk.

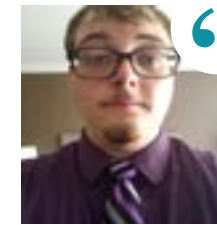
In the fall of 2016, students learned how to use the equipment in the JMU X-Labs to build components for the finished product from the small-scale prototype and the original model. The students were challenged to learn that scaling of the prototype involves more than doing scaling factors and calculations. Once they learned how to use the mathematics in the software, they were able to design what would be the final working components.

By the time Dr. Sochacki taught the third course in the spring of 2017, the class had decided to build a larger-scale prototype from wood, build machinist drawings from that prototype, and have the JMU machine shop build the components. The students even decided to continue working on the project independently over the summer with the potential of turning it into a senior project.



“ I recently joined Epic Systems (a leading healthcare software company) and the interview process included programming, so I got a chance to directly apply what I learned from Dr. Sochacki’s class in the real world! This project made me realize that there is a beautiful integration between programming and physical engineering! I have come to realize that my greatest passion is to model, design and build robots that make life easier for humanity.

Premal Patel



“ It’s rewarding to build something tangible from the math and physics we used in the design process. I would enjoy working on prototypes for research and development for a living.

Kyle Wenger



*The first walking bicycle prototype designed by students was made from an electronic remote controlled car. The wheels were replaced by legs printed on a 3D printer.*

**Student Researchers**

- Kyle Butt – Engineering, Class of 2018
- Mark Castro – Engineering, Class of 2018
- Jason Ferguson – Physics, Class of 2017
- Aaron Midkiff – Physics, Class of 2017
- Premal Patel – Physics, Class of 2017
- Bailey Swayne – ISAT, Class of 2018
- Kyle Wenger – Physics, Class of 2017
- Jared Zurn – Engineering, Class of 2018

**Benefits to the Commonwealth**

- ✓ Developed new models for teaching and learning
- ✓ Improved employment opportunities in Virginia
- ✓ Undergraduates with real-world experience

**Student Impact**

- Built a mathematical model that describes a working product
- Recognized the value of unique perspectives across disciplines
- Realized the limitations of theoretical models
- Student hired by leading software company
- Gained firsthand experience in robot design:
  - Mathematics
  - Programming
  - Animation
  - Design
  - Construction



After a series of activities, innovation leaders from ComSonics decide their approach to new ideas—ranking them from easy to hard—and create a timeline for implementation.

JMU **X Labs** Educate  
**Consulting**

Bringing Silicon Valley innovation to the Shenandoah Valley, JMU X-Labs Consulting provides a cross-disciplinary team of experts who create a culture of innovation within local companies, unlocking their potential by design. Each consulting faculty member offers a unique perspective and a wealth of real world experience in tackling ambiguous and challenging problems from every angle. JMU X-Labs methodology encourages radical collaboration that solves complex problems that have no single, correct answer. We encourage risk-taking, prototyping and a bias towards action.

## Training for community professionals

In August of 2017, JMU X-Labs offered its first professional consultation workshop to handpicked professionals at ComSonics, Inc., including their CEO and 23 others from the Harrisonburg area. The training was a success with the ComSonics team developing a series of actions to ignite innovation throughout their business units.



### Consulting Team

Nick Swayne  
Erica Lewis

Patrice Ludwig  
Keith Holland

Audrey Barnes  
Seán McCarthy

Kelsey Tate  
Emily Winter



Chris Ashley presenting at a Center for Entrepreneurship Advisory Board Meeting



JMU President Jonathan Alger and Mary Ann Alger pose with students after watching their presentations about JMU campus innovation: Chris Ashley, Timothy Moore, Emily Platt, Jack O'Neil and 4-VA Executive Director Nick Swayne

“ If I had never applied for a job with 4-VA, I'm positive my college experience would have been completely different. I never would have joined UIF, presented at SXSW EDU®, or had meetings with the JMU Board of Visitors or President Alger to influence innovation and entrepreneurship on campus. If it weren't for JMU X-Labs, I may never have learned to use tools such as 3D printers and laser cutters, which would mean I would never have started a prototyping machine manufacturing company. I was fortunate to work for people like Nick, Kai, and Kelsey who encouraged me to test out ideas and learn from the experience of success or failure.

Chris Ashley, Economics, Class of 2017



# Student Leaders in Innovation at JMU X-Labs

## An interview featuring Chris Ashley

In the fall of 2014, 4-VA hired a sophomore majoring in economics as a technology assistant to provide support and training for the telepresence systems around JMU. It was Chris Ashley's first job, and little did he know it would change the course of his entire college career. Chris experienced firsthand the explosive growth of JMU X-Labs as he helped develop programs and lead the way for many students to come.

### Interview



“The University Innovation Fellows program empowers students to become leaders of change in higher education. Fellows are creating a national movement to ensure that all students gain the necessary attitudes, skills and knowledge to compete in the economy of the future.”  
[universityinnovationfellows.org](http://universityinnovationfellows.org) at Stanford University

#### 4-VA: How did you get involved with University Innovation Fellows (UIF)?

Chris Ashley: Soon after I joined the 4-VA team, Nick forwarded me an email talking about this program out of Stanford University. He asked me if I was interested, and suggested I find a group of driven, entrepreneurial minded students to apply as a cohort. I reached out to several of the most ambitious and innovative students I knew, and 4-VA agreed to sponsor us as a cohort. Every year since then, 4-VA has sponsored a new generation of UIF students.

Aside from the actual training portion of UIF, I've gotten involved in the program as much as I can. I've helped run the national annual meetup with the UIF planning team, I've presented with them at South by Southwest® EDU (SXSW EDU), my cohort hosted a regional meetup for nearby fellows to attend at JMU X-Labs, and I've visited La Salle University in Philadelphia for their regional meetup. I've found that the payout from UIF, in terms of personal growth and creating lasting institutional change, directly correlates with the amount of involvement fellows have with the program.

#### 4-VA: How has UIF changed your thinking, life, education and career?

Chris Ashley: UIF trains fellows to view the world through an empathetic lens, always focusing on the customer and stakeholders. In learning the design thinking process and Lean Startup framework, UIF taught me how to identify problems in the world and develop win-win solutions that are the best fit for all parties involved. Additionally, the UIF network is a huge resource that I will continue to use as I launch my own company and move forward.



4-VA-sponsored UIF students from JMU visit the Microsoft campus as part of their training.

#### 4-VA: How did Bluestone Hacks originate?

Chris Ashley: After completing training for UIF in early 2015, we attended the annual meetup at Stanford University. We spent three days practicing design thinking skills and engineering ways to enhance our home-campus's innovative and entrepreneurial ecosystem. On the last night, we happened to stumble into a hackathon hosted by Stanford. Inspired by the atmosphere of the Stanford hackathon, we decided we would host our own once we returned to JMU.

#### 4-VA: What was the most rewarding part about organizing and running the hackathon?

Chris Ashley: Thinking back to the first Bluestone Hacks, our main goals were 1) to encourage cross-disciplinary collaboration by students to solve real world problems and 2) to catalyze a greater movement of institutional change. Although administration told us there wasn't enough time left in the year to host the hackathon, we planned and organized the event in about three weeks, raising around \$10,000 and attracting around 60 students. For me, the most rewarding part of it all is knowing that the team's work during those hectic three weeks paid off, as Bluestone Hacks is now an annual, institutionalized event with new, driven students running it. I believe Bluestone Hacks was really the event that sparked the innovation and entrepreneurship movement here at JMU, and I'm happy to have contributed.

#### 4-VA: Has holding Bluestone Hacks at JMU X-Labs changed things?

Chris Ashley: Hosting the hackathon in the X-Labs has greatly enhanced Bluestone Hacks by providing students access to the machines, tools, and hardware all throughout the hackathon. This collection of maker-tools isn't found anywhere else on campus, so the X-Labs was really a perfect fit for the type of event we wanted.



Debuted in 2015, Bluestone Hacks is an annual, student-run, 24-hour hackathon at JMU X-Labs where students compete for cash prizes by innovating to solve a real-world problem.

University Innovation Fellows host the 2017 Bluestone Hacks event.

## Interview

### JMU X-Labs Pop-Up Classes

Pop-up classes are free, non-credit workshops for students, faculty and community members where they get to experiment and build out ideas with topics range from 3D printing to LED programming and glassblowing (lampworking).

#### 4-VA: When and how did pop-up classes get started?

Chris Ashley: Pop-up classes started in the fall of 2015, after being inspired by the annual UIF meetup in the spring. Timothy Moore took the lead on developing the course structure, and I helped to implement and run the classes in the fall. We wanted to provide students an opportunity to learn interesting, unique skills not taught in the traditional classroom. We believed that if more students realized their potential to create and learn new skills, they would be more encouraged to explore their potential to become entrepreneurs.

#### 4-VA: What are the coolest pop-ups you've seen so far?

Chris Ashley: My favorites have been DIY Guitar Pedals and Glassblowing. Both of these classes teach students how to create real, functional items from scratch. Students walk out with a guitar pedal or pendant created with their own hands, which is a pretty cool feeling.

#### 4-VA: What impact do you think pop-ups are having on JMU students?

Chris Ashley: I think pop-ups are encouraging more and more JMU students to explore interesting topics and develop new skills. The demand for classes has increased every semester and each class typically has a waitlist. If anything, I hope the students are realizing their potential to be creators and innovators, instead of just consumers.



(Left) Chris Ashley and (right) Timothy Moore practice lampworking in the "glassblowing" pop-up class.

## Interview



The JMU Society of Entrepreneurs (SOE) brings entrepreneurially minded students together, educating each other and the JMU community on topics of interest, supporting each other with new ventures, and reaching out to entrepreneurs in the community to help them and learn from them.

[beinvolved.jmu.edu/organization/JMUSOE](http://beinvolved.jmu.edu/organization/JMUSOE)

#### 4-VA: How did you get involved with the Society of Entrepreneurs (SOE)?

Chris Ashley: I applied for and joined SOE in the fall of 2013 as a freshman. I had run an electronics wholesale business in high school, and found the group soon after coming to JMU. We were only 12 members then and the club was only a couple years old. I got heavily involved with the club, and was fortunate to have served as treasurer and two-term president as the club developed.

#### 4-VA: How did SOE start meeting at JMU X-Labs?

Chris Ashley: When I became president of SOE, we were meeting off campus at the ICE House. While it was awesome to have our own space to meet, it was tough for on-campus students to get downtown for meetings. When 4-VA opened X-Labs, it was clear that the "maker" atmosphere and on-campus location made it a perfect meeting place for SOE. X-Labs provided a home for the community of SOE to be built around. It became the common place for SOE members to meet in the evenings and weekends to work, discuss ideas, and learn from other members.

#### 4-VA: What impact did being a part of the SOE have on you?

Chris Ashley: The best part of SOE is being surrounded by like-minded student entrepreneurs with a passion for building and making. I've learned so much from talking and working with other members in SOE, and the club provided an opportunity to learn about launching my own company, becoming a leader, and helping to influence student entrepreneurship at JMU. I'm confident I'd be a completely different person had I not joined SOE.



The 2015 JMU Society of Entrepreneurs at JMU X-Labs

Chris Ashley graduated in May of 2017 with a Bachelor of Business Administration in economics with a minor in music industry. He continues to mentor students at JMU X-Labs while also co-running two companies.

The University Innovation Fellows program, Bluestone Hacks event, JMU X-Labs Pop-up classes, and JMU Society of Entrepreneurs are just a few of the many student groups, classes, events and projects that have found a home at JMU X-Labs. New innovators are following in Chris' footsteps and continue to make JMU X-Labs a hub for innovation at JMU.





The Rocktown Robotics showcase their robot at a competition.

JMU X-Labs Collaborate

# Establishing a STEM Pipeline

## Local engagement supports innovative teens

Rocktown Robotics *FIRST* Robotics Competition (FRC) Team 3274 was established seven years ago and this year—for the first time—they were invited to compete with their robot at the 2017 *FIRST* Championship (aka “Worlds”) in St. Louis, Missouri. The problem was they didn’t have the funds to take them and their robot across the country. When *FIRST* notified the team that they qualified for Worlds, they only had 24 hours to come up with the \$5,000 to pay for registration and the trip.

That’s when the community rallied together. Generous donations from Dynamic Aviation, Harrisonburg City Public Schools and a GoFundMe campaign provided the funds they needed. The Rocktown Robotics team packed up their robot and headed off to the competition. On April 26-29, 2017, 10 students competed in St. Louis, accompanied by three mentors and three additional parent chaperones, thanks to everyone’s help.

But the community support can be traced back far before the team placed at the Haymarket and Richmond regional qualifying tournaments this season:

- Premal Patel, a JMU pre-med student (physics major and math minor) mentored the FRC team.
- JMU X-Labs hosted the team, providing the makerspace throughout the season to build their robot for the competition.
- Last fall, one of the team’s coaches, Sonya Shaver, invited Bridgewater’s Dynamic Aviation to mentor them. Director of Engineering Phil Douglas and Avionics Engineering Technician Michael DeMers actively mentored the team and taught them an engineering design process. Michael even showed the team how to rewire the robot, which improved its performance.
- JMU Physics Professor Dr. Kevin Giovanetti helped the team apply for a JMU Center for STEM Education and Outreach grant. In the spring of 2017 they were awarded the grant, which helped pay for the robot parts they needed in order to compete at Worlds. The funding gave them the means to perform at a higher level than ever before.

*FIRST* Robotics Competition (FRC) is an international high school robotics competition where student teams build high-functioning robots.



**2017 *FIRST* Championship fast facts**

- 30,000 youth
- 65,000 attendees
- 1,394 teams
- 39+ countries
- 2,400 volunteers



“ Being able to participate in *FIRST* Robotics Competition (FRC) gave the students a hands-on and up-close look at engineering, mechanical design, programming, problem-solving, and teamwork, and the chance to develop skills that will allow them to become leaders in science and technology. Moving forward, we hope to continue to grow Team 3274 by reaching out to more young women and to increase our team’s diversity and reach.

Sonya Shaver, Rocktown Robotics team coach



Rocktown Robotics team members work on their robot at JMU X-Labs.



Financial support helped the team cover the cost of shipping their robot to St. Louis, Missouri.



(Left) Virginia Secretary of Technology Karen Jackson, JMU Senior Vice President of Administration and Finance Charles King, Virginia Governor Terry McAuliffe, 4-VA Executive Director Nick Swayne, 4-VA Assistant Director Kelsey Tate and JMU Assistant Vice President of Information Technology Dale Hulvey



# Governor's Technology Award

## JMU X-Labs awarded for innovation by Governor Terry McAuliffe



On September 6, 2017, Governor Terry McAuliffe and Secretary of Technology Karen Jackson awarded JMU X-Labs with a Governor's Technology Award for innovative use of technology in education. The Commonwealth of Virginia Innovative Technology Symposium (COVITS) hosts the awards ceremony every year in Richmond.

**According to the nomination criteria,**

*"Virginia's prestigious Governor's Technology Awards (GTA) program recognizes public sector information technology (IT) projects that improve government service delivery and efficiency."*

**The JMU X-Labs nomination emphasized its impact on student professional development:**

*"Employers want newly hired graduates to have hands-on experience, be able to start solving real problems on Day One, effectively work with others on a team, and produce value for their companies. The courses and student projects that come out of JMU X-Lab produce just that—experienced problem-solving teams that are trained in the latest technology."*



# Congressman Bob Goodlatte Visits the Award-winning JMU X-Labs



The congressman and Skylar watch as Nahom demonstrates the augmented reality application he developed that translates 2D chemical compounds into 3D images on a mobile device.

On September 15, 2017, Congressman Bob Goodlatte toured the award-winning JMU X-Labs facility to see innovation in action. Several students demonstrated their projects for the congressman:

- Nick Sipes, co-creator of JMU X-Labs startup Canvex, presented the drone-based photogrammetry project he's working on to map and model buildings.
- Nahom Fissaha showed how he's using 360 video to add internal spaces and visual components to buildings and develop immersive videos of activities on campus.
- Skylar Wolen demonstrated how they are developing virtual (VR) and augmented reality (AR) applications to aid in chemistry education. He then gave the congressman his own immersive experience by setting him up in a VIVE™ VR headset so he could paint 3D brush strokes using the Google Tilt Brush application.
- Chris Ashley and Richard Xu explained the new version of their Hydra project and exhibited how they are building their giant 3D printer inside JMU X-Labs.

“ [JMU] X-Labs [is] bringing students together to collaborate on new ideas. I am always impressed by the level of research conducted by students at our local colleges and universities as well as the creative ideas they turn into realities. Keep up the good work!  
Congressman Bob Goodlatte



(Left) Dean of the College of Integrated Science and Engineering Bob Kolvoord, Founder of JMU X-Labs Nick Swayne, JMU Provost Heather Coltman, Congressman Bob Goodlatte, JMU Government Relations Specialist Josh Humphries



# JMU X-Labs Start-ups

## Student ventures that began at JMU X-Labs

- **95 to Infinity** is an East Coast luxury streetwear clothing brand that strives to inspire individuality and self-expression amongst counter-culture millennials.  
By Sina Shahcheraghi
- **Canvex** uses drones to create 3D models, realistic virtual reality content, aerial pictures, and large-scale agricultural analysis.  
By Nick Sipes and Caoimhe O'Sullivan Roche
- **Duo Musical Playground** organizes programs and classes that encourage collaboration between young people and adults through musical activities, musical projects, and interaction with music technology.  
By Jon Stapleton
- **Hydra Systems Corporation** manufactures large-format, industrial, multifunction prototyping machines. Users can easily switch between functions such as 3D printing, laser cutting, and other CNC tools, allowing them to effectively have their own "micro factory" for a fraction of the cost of acquiring a machine for each function.  
By Richard Xu, Bryce Edmunds and Chris Ashley
- The new company called **presence** gives users their own 360° degree/VR social network to view and share media.  
By Akram Abdou and Dustin Hux
- **Sentinel Defense Systems** is a drone technology company that provides situational awareness in areas without GPS access for the military and local public safety teams. Using a unique proprietary drone technology system, their mission is to save lives, both on and off the battlefield.  
By Cassandra Hagstoz, Giavanna Verdi, Jared Michael Zurn, Joshua Talley and Marshall Grimard
- **Youfory Flag Co.** helps people express themselves through unique, custom-made flags.  
By Nahom Fissaha and Chris Ashley
- **Zeppy** is a brand of low calorie, low carbohydrate alcoholic beverages.  
By Allison Zeppuhar

# NMC HORIZON REPORT

## 2017 Higher Ed Edition



# Drone Class at JMU X-Labs Recognized as Trendsetter

## Listed in NMC Horizon Report

In late 2016, JMU Online Learning Coordinator and Associate Professor Dr. Doug Herrington submitted 4-VA at JMU's drone project for inclusion in the New Media Consortium (NMC) Horizon Report as a best practice. Dr. Herrington is an expert panelist for the report and he saw the value coming out of JMU X-Labs.

In February, the JMU Drone Challenge Project was included in the 2017 Higher Education edition of the report. According to the *Top 10 "Talking Points" about the Report*,

- "The topics in the report were selected by a diverse panel of 78 experts" including "institutional leaders, educators, instructional designers, technologists, industry leaders, and other key stakeholders from 22 countries".
- "The report illuminates examples of compelling trends, solutions, and technology initiatives already in practice at colleges and universities. Institutions seeking inspiration, models, and tactical insight around strategy and technology deployment can look to these exemplars from across the world."
- "The NMC Horizon Project has now informed strategic planning and decision-making around technology for 15 years."



“It seems to me that the drones project 4-VA sponsors at JMU X-Labs that enables a multi-disciplinary team of students and faculty to work together is an example of something they would probably like to include in the report. It fits into these areas:

- Advancing cultures of innovation
- Deeper learning approaches
- Collaborative learning approaches

Dr. Doug Herrington



(Left) Bryce Edmunds, Richard Xu and Chris Ashley working at JMU X-Labs



Richard Xu building his 3D printer at JMU X-Labs

JMU  Labs Innovate

## Richard Xu Builds Giant 3D Printer

Soon after JMU X-Labs first opened in late 2015, the staff started noticing that one student in particular seemed to be spending a lot of time there. Most of the students who frequent the lab have taken classes there, but engineering major Richard Xu found JMU X-Labs on his own. Ever since then, he has made it his home away from home during open lab hours, working on various projects. Primarily a kinesthetic learner, Richard enjoys tinkering with electronics and mechanical pieces and putting things together. He's currently in the process of building a huge 3D printer, which will be a key component to a venture he's started with two of his peers.

Together with Chris Ashley and Bryce Edmunds, Richard formed a company called Hydra Systems Corporation, which "manufactures large-format, industrial, multifunction prototyping machines. Users can easily switch between functions such as 3D printing, laser cutting, and other CNC tools, allowing them to effectively have their own "micro factory" for a fraction of the cost of acquiring a machine for each function." Over the summer of 2017, the team spent eight weeks participating in the Center for Entrepreneurship's Venture Creation Fellowship after receiving a \$10,000 grant for their project and an investor has backed them with another \$10,000.

For more details on Richard's project, check out the JMU News article *Not just a better mousetrap*: [jmu.edu/news/2017/07/28-mm-richard-xu-3d-printer.shtml](http://jmu.edu/news/2017/07/28-mm-richard-xu-3d-printer.shtml)

# Degree Completion



Increasing online programs

 **100+**

Students in computer and management classes in 2016-2017

 **1 week**

Of professional development learning how to teach diverse content

 **750+**

Students in RN to BSN courses in 2016-2017

## 2016-2017 Degree Completion Projects

**Facing It, Furious Flower Poetry Center**

*A seminar for faculty, teachers, and scholars to celebrate and investigate the work of Yusef Komunyakaa*

**Adult Degree Program, Outreach and Engagement**

*Online modules in computer science, management, and RN to BSN for nontraditional students*



Online programs provide access for adults to earn their bachelor's degrees.

# Degree Completion



Since 1977, Outreach and Engagement's Adult Degree Program (ADP) at JMU has served adult students who are returning to college to complete their bachelor's degrees. ADP offers online modules, providing access to those who require remote study. Since students have been able to complete 50% or more of their degrees online, admissions have annually increased by an average of 10%.

4-VA has provided funding for faculty to work with instructional designers from JMU's Innovation Services to create dynamic, content-rich online classes. Funding from 4-VA has helped double the number of available online modules as well as added online general education classes.

Degree completion courses continue to gain momentum as JMU provides access to non-traditional students and more faculty teach these online courses. During the 2016-2017 academic year, 27 students enrolled in online degree completion classes for computer science and 78 students enrolled in management classes.

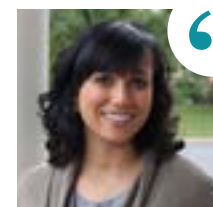
## Nursing RN to BSN Program

In 2012, hospitals across the nation started requiring that their registered nurses (RNs) go back to school to earn Bachelor of Science in Nursing (BSN) degrees. To fulfill that need, 4-VA funded the development of the RN to BSN curriculum through Outreach & Engagement. The most successful degree completion program to date, the course provides flexible online learning opportunities while allowing students to maintain employment. The balance between work and study drives the success of the program for students who lead busy professional and personal lives. During the 2016-2017 academic year, 783 students enrolled in the program.



These online courses are critical because they target economic development in the commonwealth as identified by the governor, who aims to fill the 17,000 cybersecurity jobs that are currently vacant in Virginia. (Governor McAuliffe, October 18th, 2016). The computer science courses, for example, provide data analytics and computing skills (e.g., network security) which are essential to small businesses.

Online students can work from any location that offers Wi-Fi.



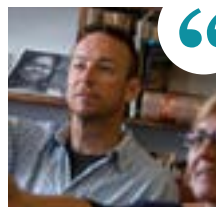
“The online aspect of this program makes earning a degree possible. There just aren't enough hours in the day for me to work, have a family, and physically attend school. In online programs, you can work at your own pace and you are not bound by attending classes. Programs such as these require a tremendous amount of self-motivation and structure, but the fact that you can do it on your own time and still be active in all other aspects of your life makes it all worth it.

Kiran Ahmad, Registered Nurse



Yusef Komunyakaa signing books

4-VA provided funding for teachers in underserved areas and the Furious Flower Poetry Center awarded Melody Wilson at Harrisonburg High School and Jeff Rudy at Strasburg High School with fellowships to attend the seminar and increase degree completion in their schools.



“There are lesson plans and there are life plans. I teach a lot of Yusef Komunyakaa’s work in my classroom; from his Vietnam poems to excerpts of his verse play *Gilgamesh*, and I’ve learned a lot of new teaching strategies over the past week that I plan on utilizing in my classroom. But the intangible—the life plans—are equally important as well. Those are the moments—found in art and in human interaction—to teach students about kindness, the human spirit, compassion, and the heart. Those aren’t testable on a bubble sheet, but will be tested throughout their journey of life. I know the next generation will be influenced by the Furious Flower & 4-VA.

Jeff Rudy, English Department Chair at Strasburg High School, Adjunct faculty member at Shenandoah University

## Facing It

### *A seminar on the work of Pulitzer prize winner Yusef Komunyakaa*

Hosted by JMU’s Furious Flower Poetry Center in June 2017, Facing It celebrated the work of Yusef Komunyakaa, whose career is marked by critical acclaim and creative distinction including the Pulitzer Prize for Poetry in 1994. Named after his most famous poem, the seminar included the poet himself along with other fellow poets, critics and scholars.

Through in-depth analytical and critical exploration, impromptu discussion, collegial connections, innovative lesson plans, and inclusive teaching strategies, college professors, high school teachers, writers, and other scholars received concrete tools and materials and learned how to increase diversity in their curricula.



(Right) Melody Wilson and Jeff Rudy explore the Furious Flower archives



“I can’t tell you how enriching it was to spend a week surrounded by college professors, tenured and untenured alike, and enter into a professional dialogue, not just about content and practice but thematic and aesthetic properties of a work. I rotated between pupil, peer, and pedagogue on an hourly basis. It was as much empowering as it was educational. It was amazing.

For me the seminar reinforced the absolute utility and necessity of poetry. In AP Lit & Comp I customarily teach poetry as its own separate unit due to the nature of the exam. I am rethinking my syllabus now to explore ways to integrate it throughout the year thematically.

I foresee that poetry will become more and more demystified, that students will learn to embrace it as an effective, easily accessible communicative tool rather than something formulaic or to be dreaded. But I am secretly hoping to inspire a new generation of poets in the process—ones who will discover new ways and choose to motivate, educate, persuade, arouse, effect change, encourage, and precipitate healing through their words.

Melody Wilson, English Teacher at Harrisonburg High School

# Also Inside

## VIRTUES II Drone Conference *Virginia Robotics and Unmanned systems Education Summit*



*Governor McAuliffe addresses the VIRTUES II audience.*

- In 2014, when a train derailment in Lynchburg created so much destruction that no one could differentiate between the train cars, a local drone owner provided the aerial view the fire department needed.
- In 2015, Dominion Virginia Power announced they would utilize unmanned systems to support inspection testing of transmission lines and towers.
- In 2016, a Blacksburg teen went missing and—without policies in place—local law enforcement couldn't use drones to search for her. Instead they turned to the Mid-Atlantic Partnership of Aviation at Virginia Tech to perform the search.
- In 2017, drone video footage provided insight into the extent of damage to Chesapeake and Virginia Beach after a tornado hurled through the area.

From accident assessment to infrastructure aerial inspections and from aerial searches to natural disaster support, unmanned aerial systems (UAS) are becoming an indispensable part of our daily lives.

**VIRTUES II Drone Conference** *Continued*

4-VA recognized this burgeoning need and offered the first VIRTUES conference in 2016 to build bridges between different areas that contribute to the UAS industry: research, curriculum, industry, policy and ethics. It was such a success that 4-VA at JMU hosted VIRTUES II in February 2017 to focus on one of the primary needs identified at VIRTUES I—strategic coordination between academia and industry.

In 2015, 4-VA at JMU had already begun building a statewide network to develop undergraduate courses that give students the skills to build and develop unmanned aerial vehicles (UAVs) to solve real world problems. Since then, two additional 4-VA member universities—GMU and ODU—have successfully joined the courses through telepresence. With this infrastructure in place, it is an opportune time for professionals to inform curriculum with their current and anticipated needs.

At VIRTUES II in 2017, President Alger and SCHEV Higher Education Innovation Director Wendy Kang opened with remarks followed by networking for participants. In attendance were administrators, faculty and students from universities across the commonwealth as well as Embry Riddle Aeronautical

University in Florida. Industry professionals from local economic development agencies, public safety departments and companies including Booz Allen Hamilton, ANRA Technologies and HAZON Solutions also participated.

On Friday, speakers from the UAS industry expressed interest in hiring graduates with more than just technical skills. They're looking for competence in communication, discernment, critical thinking and problem solving. Curriculum speakers spoke about the need for industry partnerships, facility access, class scenarios and funding.

**Industry Speakers**

- Sean Cushing – HAZON Solutions
- Harry Gregori and Robert Klenke – Virginia UAS
- Andrew Roettgen – Joint Improvised-Threat Defeat Organization

**Curriculum Speakers**

- Jonathan Washburn – Liberty University
- Darren Goodbar – Piedmont Virginia Community College (PVCC)



*A panel of faculty and students answer questions at VIRTUES II.*



*PVCC UAS Program Manager Darren Goodbar talks about drones in education.*

After small group discussions, the 70 participants reconvened to listen to a panel of faculty and students who were part of the class of cross-disciplinary teams that prototyped solutions to social and environmental challenges using UAVs. During the course, students had to familiarize themselves with the technical aspects of UAV use and operation, as well as learn to use technologies such as 3-D printers to produce attachments that expand the UAVs' functionality to tackle various problems. The panel recounted various challenges as they navigated the course, which pushed them to develop proficiencies in areas unfamiliar to most students.

Throughout the course, students performed interdisciplinary research while learning various professional skills.

Virginia Governor Terry McAuliffe provided the final address. He focused on the idea of [The New Virginia Economy](#), describing many of the successes that his administration has overseen to grow industry jobs and attract businesses and manufacturers to the area. He then described some of the technologies and ideas that he is currently excited about including self-driving cars and the installation of highway sensors. Finally, he looked to the future, talking specifically to several students and encouraging the crowd to keep innovating and taking advantage of the many unique resources that Virginia offers so that we can become first in the nation in UMS technology.

**Distinguished Guests**

- Virginia Governor Terry McAuliffe
- Virginia Secretary of Public Safety and Homeland Security Brian Moran
- JMU President Jonathan Alger
- Harrisonburg City Mayor Deanna Reed
- SCHEV Higher Education Innovation Director Wendy Kang

**Benefits to the Commonwealth**

- ✓ Demonstrated Virginia's leadership in innovation and cutting-edge technology
- ✓ Demonstrated Virginia's impact on education in UAS technology
- ✓ Initiated a statewide network for UAS collaboration and action
- ✓ Improved employment opportunities in Virginia



*Brian Moran answers questions at VIRTUES II.*

Remarks from Virginia Secretary of Public Safety and Homeland Security, Brian Moran followed the small group session. He discussed the intersection of UMS technology and public safety and shared several stories of the successful use of unmanned vehicles to protect the public. After explaining some of the legislative challenges that this technology creates, he took several questions from the crowd about privacy laws, sharing information between government, industry, and higher education, and obtaining proper access and funding to first responders.

"Capitalizing on Virginia's advantages in the unmanned systems industry is key to building a new Virginia economy," said Governor McAuliffe. "This executive order will lay the foundation for my administration's efforts to make this commonwealth the world's leader in unmanned systems and seize the enormous economic opportunities that accompany growing this industry."

[vus.virginia.gov/ums-commission](http://vus.virginia.gov/ums-commission)



*JMU student Nick Sipes participates in a VIRTUES II discussion group.*

Our goal is to develop experienced UAV leaders and establish Virginia as the nation's premier provider of the top candidates in these emerging technologies.



**“** I want Virginia to be the global leader in unmanned aerial systems.  
Terry McAuliffe, Governor of Virginia at VIRTUES II



# 4-VA Program Contacts

## 4-VA at JMU Staff

<b>Nick Swayne</b>	<i>Executive Director   Campus Coordinator</i>	swaynedd@jmu.edu
<b>Kelsey Tate</b>	<i>Assistant Director Deputy Campus Coordinator</i>	tatekm@jmu.edu
<b>Emily Winter</b>	<i>Lakeview Hall Building Coordinator</i>	winterea@jmu.edu
<b>Kim Fisher</b>	<i>Director of Communications</i>	reedyka@jmu.edu
<b>Aaron Kishbaugh</b>	<i>JMU X-Labs Manager</i>	kishaat@jmu.edu
<b>James Barnes</b>	<i>JMU X-Labs Technologist and Facilitator</i>	barnesjs@jmu.edu
<b>Claire Fulk</b>	<i>Student Assistant</i>	fulkcs@dukes.jmu.edu
<b>Emma de Leon</b>	<i>Student Assistant</i>	deleoner@dukes.jmu.edu
<b>Skylar Wolen</b>	<i>Virtual/Augmented Reality Teaching Assistant</i>	wolensj@dukes.jmu.edu
<b>Nahom Fissaha</b>	<i>Virtual/Augmented Reality Teaching Assistant</i>	fissahnm@dukes.jmu.edu

## JMU Steering Committee

<b>Heather Coltman</b>	<i>Provost and Senior Vice President for Academic Affairs</i>
<b>Yvonne Harris</b>	<i>Vice Provost for Research and Scholarship</i>
<b>Dale Hulvey</b>	<i>Assistant Vice President for Information Technology</i>
<b>Adam Murray</b>	<i>Dean, Libraries and Educational Technologies</i>
<b>Cara Meixner</b>	<i>Executive Director, Center for Faculty Innovation</i>

## JMU Contributing Members

<b>David Lamm</b>	<i>Network Services Manager, Information Technology</i>
<b>Nancy Dauer</b>	<i>Fiscal Technician, Information Technology</i>
<b>Dick Johnson</b>	<i>Director, Technical Services, Information Technology</i>

## Corporate and State Partners

<b>Dietra Trent</b>	<i>Virginia Secretary of Education</i>
<b>Peter Blake</b>	<i>Director, State Council of Higher Education for Virginia (SCHEV)</i>
<b>Wendy Kang</b>	<i>Higher Education Innovation Director, SCHEV</i>

## 4-VA Working Group

<b>Janette Kenner Muir</b>	<i>Campus Coordinator</i>	GMU	jmuir@gmu.edu
<b>Marcy Glover</b>	<i>Deputy Campus Coordinator</i>	GMU	mglover2@gmu.edu
<b>Andy Casiello</b>	<i>Campus Coordinator</i>	ODU	acasiell@odu.edu
<b>James Shaeffer</b>	<i>Deputy Campus Coordinator</i>	ODU	jshaeffe@odu.edu
<b>Dean Claud</b>	<i>ODU 4-VA Coordination</i>	ODU	rclaud@odu.edu
<b>Archie Holmes</b>	<i>Campus Coordinator</i>	UVA	ah7sj@virginia.edu
<b>Matt Banfield</b>	<i>Deputy Campus Coordinator</i>	UVA	mb3qb@virginia.edu
<b>John Ryan</b>	<i>Campus Coordinator</i>	VCU	jjryan@vcu.edu
<b>Deborah Noble-Triplett</b>	<i>VCU 4-VA Coordination</i>	VCU	nobletriplett@vcu.edu
<b>Dale Pike</b>	<i>Campus Coordinator</i>	VT	dalepike@vt.edu
<b>Will Fox</b>	<i>Grants Manager</i>	VT	willfox@vt.edu
<b>Quinn Warnick</b>	<i>VT 4-VA Coordination</i>	VT	qwarnick@vt.edu
<b>Christa Miller</b>	<i>VT 4-VA Coordination</i>	VT	christa.miller@vt.edu

## 4-VA Departures

<b>Jerry Benson</b>	<i>Provost and Senior Vice President for Academic Affairs, JMU</i>
<b>Kelsey Kirland</b>	<i>4-VA Assessment Coordinator</i>
<b>Teggin Summers</b>	<i>Deputy Campus Coordinator, VT</i>
<b>Linda Sheridan</b>	<i>Deputy Campus Coordinator, GMU</i>
<b>Chris Ashley</b>	<i>Student Assistant, JMU</i>
<b>Jack O'Neil</b>	<i>Hacking 4 Defense Teaching Assistant, JMU</i>







Produced by Kim Fisher  
Designed by Estland.us



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[4-VA.org](http://4-VA.org)

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