М

ANNUAL REPORT



2014 - 2015



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PROFILE

eorge Mason's 4-VA program is part of a five member Virginia higher education collaborative that also includes James Madison, Old Dominion, University of Virginia and Virginia Tech. The 4-VA program combines the talent and resources of each institution to further the Commonwealth's educational initiatives. Each 4-VA institution seeds shared

research grants in STEM disciplines, and supports course redesign to improve student success. Collectively, 4-VA shares critical need courses through immersive Cisco Telepresence technology, and provides easily accessible degree programs to improve educational opportunity for all Virginians.

In 2015, Mason 4-VA increased and expanded its competitive grant awards, with a renewed focus on combined research initiatives between 4-VA member institutions. Seventeen competitive grants were awarded, and eleven special initiatives were funded for a total of \$396,540. Undergraduate research opportunities and funding also increased to \$31,000.

Mason 4-VA activities fostered ongoing partnerships among the Office of the Provost, Information Technology Services, the Office for Student Creative Activity and Research and the Smithsonian-Mason School of Conservation.

» EVENTS SPONSORED OR CO-SPONSORED:

- o Innovations in Teaching and Learning Conference, September 2014
- o George Mason Water Forum Water Awareness Month, March 2015
- o STEM Boot Camp, August 2014
- o Governor's School Student Research Camp Phages, June 2015
- o Aspiring Scientists Summer Internship Program, Summer 2015

» 2014–2015 PARTNERS:

- o Fairfax County Park Authority
- o Occoquan Regional Park
- o Smithsonian Institution
- o Potomac Environmental and Research Education Center (PEREC)
- o Virginia Early Childhood Foundation
- o Virginia Governor's School programs across the state

RESOURCES WITHIN MASON:

Mason 4-VA collaborates with the following Mason units:

- o Aspiring Scientists Summer Internship Program (ASSIP)
- o Information Technology Services
- o College of Humanities and Social Sciences
- o College of Science

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Mason 4-V 2014-15 HIGHLIGH



EXPAND ACCESS TO PROGRAMS IN PREPARING ALL VIRGINIANS FOR REWARDING CAREERS.

4-VA GOALS

A-VA Commonwealth Collar

ENHANCE THE SUCCESS RATES OF STUDENTS IN STEM COURSES & PROGRAMS.

INCREASE RESEARCH COMPETITIVENESS.

EXPENDITURES AND BY THE NUMBERS PROJECT BREAKDOWNS

Mason 4-V⊾	EXPENDITURES BREAKDOWN 2014 -2015	% of Total	
TECH INITIATIVES	\$319,549	38%	
INNOVATION RESEARCH GRANTS	\$267,440	32%	
OPERATIONS	\$122,900	14%	
SPECIAL INITIATIVES	\$111,100	13%	
COURSE REDESIGN AND COLLABORATION	\$18,000	2%	
DEGREE COMPLETION	\$11,011	1%	
TOTAL ALLOCATED	\$850,000	100%	



PROJECT BREAKDOWN:

Degree Completion	3
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TOTAL DEDICATED TO:

- » Innovation Research Grants
- » Special Initiatives
- » Course Redesign & Sharing

INNOVATION GRANTS

A search for the origin of super massive black holes Shobita Satyapal, PhD, Associate Professor, School of Physics, Astronomy, Computational Sciences

A team of interdisciplinary faculty members prepare future STEM leaders through cutting-edge hands-on research experiences

Lance Liotta, PhD, Co-Director, Applied Proteomics & Molecular Medicine

Caps 4 Caps Research

Anna Evmenova, PhD, Assistant Professor, Assistive and Special Education Technology

Discovery of antimicrobial peptides in Bedbugs Monique van Hoek, PhD, Associate Professor, Systems Biology

Engaging incoming STEM majors through preparatory camps to improve freshmen academic performance and retention in STEM

Padmanabhan Seshaiyer, PhD, Professor, Mathematical Sciences, Director, <u>STEM Accelerator Program</u>

Genetically-encoded chimeras reveal functional properties of NMDA receptors that separately support spatial learning or memory

Theodore Dumas, PhD, Assistant Professor, Molecular Neuroscience, Krasnow Institute for Advanced Study

Investigating Phage Ecology: An interdisciplinary summer research experience for undergraduate and Governor's School high school students.

J. Reid Schwebach, PhD, Term Assistant Professor, Systems Biology, Coordinator, COS HS Outreach & Recruitment, Governor's School, Innovation Park

Mason Water Forum

Paul Houser, PhD, Associate Professor, Geography & Geoinformation Science

Mechanisms of Susceptibility to Nicotine Addiction in Adolescents: A Focus on the Addition of Menthol to Tobacco Products.

Nadine Kabbani, PhD, Assistant Professor, Molecular Neuroscience, Krasnow Institute Teaching Hidden History: Implementation Grant Kelly Schrum, PhD, Associate Professor, Higher Education Program; Director, Educational Projects, Roy Rosenzweig Center for History and New Media

The Mason Water Data Information System (MW-DIS): Empowering water data sharing and discovery at George Mason University and beyond *Celso Ferreira*, *PhD*, *Assistant Professor*, *CEIE*

<u>The Rain Project</u>: Building a floating wetland for sustainable stormwater management Changwoo Ahn, PhD, Associate Professor, Environmental Science & Policy

Wind energy and watershed action partnership Cynthia Smith, PhD, Assistant Professor, New Century College, Environmental Science & Policy

Photo, Page 4: NASA's Chandra X-ray Observatory. A research team lead by Shobita Satyapal works with students to search for the origin of super massive black holes using X-rays to find those that would have been hidden from detection using the more common optical surveys. <u>Mason student Nathan Secrest and other researchers discovered one such black hole</u> using NASA's Chandra X-ray Observatory. Photo courtesy of NASA



32% OF TOTAL ALLOCATED



Below: NBC News4 meteorologist Veronica Johnson speaks at a STEM prepatory camp run by Padmanabhan Seshaiyer, PhD. The camp is the <u>College of Science's Summer STEM</u> <u>FOCUS (Females of Color Underrepresented in STEM)</u> camp held at Mason's Fairfax Campus.



GRANT SPOTLIGHT: SUSTAINABLE FOOD SYSTEMS SYMPOSIUM

A Mason 4-VA grant initiative funded the Sustainable Foods Systems Symposium, held in May at the Smithsonian Mason School of Conservation in Front Royal. The two-day symposium brought 39 participant faculty and staff from 4-VA members Mason, James Madison University, University of Virginia and Virginia Tech. In presentations and break-out sessions, participants across the academic spectrum discussed climate change and how it will impact future food choices. Other issues discussed: the importance of local place-based food, food deserts, partnership with local farms and the possibilities of a joint 4-VA member food hub in a central location of the state. A food hub would create efficiencies in cost, delivery and food storage, and promote community engagement.

The symposium illustrated Mason's commitment to sustainability. In 2014, Mason became the first university in Virginia to achieve a **Gold Rating** from the Association for the Advancement of Sustainability in Higher Education. Sustainable stewardship of the earth's economic and natural resources is also a core value in the **Mason Strategic Plan**. The 4-VA grant's principal investigator is New Century College's Sustainability Studies Fellow, Associate Professor Andrew Wingfield (pictured next page, top right). He is the founding director of the Environmental and Sustainable Studies BA at Mason. Wingfield notes, "Virginia's state universities are poised to play a leading role in creating a more robust and sustainable local food system throughout the Commonwealth. The 4-VA Sustainable Food Systems Symposium provided an opportunity for participants to learn about the excellent work our universities are already doing in sustainable food systems research and curriculum development, campus food production, and green dining. The conversations started at the symposium will, I hope, lead to fruitful cross-university collaborations in the future."

• FOOD IS A COMMON LANGUAGE FOR EVERYONE. ,, The symposium also brought together for the first time 4-VA member dining and operations staff to exchange ideas. Mason's President's Park greenhouse, for example, partners with Sodexo to provide hydroponic lettuce, micro greens and herbs to the dining halls on campus.

Doni Ward, Mason's Greenhouse Coordinator (pictured below), discussed the importance of local food noting, "chefs are so excited because they never get food this fresh. To them, local is a 240 mile radius, so this is the most local food that campus has ever eaten." Produce from the Mason Greenhouse is served in the dining halls the same day of harvest. The symposium gave Ward an opportunity to learn about what other 4-VA institutions are doing to promote sustainability. As she explains it, "universities are really at the forefront of those new systems that are coming into play to ensure... what is necessary for our future – food security and sustainability."



Doni Ward, Mason's Greenhouse Coordinator, displays its hydroponic lettuce.

Feedback from symposium participants demonstrate the passion and commitment that they brought to the event. Susan Clark, PhD, Associate Professor, Sustainable Food Systems, at Virginia Tech noted, "It was affirming to learn more about the diverse and unique approaches and practices others are using to engage sustainable food systems work on their campuses. This conference afforded us the opportunity to creatively think about how we can collectively collaborate in the future in new and innovative ways around sustainable food systems initiatives, curriculum, extracurricular activities, and dining services partnerships."

Michelle Hesse, PhD, Assistant Professor of Health Sciences at James Madison, added, "I learned that we have endless resources... when our institutions join together around the table. We are stronger in numbers when we band together



Andrew Wingfield, Director of Mason's Environmental and Sustainability Studies Program.

and tackle a common cause/ problem. As we birthed ideas and shared stories it was amazing to watch how at one institution a concern/ problem could be solved using another institution's resources. Food is a common language for everyone. Our lives revolve around food. So to couch the discussion of sustainability around our food system is appropriate and applicable to all. To move this conversation forward beyond the 4-VA members who attended this symposium, it is necessary that we establish common ground and food is that platform."



Danielle Wyman, Project Manager, Mason's Office of Sustainability, promotes sustainable gardening practices.

GRANT SPOTLIGHT: THE RAIN PROJECT CHANGWOO AHN

Creating "ecologically literate citizens" able to tackle issues related to real problems is the goal of Associate Professor Changwoo Ahn's 2015 Mason 4-VA Innovation Grant, "The Rain Project." The Environmental Science and Policy professor has gathered twenty undergraduate students to form the Rain Project Student Leadership Group. Under Ahn's direction, students from the fields of art, science, communication, film and media were selected to build a "floating wetland" on Mason Pond, which provides "sustainable stormwater management in the era of climate change." The students helped design, showcase, and construct the Rain Project (see diagram). Two courses at Mason, Ecological Sustainability and Eco+Art, were involved in the project.

Ahn is founder and director of the EcoScience+Art initiative at Mason. His projects can be found at the Ahn Laboratory based on campus. The initiative is an interdisciplinary effort to "share knowledge, expertise and strategies for creatively engaging in the common pursuit of a sustainable future." Ahn sees the initiative as a way to "develop innovative ways of integrating teaching, research, and community service that can be adopted for designing college STEAM education."

Ecology is a small branch of biology, and the field is only 100 years old. Ahn sees wetland ecology as interdisciplinary – civil engineering, chemistry, art, design, communications, film and media. Ahn plans to present a workshop outlining the Rain Project to the campus and local community in Fall 2015. He also works with K12 schools, and will invite students and teachers to campus later this year to view the Rain Project.

FLOATING TREATMENT WETLAND



STUDENTS chosen to build "floating wetlands"

GRANT SPOTLIGHT: ENGAGING OUR COMMUNITY CYNTHIA SMITH



4-VA SUPPORTS STEM OUTREACH

Mason 4-VA supported a STEM Outreach and Community Engagement project that helped to bring 800 Northern Virginia PK-12 grade students to the 4th annual School Environmental Action Showcase (SEAS) held on campus April 9. The SEAS event provided a "fun and educational way to develop budding engineers and future scientists that could help solve our environmental problems," according to Cynthia Smith, the event organizer and grant PI.

Smith is an assistant professor in Mason's Environmental Science and Policy program, and Education Director for the Potomac Environmental Research & Education Center (PEREC).

The Mason 4-VA grant provided funds for community outreach and paired the initiative with a 2 credit class, EVPP 490, focused on STEM outreach. The course was shared with Remy Pangle from James Madison University's Center for Wind Energy. Students in the shared course coordinated the logistics for the SEAS event and served in organizational and leadership roles. Final projects submitted by students in the class were uploaded to YouTube. Two examples of the class submissions are Shelby Galvin's video reflection and Elizabeth Sponn's presentation. A highlight of the event was the KidWind Challenge. Sixty students from participating middle and high schools designed wind turbines that were then tested at the event for energy output (pictured below). The top three teams competed April 25th in the regional event held at James Madison University Center for Wind Energy.

Caring for our Watersheds, another event featured at SEAS, is a competition among participating schools to demonstrate new ways to help improve local watersheds. George Washington, Lanier, and Kenmore Middle Schools collectively took home \$6,000 in cash prizes. Other events included a school mascot competition utilizing recycled materials, the prize-winning mascot going to Providence Elementary School's Panthers.



Smith (above, second from left) helps students construct wind turbines at SEAS' 4th Annual event.

GRANT UPDATES



In the Mason 4-VA grant, "Assessing the impacts of conservation actions on the population trends of endangered bird species," David Luther at Mason and Jeff Waters at Virginia Tech complied data on threatened and endangered birds listed under the US Endangered Species Act.

"Using data from the US Fish and Wildlife Service (US-FWS), the researchers reviewed recommendations and conservation actions, as well as population trends and funding. According to Luther, results to date indicate that threatened and endangered bird species on US islands are worse off than species that inhabit the continental US. Island species are more likely to have declining populations, receive tenfold less funding, and fewer conservation actions. The results of this study will be helpful to conservationists as they attempt to decrease the rates of biodiversity extinction." MONDLE VAN HOEK

ANTI-MICROBIAL PEPTIDES IN BED BUGS

Monique van Hoek is in the second year of her collaborative James Madison/ Mason 4-VA grant work researching Cimex lectuarlis, commonly known as bedbugs. Her work utilizes genomic mining to identify antimicrobial peptides.

Bedbugs do not transmit disease to humans, but van Hoek's research team, has discovered that the insect has antimicrobial properties. They have identified a new "bed bug defensing peptide from a genomic sequence deposited in a database in Japan, and had the peptide synthesized in China, and are now testing it for activity. We were able to demonstrate activity of this antimicrobial peptide against Staphylococcus aureus, Staphylococcus epidermis and Escherichia coli K12." The peptide is active against much of the bacteria found on human skin.

Changwoo Ahn views the Rain Project as a way to "develop innovative ways of integrating teaching, research, and community service that can be adopted for designing college STEAM education." The floating wetland on Mason Pond provides sustainable stormwater management in the era of climate change."

In July 2015, Ahn says, "The plants have been growing well, especially with vigorous growth of roots which play the key role in filtering the sediments and taking up the nutrients. There is a visible buildup of sediments on the roots of the plants. Based upon our diurnal water quality measurements dissolved oxygen levels seem to increase (about 30%) around and underneath the floating wetlands. The pond water was also less turbid (up to 40%) at and near the floating wetlands, indicating their role of filtration. Further monitoring is necessary and underway."



THE RAIN PROJECT AND SUSTAINABLE STORMWATER MANAGEMENT





INCREASING STUDENT RESEARCH opportunities



HIRED

GRADUATE Researchers Hired



SPECIAL INITIATIVES

GOVERNOR'S SCHOOL

REID SCHWEBACH, COORDINATOR

PHAGE ECOLOGY SUMMER RESEARCH EXPERIENCE

For three weeks this past summer, selected undergraduate and Governor's School students conducted research focused on phage ecology. Schwebach developed the high school curriculum for phage ecology currently offered at the Governor's School in Innovation Park. Phage microorganisms are considered the most numerous organisms on Earth and are an easily accessible research subject for young scientists. The workshop provided rich student research experiences and mentorship opportunities for Governor's School teachers to bring phage research techniques back to their high schools. Schwebach collaborated on the program design with Steve Cresawn, Associate Professor of Biology at James Madison.

BRAZEN CAREERIST INITIATIVE

CHRIS CLARK-TALLEY, ASSOC. VP, ALUMNI RELATIONS

ALUMNI ASSOC. BRAZEN CAREERIST INITITATIVE

Brazen Careerist connects alumni, students and employers to each other in a virtual environment. The Alumni Association has two upcoming networking events that will utilize the platform: Young Alumni and Recent Graduates and Government Workers Networking. Clark-Talley noted,

Mason 4-V ↓ FUNDS ALLOWED US TO CONTRACT WITH A SERVICE THAT HAS FA-CILITATED STUDENT AND ALUMNI CAREER NET-WORKING ONLINE. WE HAVE BEEN ABLE TO PART-NER WITH ACADEMIC UNITS AND DEPARTMENTS AND CONNECT WITH ALUMNI THROUGHOUT THE STATE WITH A STATE-OF-THE-ART PLATFORM.

"

WRITING CENTER SUPPORTS STEM RETENTION

SUSAN LAWRENCE, DIRECTOR

WRITING CENTER SUPPORT TO INCREASE RETENTION IN STEM PROGRAMS

The 4-VA Initiative gave the Writing Center funds to hire additional tutors in STEM disciplines, with the goal to improve retention in STEM majors. Lawrence indicated that, "the 4-VA funds have given peer tutors from the STEM disciplines a strong presence in the Writing Center. With these tutors, we have served Mason's STEM writers, 20% of our client base, much more effectively in tutoring sessions." The STEM tutors led workshops on campus and outreach initiatives for secondary school students study-ing in the STEM fields. In an exit survey, one engineering major noted that the most valuable skills developed as a peer tutor were listening, encouraging, discerning situations and people, writing, and collaborative learning.

rs. Evelyn Sander, Christopher Manon and Padhu Seshaiyer introduced 3-D printers in Calculus I and III classes to help students to visualize calculus concepts.

Students produced 3-D figures and shapes from calculus problems using the software program Mathematica. A rotating mathematical art display in the entrance to Exploratory Hall displays student and faculty 3-D art. Examples can also be found on the Mathmaker Blog. The course labs are now available for use by other faculty in future semesters. "We believe this new way of thinking benefits diverse learners and underrepresented populations in STEM studies who may feel out of place in more traditional methods of teaching," says Seshaiyer.

Attitude surveys were conducted at the beginning and end of the semester for the pilot program courses and traditionally taught course sections. The two surveys indicated that the pilot program students "were enthusiastic about interactive and innovative teaching techniques and incorporation of new technology."

3-D labs showed dramatically increased attendance. Out of eight labs, seven had less than 10% absences. The surveys also showed a 20% knowledge increase of graph functions.

Sander noted in the final grant report, that "3-D printing will very likely become a key piece in many future technical careers. This exposure to 3-D printing will help to prepare students for future employment opportunities."

This summer Sander is teaching 3-D printing as part of a week long Mason STEM camp for middle school girls gathered from underrepresented groups. The camp is part of a Mason 4-VA grant awarded to Seshaiyer.

COURSE REDESIGN

PROJECT HIGHTLIGHT:

EVELYN SANDER

OTHER PROJECTS

STEM BOOTCAMP PADHU SESHAIYER, DIRECTOR

Provided 52 incoming STEM freshmen the opportunity to spend a week on campus, participating in lectures and exams in gatekeeper classes such as Calculus, Chemistry, Biology and Physics. This initiative is a part of the STEM Accelerator Program, and was developed by Seshaiyer and co-investigator Claudette Davis, Assistant Professor of Biology to increase retention in STEM majors. So far, it has been recognized with a Virginia Mathematics and Science Coalition 2015 Programs That Work award, and results from this first cohort show that 83% of declared STEM majors participating in the Boot Camp remain in their major.

REVERSE CLASSROOMS COLIN REAGLE, LEAD

This past year Colin Reagle, Mason assistant professor of mechanical engineering and James Madison professor Karim Altaii, professor of integrated science and engineering, collaborated on a course redesign of Thermodynamics. The two professors used a reversed classroom approach where lectures are recorded and available online, and class sessions are focused on problem solving.

FACULTY DEVELOPMENT LEARNING COMMUNITY

CALCULUS

AS ART

LYNNE SCOTT CONSTANTINE, ANASTASIA SAMARAS, AND LESLEY SMITH

Funded a one-year cross-disciplinary and collaborative learning community devoted to the self-study of teaching and learning in visually rich digital learning environments. Thirteen participants represented seven of Mason's constituent colleges. Two members of the learning community will be presenting at upcoming conferences.



PROJECT WORTH WATCHING IN 2015-16: <u>TEACHING HIDDEN HISTORY</u> - KELLY SCHRUM, LEAD Course sharing within the 4-VA collaborative fulfills a critical need, providing a way to complete courses that would otherwise not be available to students at a particular institution. For example, Korean foreign language courses have been provided by Mason to Madison through this shared course model for the past two years. Course sharing is made possible through TelePresence technology and faculty development supported by the 4-VA funds.

From Spring 2012 through Spring 2015, Mason enrollment in shared courses included 233 students, with Mason hosting 21 courses and receiving four courses from other institutions within the collaborative. This year, from Fall 2014 to Spring 2015, 44 students studied in six courses, one STEM course and five foreign language courses.

FALL 2014

CHIN 480 KORE 101 KORE 250	4th Year Chinese I – with Virginia Tech Elementary Korean – with James Madison Gateway to Advanced Korean – with James Madison
SPRING 2015	
EVPP 490	Special Topics in Environmental Science & Policy: Community Engagement – with James Madison
KORE 210	Intermediate Korean – with James Madison
KORE 330	Advanced Korean – with James Madison



4-VA SUPPORTS TELEPRESENCE

Instructor Xi Chen (below, middle) teaches students across Virginia, including JMU and UVA students, Chinese for the Business World using TelePresence technology supported by the 4-VA Initiative.

INCREASING COURSE SHARING COLLABORATION

PAVING THE WAY TO DEGREE COMPLETION

MASON 4-VA: SMOOTHING TRANSITIONS AND TIME TO DEGREE

Mason 4-VA's committed resources during the 2014-15 year to strengthen ties with Northern Virginia Community College (NVCC), a key stakeholder and Mason partner. AAS degrees at NVCC transfer to seven concentrations in Mason's Bachelor of Applied Science (BAS) degree, including the fully online Cybersecurity concentration http://bas.gmu.edu. In order to increase accessibility and help towards degree completion, Mason 4-VA sponsored a daylong advising symposium for 69 NVCC first year advisors, counselors and faculty advisors.

The event was hosted by 39 members of MAAN, the Mason Academic Advisor's Network, and organized by advisors Brydin Banning, and Wayne Adams. Brydin Banning is the first NVCC Pathway to the Baccalaureate advisor to be based on the Mason campus. Brydin served as a bridge between the two institutions during the planning process. "Why don't we talk to each other?" she exclaimed. She said a common refrain from the NVCC advisors was a lack of communication between Mason and NVCC. The impact of poor communication – difficult transfer transitions, student frustration, and increased time to graduation. Wayne Adams, Mason School of Art academic advisor, said that the symposium improved "communication and collaboration" between the two institutions. Transfer students are coming into Mason at a time of transition, and they need additional support and information. The symposium servesd as a vehicle to increase information to both advisors and the transfer population.

Julia Brown, NVCC's Coordinator for Transfer Policy, said the event was a "most worthwhile day" for the NVCC staff, and "provided an excellent and much needed opportunity" to talk directly to Mason advisors about Mason transfer programs and the application process. Surveys conducted at the end of the day showed that the attendees strongly agreed that the symposium as valuable for the Mason and NVCC communities. Planning for next year's event has already begun, and with Mason 4-VA support will continue to build collaboration among Virginia institutions.

ADMINISTRATION

4-VA MANAGEMENT BOARD

The 4-VA Management Board sets the vision for the 4-VA collaborative, and is comprised of Virginia's Secretary of Education, 4-VA's five member university presidents, the Executive Director of the State Council of Higher Education for Virginia (SCHEV), and Cisco's Senior Vice President.

In 2014, the Executive Office of 4-VA rotated to James Madison University. Nick Swayne serves as the Executive Director, and Kailynn Brokamp is the Assistant Director.

MASON 4-VA 2014-2015 ADVISORY BOARD

Mason 4-VA's advisory board supports the program's research activities, and is composed of:

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