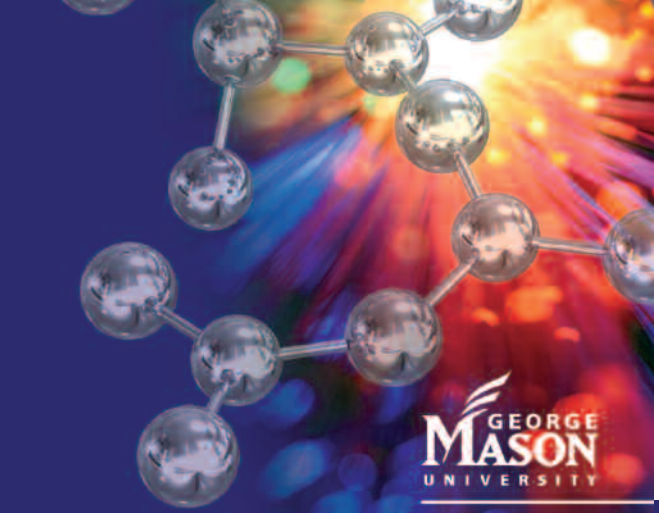


GEORGE MASON UNIVERSITY

Where Innovation Is Tradition

Periodic Elements

from the College of Science

Photo: Mark Greenberg

Now Boarding for Suborbital Space

story, page 10

Vol. 7 Spring 2012 cos.gmu.edu

New Scope Provides 4,500 Pounds of Education

It's only a short elevator ride to the roof of Research Hall and the Astronomy Observatory, but Harold Geller fills the time with facts about the building's construction, history of astronomy at Mason, and the excitement felt in the local community about the new thirty-two-inch diameter Ritchey-Chrétien telescope in the College of Science. The new scope is possibly the largest on-campus telescope of its kind at any university on the East Coast.

Geller, observatory director and associate professor in the School of Physics, Astronomy, and Computational Sciences, explains that this new telescope continues a tradition that started in 1975. Students back then first hand-built a six-inch refractor telescope, then a twelve-inch reflector telescope. The university's commitment to physics, astronomy, and computational sciences has grown since the 1970s. About twenty-five graduate students are currently enrolled in the astronomy program, and another 1,500 students take astronomy classes each year.

"This is a professional-grade telescope," says Geller. "It allows us to see as far into space as possible." The scope is mounted in the dome of the observatory and is controlled by three computers. One system displays a graphical user interface that takes the guesswork out of searching for objects in the sky. Geller explains that the 4,500-pound telescope can easily be positioned by typing in commands that have the sky mapped with precise coordinates. The dome roof opens and closes, and the telescope rotates into position. He adds that the enormous telescope was dropped into place from the open dome roof and assembled inside the room.

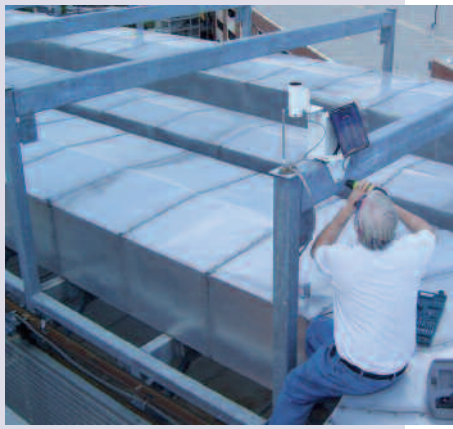
continued on page 2

Photo: Creative Services

An evening viewing session at the Astronomy Observatory

Come experience the night sky.
Visit the observatory website for public viewing times throughout the year.

http://physics.gmu.edu/~hgeller/observing.html



A light pollution monitor is mounted on the observatory roof to measure nighttime light levels.

New Scope, from page 1

And while the new scope is impressive, the observatory itself has features designed specifically for small groups. The room has been fitted with a motorized lift that allows for handicap access up to the scope, a screen and sound system for presentations, and red safety lighting that does not interfere with viewing the night sky. In addition to the new scope, the observatory houses a twelve-inch Schmidt-Cassegrain (Mancini) telescope, a six-inch solar telescope, a sixteen-inch Dobsonian (Strickland) telescope, and also has one telescope from the original observatory on display.

"The scopes are primarily used for education," explains Geller. Students get a first-eye view of stars and planets and are introduced to different types of research. Although the software automates the positioning of the scope, students still get valuable experience working with a scope this large. That experience will serve them well if they continue their research at other facilities, especially if they work on the West Coast at larger observatories.

Photo: Creative Services

The Astronomy Observatory adjoins Research Hall on the Fairfax Campus.

Research and education is what the Astronomy Observatory are all about. In addition to regular evening viewings for the public, the college also has a weather station and is participating in the International Dark-Sky Association project to measure light pollution across the globe. According to the International Dark-Sky Association, "human-produced light pollution not only mars our view of the stars; poor lighting threatens astronomy, disrupts ecosystems, affects human circadian rhythms, and wastes energy to the tune of $2.2 billion per year in the United States alone." Mason has received a grant to serve as a single measurement point. Research facilities around the world are measuring nighttime light levels. Each single point, when measured together, will help create a worldview of current light pollution levels. Geller is also working on a grant that will measure daytime light levels. Preserving our view of the night sky is essential for astronomical research and for inspiring the next generation of scientists.

COS, Russian Researchers Work Together toward Cancer Diagnostics and Monitoring

A major goal for the diagnosis and treatment of cancer is early identification of molecular changes that signal the onset of disease. These molecular changes, or biomarkers, correlate to the progression of normal tissue toward formation of the tumor and can be distinguished from other biological changes in a person's cells, proteins, or other molecules. The home for such clinical research within the College of Science is the School of Systems Biology (SSB).

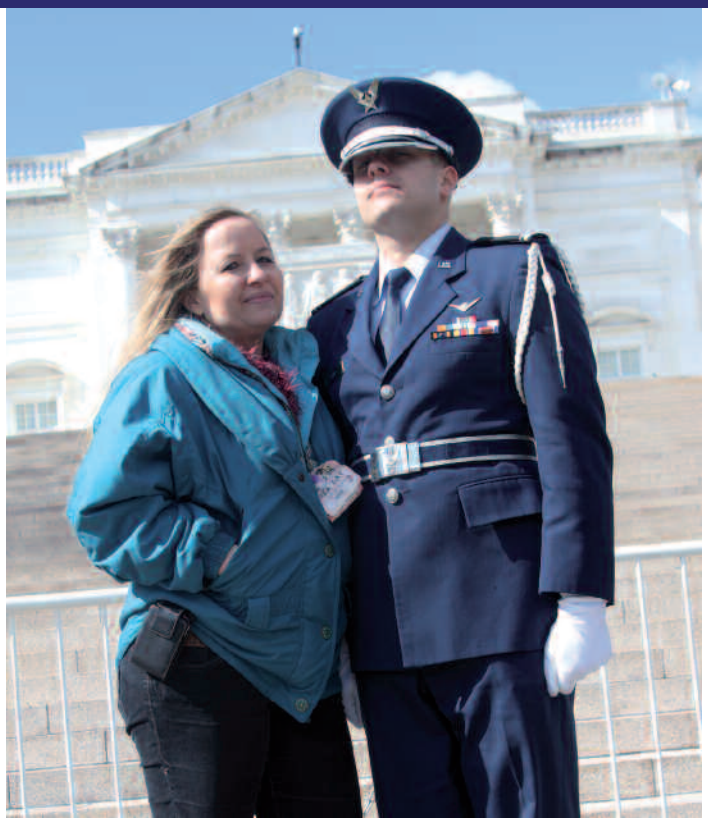
Ancha Baranova, an associate professor in SSB, came to Mason to pursue her research interests in molecular biology and genetics as they relate to cancer and obesity. When she left the Vavilov Institute of General Genetics in Moscow, she kept her ties—and her working relationships—with her colleagues and students there.

As a principal investigator in the Functional Genomics Group at the Vavilov Institute, she had five doctoral students working on their theses when she left for the United States. "I continued working with my students, discussing the results of their experiments and my own research progress," Baranova explains. "Over time, we discovered that certain experiments were less expensive to conduct in Moscow and others were conducted at Mason, all resulting in collaborative papers."

As her students earned their doctoral degrees and moved on to other academic research labs in Russia, they maintained their scientific interaction and brought more than a dozen other scientists into the group. These relationships evolved into a whole range of research projects in various areas of cellular and molecular biology, with twenty-seven papers being published in several peer-reviewed journals. The scientists recently commemorated ten years of collaboration with a workshop at the Vavilov Institute that summarized their research achievements.

Baranova sees the results of her collaborative research as changing the landscape of cancer diagnosis and post-treatment monitoring. "We envision the use of high-throughput profiles to comprehensively describe tumor biopsies, for example, instead of individual biomarkers," Baranova describes. "These tests will result in easily understood images that answer a patient's most pressing question: 'How bad is my tumor?'"

The work that these researchers began ten years ago has built a foundation for future developments in cancer treatment and many other clinical fields. High-throughput detection of anomalies and molecular pathway analysis have implications for heart disease, diabetes, and liver disease, among others. Baranova notes, "They will pave the way for truly individualized medicine."



Jody and Devin Shipp at a recent event

Two Students Plus One Shared Passion Equal Math Success

In Ellen O'Brien's linear algebra class, Jody and Devin Shipp faced the first among many curious looks they would encounter in the Department of Mathematical Sciences. O'Brien was asking the students their last names as she handed back recently graded exams. Jody had already received hers, and Devin piped up, "My name is Shipp, as well." Surprised, O'Brien asked, "Oh, is that your sister?" When Devin replied, "No, it's actually my mom," it didn't compute for O'Brien. Confused, she kept asking, "You're taking this class and sitting next to your mom?"

"She was just shocked," remembers Devin, 26. "She couldn't get over the fact that we would sit together and work together on stuff." That was 2010, and since then, the mother-and-son team of Jody and Devin Shipp have become exemplary students and role models for their peers. As they prepare to graduate this spring, this pair demonstrates the power of a unique parent-child partnership.

While many children want to put distance between themselves and their parents, Devin often conferred with Jody before signing up for classes each semester. "I liked to take the same classes because it tends to make me work harder," Devin says.

She sums up her parenting style with a simple but powerful concept: love your children for who they are. Jody instilled in Devin a love of math since his childhood. The only question she would ask him when he returned from school was, "Did you get any math homework?" Once he finished his assignment, Jody gave Devin the task of doing extra math problems, which they would work on together. "Obviously, I was reluctant to listen half the time," he remembers. "But that's what got me going on math because actually, when you're doing math that much, you become good at it."

As math tutors, both Jody and Devin strongly believe that success doesn't come overnight. Jody, in particular, takes issue with the notion that one is either born with the so-called math gene or not. Learning math takes hours of practice and, in some cases, help from a tutor. Math educators haven't done the best job of illuminating the real-world applications of math for students who struggle and eventually lose motivation, she notes. "I would tell students to stick with it and try to find a way to relate math to your own life," she says.

For the Shipps, learning math is like learning a language: Repetition creates fluency, and fluency fuels passion. Math's power was first demonstrated to Jody in high school, when she learned to use trigonometry to figure out a building's height. Devin embraces math's consistency: "In a world of uncertainty, math is something that's rock solid."

Of the two, Devin will say his mom is more of a math superstar, although his mom disagrees. Last year, she was chosen to participate in a National Science Foundation–supported program called Undergraduate Research in Computational Mathematics, attending the Joint Mathematics Meeting in Boston earlier this year to present her work. In 2010, she received the Amer Bešlagić Award from the math department and, before that, a math award from Northern Virginia Community College.

These accolades are a long time coming for Jody, who began her college career more than twenty years ago as an electrical engineering major at Utah State University. She left school after two years when she married. Now at forty-nine—and after a fifteen-year career in customer service at Delta Airlines—she is picking up where she left off, exemplifying the adage, "It's never too late." Jody will start her master's degree in education at Mason after earning her bachelor's degree in mathematics this spring.

Devin, a member of the Reserve Officers' Training Corps, was recently selected to become a pilot in the U.S. Air Force. He will begin training at Laughlin Air Force Base in Del Rio, Texas, after graduating with his bachelor's degree this spring. He loves how math relates to patterns and codes and aspires to work at the National Security Agency some day, helping defend the United States against cyber attacks. A doctoral degree in math is also in his sights.

Trishna Dutta collecting field samples.

Husband and Wife Team have Big Ideas for Big Cat Conservation

Not everyone can say that they passed on an offer to study at Oxford University. Trishna Dutta and Sandeep Sharma did just that in 2006, when the husband and wife pair received admission to pursue their graduate degrees in conservation. They chose George Mason University instead and are now close to finishing their doctorates through the environmental science and public policy program in the College of Science. Why Mason? Among the factors are the school's proximity to Washington, D.C., home to public policy's movers and shakers, and its special relationship with the Smithsonian Conservation Biology Institute (SCBI) and the National Zoo, where they both are doctoral fellows.

Dutta's and Sharma's research deals with one of the most pressing issues in conservation policy today: how to ensure the preservation of large cat species in India, the world's second-most populous nation. Specifically, they're studying whether forest corridors that connect five major tiger reserves in the central Indian states of Madhya Pradesh and Maharashtra are functioning for two species, the Indian leopard (*Panthera pardus fusca*) and the Indian tiger (*Panthera tigris tigris*).

In theory, the corridors should provide safe passage for wild cats to move around different reserves to breed with a variety of mates. The reality is that unlike the tiger reserves, these corridors are not legally protected landscapes and often coincide with villages, highways, and other disturbances. Ensuring that these cats have access to numerous and unique partners means there will be proper gene flow, resulting in the kind of genetic diversity necessary to a species' long-term survival, according to Dutta and Sharma.

"You sample across the entire landscape and see if genes from one population are moving across to another," says Dutta. "That's an indication that the animal has not only physically moved from point A to point B, but that it has also bred there and contributed to the gene pool . . . that's absolutely essential."

Sandeep Sharma measuring tiger claw marks.

To determine whether genes are flowing within tiger and leopard populations, Dutta and Sharma are using noninvasive genetic sampling, a technique they learned at SCBI, to extract an animal's genetic material without trapping and handling it. The samples are not blood or tissue, but scat, fecal matter containing sloughed-off cells from the intestinal lining, from which DNA can be extracted.

The downside to this approach is that DNA tends to be "highly degraded," says Sharma. "You have small pieces of DNA that are not really good," explains Dutta, "so the whole emphasis on the method is to try to get as much information as you can while maintaining a strict quality control."

Since returning from the field in 2010, the couple has spent countless hours in the lab working on the hundreds of scat samples they collected over two years. While leery of drawing firm conclusions yet, they've identified 217 individual leopards and 273 individual tigers from their samples, and preliminary results suggest that corridors are playing an important role in maintaining genetic diversity in these two species.

Ultimately, they say, sound conservation policy must be rooted in evidence-based science; they're hopeful that their work will help policy makers in India make better decisions regarding animal habitats. "With this large sample size," says Sharma, "we'll have some conclusive results that you can transform into policy or management recommendations."

Partners in both work and life, Dutta and Sharma spend a lot of time together. They met in 2001 and worked on a research project on snow leopards and wolves in the trans-Himalayan region in northern India in 2004. The harsh environment made for a challenging experience, one that seemed to seal their bond. "Once we pulled through that, we thought, if we can deal with this together, then I think we can deal with anything," says Dutta. "Working as a couple makes field work enjoyable and navigating all the hurdles simpler. Whether it's sampling in the field or writing papers, it's a huge support to know that you have each other to fall back on."

Trishna Dutta and Sandeep Sharma working in India

> "Ultimately, they say, sound conservation policy must be rooted in evidence-based science; they're hopeful that their work will help policy makers in India make better decisions regarding animal habitats."

Results by the Numbers

- Central Indian states of Madhya Pradesh and Maharashtra connect five tiger reserves.
- Sharma and Dutta have identified 217 individual leopards and 273 individual tigers from their field samples.
- Preliminary results suggest that forest corridors are playing an important role in maintaining genetic diversity for these two big cat species.

> Mason's location near the federal government and high-tech industries means that there will be a growing need for professionals with this type of education.

Wind turbines are an alternative source of energy in this Cheyenne, Wyoming, locale.

COS Powers Up for Renewable Energy Studies

The need to achieve energy independence and develop clean and affordable renewable energy sources has been a rallying cry here in the United States for decades. The lingering effects of the global recession and political instability in the Middle East have only underscored these concerns. Physics professor Robert Ehrlich is leading efforts in the College of Science to develop renewable energy studies and is writing a new textbook that will be suitable for energy programs across the country.

> Ehrlich hopes that the growth of this program will mirror the need in the job market, which appears likely to be very strong in the future.

Ehrlich came to Mason in 1977. He has done physics research, worked to improve physics education, and has been a champion for communicating science to the public. Ehrlich began the work of bringing renewable energy studies to the university three years ago. He says that he is coming to the end of his teaching career and that renewable energy is a good fit for him and Mason.

However, for a man talking of retiring, he shows no signs of slowing down. In addition to writing the textbook, he maintains the Renewable Energy Valuation and Understanding Project (www.rev-up.org), a website that he started in 2009 "to be the most essential web-based source of information for teachers, students, and others interested in renewable energy education." And he recently sent a letter of inquiry to the Alfred P. Sloan Foundation seeking seed money to organize a group of techno-environmental educators who can work together to safeguard the environment with an understanding of balancing economics with environmental concerns.

Ehrlich sees a growing need for renewable energy education and not just from a scientific approach. He explains that the discussion needs to include public policy, economics, and law. Mason's location near the federal government and high-tech industries means that there will be a growing need for professionals with this type of education. The National Science Foundation and the U.S. Department of Energy often fund many internship opportunities at many sites around the nation, and especially in the Washington, D.C., area.

Currently, a renewable energy minor is offered through the college's School of Physics, Astronomy, and Computational Sciences that is designed for students seeking education for careers in renewable energy or as preparation for graduate work. Students can also enroll in Mason's master's degree program in interdisciplinary studies and seek a concentration in energy and sustainability studies. This program is ideal for students who are interested in pursuing careers in energy and environmentally related applications in the law, national and international policy, government, print and media journalism, public and social service, teaching, advanced graduate studies, ethics, business, and basic and applied research.

Whether to stick with the current structure or to expand to a full degree program in renewable energy at the university is an issue that will be contingent on the growth of the current offerings and staffing. Ehrlich hopes that the growth of this program will mirror the need in the job market, which appears likely to be very strong in the future. He says that currently "only five percent of schools in the nation have energy-related programs." There's a growing need for more, and Mason has a chance to become a leader.

Science and Math Accelerator Supports STEM Learning

Improving achievement in science, technology, engineering, and math (STEM) is a high priority for the United States at the national, state, and local levels. A new College of Science (COS) initiative, the Science and Math Accelerator, supports Virginia's STEM education goals while boosting Mason student achievement in these subjects.

The Accelerator's goals are to increase the number of students in COS majors, streamline their path to graduation, and improve job placement rates. Cody Edwards, director of the Science and Math Accelerator, describes the program as early intervention for at-risk students to provide extra instructional support. Traditionally, tutoring and exam preparation take place after students have shown poor performance. Edwards is working to change that approach. "We want to identify students and offer them help before they fail an exam," he explains.

Science and Math Accelerator faculty members take improved teaching techniques directly to their classrooms. Accelerator assistant professor Jocelyn Prendergast (center), who also teaches in the forensics program, works with students on electrostatic lifting of fingerprint impressions.

Five newly hired faculty members in the Accelerator have begun working with their individual units to identify academically at-risk students. The five initial units are mathematics; physics, astronomy, and computational sciences; chemistry; biology; and forensics. Accelerator professors are administering assessment exams to students before they enroll in certain difficult prerequisite courses (for example, organic chemistry).

Once the students are identified, Accelerator professors and student assistants offer them programs that target their specific needs. Two pilot programs, peer-to-peer tutoring and oral reviews, are showing success.

The oral reviews were brought to Mason by Accelerator faculty member Mary Nelson, assistant professor in the Department of Mathematical Sciences. The reviews take place just a few days before each exam and provide a specialized, small-group experience. About five students meet with a faculty facilitator who helps them understand the underlying concepts for the material to be covered in the exam. "We don't ask them to practice procedures, but rather to explain how the procedures work and why they are helpful in real life," Nelson explains.

The oral reviews are already showing dramatic results. "During my first round of orals here at Mason, just over thirty percent of the students participated. The average grade for participants was twenty percent higher than that of the nonparticipants," Nelson noted. "This result is more dramatic than anything I previously saw; average gains were usually between four and eight percent."

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Making Room for Science

In spring 2013, many functions of the College of Science, including the new Science and Math Accelerator, will share space in a new home. The renovation and expansion of Exploratory Hall (the former Science and Technology II building) brings the college together into one area of the Fairfax Campus, creating a new science complex that comprises David King Hall, Planetary Hall (the former Science and Technology I building), Exploratory Hall, and Research Hall.

The $52 million project is being designed to achieve LEED Silver certification and will showcase state-of-the-art teaching labs for biology, geology, and environmental science and policy. The updated facilities will help support science, mathematics, and science-related technology education standards and meet faculty instructional needs. Exploratory Hall will demonstrate the creative link between art and science through a visualization lab, art exhibits, and other dynamic features.

The four-story addition connects Exploratory Hall and Planetary Hall and houses the teaching labs, among other workspaces. This addition also incorporates several green elements to meet LEED standards, such as a rooftop greenhouse, an herbarium, a geology garden, and extra "green roof" space for educational and environmental benefits.

Other features of the renovation are a shared testing center, areas for scientific collections, computational and dry labs, classrooms equipped with updated technology, and office, lecture hall, and gathering spaces.

Science and Math Accelerator, *from page 7*

Other learning tools and activities are in the works for the Accelerator, including a course that Edwards has dubbed "STEM 101." He envisions it as a critical thinking course to prepare students to be able to transfer the ability to analyze and solve problems to any subject. "We have very capable students, but many lack critical thinking skills," explains Edwards. Taking details from word problems and translating them to formulas seems to be challenging for some students. "We want students to be successful in all the STEM fields," points out Edwards. "We're trying early on to develop activities that can have the biggest impact for the most students."

Radleigh Smith, learning assistant for organic chemistry, works with students during an Accelerator tutoring session.

The Accelerator has hosted a career night with panels of alumni and other professionals in STEM fields. "Students can ask alumni what courses they took in college, what training they're looking for in new hires," Edwards says. "That's information that you just can't get by looking at a web site."

Edwards emphasizes that the Accelerator isn't just for current Mason students: they're seeking future students through recruiting outreach activities. Another Accelerator professor, Jocelyn Prendergast in the forensics program, is visiting local high schools to target students who may not be considering attending Mason.

The activities of the Accelerator extend beyond students and present a framework for COS faculty to contemplate pedagogy and teaching methods. Further, the Accelerator's faculty members are applying for grants to support their work in this area.

The Accelerator's early success shows its benefits for students and faculty at Mason, and also for Virginia businesses and research organizations. "For students who want to enter STEM fields," Edwards points out, "this program helps them graduate in a reasonable time frame." The networking opportunities available through the Accelerator help students get jobs and businesses find employees—all of which will show Mason as an innovator in STEM education.

COS Doctoral Students Impress National Audience

Researchers at the National Center for Biodefense and Infectious Diseases (NCBID) stepped away from their experiments briefly last November to attend the Defense Threat Reduction Agency (DTRA) 2011 Chemical and Biological Defense Science and Technology Conference in Las Vegas, Nevada.

DTRA is the U.S. Department of Defense's official Combat Support Agency for countering weapons of mass destruction. NCBID scientists work with DTRA in the study of highly infectious pathogens that could pose national security threats. At NCBID, they focus on understanding host-pathogen interactions, which is an effective strategy to identify therapeutic targets for both viral and bacterial infections.

Conference attendees included Charles Bailey, Myung-Chul Chung, Ramin Hakami, Kylene Kehn-Hall, Serguei Popov, Monique van Hoek, and students Saira Ahmad Chaudhry, Scott Dean, Cathaleen King Madsen, and Rachel Van Duyne. The group presented a total of thirteen posters and an oral presentation. Both Chaudhry and Madsen were awarded DTRA student scholarships that covered their costs to attend the event and present their research findings.

Cathaleen King Madsen

"It is a great honor for their doctoral work to have been selected by the review committee as being worthy of scholarship support," says van Hoek. "I am very proud of Saira and Cathy for their accomplishments."

Chaudhry works in van Hoek's lab and credits her and the entire team for their support and research expertise. Chaudhry presented a poster on "Inhibition of *Francisella* Biofilm: Identification of LL-37 Targets." Madsen, who works for Kehn-Hall, gave an oral presentation about "Changes in Cellular Micro-RNA Following Rift Valley Fever Virus Infection."

Madsen's research is focused on identification of altered microRNAs following Rift Valley Fever Virus (RVFV) infection, explains Kehn-Hall. RVFV is a Category A select agent and potential bioterror weapon that could have a significant impact on both humans and livestock.

Chaudhry explains that researchers from academia, industry, and the military come to DTRA conferences, and that the opportunity to meet so many different people with

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***COS Doctoral Students**, from page 8*

shared interests was exciting. Madsen says she was honored to be asked to give an oral presentation to such a distinguished crowd.

"It is wonderful for these two students to get the opportunity to present their research at a national conference," says van Hoek. "It allows students to discuss their work with other scientists in the field and get feedback on their doctoral research projects. It also exposes the students to the broad range of research activities that are ongoing in the field of biodefense."

Saira Ahmad Chaudhry

Chaudhry is finishing her dissertation and plans to graduate this spring. She hopes to continue her research by moving into the pharmaceutical industry. Madsen is continuing her doctoral research and also teaches undergraduate biology lab classes. Having worked in industry, policy, and teaching, she says she has multiple career options. "In the end, it's all about working to advance the state of scientific knowledge in this area and sharing that knowledge with others."

Neuroscience Students Move from Textbooks to Patient Research at Inova Hospital

College of Science neuroscience students have been given an exceptional opportunity to work one-on-one with health care providers and scientists at Inova Fairfax Hospital. Currently, eleven undergraduate and graduate students from the College of Science and molecular neuroscience and psychology departments in other Mason academic units are participating in this semester-long Inova Biomedical Internship Program in Neuroscience.

Robert Lipsky, director of translational research, and Beverly Walters, director of clinical research, started the program. Both researchers work in the department of neurosciences at Inova Fairfax Hospital. Lipsky is also a professor of molecular neuroscience at Mason's Krasnow Institute for Advanced Study, where he works with two of the interns on laboratory-based research projects.

Walters, who is also an adjunct professor of neurosurgery and the director of clinical research at the University of Alabama at Birmingham, serves as the director of the internship program. She worked with the college's Larry Rockwood, biology program director, and Amy VanMeter, director of the Aspiring Scientists Summer Internship Program and a research specialist in the Center for Applied Proteomics and Molecular Medicine, to recruit Mason students to participate in the program.

VanMeter says that Inova developed the program specifically for Mason students for two major reasons. "The department of clinical neurosciences at Inova Fairfax Hospital has a significant amount of data available to analyze," she explains. "Mason students were a perfect fit because the university is near the hospital and our curriculum helps prepare students for this opportunity."

INOVA™
Join the future of health.

Two interns are working in Lipsky's Krasnow Institute laboratory performing molecular analysis and studying neuroblastoma and traumatic brain injury. The other nine interns are working with physicians at Inova Fairfax Hospital on clinical research projects. These projects range from developing identification methods that can predict subcortical versus cortical strokes, reviewing neurosurgical cases of soldiers from Operation Iraqi Freedom, and reviewing a method used in patients with malignant cerebral artery strokes.

Besides learning to analyze and interpret results, the students are learning scientific writing and oral communication skills and ways to apply textbook knowledge to solve hypothesis-driven questions—key skills for medical careers. "These internships will strengthen the students' résumés and applications as they apply to medical school, graduate programs, and future careers in the field," VanMeter points out. "Our hope is for the students to publish their research in peer-reviewed journal articles that physicians around the world can access."

The neuroscience internship program both benefits from and builds on the strong, well-established collaboration between Mason and Inova Fairfax Hospital. "Our students are engaging in real-world clinical research directly with Inova's neuroscience physicians," says VanMeter. Their results could change current medical practices in the neuroscience field.

Commercial Space Flight Takes Science into Orbit

"Within the next five years, there will be at least one commercial space flight a day," says Mike Summers, director of the School of Physics, Astronomy, and Computational Sciences. Summers just returned from the 2012 Next-Generation Suborbital Researchers Conference held in Palo Alto, California, where he sits on the program committee and works to advise the group on how to use space vehicles to support education. "There were over 450 registered attendees this year," says Summers. "This was the most exciting conference we've ever had."

Photo: Mark Greenberg

Virgin Galactic Test Flights over New Mexico.

Summer's excitement about the future of commercial space flight is infectious. "Commercial space exploration leads the way," he says. Through companies such as Virgin Galactic, XCOR Aerospace, and Space Adventures—just down the road from Mason in Vienna, Virginia—"average people will be able to travel to space, and there will be new venues to study planetary science, climate, and space medicine, and develop new technology."

> "The next generation of space flight will take tourists not to the moon but rather to suborbital space, which is defined as 100 kilometers above sea level. From there, passengers will experience weightlessness and see the infinite darkness of space and the curvature of the Earth."

Former astronaut Neil Armstrong delivered this year's conference keynote address. He spoke about space exploration in the 1950s and 1960s and the importance of going back into space. Armstrong has not spoken publicly in many years. "He brought back all the excitement about space that I felt as a kid," says Summers. "The public needs to feel motivated again, and that enthusiasm was felt here."

The next generation of space flight will take tourists not to the moon but rather to suborbital space, which is defined as 100 kilometers above sea level. From there, passengers will experience weightlessness and see the infinite darkness of space and the curvature of the Earth. The cost for the adventure starts at about $100,000. And while that is no small sum, it is attainable for many people and equivalent to mounting an expedition to Mt. Everest. Summers says that many companies are giving flights away to promote their services. But what's more exciting is that the cost of sending experiments into space will be affordable, somewhere between $5,000 and $10,000. Companies are working with both NASA and the Federal Aviation Administration on safety rules and regulations.

Summers envisions that students can run fundraisers, create and launch experiments, and analyze the data all within a semester. He feels that companies will offer free space on board flights for research studies, as well. He is interested in bringing space research to Mason and would like to develop an undergraduate concentration in space science and technology. He sees it working well with physics, computational sciences, and biology.

Currently, he is working with Purdue University in Indiana on an experiment that will measure temperature and pressure levels in the upper atmosphere. Summers explains that we have little information about that part of our atmosphere and that suborbital space flights will allow us a new view of the planet. Part of the challenge and education that comes from gathering data is teaching students how to design the experiments, and that too is something Summers envisions happening at Mason. "We have free access to equipment, and we can build our experiments in small labs," he explains. "Now all we need is to find a place on campus." The sky's the limit.

NanoNotes

Elements of Distinction about the College of Science, its Faculty, Staff, and Students

Last fall, the College of Science initiated an annual awards program to recognize those scientists who embody the creativity, dedication, and discoveries that shape today's world. Congratulations to the 2010–2011 award recipients for their contributions and accomplishments.

The *Publication Award* recognizes high-impact, creative, and well-written scholarly contributions by COS faculty members who are at the forefront of scientific research.

Ancha Baranova, School of Systems Biology
Iosif Vaisman, School of Systems Biology
Yuntao Wu, School of Systems Biology
Barney Bishop, Department of Chemistry and Biochemistry
Chaowei Yang, Department of Geography and Geoinformation Science
Lingli Wang, Department of Geography and Geoinformation Science
Juan Cebral, School of Physics, Astronomy, and Computational Sciences
Predrag Nikolic, School of Physics, Astronomy, and Computational Sciences
Mario Gliozzi, School of Physics, Astronomy, and Computational Sciences
Timothy DelSole, Department of Atmospheric, Oceanic, and Earth Sciences
Patrick Gillevet, Department of Environmental Science and Policy
Evelyn Sander, Department of Mathematical Sciences

The *Teaching Award* recognizes COS faculty members who are outstanding teachers or mentors or who have made major contributions to COS educational activities during the previous year.

Daniel Cox, School of Systems Biology
Monique van Hoek, School of SystemsBiology
Charles Madden, Program in Biology
Paul Cooper, Department of Chemistry and Biochemistry
Kevin Curtin, Department of Geography and Geoinformation Science
Joseph Weingartner, School of Physics, Astronomy, and Computational Sciences
Robert Weigel, School of Physics, Astronomy, and Computational Sciences
Giussepina Kysar Mattetti, Department of Atmospheric, Oceanic, and Earth Sciences
Dann Sklarew, Department of Environmental Science and Policy
Padmanabhan Seshaiyer, Department of Mathematical Sciences

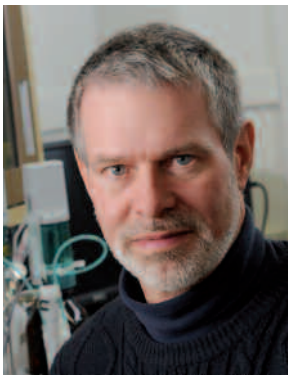
Fatah Kashanchi

The *Impact Award* recognizes individuals who have made major contributions to their field of scientific research or education over the course of their career at Mason. This can be demonstrated in research by high publication and citation rates, or in the case of teaching, by major contributions to COS educational programs and demonstrated excellence in teaching.

Fatah Kashanchi, School of Systems Biology

Tamanna Nabi, Biology undergraduate student, received the John C. and Louise P. Wood Undergraduate Scholarship from the George Mason University Alumni Association. The scholarship is awarded annually to a student who demonstrates unusual motivation and ability in the pursuit of education and who has contributed to the development and welfare of the university, the community, or both.

Robert Hazen, Department of Atmospheric, Oceanic, and Earth Sciences and Clarence J. Robinson Professor of Earth Sciences, was honored with a 2012 Outstanding Faculty Award from the State Council of Higher Education for Virginia. The award recognizes superior accomplishments in teaching, research, and public service and is the highest honor bestowed on faculty at Virginia's public and private colleges and universities.



Robert Hazen

Larissa Mark, doctoral student in the Environmental Science and Public Policy program, recently completed a Climate Change Fellowship in Columbia, where she worked with leading professionals and organizations to combine the power of citizen diplomacy and long-term engagement with climate change issues that affect multiple communities. The fellowship was offered by Partners of the Americas through the U.S. Department of State's Bureau of Educational and Cultural Affairs.

continued on page 12

Dean's Message

Photo: Creative Services

Vikas Chandhoke
Dean, College of Science

Scientific advancements do not happen in isolation. Shared experiments, the publishing of data, and cross-discipline collaboration have shaped our current world. Nowhere is this more important and true than here in the College of Science.

Our researchers, faculty, and students work together in the classroom and in their labs to build the foundation for teaching and learning. They seek answers to questions as old as the heavens and as cutting edge as the latest advancements in molecular medicine. However, something more is happening here—a natural collaboration of students who have discovered that the adage "two heads are better than one" works across all disciplines.

In this issue of *Periodic Elements*, you will read about student achievements that, viewed separately, are impressive. But when viewed in tandem, they become something far more interesting and uplifting. Our students have learned to appreciate the power of our community here at Mason. When they leave our classrooms, they will serve as our ambassadors.

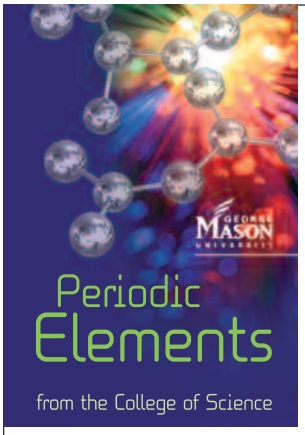
Our role as a research university is to solve problems and pose new questions to benefit science. We must continue to share what we know, expose our students to real-world concerns, and teach them to work together outside their classrooms and labs. Judging by the growing interest in our programs and the special collaborations we have with groups such as the Smithsonian Institution and Inova Health System to name just two, we are doing something right. We'll continue to work together and teach our students to do the same. But it's clear they have learned the lesson and are teaching us, as well.

***Nano Notes**, from page 1*

Michael Hallworth, a doctoral student in the Environmental Science and Public Policy program, is the recipient of the 2012 Max and Vera Britton Environmental Science Award from the Cosmos Club Foundation. The award, part of the foundation's annual Cosmos Scholars Grant Program, will support his research titled "Quantifying Migratory Connectivity for a Neotropical Migratory Bird Using Direct and Indirect Techniques." Currently pursuing his work on-site in Jamaica, Hallworth is one of twenty-two scholars selected this year from 197 applicants from universities in the Washington, DC, metropolitan area.

Diego Torrejon, Mathematics undergraduate student, received an Outstanding Presentation Award at the 2012 Joint Mathematics Meetings of the Mathematical Association of America held recently in Boston, Massachusetts. He was recognized for his poster "An Analytical Approach to Solving Green Oxidation Processes."

Join us for the COS Convocation
on Wednesday, May 16, 2012, 2 p.m.,
at the Patriot Center.
We are honored to welcome
Dr. John M. Butler, a leading expert
in DNA typing from the
National Institute of Standards and
Technology, as this year's keynote speaker.



A publication of the
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College of Science
cos.gmu.edu

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