When Volgenau professor Gerry Cook was channel surfing and the National Geographic special *Five Years on Mars* captured his attention, he didn’t expect to see former grad student Ashley Stroupe featured in it. Stroupe was one of Cook’s master’s students, so we reached out to interview her. We caught up with Stroupe, now a staff engineer at NASA’s Jet Propulsion Laboratory, to ask about her Mason experience and her work at the lab.

**What was the best part about being a student at Mason?**
The support from faculty was really amazing. My bachelor’s degree was in physics, but I found out I was really interested in robotics. I had great professors who were willing to take the extra steps, work with me, and help me shift gears.

**How did your time at Mason prepare you for the work you are doing now?**
I knew the engineering school had a good robotics program. My Mason degree prepared me to continue my education and earn my PhD from Carnegie Mellon University and then land the job with NASA.

**What projects are you working on now at the Jet Propulsion Laboratory?**
I still spend one day a week driving the Mars rover, *Opportunity*. The other four days I am the lead science planner on the newest rover, *Curiosity*. This job is more of a systems engineering job. I manage the team, set policies. We are putting things in place and doing the modeling that will make the project successful.

**What is the best part of your job?**
It’s hard to pinpoint one thing. I’m excited to go to work every day. I feel honored to work with so many dedicated, enthusiastic, and capable people. Of course, driving a car on another planet and...
Dear Alumni and Friends,

Since the ECE Department’s inaugural newsletter, a number of exciting things have occurred. First, George Mason University is now ranked among the highest research institutions in the country by the Carnegie Classification of Institutions of Higher Education. Mason now joins an elite group of 115 institutions known for performing research at the highest level. The news of the Carnegie R1 ranking was followed by the Times Higher Education 150 under 50 rankings. This ranking of the top 150 universities less than 50 years old, which placed George Mason in the number-three spot of American schools, focuses on five areas—teaching, research, citations, international outlook, and innovation. Finally, I am happy to report that the electrical engineering and computer engineering programs continue to rise in the national rankings. As our dedicated and talented faculty members continue their excellence in scholarship, research, teaching, and service, I hope to see continued recognition of the excellence in our department.

This past spring, we conducted a search for two tenure track assistant professors—one in computer engineering and one in electrical engineering in the area of controls and robotics. I am very excited to report that the candidate pool was so strong that we made offers to three outstanding young faculty members, and all three will be joining us in the fall.

I am also extremely happy to report that Smriti Kansal, ECE’s academic advisor and the editor of this newsletter, was honored this year with the George Mason Academic Advisor of the Year Award. With 115 advisors nominated for this award and a record number of votes being cast, it is an honor and a tribute to her outstanding service to the department and our students that she received this award. I would also like to recognize Dr. Kathleen Wage, who was featured in our first newsletter, for her continued dedication to excellence in teaching. This year she was recognized by the university as a Teacher of Distinction—and also by the IEEE Education Society, which awarded her the 2016 Harriett B. Rigas Award.

I invite you to follow us on Facebook, and I look forward to sharing more news and stories of our department in the future.

Monson H. Hayes  
Chair, Department of Electrical and Computer Engineering
In the 1990s, Gerry Tian thought her career would be in a STEM field, but in her native China, and even in the United States, no one called it STEM back then.

“Things were much different. In China the educational system at that time didn’t have the variety of fields that it does now,” says Tian. “In my generation, many young people had a dream to be a scientist.”

Since then, Tian has fulfilled her dream. She earned her PhD and became a professor, funded researcher, and mentor to younger faculty and graduate students. After she finished her undergraduate degree in China, Tian wanted to continue her education and found a good fit in systems engineering at Mason’s C3I Center (now the C4I Center).

“At that point control theory was at a low point, and there weren’t many people doing research in the area,” she says.

Tian reasoned that if she approached control theory from a systems point of view, she could broaden the topic and find meaningful connections. She earned her PhD at Mason and in 2000 went to Michigan Tech and became one of their early research faculty members strategically hired for extensive research. Michigan Tech had been known for its strong undergraduate teaching mission, and was beginning to build a research enterprise.

Tian’s research and tenure dossier became a model for subsequent faculty hires.

Tian returned to Mason from Michigan in winter 2015 and is now finishing her third semester as a professor in the ECE Department.

Her current research involves signal processing and wireless communications, specifically cognitive radio and compressed sensing. She and her team are exploring ways to find more effective and efficient means to transmit and process all of the data that has to go through the airways. They are looking for ways to minimize distortion, making the systems flexible, responsive, and economical. Both the theory and the application of the research uses sophisticated mathematical models to build the system so it can be manipulated and optimized.

“The demands for wireless communications are much greater in 2016 than they were in 2000, or even in 2006,” says Tian.

Smartphones have been a game changer. Now people don’t want simply to talk through wireless, they want to watch movies, stream video from sporting events, send pictures to friends, unlock their cars, and more. The airwave frequencies are full and getting more and more crowded. How do you find the bandwidth for all of that?

One application Tian is pursuing, called “cognitive radio,” dynamically searches for spectrum opportunities using owned frequencies when they are not in use. Another application uses higher frequencies over millimeter waves that were considered infertile for commercial wireless services in the past.

Tian’s role as a mentor and leader extends outside the university in the wider signal processing community. She is an elected member of the IEEE Signal Processing for Communications and Networking Technical Committee and the IEEE Signal Processing Society Big Data Special Interest Group. This year she is serving as a general chair for the IEEE Global Conference on Signal and Information Processing, which will be held in Washington, D.C., in December.
NEW FACULTY

A new computer engineering faculty member, Avesta Sasan, joined the ECE Department in January of this year. Sasan earned a BS in computer science and MS and PhD in electrical and computer engineering, all from the University of California, Irvine. He comes to Mason with a wealth of industry experience. Most recently, he was a member of the VLSI Technology Research Team at Qualcomm, where he developed signoff toolsets for timing analysis. He has been working in the semiconductor industry for more than 10 years.

During his undergraduate studies, Sasan began working at Jazz Semiconductor. Later, during his PhD studies, he worked for a year at Novelics focusing on custom memory compiler design. He then moved to the broadband VLSI group at Broadcom, where he focused on creating a custom library to accelerate testing of low-density parity check encoders and decoders. After completing his PhD, he made an exciting move to the Office of the Chief Technology Officer at Broadcom to focus on modeling voltage variability during timing signoff. He later moved to physical design and implementation of ARM cores and served as the physical design lead for two ARM tapeouts at Broadcom.

Sasan was recruited to join Qualcomm for his expertise in toolset development, and he remained at Qualcomm for two years before joining the faculty at Mason. The overall idea guiding his research interests is that of low-power design, allowing Internet-of-Things devices to operate for years or even decades on only battery power. In particular, he is interested in designing devices that operate near transistor threshold voltage. Sasan is also interested in reducing power consumption via approximate computing—permitting small distortions that may allow for much simpler circuit implementations and a lot of power saving.

In addition to extensive industry experience, Sasan also taught as an adjunct professor at the University of California, Irvine for four years. His passion for both research and teaching led him to pursue a career in academia. During his time in industry, he had many research ideas of his own—often long-term, high-risk ideas that were outside the scope of the short-term focus in industry. He is excited to pursue these ideas as a Mason faculty member.

When not working on his research, Sasan enjoys playing chess and racquetball and watching movies. He also paints. He is happy with his move to the nation’s capital and is especially excited to visit all the museums.

ADJUNCT FACULTY

Carl Schaefer has been an adjunct professor in the Electrical and Computer Engineering Department at George Mason University since 1999 and currently teaches robotics, embedded systems, and fourth-year engineering design. He won the university’s outstanding adjunct award in 2015.

Schaefer has nearly 35 years of experience in the aerospace, defense, and unmanned aerial systems (UAS) industry, with 13 of those years spent working at Aurora Flight Sciences as a senior program manager. Aurora recently won DARPA’s VTOL X-Plane bid with a unique hybrid-electric distributed propulsion. Schaefer is excited to be leading this effort and envisions a wealth of research opportunities.

Prior to his current position as the program manager for the DARPA VTOL X-Plane program, Schaefer served as the director for UAS development and delivered Aurora’s Skate UAS to soldiers in Afghanistan—Aurora’s first UAS to see service in a theater of operation. He has managed a number of programs for Aurora, including the DARPA Organic Air Vehicle program, the Advanced Composite Cargo Aircraft program, and the CH-53K main rotor pylon and nacelles manufacturing programs.

Before joining Aurora in 2003, Schaefer was president of FutureLink Inc., a successful engineering consulting firm he cofounded in 1995. Prior to FutureLink, he worked for the Naval Air Systems Command (NAVAIR) as a senior flight loads and dynamics engineer. While at NAVAIR, Schaefer was awarded the coveted Senator John W. Warner Fellowship for Systems Engineering.

Schaefer holds three patents, is named on a fourth patent pending, and is the author of nearly 20 technical papers. He has a bachelor’s degree in aerospace and ocean engineering and a master’s degree in systems engineering, both from Virginia Tech.

When he is not teaching or researching, Schaefer spends time on the Potomac River racing one of his two boats, Cadence II (an Etap 30) or Barnstormer (an Inland 20 scow). He also builds and flies RC model helicopters. A watersports and aviation photographer, Schaefer is a contributing photographer to Getty Images. His credits include National Geographic’s Cherry Blossoms: The Official Book of the National Cherry Blossom Festival, Spinsheet Magazine, Airbus, several sailing calendars, and many other publications and websites.
STEM OUTREACH

Mason Robots Get Around

Lofaro Labs Robotics, a member of the Drexel Autonomous Systems Lab Group, is headed by Daniel Lofaro, assistant professor in the ECE Department. The lab focuses on humanoid and cloud robotics, as well as alternative actuators and sensing. To help keep Lofaro Lab’s undergraduate research efforts active, Lofaro works with the university’s Office of Student Scholarship, Creative Activities, and Research Program. In addition, he fully supports the student-centric maker space called the Mason Innovation Exchange (MIX) and the proposed plan to convert a portion of the former Fenwick Library A-wing to support a new, expanded innovation center for student-centric innovation and entrepreneurship.

Lofaro Labs also emphasizes STEM outreach. The primary reason for the outreach program is to get younger students excited about technology, and robots make this easy. Lofaro believes it is never too early to engage young engineers with the interdisciplinary field of robotics.

The lab participates in demonstrations at Maker Faires such as the NoVa Mini Maker Faire, the National Maker Faire in Washington, D.C., the HayMaker Faire, and more. The highlight each year is Lofaro Labs’ demonstrations at the Smithsonian’s National Air and Space Museum for the kickoff ceremony of National Robotics Week. At this year’s ceremony in April, Lofaro Labs focused on hands-on demos centering around cloud robotics and alternative localization methods.

Lofaro Labs has also started a battle bots team to encourage new talent. This, combined with the lab’s work with the Robotics Club (co-run by the Autonomous Lab in the Computer Science Department), regularly attracts new students.

FACULTY AWARD

Kathleen Wage won the 2016 Harriett B. Rigas Award from the IEEE Education Society. The award, developed by the Education Society in cooperation with the Hewlett-Packard Company, recognizes outstanding faculty women who have made significant contributions to electrical/computer engineering education.

The award will be presented at the Frontiers in Education annual conference in Erie, Pennsylvania, October 12–15, 2016.
This past winter I attended a three-day conference of the North American Network Operators Group (NANOG) with five students enrolled in the MS in Telecommunications Program. The meeting provided opportunities for students to attend technical presentations and, even more importantly, to interact with the engineers who run the internet. The meeting location and timing—San Diego in February—was an added bonus.

NANOG is the professional association for internet engineering and architecture. It focuses on the technologies and systems that make the internet function: core routing and switching; Internet inter-domain routing; the domain name system; peering and interconnection; and Internet core security. NANOG’s focus aligns well with the core of the MS in Telecommunications Program.

The highlight of the technical program may have been a keynote address by KC Claffy, David Clark, and Geoff Huston. In addition, two broad topics seemed to dominate the agenda—data centers and automating the management of large network deployments. The students all agreed that a two-part, hands-on tutorial presented by Facebook engineers titled “NetOps Coding” was extremely valuable.

Each evening offered an opportunity to socialize and interact with engineers from companies that included all of the well-known internet service providers, as well as large content providers, including Google, Facebook, Netflix, Microsoft, and Apple. Throughout, it was great to observe our students not just following discussions but actively contributing to in-depth discussions of network problems.

NANOG supports our student travel to the conferences and we hope to make participation in NANOG meetings a regular opportunity for our best students.
Going Dark

BY BOB OSGOOD, DIRECTOR, COMPUTER FORENSICS

Today, the world of digital forensics is dealing with a challenge that heretofore was an academic exercise. What if the criminal, terrorist, or spy is using a digital container that cannot be accessed by law enforcement? Or, what if some criminal or terrorist organization is using encryption to communicate, thwarting legitimate law enforcement efforts to obtain vital evidence? Even when the police have a search warrant, they are technically barred from getting into the device, meaning that a judge and jury will never see the evidence contained in the device.

This phenomena is called “Going Dark.” Over the last 10 years, numerous individuals have testified before Congress about how to handle this challenge, but to date, there has been little legislative action.

The challenge is complicated. On one side, the fourth amendment of the Constitution guarantees a right to a reasonable expectation of privacy. On the other side, the government has an obligation to protect its citizens. The arbiter of this balance is a judge. Going Dark reached an apex in the form of a legal battle between the FBI and Apple Computer when Apple refused to honor both a federal search warrant and a court order, stating, among other things, privacy concerns. Government agents requested Apple modify the operating system of the iPhone so they could crack the encryption on an iPhone seized during the terrorist incident in San Bernardino.

Thwarting encryption is a daunting task, and very few law enforcement agencies have the resources to do so. Encryption may be beaten using one or more methods including:

- Brute force, which is putting massive amounts of processor power on the encrypted files in the hopes of guessing the encryption key
- Social engineering the passphrase or key from the user
- Obtaining the key from other digital media or recordings
- Obtaining the key through a technical exploit

Encryption is vital to both our security and privacy, but there needs to be a balance. Real-life challenges to this balance are likely to continue, and forensic specialists must be prepared to address them.

STUDENT AWARDS

Melissa Davis, a senior in Mason’s Electrical Engineering Program, was accepted into the Research Experiences for Undergraduates program in summer 2016 at Florida State University’s High Performance Materials Institute. Her topic was “Manufacturing of Large Area, Flexible LED Panels Based on Halide Perovskites.” Davis says this is a “fancy way to say that I will be making my own LED panels that are flexible and are made out of organic materials.”

In spring 2016, the senior design project of Adam O’Connor, Liza Kanaan, Avishek Bose, Ferede Abebe, and Nhat Trinh earned a Patriot Green Fund (PGF) student research grant through the Office of Sustainability. The PGF was established, in part, to encourage environmental, social, and economic stewardship through the funding of student research. The goals of the design project, titled “Climate Control Analytics,” coincide with the stated purpose of the PGF by providing the community with a tool designed to enable more effective stewardship of resources by capturing and analyzing energy inputs and outputs associated with indoor climate control.

Doctoral student Neil Moser received a Science, Mathematics, and Research for Transformation (SMART) Scholarship. The scholarship applies to all tuition and fees and provides a stipend for the estimated remainder of his doctoral research. Additionally, the scholarship involves a paid internship at the sponsoring facility during the summer. Currently Moser works at the Air Force Research Laboratory extracting and evaluating analytical models for both gallium nitride- and gallium oxide-based transistor devices. The research goal is to use these models and their parameters to reduce the cost of the design cycle for radio frequency analog circuits using these materials, and to allow a better fundamental understanding of high-power devices created with these materials. After obtaining his doctoral degree he plans to work for the Department of Defense as an Air Force civilian.
The fourth IEEE Global Conference on Signal and Information Processing (GlobalSIP) will be held in Washington, D.C., December 7–9, 2016. GlobalSIP has rapidly assumed flagship status within the IEEE Signal Processing Society. It focuses broadly on signal and information processing with an emphasis on up-and-coming signal processing themes. The conference will feature world-class plenary speeches and overview talks, tutorials, exhibits, oral and poster sessions, and government panel discussions on emerging topics and funding opportunities in signal and information processing. The Electrical and Computer Engineering Department is playing a major leadership role in bringing the conference to Washington, D.C., and organizing it.

ieeeglobalsip.org