THE FINAL FRONTIER

RIT alumni helping to boldly go where no one has gone before

A mechanical engineering graduate works with Boeing's Space Exploration Division on the launch system that will one day take people into space. Another certifies the equipment on the Falcon 9 rocket designed and manufactured by SpaceX.

A photography graduate at NASA is teaching astronauts aboard the International Space Station how to use cameras. Another graduate at NASA is developing equipment that could one day allow people to live on Mars.

These and many other alumni are making an impact in space exploration today by contributing expertise in engineering, imaging science, physics and photography, among others. RIT has ranked nationally as a school companies prefer when recruiting and hiring in the aerospace industry.

Don Figer, director of the Center for Detectors at RIT and a leader in developing and deploying new photon detection technologies in the field of astrophysics, said companies like his students because they have experience solving real problems and working in teams. His students come from engineering, science, business and imaging arts and sciences and completely run the Center for Detectors.

"They are going to be operating at a much, much higher level and capability," Figer said.

Edward Hensel, associate dean for research and graduate studies in Kate Gleason College of Engineering, also credits real-world experience through the co-op program for exposing students to the entire aerospace industry ecosystem.

"They work for the big aircraft companies, defense companies, but they also work for the suppliers that may be only one or two layers removed from that," he said. "I think that is unique."

Here are some of their stories.

The Delta II rocket, carrying the NOAA/NASA Suomi environmental satellite, is being prepared for an early-morning launch in 2011 at Vandenberg Air Force Base in California. One member of the team who designed and prepared the satellite was an RIT alumnus.

Photo provided by Integrity Applications Inc.

Photo provided by NASA

Clayton Turner '90 was named deputy director at Langley Research Center this summer. He oversees 3,600 employees.

Deputy director, *NASA's Langley Research Center*

Clayton Turner had job offers from the CIA and NSA after he graduated from RIT, but when NASA called him about a job, he had to entertain the offer.

To start with, NASA officials called him on his birthday from Langley Research Center in Hampton, Va., which shares a landing field with Langley Air Force Base, where Turner was born.

Then when he visited Langley Research Center, he observed the engineers working on the Halogen Occultation Experiment (HALOE) mission, which was designed to improve understanding of stratospheric ozone depletion.

"I watched the excitement and the energy of the people who were doing that test because that was their baby," said Turner '90 (electrical engineering). "That was the thing they were going to launch on a future mission. And I was hooked from that point forward."

In June, Turner was named deputy director at Langley. He is still as excited about the work he and his colleagues at Langley are doing as he was during that visit in 1990. "I can't believe I get to do what I get to do every day," he said

Turner started as a Lidar In-Space Technology Experiment (LITE) engineer. The instrument orbited the Earth inside the payload bay of Space Shuttle Discovery, measuring the Earth's cloud cover and tracking particles in the atmosphere. The goal was to help scientists better understand global climate and how it might be changing.

Next he was assigned to the Gas Permeable Polymer Materials Experiment, which used the microgravity of space to produce plastics that were more uniform and permeable than those produced on Earth. The work resulted in a private company making contact lenses based on plastics produced commercially in space.

Turner continued to work his way up at Langley, each time getting more responsibility. He became assistant branch head, branch head, directorate chief engineer, director of the Engineering Directorate and center chief engineer.

As center chief engineer, he was responsible for the technical excellence of the work at Langley, which in the early 2000s was working on the systems engineering of the Ares 1-X rocket. The rocket, which was a test version of a system designed to carry a four-to six-person crew capsule, successfully launched in 2009.

As deputy director, Turner's job involves overseeing 3,600 employees, improving effectiveness and efficiency, communicating with the public and working with his colleagues at other NASA centers.

He is excited to contribute now in this new role. "I pinch myself that here's how I get to serve the nation," he said. "I just revel in the opportunity to be a part of this NASA team."

Mindy Mozer

Photo by A. Sue Weisler

Kursten O'Neill '11 is a cross between a systems engineer and a project manager at the private company SpaceX. She returned to RIT in September to mentor students.

Certification integration engineer, *SpaceX*

Simplifying something as complex as a rocket system is no easy task, but trained with a mechanical engineering and public policy background, communicating information about the system and mission impact becomes that much easier, said Kursten O'Neill.

As a lead certification integration engineer at SpaceX, O'Neill '11 (mechanical engineering) is a cross between a systems engineer and a project manager, a technical expert who can translate the complex into understandable terms. She works with different technical departments that build, test and launch the company's Falcon 9 rocket and communicates information to its government partners to show that the Falcon 9 is a reliable, dependable system to launch national security payloads.

"This is my dream job, to be the technical interface between our government on the aerospace side for a private company," she said. "It was natural for me to want to do something like this where I can take the technical information of a design and easily break it down for others."

The experience of applying coursework to design work and team competitions gave her the edge when looking for a job, she said. The Buffalo, N.Y., native selected RIT based on its co-op program, academics and activities.

She competed on the swim team for two years and held leadership positions on RIT's SAE Formula collegiate race team, serving as co-project manager for the 2010-2011 season. During her time on the team, all the racing-planets aligned as the team was in the top-20 among 500 international Formula race teams, peaking at No. 4 in 2010.

Her co-ops were at Moog and Boeing Co., as a product engineer and flight controls engineer, respectively. After graduating, O'Neill worked as a vehicle systems and mechanical engineer for Boeing, and it was there she found an example of what a mentor is and how to be a mentor herself.

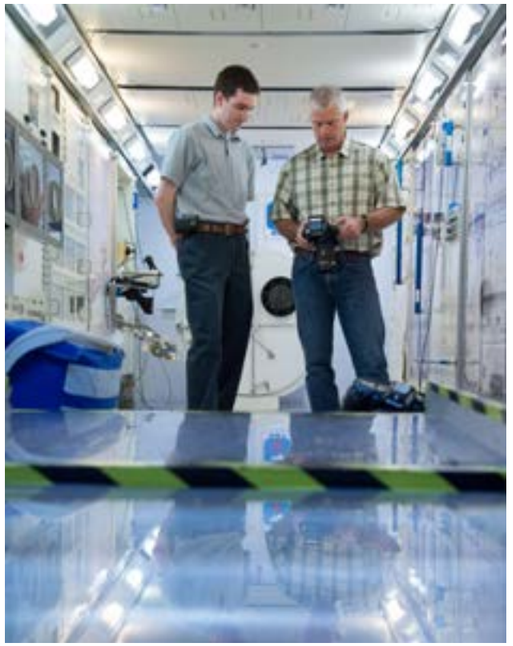
"When you start a new job, or an internship, find someone you connect with, someone willing to be your mentor—no matter what company you go to," said O'Neill, who has been at SpaceX since 2013 and currently mentors a SpaceX intern.

She also is involved with RIT's newest racing team—an all-female SAE Formula electric race car, which SpaceX also supports as a founding sponsor. The team will compete for the first time this spring.

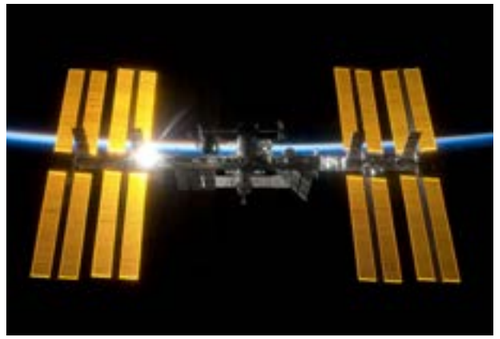
A certification engineer is a position often filled by specialists with many years of experience.

"On a personal level, I feel like I am making a difference. Having the responsibility that I have, I take a lot of pride in what I can contribute to the company. I think taking pride in your job makes you a better engineer, a better worker, a better team player," she said. "We are bringing new technology to the space industry that I have always wanted to be a part of. I found that opportunity at SpaceX."

Michelle Cometa '00



Paul Reichert '01, left, trains astronaut Steve Swanson, who was on the International Space Station from March to September in 2014. Reichert works at NASA's Johnson Space Center as a photography/television instructor.



Reichert trained the astronaut who took this photo of the International Space Station. The crew is in the pressurized modules in the middle of the picture.

The STS-135 Space Shuttle re-enters the Earth's atmosphere to land at Kennedy Space Center in Florida. The orange/yellow streak is the plasma trail that the shuttle creates as it re-enters the Earth's atmosphere. The Space Shuttle is at the end of the trail.

Photos provided by NASA

Photo Instructor, *NASA's Johnson Space Center*

When President Barack Obama tweeted astronaut Scott Kelly that he is "loving the photos" Kelly posted on social media from aboard the International Space Station, RIT graduate Paul Reichert knew he had done his job well.

Reichert '01 (imaging and photographic technology) works at NASA's Johnson Space Center as a photography/television instructor. That means he teaches crew members before they head to the International Space Station how to take all the photos and videos made available to the public.

"The news doesn't typically cover the space station," Reichert said. "This is their chance to explain what they are doing up there and get the word out as to what's going on."

Reichert started at NASA two weeks after graduating from RIT. For the first 10 years of his career, he worked on the space shuttle program, teaching the astronauts how to use all the cameras and supporting them while they were in orbit.

When the space shuttle program ended in 2011, he moved to the International Space Station program.

Reichert estimates that he has trained more than 150 astronauts, who like the general population have varying levels of photography experience.

He is lead for the current crew on the space station now and is training the crew that will go up this spring and summer.

When Reichert isn't training a new crew or supporting them when they are in orbit, he works on NASA's Commercial Crew Program, which is working to establish safe access to space with private companies such as SpaceX.

He also works on projects as they arise. For example, the space station is developing a new interior light that will help control the crew's circadian rhythm.

Reichert was tasked with working with engineers to make sure the light works properly with the cameras.

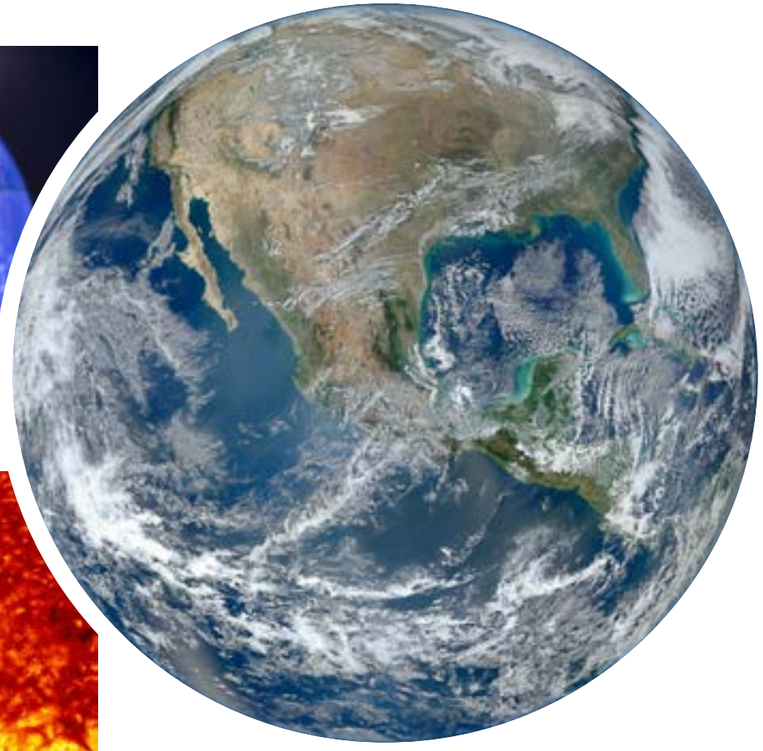
But he is most proud of how the imagery shot by his subjects is used by engineers for data. He used the space debris that hits the International Space Station as an example. The debris can put a tiny hole through a solar array or a radiator, and the imagery the astronauts take of the damage helps keep NASA informed.

"They get a lot of data off those pictures and video that you can't do any other way," he said. "You can't put a sensor on it and get the data you need. You have to get that imagery."

Mindy Mozer

Photo by Chris Gunn

Rebecca Roth '91 (professional photographic illustration)



As an image coordinator at NASA's Goddard Space Flight Center, Roth shares NASA imagery with the media and the public. This image of Earth known as the Blue Marble has more than 6 million views on Flickr.

Photos provided by NASA's Goddard Space Flight Center

This view of Venus passing in front of the sun was captured on June 5, 2012. The image has been popular on social networking sites. Roth shares photos like these with the public.

Image Coordinator, *NASA's Goddard Space Flight Center*

Rebecca Roth in many ways spent her career preparing for her current position as image coordinator and social media specialist at NASA's Goddard Space Flight Center in Maryland.

Roth '91 (professional photographic illustration) started at NASA six years ago after working as a photojournalist or photo editor for newspapers, including *Roll Call*; magazines, including *USA Weekend;* and National Geographic's Television and Film Division.

"I look back at my career and I think everything I did gave me the skills and knowledge and experience to do this job now," she said. "This is a really unique position and it fits my personality."

Part of her job at NASA Goddard is sharing imagery with the media. The other part is sharing those images with the public, mainly through social media such as Instagram and Flickr.

"At Goddard we have new science happening all the time," Roth said. "We have satellites capturing new images of Earth every day."

To help people find those images, Roth started a NASA Goddard Instagram account, Twitter account and beefed up the Flickr page. Instagram and Twitter are online social networking services that allow people to share images and videos. Flickr is a website where images and videos can be posted.

An image of Earth known as the Blue Marble posted by NASA Goddard has more than 6 million views on Flickr.

"We went from about 100 views a day to over 100,000 views a day," Roth said. "We believe our 2012 'Blue Marble' image is one of the all-time most viewed image on all of Flickr."

Other images that have been popular are the view of Venus passing in front of the sun, weather imagery and a fun image of craters that look like Cookie Monster's face on Mercury's surface.

"I'm always trying to keep it different and trying to keep it fresh and looking for new ways to engage the public."

The approach has worked. The social media team at Goddard won a Shorty Award last year in the government division, which is like winning an Oscar for social media. The manager of that team is executive producer Wade Sisler '83, '85 (professional photography).

Roth said the award was nice but her favorite part of the job is being able to interact with the public through these social media channels.

"We are able to grab people's attention with amazing images and teach them something interesting about space and whatever science stories we are telling," she said. "You get to see people sharing, liking and commenting and little kids saying, 'I want to work for NASA when I grow up.' It's a great opportunity to be able to make a difference."

Mindy Mozer

Photos provided by Boeing

Jason Grow '04, '05 worked with Boeing and NASA engineers to test the liquid oxygen tank that will fuel the agency's new rocket, the Space Launch System.

Grow was part of the team building a replica of the Space Launch System rocket, including its 200-foot plus test-stand, at NASA's Marshall Space Flight Center in Alabama.

Propulsion engineer, *Boeing*

NASA's Space Launch System rocket, complete with a 70-metric-ton engine, has more than 8 million pounds of thrust, equal to the horsepower produced in 160,000 Corvette engines. And that's just the smaller of the two engines being built.

One of the engineers helping to configure all that power is Jason Grow '04, '05 (mechanical engineering), a propulsion engineer with Boeing's Space Exploration Division.

"The project I'm working on is for NASA to resume deep space, human exploration. Boeing is building the rocket that will take humans farther than we've ever gone before," said Grow about the launch system that one day will take people into space. "I'm a big supporter of these missions, whether to the moon or to Mars. There are so many people involved with many different backgrounds."

His area is in the analysis, test, integration and operation of space propulsion systems. Grow, who has been with Boeing for 10 years, relocated from California to NASA's Marshall Space Flight Center in Alabama for the project. He was the lead analyst/test director of the full-scale replica of the liquid oxygen system that would be used in the rocket. With his team, they assembled and tested more than 250 intricate pieces of instrumentation on the feed-line liquid oxygen system.

"Loading the volatile propellants onto the rocket is a daunting task with the liquid oxygen being minus 300 degrees Fahrenheit. It's a different world and when you know you have to load a rocket with astronauts—nothing can go wrong. We have to prepare and practice and be absolutely 100 percent on everything for that moment when the engines start and the rocket leaves the launch pad."

Grow always knew he wanted to work in the aerospace industry and took advantage of the aerospace concentration as an undergraduate in the Kate Gleason College of Engineering. He was a member of the Aero Club, led a MicroAir Vehicle project team and played for RIT's soccer team. He sought opportunities whenever he could to learn more about the aerospace field through senior design projects and work with faculty.

This past summer, Grow was presented the 2015 Early Career Stellar Award for his work on the liquid oxygen feed system. Given by the Rotary National for Space Achievement, the awards recognize top teams' and individuals' work in U.S. space-related associations. It was like the Oscars, said Grow. But instead of Hollywood celebrities announcing winners, U.S. astronauts celebrated those whose contributions to projects will influence the country's future space voyages and discoveries.

"We are helping to shape the future of space exploration. And right now, there's only one place in the world for me to be a part of it—and that's why I'm here."

Michelle Cometa '00

Photo provided by Integrity Applications Inc.

Michael Denning '07 oversees the development of satellite systems built for NASA. This photo was taken at Vandenberg Air Force Base in California, shortly before the launch of the Delta II rocket on Oct. 28, 2011.

Remote sensing scientist, *Integrity Applications Inc.*

He may not be able to control Mother Nature, but Michael Denning is helping to create the systems that record her most changeable weather patterns.

Denning '07 (imaging science) is a senior system engineer and remote sensing scientist at Integrity Applications Inc., a private engineering and software services company based in Virginia with contracts primarily supporting the aerospace needs of government agencies. One of his first projects was overseeing the development, launch and operations of a satellite for NASA and the U.S. National Oceanic and Atmospheric Administration (NOAA).

"The Joint Polar Satellite System is our nation's most advanced polar-orbiting environmental satellite system and is one of two major programs that provides the government with data for improving short-term weather forecasts and monitoring long-term climate change," he said.

Denning, who began work on the project in 2007, provided cross-agency programmatic and technical support and was able to see firsthand the entire lifecycle of a satellite program from its initial development to routine operations to production of end user products. "And the launch was exciting even though it took place at 3 a.m.," he said, laughing.

"We were in California watching the rocket fly into orbit. After a few minutes it was just another star, and then a few minutes later it was out of sight completely. It was a great experience knowing that you helped the mission succeed, that you contributed to something that would be orbiting the Earth 14 times a day at 500 miles over our heads for years to come."

In October 2014, Denning transitioned to a new project for the White House Office of Science and Technology Policy. While his work with NASA and NOAA focused on one single satellite system, his newest role requires gathering information about hundreds of Earth-observing systems and evaluating the impact of those systems. The work brings together many government agencies, corporations and academic researchers, and culminates with a report intended to help the government develop a strong national plan for the use of, and investment in, Earth-observing systems.

Denning, who was hired right after graduating from RIT's imaging science program, said his undergraduate education gave him the context needed to excel in his jobs where rapidly integrating technical information from multiple sources and responding in intelligent ways was absolutely critical.

"The imaging science program is very unique, especially for an undergrad," he said. "It is a field that pulls from many disciplines such as mathematics, physics, engineering, computer science and others with a focus on anything imaging-related, from printers to MRIs to satellites, for example. Students typically do not have an opportunity to study such a specialized field without getting a graduate degree. So as an undergraduate imaging science major, I was especially attractive to employers and well positioned to find meaningful work and go directly into industry upon graduation. Without my education at RIT, I would not be where I am today."

Washington, D.C., is a hub for imaging science graduates who, like Denning, go into the government's classified and civil sector programs. It is work that gives him a sense of meaning and purpose.

"It's reassuring to know that your work has a positive impact on society, that these technologies and data are used to save lives and property and to advance our world in so many ways."

Michelle Cometa '00

Photo provided by NASA's Jet Propulsion Laboratory

Thomas Brown '02 '12 will be developing life sustaining systems to be installed on the newest science rover, Mars 2020, following in the successful tracks of NASA's Curiosity Rover, pictured above.

Mechanical systems engineer, *NASA's Jet Propulsion Laboratory*

Space travel to Mars is the millennial generation's voyage to the moon, and Thomas Brown '02, '12 (mechanical engineering, microsystems engineering) is helping develop equipment that will generate oxygen from the Red Planet atmosphere. In future manned-missions, this vital resource could be used to sustain life and help burn the rocket fuel that will bring astronauts back home.

Brown, a mechanical systems engineer with NASA's Jet Propulsion Lab, is helping to develop the Mars Oxygen In-Situ Resource Utilization Experiment, or MOXIE, a complex atmospheric acquisition and processing system that will be installed in the Mars 2020 robotic science rover.

"The instrument that I am working on has the potential to transform the future of Martian exploration," he said. "Developing technologies like the one I work on that could potentially reduce the resources we must bring to Mars to support life in the future could substantially reduce the cost of future manned missions to Mars."

Brown, a Rochester native, worked for several years at an automotive supply company after graduation, then returned to RIT to complete his Ph.D. in microsystems engineering. The doctoral program gave him the chance to better understand how expertise from different fields such as physics, chemistry and imaging benefit large-scale design projects like the one he'd eventually be assigned to at NASA.

"We're constantly learning new things about Mars," he said. "Knowing that the work I do is going to directly impact future manned missions to Mars is exciting. Being a lead engineer for an instrument that will do something that has never been done before makes for dynamic workday."

Michelle Cometa '00

Detector engineer and optical engineer, *Ball Aerospace*


Michael Every


John Frye

John Frye '10 (computer engineering) and Michael Every '14 (physics) didn't know each other at RIT, but they followed similar paths to Ball Aerospace & Technologies Corp. in Boulder, Colo.

Frye had always pictured himself working for a company like Intel making microprocessors after graduation until he snagged a co-op in 2009 in RIT's Center for Detectors, a research lab established by Don Figer within the College of Science.

Every thought he would specialize in astronomy until he worked in the Center for Detectors from 2012 to 2014. He is now an optical engineer at Ball.

Frye started as a detector engineer at Ball in 2011 after staying on at the Center for Detectors after graduation. The company, which built science instruments aboard the Hubble Space Telescope and the Operational Land Imager on the Earth-observing satellite mission Landsat 8, specializes in space-based instruments and sensors. Frye works on national defense-related projects and research and development. Every works on testing camera systems for satellites, including the Ozone Mapping and Profiler Suite.

Both said the work they did in the Center for Detectors prepared them well for their positions, particularly being exposed to a wide variety of engineering disciplines. "The hands-on experience that the Center for Detectors gave me was invaluable," Every said.

"They were very impressed with the amount of pre-learned skill I had for coming out of RIT," Frye said. "RIT does a very good job preparing students to contribute from day one."

Mindy Mozer

Stephanie Mauro '13 works in the same department at NASA's Marshall Space Flight Center as she did as a co-op student.

Thermal engineer, *NASA's Marshall Space Flight Center*

When Stephanie Mauro was in high school, she always thought it would be cool to work in the space industry.

"But I never really thought that I would just because it seems so far-fetched," said Mauro '13 (mechanical engineering). "Everyone says it's so hard to work at NASA. But it's really not. If you work hard, you can get there."

Mauro is proof of that. She started full time at NASA in March of 2013, even before she officially walked across the graduation stage. She was hired at Marshall Space Flight Center in Huntsville, Ala., after she completed a co-op there in the spring and summer of 2012.

She's a thermal engineer in the Thermal and Mechanical Analysis Branch of the Space Systems Department, the same department she worked in as a co-op student. When she was on co-op, Mauro worked on a payload for an unmanned aerial vehicle that measures wind speeds and rain rates in hurricanes.

She performed the thermal analysis of the payload, which is called Hurricane Imaging Radiometer (HiRad), before it flew. When she came back full time, she compared her analysis with data from the flight concerning the behavior of hurricanes.

She is currently working on Iodine Satellite, a 12-unit cubesat, or miniaturized satellite, scheduled for launch in 2017. "I like the work I get to do because it is challenging and a lot of problem solving and figuring things out," she said.

Mindy Mozer