

National Aeronautics and Space Administration



GoddardView

Volume 14 Issue 1
January - February 2018



TRENDING



Goddard's U.S. Representative Visits Center
U.S. Rep. Steny Hoyer of Maryland, who represents Greenbelt's congressional district, spoke to Goddard employees and shared his vision for the future of NASA and spaceflight prior to taking a tour of the center.

A Launch as Good as GOLD
The Global-scale Observations of the Limb and Disk, or GOLD, mission launched in late January. GOLD will investigate the dynamic intermingling of space and Earth's uppermost atmosphere to see what drives change in this region.



Astronaut Honors MLK in Goddard Address
In celebration of Martin Luther King Jr. Day, NASA astronaut Alvin Drew explained King's impact on his own upbringing and career aspirations during a centerwide address to Goddard employees.

Friends and Family Say Goodbye to ICESat-2 Instrument
Launching later this year, ICESat-2 will measure Earth's ice sheet elevation and sea ice freeboard. Friends and family members of project staff were able to see its ATLAS laser before it departed Goddard.



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On the cover: Local dinosaur track expert Ray Stanford (right) presents the cast of a dinosaur footprint to U.S. Rep. Steny Hoyer of Maryland. Stanford discovered the footprint in 2012 prior to the construction of Building 36.

Photo credit: NASA/Goddard/Bill Hrybyk

GoddardView Info

Goddard View is an official publication of [NASA's Goddard Space Flight Center](#) in Greenbelt, Maryland. Goddard View showcases people and achievements in the Goddard community that support the center's mission to explore, discover and understand our dynamic universe. [Goddard View](#) is published by the Goddard Office of Communications.

You may submit story ideas to the editor at darrell.d.delarosa@nasa.gov. All contributions are subject to editing and will be published as space allows.

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WMAP SCIENCE TEAM AWARDED BREAKTHROUGH PRIZE

By [Jeanette Kazmierczak](#)

The 2018 Breakthrough Prize in fundamental physics was awarded to the Wilkinson Microwave Anisotropy Probe (WMAP) science team.

Launched in June 2001, WMAP measured the electromagnetic radiation left over from the big bang, called the cosmic microwave background. The space between stars looks dark and empty when viewed with a regular telescope, but WMAP used full-sky temperature readings to map the faint hot and cold spots in the pervasive afterglow left over from the early universe.

Data from the mission helped determine that the geometry of the universe is spatially flat and showed that the universe is composed of roughly 5 percent matter, 20 percent dark matter and 75 percent dark energy. WMAP collected data from 2001 to 2010, and the final data and publications were released in 2012.

"Congratulations to the people involved in the WMAP mission on this great recognition," said Chris Scolese, center director of NASA's Goddard Space Flight Center, which developed the mission in partnership with Princeton University. "It is certainly well-deserved and demonstrates not only the scientific leadership, but also the engineering and programmatic leadership, of Goddard and NASA."

Often called the "Oscars of Science," the Breakthrough Prizes are awarded annually in the categories of life science, fundamental physics and mathematics by selection committees made up of previous recipients. They were established by Google co-founder Sergey Brin, Facebook co-founder Mark Zuckerberg, pediatrician Priscilla Chan, entrepreneur Yuri Milner, artist Julia Milner, 23andMe CEO Anne Wojcicki and entrepreneur Pony Ma.

This year, WMAP was recognized for its "detailed maps of the early universe that greatly improved our knowledge of the evolution of the cosmos and the fluctuations that seeded the

formation of galaxies." The \$3 million prize will be split among the 27 named recipients.

"I believe it's a great honor," said Edward Wollack, a Goddard astrophysicist who worked on the mission. "One thing which was nice about the way WMAP was recognized was that the efforts of the entire team were acknowledged. This reflects the importance of collaboration in science."

During the mission, Goddard-based WMAP science team members included Charles Bennett, Mike Greason, Robert Hill, Gary Hinshaw, Alan Kogut, Michele Limon, Nils Odegard, Janet Weiland and Wollack.

Wollack also highlighted the many contributors to the mission not mentioned in the awarding of the prize, including the engineers, scientists and staff who helped build the spacecraft at Goddard, an instrument at Princeton and detectors at the National Radio Astronomy Observatory.

"When the mission was first proposed, it was not clear to the scientific community that you could even make a map out of the ton of data that we would get," Kogut said. "One of the first things we did was write a paper showing a new algorithm that would allow you to take all these gazillion samples of different spots in the sky over many years and turn them into a recognizable sky map that wouldn't take 100,000 years of CPU time."

The mission was originally called the Microwave Anisotropy Probe, but was renamed to honor David Todd Wilkinson, a member of the mission's science team, who passed away in 2002. ■

Above: Members of the Wilkinson Microwave Anisotropy Probe team.

Photo credit: NASA/Goddard/Britt Griswold

SPACEFLIGHT DESIGN CHALLENGE

FEATURES UNPRECEDENTED COLLABORATION

By [Emily Certain](#)

NASA's Spaceflight Design Challenge is an initiative aimed toward engaging students in the project life cycles of spacecraft systems. Made possible by funding from NASA's Independent Verification & Validation Facility in Fairmont, West Virginia, and the West Virginia Space Grant Consortium, the challenge fosters innovation with the help of K-12 schools, universities and industries across the nation. Participants are equipped with the skill set required to compete in the fabrication and operation of spaceflight systems in low-Earth orbit via amateur radio operations.

A team has been selected for this year's challenge, and it's unlike any other in the history of the initiative.

The team comprises a nationwide collaboration among several universities and industries, as well as a K-12 school for the deaf and blind. Once fully developed, the team's final payload will launch in June 2018 aboard a suborbital sounding rocket from Wallops Flight Facility in Virginia. The team will select its payload from a variety of experiments aimed at benefiting the SmallSat, astrobiology, medical, engineering and pharmaceutical communities.

The collaborating units, described as follows, were selected for their displays of scientific merit, teamwork and dedication.

West Virginia University Amateur Radio Club (Lead: Jeffrey Moe): The club's objective is to collect and transmit flight data through amateur radio operations throughout the suborbital mission. Data will be received at several scattered ground stations to track propagation as the sounding rocket moves through the layers of the atmosphere.

NASA Pathways Agency Cross-Center Collaboration, GlaxoSmithKline, the Massachusetts Institute of Technology and the University of Minnesota (Lead: Nicholas Bense): The collaboration's mission is made up of several objectives, including designing and testing a systems payload within the capabilities of a sounding rocket in order to gather scientific results and troubleshoot the package for a future

long-duration CubeSat mission. The team also aspires to create a fourfold payload, which includes a deorbiting mechanism that has the potential to reduce the growing amount of orbital debris that may result from CubeSat experiments.

West Virginia University National Society of Black Engineers (Leads: Morgan Cassels and Francis Mbuyamba): The group's mission is to collect and store real-time flight data, such as altitude, temperature, pressure, trajectory, angular rotation and speed of the rocket during the entirety of the mission for postflight analysis at Wallops.

Fairmont State University (Lead: Jeffrey Reynolds): The university's mission is to gather telemetry data from the suborbital flight and then transmit them to a ground station for further analysis. The live-feed data are also intended to model the orientation and trajectory of the rocket in real time.

Blue Ridge Community and Technical College (Lead: Ronald Willis): Its mission objective is to monitor the oscillation of a suborbital sounding rocket in motion on the X, Y and Z planes in order to generate a vibration profile of the rocket through the utilization of piezoelectric ceramic discs.

School of the Deaf and Blind (Leads: Emily Certain and Kenneth Silberman): The mission is to provide students with impairments

the opportunity to gain hands-on experience in spacecraft development. Through lessons in the design, building and testing stages of payload fabrication, students participating in the widespread outreach program will be taught how to code and create their own CubeSat footprint payload capable of capturing standard units of telemetry during the mission. ■

Center: Collaborating teams in NASA's Spaceflight Design Challenge.

Photos courtesy: NASA's Spaceflight Design Challenge team leads



Brittany Klein

Code 101, Proposal Development Specialist

Why Goddard?: I have always wanted to work at NASA. It is truly the best place to work.

Hobbies/interests: horseback riding, ice hockey, art



Jon Davis

Code 240, Emergency Manager

Why Goddard?: Working at NASA has always been a dream, so I feel very honored to be here.

Hobbies/interests: traveling, racquetball, taking college courses, meeting people, relaxing



Ryan McClelland

Code 543, Mechanical Engineer

Why Goddard?: I want to work on world-class astrophysics observatories.

Hobbies/interests: sailing, virtual reality



Hui Li

Code 551, Senior Optical Systems Design Engineer

Why Goddard?: My childhood dream was to become an astronaut. Working at NASA is like a dream come true.

Hobbies/interests: Toastmasters



Alonda Woodley

Code 210, Contract Specialist

Why Goddard?: The work and missions are unique, and employees are recognized for outstanding work.

Hobbies/interests: traveling, volunteering, bowling, new cuisines, do-it-yourself projects



Iman Watson

Code 155, Lead Accountant

Why Goddard?: I'm extremely fascinated by space and science fiction. It's cool to work for the most recognized government organization in the world.

Hobbies/interests: golf



Theresa Beech

Code 583, Product Development Lead

Why Goddard?: It's a group I respect and like. I can also influence technical space strategy.

Hobbies/interests: family, childhood cancer advocacy, hiking

EMPLOYEE SPOTLIGHT

Goddard is pleased to welcome these new employees to the NASA community.



DINOSAUR AGE MEETS THE

By [Ashley Hume](#) and [Patrick Lynch](#)

A slab of sandstone discovered at NASA's Goddard Space Flight Center contains at least 70 mammal and dinosaur tracks from more than 100 million years ago, according to a paper published on Jan. 31 in the journal *Scientific Reports*. The find provides a rare glimpse of mammals and dinosaurs interacting.

The tracks were discovered by Ray Stanford — a local dinosaur track expert whose wife, Sheila, works at Goddard. After dropping off Sheila at work one day in 2012, Stanford spotted an intriguing rock outcropping behind Sheila's building on a hillside. Stanford parked his car, investigated and found a 12-inch-wide dinosaur track on the exposed rock.

Excavation revealed that the slab was the size of a dining room table, and examination in the ensuing years found that it was covered in preserved tracks.

The remarkable Goddard specimen, about 8 feet by 3 feet in size, is imprinted with tracks from eight species, including squirrel-sized mammals and tank-sized dinosaurs. Analysis suggests that all of the tracks were likely made within a few days of each other at a location that might have been the edge of a wetland.

"The concentration of mammal tracks on this site is orders of magnitude higher than any other site in the world," said Martin Lockley, paleontologist at the University of Colorado, Denver, and a co-author of the paper.

Lockley began studying footprints in the 1980s and was one of the first to do so. "I don't think I've ever seen a slab

this size, which is a couple of square meters, where you have over 70 footprints of so many different types. This is the mother lode of Cretaceous mammal tracks."

After Stanford's initial find, Stephen J. Godfrey — curator of paleontology at the Calvert Marine Museum in Maryland — coordinated the excavation of the slab and produced the mold and cast that formed the basis of the scientific work.

The first track Stanford found was that of a nodosaur. "Think of them as a four-footed tank," Stanford said.

Subsequent examination revealed a baby nodosaur print beside and within the adult print, likely indicating that they were traveling together. The other dinosaur tracks include those of a sauropod, or long-necked plant-eater; small theropods, crow-sized carnivorous dinosaurs closely related to the Velociraptor and Tyrannosaurus rex; and pterosaurs, a group of flying reptiles that included pterodactyls.

"It's a time machine," Stanford said. "We can look across a few days of activity of these animals, and we can picture it. We see the interaction of how they pass in relation to each other. This enables us to look deeply into ancient times on Earth. It's just tremendously exciting."

The dinosaur tracks are impressive, but it is the collection of mammal tracks that makes the slab significant. At least 26 mammal tracks have been identified on the slab since the 2012 discovery — making it one of two known sites in the world with such a concentration of prints. Furthermore, the slab also contains the largest mammal track ever discovered from the Cretaceous.



SPACE AGE AT GODDARD

Lockley and Stanford said most of these ancient footprints belong to what we would consider small mammals — animals the size of squirrels or prairie dogs. Most Cretaceous mammals discovered to date have been the size of rodents, their size usually determined only from their teeth. "When you have only teeth, you have no idea what the animals looked like or how they behaved," Lockley said.

Lockley and Stanford believe the wide diversity and number of tracks show many of the animals were in the area actively feeding at the same time. Perhaps the mammals were feeding on worms and grubs, the small carnivorous dinosaurs were after the mammals, and the pterosaurs could have been hunting both the mammals and the small dinosaurs.

The parallel trackway patterns made by four crow-sized carnivorous dinosaurs suggest they were hunting or foraging as a group. "It looks as if they were making a sweep across the area," Lockley said.

Several of the mammal tracks occur in pairs, representing hind feet. "It looks as if these squirrel-sized animals paused to sit on their haunches," Lockley said. The team gave the new formal scientific name of "Sederipes goddardensis," meaning sitting traces from Goddard Space Flight Center, to this unusual configuration of tracks.

"We do not see overlapping tracks. Overlapping tracks would occur if multiple tracks were made over a longer period while the sand was wet," said Compton Tucker, a Goddard Earth scientist who helped with the excavation,

coordinated bringing in multiple scientists to study the tracks and has worked to create a display of the cast in Goddard's Earth science building. "People ask me, 'Why were all these tracks in Maryland?' I reply that Maryland has always been a desirable place to live."

What is now Maryland would have been a much hotter, swamplier place in the Cretaceous, when sea levels would have been hundreds of feet higher than today. As scientists continue to study the slab and compare the tracks to others found in the area and around the world, they will continue to discover more about prehistoric life that existed here.

"This could be the key to understanding some of the smaller finds from the area, so it brings everything together," Lockley said. "This is the Cretaceous equivalent of the Rosetta Stone."

In addition to Stanford and Lockley, Tucker, Godfrey and Sheila Stanford were also co-authors of the *Scientific Reports* paper. ■

Above (left): Local dinosaur track expert Ray Stanford (left) and University of Colorado paleontologist Martin Lockley stand behind a cast of the footprints. Photo credit: NASA/Goddard/Swarupa Nune

Above (right): Ray Stanford (center) points out the impression of the footprints to Goddard officials and local media. Photo credit: NASA/Goddard/Rebecca Roth



NEWLY RENAMED SWIFT MISSION

By [Francis Reddy](#)

Observations by NASA's Swift spacecraft, recently renamed the Neil Gehrels Swift Observatory after the mission's late principal investigator, have captured an unprecedented change in the rotation of a comet. Images taken in May 2017 reveal that comet 41P/Tuttle-Giacobini-Kresák – or 41P for short – was spinning three times slower than it was in March, when it was observed by the Discovery Channel Telescope at Lowell Observatory in Arizona.

The abrupt slowdown is the most dramatic change in a comet's rotation ever observed.

"The previous record for a comet spindown went to 103P/Hartley 2, which slowed its rotation from 17 to 19 hours over 90 days," said Dennis Bodewits, an associate research scientist at the University of Maryland in College Park (UMD), who presented the findings on Jan. 10 at the American Astronomical Society (AAS) meeting in Washington. "By contrast, 41P spun down by more than 10 times as much in just 60 days, so both the extent and the rate of this change have never been seen before."

The comet orbits the sun every 5.4 years, traveling only about as far out as Jupiter, whose gravitational influence is thought to have captured it into its present path. Estimated to be less than 0.9 mile across, 41P is among the smallest of the family of comets whose orbits are controlled by Jupiter. This small size helps explain how jets on the surface of 41P were able to produce such a dramatic spindown.

As a comet nears the sun, increased heating causes its surface ice to change directly to a gas, producing jets that launch dust particles and icy grains into space. This material forms an extended atmosphere, called a coma. Water

in the coma quickly breaks up into hydrogen atoms and hydroxyl molecules when exposed to ultraviolet sunlight. Because Swift's Ultraviolet/Optical Telescope (UVOT) is sensitive to UV light emitted by hydroxyl, it is ideally suited for measuring how comet activity levels evolve throughout the orbit.

Ground-based observations established the comet's initial rotational period at about 20 hours in early March 2017 and detected its slowdown later that month. The comet passed 13.2 million miles from Earth on April 1, and eight days later made its closest approach to the sun. Swift's UVOT imaged the comet from May 7 to 9, revealing light variations associated with material recently ejected into the coma. These slow changes indicated 41P's rotation period had more than doubled to between 46 and 60 hours.

UVOT-based estimates of 41P's water production, coupled with the body's small size, suggest that more than half of its surface area contains sunlight-activated jets. That's a far greater fraction of active real estate than on most comets, which typically support jets over only about 3 percent of their surfaces.

"We suspect that the jets from the active areas are oriented in a favorable way to produce the torques that slowed 41P's spin," said Tony Farnham, a principal research scientist at UMD. "If the torques continued acting after the May observations, 41P's rotation period could have slowed to 100 hours or more by now."

Such a slow spin could make the comet's rotation unstable, allowing it to begin tumbling with no fixed rotational axis. This would produce a dramatic change in the comet's



SPIES A COMET SLOWDOWN

seasonal heating. Bodewits and his colleagues note that extrapolating backward suggests the comet was spinning much faster in the past, possibly fast enough to induce landslides or partial fragmentation and exposing fresh ice. Strong outbursts of activity in 1973 and 2001 may be related to 41P's rotational changes.

A less extreme relationship between a comet's shape, activity and spin was previously seen by ESA's (European Space Agency) Rosetta mission, which entered orbit around comet 67P/Churyumov-Gerasimenko in 2014. The comet's spin sped up by two minutes as it approached the sun and then slowed by 20 minutes as it moved farther away. As with 41P, scientists think these changes were produced by the interplay between the comet's shape and the location and activity of its jets.

Swift has conducted a broad array of science investigations for 13 years – monitoring comets, studying stars hosting exoplanets, and catching outbursts from supernovas, neutron stars and black holes – and it continues to be fully operational. NASA announced at the AAS meeting that the mission has now been renamed in honor of Neil Gehrels – former astrophysicist at NASA's Goddard Space Flight Center – who helped develop Swift and served as its principal investigator until his death on Feb. 6, 2017.

Swift's rapid scheduling capability, plus a trio of telescopes covering optical to gamma-ray wavelengths, continues to deliver important contributions in the study of gamma-ray bursts – the most powerful explosions in the universe – while maintaining a critical role in monitoring how astronomical objects as diverse as comets, stars and galaxies change over time.

"The Neil Gehrels Swift Observatory is a name that reflects Swift's current status as the go-to facility for rapid-response, multiwavelength follow-up of time-variable sources," said Paul Hertz, director of NASA's Astrophysics Division at its headquarters in Washington. "With Swift, Neil helped usher in the era of time-domain astronomy. He would have been very excited about today's discovery."

"Swift is still going strong, and we continue to receive four urgent 'target-of-opportunity' observing requests from the broader astronomical community each day," said S. Bradley Cenko, who was recently appointed as the mission's principal investigator. "Neil's leadership and vision continue to guide the project, and we can think of no better way to honor this legacy than with the new name."

Goddard manages the Swift mission in collaboration with Pennsylvania State University in University Park, the Los Alamos National Laboratory in New Mexico, and Orbital Sciences Corp. in Dulles, Virginia. Other partners include the University of Leicester and Mullard Space Science Laboratory in the United Kingdom, as well as Brera Observatory and the Italian Space Agency in Italy. ■

Above (left): The Neil Gehrels Swift Observatory has become the go-to facility for rapid-response multiwavelength follow-up of time-variable sources. Image credit: NASA/Goddard

Above (right): Comet 41P orbits the sun every 5.4 years, traveling only about as far out as Jupiter, as shown in this illustration. Image credit: NASA/Goddard



A SCIENTIST'S 'DETERMINATION' HELPS

By [Jenny Hottle](#)

If the lines from Heather Graham's rock opera sound more like a scientific paper than song lyrics, you're not wrong.

Before "Hidden Figures" shed light on the unsung heroes of NASA, Graham – an astrobiologist at NASA's Goddard Space Flight Center – set the story of mathematician Katherine Johnson's life and her work on the Apollo program to music. "Determination of Azimuth," first staged in 2015 by the Baltimore Rock Opera Society, turned mission control transcripts, scientific papers and interviews into a rock opera.

"When we were putting the show together, we asked ourselves what people should take away from the show," Graham said. "Was it a show about physics, a show about space? It was very much about Katherine Johnson, but it was supposed to be an entry point of information. We wanted to saturate the audience with information while staying true to the science and true to the math."

Graham was drawn to Johnson's story while researching scientists for African American History Month. As a National Science Foundation graduate fellow in K-12 education, she spent a few days a week supporting science education at an underperforming middle school in Harrisburg, Pennsylvania. One idea she had was to create a month-long lesson plan that taught students about a different black scientist each day.

"Every day, I had a biography and an activity for students to follow," Graham said. "I wanted to show the students that if they pursued science as a career, they'd have colleagues and mentors."

As a woman pursuing a career in space science, Graham said Johnson's story especially resonated with her, and she wanted to share it with more people. When the Baltimore Rock Opera Society held an open call for scripts, she pitched the idea of telling Johnson's story, backed by experimental music, a bunch of math and dancers acting out physics.

The artistic council loved the concept, and the cast ended up performing "Determination" – named after one of Johnson's scientific papers – nine times in 2015, selling out each time. It was a technically demanding show, said Graham, who wrote the script during the first year of her postdoc at Goddard. During the entire show, seven actors on stage perform in two alternating timelines, and sound effects complement four live musicians and multiple video feeds.

The show starts with a launch. Audience members receive a briefing packet and hustle into a pitch-black room. The floor starts rumbling, and screens light up. Men working in mission control communicate with astronauts on one side of the stage, and a group of female mathematicians calculate furiously at a desk on the other side of the stage. In the middle of the chaos, Johnson steps out and begins telling her story.



BRING HIDDEN FIGURE TO LIGHT

"When they went to the moon the first time, everyone was so concerned about how we were going to get them there. But putting rockets into space was the easy part. Getting them back home is where it gets hard."

Nearly all of Johnson's lines, which make up about 70 percent of the show, were direct quotes from interviews. The dialogue between mission control and the astronauts came from real NASA transcripts. The song lyrics are lines from the papers that Johnson wrote with then-NASA engineer Ted Skopinski.

"I'm a scientist, so I like referencing things," Graham said. "There's very little content in my script that was original. It's just rearranged from reality. I like to imagine that if Katherine Johnson saw 'Determination,' she'd be pleased that we really tried to be respectful of the scientific and historical material."

Even the show's choreography was inspired by science.

"Our choreographer was very interested in doing body movements that were representative of physics," Graham said. "She would read something about physics, such as the idea of recoil, then ask me how it relates to rocketry and work with the actors to find movements that were indicative of it."

The cast and crew aimed to stay true to the math and science behind the Apollo program, but not all of it was

entirely serious. Graham described "Determination of Azimuth" as "'Sesame Street' meets 'Einstein on the Beach'" and said they added elements of absurdity to give the audience an excuse to laugh from time to time. For one thing, the astronauts were puppets instead of actors. Including puppets in the show was both a nod to the Baltimore Rock Opera Society and a way to de-emphasize the astronauts.

"We wanted to make the mathematicians the heroes and keep the focus on the people who were doing the scientific work," Graham said. "People focus so much on the astronauts, but there's a whole team sending people to space."

The show was recently resurrected for two weekends in February at Baltimore's Arena Players, the oldest African-American community theater in the nation. With the popularity of "Hidden Figures" now running alongside Graham's production, she hopes artistic endeavors such as hers will help bring other female pioneers out of relative obscurity.

"It's just so gratifying to see these stories and histories finally coming to light," she said. "Scientific progress is like an iceberg – the big visionary stuff is what we see, but it's supported by immense labor and ingenuity of incremental work. Science, like art, is all about collaboration." ■

Above: Scenes from "Determination of Azimuth."

Photos courtesy: Heather Graham

KAREN MOHR: A DIFFERENT PATH TO GODDARD

By [Elizabeth M. Jarrell](#)

What do you do and what is most interesting about your role here at Goddard? How do you help support Goddard's mission?

I provide day-to-day support for the operations of the atmospheric science labs. I help manage budgets, travel, IT security, hiring, technical equipment, personnel actions and training.

I am an active atmospheric scientist with a specialty in hydrometeorology. I study the formation of clouds and precipitation in arid regions. I am particularly interested in the precipitation variability of West Africa. Everything I do is based on remote sensing of clouds and precipitation from satellites.

What was your path to becoming an atmospheric scientist?

I came to this profession in a rather round-about way. I was an undergraduate physics major at the College of the Holy Cross in Worcester, Massachusetts. I joined the Air Force while in college. After graduation, the Air Force assigned me to the Air Weather Service, and I spent the next year studying meteorology at Penn State. The Air Force then assigned me to Travis Air Force Base near San Francisco as an aviation meteorologist. I made forecasts for Air Force bases and Air Force missions around the Pacific Rim. That is where I got my start as a meteorologist.

I served five years in the Air Force and then took a civilian job as a wind energy meteorologist in the San Francisco area. I analyzed wind turbine production data versus wind availability.

After a couple of years in the wind energy industry, I went to Texas A&M for graduate school to study tropical meteorology. After obtaining my master's degree in atmospheric science, I decided that I preferred to study Earth system science, so I transferred to the University of Texas in Austin. I earned my doctorate with a concentration in hydrology.

Where did you work after you got your doctorate?

From 2000 to 2008, I was a professor of atmospheric science in the Department of Atmospheric and Environmental Science at the University at Albany, State University of New York. I taught graduate and undergraduate courses, mentored graduate students and conducted my own funded research program in hydrometeorology.

What are the differences between academia and Goddard?

I love being here! Ultimately, I found that academia was too isolating an existence for me. When I was at the university, I worked with satellite data, but I wanted to actually work on the satellite programs, which is what I now do. I prefer being in an environment where teamwork and mission are the goals. I enjoy being around other people who are also focused on the satellite programs. I like being part of a team.

How is science a team sport?

We have to have a playbook, rules and teammates who support each other. We all need to work together to get the ball across the goal line. Our program scientists are our coaches who guide and support us.

We all have the same goal, which is to get the satellite off the launch pad and operational with data products flowing to users all over the world. This is not an individual endeavor; it requires a team from Goddard partnering with teams from other government agencies and universities from around the world.

Who at Goddard has inspired you and how?

The late Joanne Simpson was a Goddard chief scientist and is the closest we have to the mother of tropical meteorology. She was the first woman to get a doctorate in atmospheric science in the United States, and she revolutionized our understanding of tropical atmospheric circulations. She mentored my mentor so I feel that I knew her and admire her. Her papers are still being cited.

I also look up to Wei-Kuo Tao, an atmospheric scientist. He helped me with my research in graduate school, gave me career advice as I launched my career, provided references and encouraged me to apply to Goddard. I talk to him every week. We are very close. He is still producing groundbreaking research after 30 years at Goddard and yet makes time for me and others he mentors. ■

Center: Karen Mohr

Photo credit: NASA/Goddard/Bill Hrybyk

