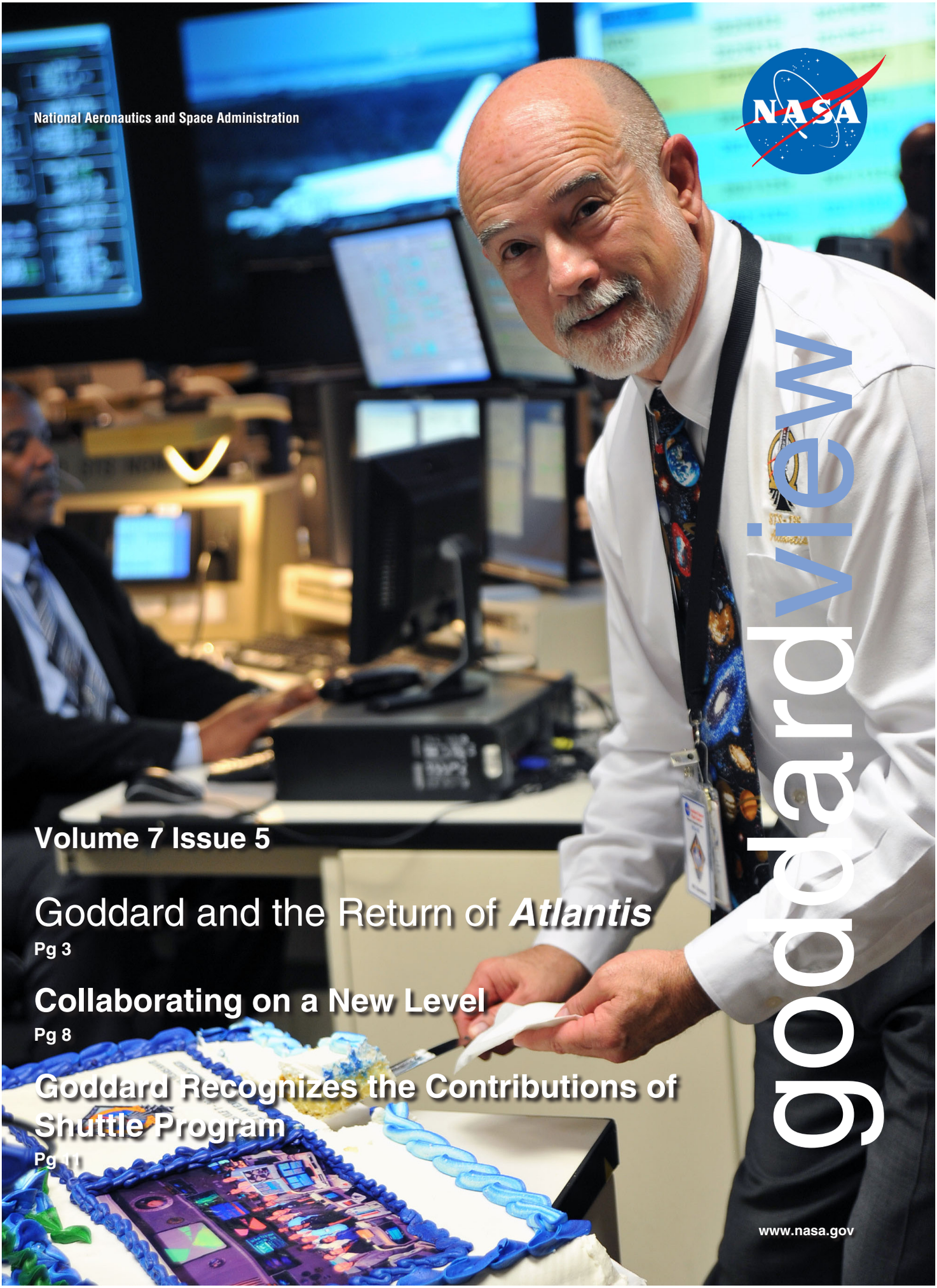

National Aeronautics and Space Administration

goddardview

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Expansion Ceremony Held for Forest Partnership

By Darlene Squibb

The Baltimore Washington Partners for Forest Stewardship (BWPFS), a federal-state-nonprofit partnership to advance stewardship of the combined landscape they manage, honored new partners on June 23, 2011. The six original partners, who include Goddard, the Maryland Department of Natural Resources, the Center for Chesapeake Communities, the U.S. Department of Agriculture Beltsville Agricultural Research Center, the U.S. Fish and Wildlife Service Patuxent Research Refuge, and the U.S. Army Fort George G. Meade, formed the BWPFS through a Memorandum of Understanding (MOU) signed in 2006. Collectively, these Agencies own and manage over 40 square miles of land, 64 percent of which is either forested or wetlands.

A MOU signature ceremony and tree planting was hosted by the City of Greenbelt for the BWPFS to welcome the new partners: the City of Greenbelt, the University of Maryland, the U.S. Secret Service, the U.S. Forest Service, and the U.S. Geological Survey. The new partnership expands the area of contiguous managed landscape to nearly 47 square miles. These unique ecological resources are among the last significant tracts of contiguous forest land in this highly urbanized region. They provide important ecosystem services to Marylanders such as clean air and water, soil erosion and flood control, biodiversity, and recreational and educational opportunities.

Together with new partners, the BWPFS will seek to expand tree canopy cover, conserve and improve wildlife habitat, reduce nutrient and sediment pollution to the Chesapeake Bay, promote coordinated land management and collaborative scientific research, pursue green building technologies and climate change action strategies, and offer environmental education opportunities to the public.

Three divisions at Goddard are ensuring support of the BWPFS. Darlene Squibb, Janine Pollack from the Medical and Environmental Division, and Alan Binstock from the Facilities Management Division serve on the steering committee. Dr. Molly Brown from Biospheric Sciences, part of the Hydrospheric and Biospheric Science Laboratory, has been leading a science subcommittee. ■

Photo provided by Darlene Squibb

Caption: Present from Goddard for the ceremony were: Nancy Abell, Darlene Squibb, Alan Binstock, Edward Connell, and Tom Paprocki.

GoddardView

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On the cover: James Bangerter, Network Director at Goddard's Network Integration Center, cuts into a cake to commemorate the final landing of Space Shuttle *Atlantis.*
Photo credit: NASA/Goddard/Debora McCallum

GoddardView Info

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Goddard and the Return of *Atlantis*

By Malissa Reyes, Karl Hille, and Rob Garner

Atlantis touched down just before 6 a.m. EDT on July 21, 2011, signaling the end of the space shuttle era, a program with 135 launches over 30 years and conceptual roots dating back to the Nixon administration.

The five orbiters, *Columbia*, *Challenger*, *Discovery*, *Atlantis*, and *Endeavor*, had no shortage of achievements; Goddard's workforce contributed to many of them. Among the shuttles' greatest success stories is the deployment and later servicing of the *Hubble Space Telescope*, managed and operated at Goddard.

Goddard employees worked around-the-clock during every shuttle mission to guarantee constant, uninterrupted lines of communication between astronauts with Mission Control. The careful dance of satellite relays necessary to keep channels open requires global coordination, but it all comes together in Goddard's Network Integration Center.

Photo credit: NASA/Goddard/Debora McCallum

Caption: Goddard's Network Integration Center team celebrate a bittersweet final landing of Atlantis.

Goddard has fulfilled this communication role in literally all of NASA's manned space flights. We all know the words, "One small step for (a) man; one giant leap for mankind," but no one on Earth would have heard Neil Armstrong say them on July 21, 1969, if not for Goddard.

Among *Atlantis*' final contributions to the *International Space Station* is the Robotic Refueling Mission, developed at Goddard. This module will provide key support in maintaining future spacecraft for years to come. STS-135 (the final shuttle mission's official designation) astronauts traveled to Goddard to complete special training for RRM.

In the 30-year flight history of the Shuttle Program, RRM is only one of dozens of payloads with Goddard tie-ins, ranging in size from massive, such as the 12-ton *Hubble*, to minute, such as 60-pound "Get Away Specials (GAS)."

Many Goddard scientists, engineers, and managers got their starts with GAS canisters and other small payloads projects.

In the mid-1980s, Dr. James Garvin, then a fresh-faced geoscientist from Brown University, flew laser altimeter equipment aboard aircraft out of NASA's Wallops Flight Facility in Virginia. In the mid-90s, his team got the chance to adapt the technology for two space shuttle flights. With the Shuttle Laser Altimeter missions, "We realized we could…measure the biomass of the planet," Garvin said. "We started getting these booming echoes that turned out to be the tops of trees, and smaller returns from the ground underneath. What it did for us was show what we could actually do for Earth science."

"The legacy of those experiments was the proving ground for what we have since accomplished in developing these LIDAR instruments for other planets," Garvin said. "Everyone who worked on this project went on to really make a contribution to science." Garvin is now Goddard's Chief Scientist.

At a Goddard employee ceremony later in the morning, *Geostationary Operational Environmental Satellite–R* Observatory Manager and former astronaut Paul Richards shared his own experiences with the shuttle, offering commentary on a replay of video from *Atlantis*' landing—an experience he described as similar to "riding a roller coaster for 45 minutes."

"It's kind of bittersweet," Richards said of the Shuttle Program's conclusion. "I really hope that human spaceflight can continue in a manner, like it did for the shuttle, that can inspire [another] generation."

Center Director Rob Strain addressed employees about the significance of the Shuttle Program and Goddard's role in it. "Today we are here to salute the thousands of men and women who made the [shuttle] program a success," he said. "We salute your tireless dedication and commitment, and applaud you for a job well done. While this ends one chapter in the history of this Agency, Goddard will continue to have a prominent role in the human spaceflight program."

NASA Administrator and former astronaut Charlie Bolden issued a statement about the 30-year program: "At today's final landing of the space shuttle, we had the rare opportunity to witness history. We turned the page on a remarkable era and began the next chapter in our Nation's extraordinary story of exploration. This final shuttle flight marks the end of an era, but today, we recommit ourselves to continuing human spaceflight and taking the necessary—and difficult—steps to ensure America's leadership in human spaceflight for years to come." ■

NPP Runs the Gauntlet of Environmental Testing

By Ellen Gray

The NPP satellite sits surrounded by 144 rock concert speakers. They're stacked in a circle 16 feet high in a testing room at Ball Aerospace in Boulder, Colorado.

As engineers set up for the environmental test, Pink Floyd's song "Money" plays gently in the background. The music stops. The room clears. Then the sound engineer wearing earplugs and headphones in the control room next door flips a switch.

Slowly, the noise of thousands of pounds of exploding rocket fuel builds louder and louder until it blasts the satellite at a deafening 143.6 decibels—loud enough to cause serious damage and pain to unprotected ears. "I was outside the building when they did the full level acoustics," says Glenn Iona, NPP Chief Engineer at Goddard, "and I could feel the ground shaking."

The acoustic test is one of a gauntlet of environmental tests a satellite must pass to prove that it can survive launch and life in space. For Large Class Observatory mission NPP, this process took years to plan, 15 months to execute and was fraught with as many engineering challenges as building the satellite itself.

The NPOESS Preparatory Project (NPP) is the prototype for the next generation of Earth-observing satellites that will monitor daily weather and long-term ozone levels and climate change.

NPP's five instruments will continue data collection now done by an aging fleet of satellites. NASA's oldest Earth Observing System (EOS) satellites are more than 10 years old, with instrument designs and technology dating back to the early 1990s. NPP is the bridge between the original EOS missions and the Joint Polar Satellite System (JPSS). JPSS, previously called the National Polar-orbiting Operational Environmental Satellite System (NPOESS), will be developed by NASA for the National Oceanic and Atmospheric Administration (NOAA).

Testing to evaluate whether a satellite is ready for space occurs at several levels. Some individual parts and each individual instrument from the satellite go through three types of testing: dynamic, electromagnetic compatibility, and thermal vacuum.

Then the parts are integrated onto the main satellite bus, a wedge-shaped block the size of a four-door sedan. The bus has propulsion systems, a flight computer, a data processing computer, data storage, and a solar panel wing that powers it all. Engineers then put the spacecraft and instruments through their paces to get a performance baseline before the whole satellite is run through the suite of environmental tests again.

The challenge, according to Iona, who oversaw environmental testing for NPP, which took place in 2010 and 2011, is testing the satellite while taking into account all the different instruments' requirements and restrictions: Will the electromagnetic field generated by one instrument's electronics interfere with the instrument sitting next to it? Will the jitter caused by the spacecraft or other instruments affect the sensitive Cross-track Infrared Sounder (CrIS)?

Iona says they weren't sure about the shaking, so just in case, they designed a way to isolate CrIS's platform from vibrations using frangi-bolts that will break in a controlled manner when heated on command, allowing the instrument to "float" on shock absorbers.

Keeping Out Dust Bunnies

Engineers also must figure out how to run the tests without damaging or contaminating the instruments.

Most of the tests happen in specially ventilated clean rooms—no dust allowed. Engineers work in white coveralls, called "bunny suits," which prevent contamination from clothes, skin, and hair. But even those precautions weren't enough for the super-sensitive Ozone Mapping and Profiler Suite (OMPS). It detects solid particles and molecular gases in the atmosphere, and is sensitive to contamination from the tiniest amount of dust. During testing, frequent inspections and a plastic bag protected it. While that worked for OMPS, Iona says that solution wouldn't work on other instruments.

"CrIS has paint you can't touch," he says. The specialized paint reflects the Sun's heat because part of the instrument's design is to have a stable operating temperature. Anything touching it may fleck the paint away. Iona says the challenge was, "How do you keep it clean from contamination if you can't put a bag over it?" The answer: special hard covers or, during dynamics testing, a tented drape that avoided the paint.

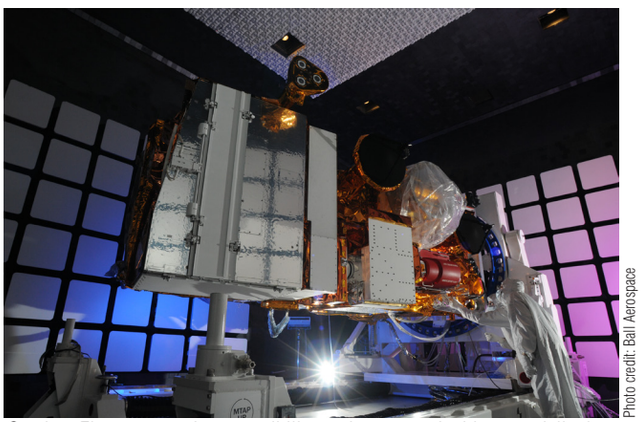

Photo credit: Ball Aerospace

Caption: Electromagnetic compatibility testing occurs inside a specially designed room that stops the reflection of sound or electromagnetic radiation, called an anechoic chamber.

In the dynamics testing room, the whole satellite wears protective bagging and sits on a giant shaker table where it's rattled up and down and side-to-side to simulate its rocket ride. In another chamber, testers bombard the satellite with the types of electromagnetic radiation it will encounter in space—and then test for how much radiation it emits that might affect neighboring satellites.

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NPP Runs the Gauntlet of Environmental Testing

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The 'Iron Maiden'

But the most complicated and challenging test is thermal vacuum (TVAC) where the satellite goes through four cycles of extreme cold to extreme heat in a vacuum chamber. The test simulates the temperature changes NPP will encounter on the day and night sides of Earth, as well as worst case scenarios of whether the instruments can come back to life in case of a shut down that exposes them to even colder temperatures.

According to Scott Compton, Integration and Test Manager at Ball Aerospace, preparing for the thermal vacuum test took a year and a half and involved building a scaffold that engineers fitted to the satellite like a dress. It was an engineering "project within a project," says Compton.

Called the "Iron Maiden" after the medieval torture device, the scaffold held heaters and coolers less than an inch away from each instrument to meet their individual hot and cold temperature requirements. Liquid nitrogen was used to cool OMPS, the Advanced Technology Microwave Sounder (ATMS), and the Clouds and Earth's Radiant Energy System (CERES) while CrIS and the Visible Infrared Imaging Radiometer Suite (VIIRS) were subjected to even colder liquid helium, to reach temperatures ranging from 30–120 Kelvin. VIIRS and CrIS complicated matters because they are both designed to be thermally stable—they resisted cooling down and heating up.

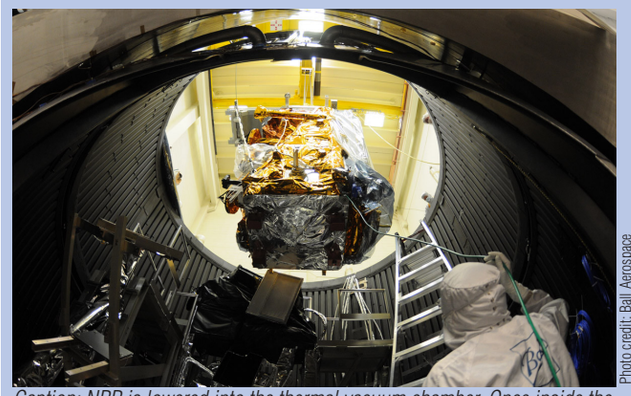


Photo credit: Ball Aerospace

Caption: NPP is lowered into the thermal vacuum chamber. Once inside the Iron Maiden (visible in the lower left) is fitted in place. Then air is pumped out of the chamber and temperature extremes are applied to replicate orbit conditions.

During the test, the temperature changes were carefully monitored because too quick of a change would damage the instruments. Coordinating the many heaters and coolers "was a ballet for the thermal engineers," says Compton, who adds that NPP's thermal vacuum test was the most complex he's been involved with.

Seventy-five people, from the testing team to each instrument's engineering and data analysis teams, camped out onsite for the 24-hour testing that lasted 49 days in March and April of 2011. The scientists who will be using NPP's data were on standby across the country to evaluate the instruments' performance.

Air Hockey, Anyone?

Last, but perhaps most important, the testing team unfolded NPP's three solar panels. Looking like a set of blackboards on wheels, the team simulated weightlessness by using what acts like the world's largest air hockey table. Hoses attached to temporary support legs for the solar panels pushed air underneath hockey pucks on the feet. This created a localized air cushion 30 thousandths of an inch high. With reduced friction, the pucks then slid across a slick dance floor made of polymer roofing material, and the three panels locked themselves into place perfectly.

Photo credit: Ball Aerospace

Caption: On a slick floor made of polymer roofing material, NPP's solar panels glide on a cushion of air to test the mechanisms that unfold and lock the solar array into place.

After resolving the 107 test anomalies they found during months of vibration, noise, electromagnetic radiation, and controlled swings in temperature, the satellite's onboard computers and instruments passed their final performance tests. NPP is ready for space. Iona says his favorite part of the process was that, even with all the complications and problems that cropped up, the environmental testing team passed every stage on or ahead of schedule. "Seeing the environmental testing come together and leading the team, TVAC in particular, was really satisfying on so many levels," he says.

NPP is scheduled to launch into orbit from Vandenberg Air Force Base in California on October 25, 2011. For more information on NPP, visit: http://jointmission.gsfc.nasa.gov. ■

NASA Researchers: DNA Building Blocks Can Be Made in Space

By Bill Steigerwald

NASA-funded researchers have evidence that some building blocks of DNA, the molecule that carries the genetic instructions for life, found in meteorites were likely created in space. The research gives support to the theory that a "kit" of ready-made parts created in space and delivered to Earth by meteorite and comet impacts assisted the origin of life.

"People have been discovering components of DNA in meteorites since the 1960s, but researchers were unsure whether they were really created in space or if instead they came from contamination by terrestrial life," said Dr. Michael Callahan of Goddard. "For the first time, we have three lines of evidence that together give us confidence these DNA building blocks actually were created in space." Callahan is lead author of a paper on the discovery appearing in Proceedings of the National Academy of Sciences of the United States of America.

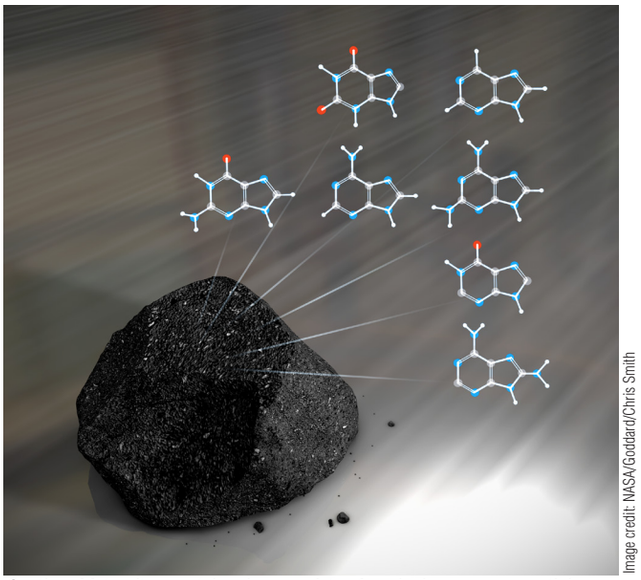


Image credit: NASA/Goddard/Chris Smith

Caption: Meteorites contain a large variety of nucleobases, an essential building block of DNA.

The discovery adds to a growing body of evidence that the chemistry inside asteroids and comets is capable of making building blocks of essential biological molecules. Previously, these scientists at the Goddard Astrobiology Analytical Laboratory have found amino acids in samples of comet Wild 2 from NASA's *Stardust* mission, and in various carbon-rich meteorites. Amino acids are used to make proteins, the workhorse molecules of life, used in everything from structures like hair to enzymes, the catalysts that speed up or regulate chemical reactions.

In the new work, the Goddard team ground up samples of twelve carbon-rich meteorites. They extracted each sample with a solution of formic acid and ran them through a liquid chromatograph, an instrument that separates a mixture of compounds. They further analyzed the samples with a mass spectrometer, which helps determine the chemical structure of compounds.

The team found adenine and guanine, which are components of DNA called nucleobases, as well as hypoxanthine and xanthine. DNA resembles a spiral ladder; adenine and guanine connect with two other nucleobases to form the rungs of the ladder. They are part of the code that tells the cellular machinery which proteins to make. Hypoxanthine and xanthine are not found in DNA, but are used in other biological processes.

Also, in two of the meteorites, the team discovered for the first time trace amounts of three molecules related to nucleobases: purine, 2,6-diaminopurine, and 6,8-diaminopurine; the latter two almost never used in biology. These compounds have the same core molecule as nucleobases but with a structure added or removed.

It's these nucleobase-related molecules, called nucleobase analogs, which provide the first piece of evidence that the compounds in the meteorites came from space. "You would not expect to see these nucleobase analogs if contamination from terrestrial life was the source, because they're not used in biology, aside from one report of 2,6-diaminopurine occurring in a virus (cyanophage S-2L)," said Callahan. "However, if asteroids are behaving like chemical 'factories' cranking out prebiotic material, you would expect them to produce many variants of nucleobases, not just the biological ones, due to the wide variety of ingredients and conditions in each asteroid."

The second piece of evidence involved research to further rule out the possibility of terrestrial contamination as a source of these molecules. The team also analyzed a 17.64-pound (8 kilogram) sample of ice from Antarctica, where most of the meteorites in the study were found, with the same methods used on the meteorites. The amounts of the two nucleobases, plus hypoxanthine and xanthine, found in the ice were much lower than in the meteorites, where they were generally present at several parts per billion. More significantly, none of the nucleobase analogs were detected in the ice sample.

Thirdly, the team found these nucleobaseswere produced in a completely non-biological reaction. "In the lab, an identical suite of nucleobases and nucleobase analogs were generated in non-biological chemical reactions containing hydrogen cyanide, ammonia, and water. This provides a plausible mechanism for their synthesis in the asteroid parent bodies, and supports the notion that they are extraterrestrial," says Callahan.

"In fact, there seems to be a 'Goldilocks' class of meteorite, the so-called CM2 meteorites, where conditions are just right to make more of these molecules," adds Callahan.

The team includes Callahan and Drs. Jennifer C. Stern, Daniel P. Glavin, and Jason P. Dworkin of Goddard's Astrobiology Analytical Laboratory; Ms. Karen E. Smith and Dr. Christopher H. House of Pennsylvania State University, University Park, Pa.; Dr. H. James Cleaves II of the Carnegie Institution of Washington, Washington, DC; and Dr. Josef Ruzicka of Thermo Fisher Scientific, Somerset, N.J. The research was funded by the NASA Astrobiology Institute, the Goddard Center for Astrobiology, the NASA Astrobiology: Exobiology and Evolutionary Biology Program, and the NASA Postdoctoral Program. ■

MAVEN Marks Major Mission Milestone

By Nancy Neal Jones and Rob Gutro

The Mars Atmosphere and Volatile EvolutioN (MAVEN) mission reached a major milestone in July when it successfully completed its Mission Critical Design Review (CDR).

MAVEN, scheduled for launch in late 2013, will be the first mission devoted to understanding the Martian upper atmosphere. The goal of MAVEN is to determine the history of the loss of atmospheric gases to space through time, providing answers about Mars climate evolution. It will accomplish this by measuring the current rate of escape to space and gather enough information about the relevant processes to allow extrapolation backward in time.

Noting this milestone, Michael Meyer, Lead Scientist for NASA's Mars Exploration Program at NASA Headquarters said. "It is a real pleasure to see the MAVEN team doing an exemplary job on this important mission, which was identified as a top priority mission in the 2002 National Research Council Decadal Survey and addresses high-priority goals of two Divisions—Planetary Sciences and Heliophysics."

"Understanding how and why the atmosphere changed through time is an important scientific objective for Mars," said Bruce Jakosky, MAVEN Principal Investigator from the Laboratory for Atmospheric and Space Physics at the University of Colorado (CU/LASP) at Boulder. "MAVEN will make the right measurements to allow us to answer this question. We're in the middle of the hard work right now—building the instruments and spacecraft—and we're incredibly excited about the science results we're going to get from the mission."

From July 11–15, 2011, the MAVEN Critical Design Review was held at Goddard. An independent review board, comprised of reviewers from NASA and several external organizations, met to validate the system design. Critical Design Reviews are one-time programmatic events that bridge the design and manufacturing stages of a project. A successful review means that the design is validated and will meet its requirements, is backed up with solid analysis and documentation, and has been proven to be safe. MAVEN's CDR completion grants permission to the mission team to begin manufacturing hardware.

Photo credit: NASA

Caption: MAVEN team in front of Building 34 at the successful Mission Critical Design Review.

"This team continues to nail every major milestone like clockwork, as laid out three years ago when the mission was proposed," said Dave Mitchell, MAVEN Project Manager at Goddard. "CDR success is very important because it validates that the team is ready for fabrication, assembly, and test of all mission elements. It also enables us to stay on plan for launch in November 2013."

MAVEN will carry three instrument suites. The Particles and Fields Package, built by the University of California at Berkeley with support from CU/LASP and Goddard, contains six instruments that will characterize the solar wind and the ionosphere of the planet. The Remote Sensing Package, built by CU/LASP, will determine global characteristics of the upper atmosphere and ionosphere. The Neutral Gas and Ion Mass Spectrometer, provided by Goddard, will measure the composition and isotopes of neutral ions.

MAVEN's Principal Investigator is based at CU/LASP. The university will provide science operations, build instruments, and lead education/public outreach. Goddard will manage the MAVEN mission.

For more about MAVEN, visit: http://www.nasa.gov/maven. ■

Collaborating on a New Level

By Lori Keesey

Except for a two-year stint as a detailee to the White House Office of Science and Technology Policy, Christyl Johnson has spent her entire professional career working for NASA. In December, she assumed her new job as Goddard's Deputy Director for Science and Technology—a position that requires her to oversee Goddard's research and development portfolio and formulate the Center's future science and technology goals. In a recent interview, she talked about the challenges NASA faces in an era of shrinking budgets and her plans to better position Goddard to meet those hurdles.

Photo credit: NASA/Goddard/Pat Izzo

Caption: Christyl Johnson looks to the future.

What are the challenges on the horizon?
The environment is shifting. We can't count on a certain amount of funding each year. What will more than likely happen, given our budget deficits, are further cuts in discretionary funding. Making matters worse is talk among some Congressional staffers who have suggested that perhaps we need to carve out parts of NASA and give those responsibilities to other Government Agencies as a way to help reduce the annual budget. Cost overruns on high-profile missions have, I believe, exacerbated the situation. Although these ideas may never gain traction, and they certainly aren't a reality for the Obama administration, the talk nonetheless is out there.

What should NASA, and more particularly Goddard, do to secure its future?
Given the budget realities, we need to do more with less. I'm not suggesting that we cut back on important technology-development efforts, but we do need to work with other Federal Agencies and private industry to develop mutually beneficial technologies. There is money out there. People in industry have R&D programs. The Defense Department has even deeper pockets. By collaborating, we can spread the costs of innovation and, more particularly, reduce the costs borne by NASA.

What do you think is the biggest barrier to collaboration?
Part of the problem is that people, including Government Agencies, are accustomed to viewing their R&D efforts as belonging exclusively to them. They erect stovepipes. In an environment of diminishing resources, however, we need to eliminate those barriers.

How do you propose to do that?
Let me first say that our technologists do collaborate. They do look beyond these walls to find partners in academia and industry who can help them advance emerging technologies. Examples abound, and, in fact, many of them are highlighted in each issue of Goddard Tech Trends. I applaud these efforts and encourage more of it. I strongly believe collaboration is the linchpin to future success. With that said, however, I believe we need to do more to tear down the barriers. We already have great IRAD (Internal Research and Development) and bid and proposal capabilities. Now, I am adding a third leg to the stool. In a few weeks, I plan to officially roll out the Strategic Collaboration Initiative (SCI). I'm excited about the possibilities.

What exactly is the Strategic Collaboration Initiative?
Anyone who has ever submitted an IRAD proposal knows that to win funding, he or she must demonstrate that the proposal maps to one or more of Goddard's lines of business—the technical areas we believe are strategically important to the Center. Currently, we look across our six lines of business and identify technologies that should be developed over five years to ensure Goddard's competitiveness and our ability to meet future science and exploration goals. Under the Strategic Collaboration Initiative, we will take this focus one step further. We will make a concerted, top-down effort to establish formal relationships with other Federal Agencies, private industry, and academia.

How will this benefit the technology community?
Our goal is to get buy-in at the executive level. What we hope is that these top-level relationships will foster a culture of collaboration, making it easier for our people and theirs to combine resources and partner on important technologies beneficial to all.

Do you have other ambitions for SCI?
The SCI team also will evaluate how we can better leverage our resources to meet National needs, such as national security, environmental protection, food supply, water quality, and disaster management, to name a few.

What message do you want to leave with readers?
As a Nation, we have severe budget problems. Budget reductions are on our horizon. But that doesn't mean our future isn't bright. Actually, the sky is the limit as long as we think creatively about doing more with less. It's all up to us. ■

NASA Blueshift Makes Space Food Fancy

By Maggie Masetti

Collaborations, especially unlikely ones, can often yield interesting results. Such was the case when Erik Trinidad, the mastermind behind the food humor blog, Fancy Fast Food, came to visit Goddard to shoot a video about space food.

Sara Mitchell and Maggie Masetti, both from NASA Blueshift, the Astrophysics Science Division's social media outreach presence, met Trinidad at the BlogWorld and New Media Expo in 2010. The Fancy Fast Food blog features Trinidad's (amazingly successful) attempts to take a fast food meal and transform it into something that looks like haute cuisine. Sara was already a fan of his site, and to Blueshift it seemed like a fun opportunity for an unusual collaboration. But what topic could a food blog and a NASA blog explore together? The answer was space food.

Photo provided by Erik Trinidad

Caption: From left, photographer Maurice Murdock, Sara Mitchell, Maggie Masetti, NASA astronaut Paul Richards, and Erik Trinidad take a break from filming.

Because Goddard does not work on space food, another partner was needed for this venture. Vickie Kloeris, a food scientist and NASA's Shuttle and *International Space Station* Food Systems Manager at Johnson Space Center was kind enough to send samples of real space food to Trinidad, who brainstormed on what sort of faux cuisine (with incorporated space puns) he could create. He considered "Astroroulade du Poulet," but the bread was too flaky to roll. Other ideas included "Jupiterrine de Boeuf," "Terramisu," "Cosmole Chicken," and "Astroulet de Porc et Saucisson."

Ultimately the winners were "NASAlmon Soufflé" and "Solar Éclairs." Instead of a regular blog entry, the group decided they would make a video and film it at Goddard. Not only was Goddard the backdrop for the video, but a variety of people with interesting jobs were interviewed for the video, including NASA astronaut Paul Richards, someone who has actually eaten space food in space.

Photo provided by Erik Trinidad

Caption: The finished product: NASAlmon Soufflé.

After a very full day of shooting interviews, background footage around Goddard, and two cooking segments, Trinidad returned to New York City with hours of footage to edit together. Much of it necessarily ended up on the cutting room floor, including the segment on "Solar Éclairs." We can tell you, though, that the space waffles used in the recipe were delicious!

The result of Trinidad's day at Goddard is a humorous, and slightly irreverent, six-minute video about making space food fancy, with cameos by many employees who gave a bit of their time to be part of the project.

If you would like to make your own NASAlmon Soufflé, you'll need 1 packet of chipotle snack bread, 1 pouch of outer space-ready Chicken of the Sea pink salmon, 1 package of freeze-dried asparagus, 1 package of freeze-dried vegetable quiche, and water to reconstitute the contents of the freeze-dried pouches. If you can't get the space versions, you could probably substitute Earth versions of these things, but we warn you, this soufflé probably tastes best in a simulated space environment.

To watch the video on YouTube, visit: http://youtu.be/ahoU8i1seWs.

Trinidad's Fancy Fast Food blog can be found at: http://www.fancyfastfood.com/post/7531515695/fancy-space-food.

Read NASA Blueshift's behind-the-scenes blog at: http://astrophysics.gsfc.nasa.gov/outreach/podcast/wordpress/index.php/2011/07/12/maggies-blog-fancy-fast-space-food.

The video and NASA Blueshift's follow-up interview about filming at Goddard are available on the Blueshift Web site: http://astrophysics.gsfc.nasa.gov/outreach/podcast/wordpress/index.php/2011/07/15/maggies-blog-foodies-at-nasa. ■

Firsts and Lasts

By Edward Campion

Edward Campion is the News Chief at Goddard. His NASA career began in 1981, the same year the first Space Shuttle was launched.

Before coming to Goddard, Campion was Chief of Media Operations at NASA's Johnson Space Center (JSC). He also worked in the Mission Control Center as a commentator on NASA television for Space Shuttle launches.

Campion was also the Public Affairs Officer for NASA Headquarters' Office of Space Flight and was responsible for Public Affairs Office (PAO) policy and planning activities for almost 50 Shuttle missions.

At various times in my life, I have wondered about why we almost always know about "firsts"—first day of school, first day on a new job, etc.—but most times we don't know about "lasts"—the last time we'll get to talk to a loved one or visit a special place that we've been to numerous times before. I finally decided the reason we don't know a lot of the "lasts" is because it would just make things too damn hard. I mean, if you knew every time something was the "last time," you'd find yourself constantly tied up in emotional knots.

But sometimes, you do know when a "last" is happening. And of course the one that's been going through my head for the last several weeks is the one that happened today—the Space Shuttle Program coming to an end.

Just before 6:00 a.m. EDT this morning, Space Shuttle *Atlantis* completed her final journey home to the Kennedy Space Center. She brought her crew of four astronauts home safely and brought to a close a 30-year-long adventure.

Experts and historians will engage in debates about whether the Space Shuttle program lived up to all its promises, what was accomplished or was it all it worth the costs in both money and human lives. Others will reminisce about engineering feats achieved or about the many signature moments when planning, training, and professionalism produced great things.

Those folks are welcome to have any and all of those conversations. For me, what the program represented was simply a shining example of what can truly happen when dedicated people take their dreams and visions, and strive to make them a reality.

At one time, the idea of a reusable space ship was just an idea. And yet, at an assembly plant in Palmdale, Calif., five such magical ships—*Columbia*, *Challenger*, *Discovery*, *Atlantis*, and *Endeavour*—came to life.

We dreamed of having a telescope flying high above the Earth's atmosphere. The Space Shuttle not only delivered the *Hubble Space Telescope* to orbit but also made five "house calls" which allowed the orbiting observatory to have cutting edge science instruments for collecting observations that recently passed the ONE MILLION mark.

We wondered if former Cold War warriors could come together in collaboration rather than competition, and we got our answer with the U.S. Space Shuttle/Russian Space Station *Mir* program.

We envisioned countries around the world coming together in designing, building, and operating an orbiting research facility. After a little over three-dozen Shuttle flight missions, more than 925,000 pounds of hardware now constitute the fully assembled *International Space Station.*

There are many other examples of dreams being turned into deeds because a Space Shuttle roared off a launch pad—but as I said earlier, that is a conversation for others to have.

I am sorry for any of you who never got to see a Space Shuttle launch. The sight and sound of four-and-a-half million pounds of hardware thundering aloft under seven million pounds of thrust made every viewer's heart race and spirit soar. It was the absolute personification of the dream taking flight. I was fortunate enough to see many launches during my NASA career but the one that will always stand out was in October 1990 when I was able to get my dad down to see a launch.

We watched *Discovery* climb into a brilliant blue Florida sky. As the launch noise was fading, my father turned to me with a look of total awe and summarized his Space Shuttle experience in three words—THAT WAS INCREDIBLE!

Dad, I couldn't have said it any better myself. ■

Goddard Recognizes the Contributions of Shuttle Program

By John M. Putman. Photos by Bill Hrybyk and Debora McCallum

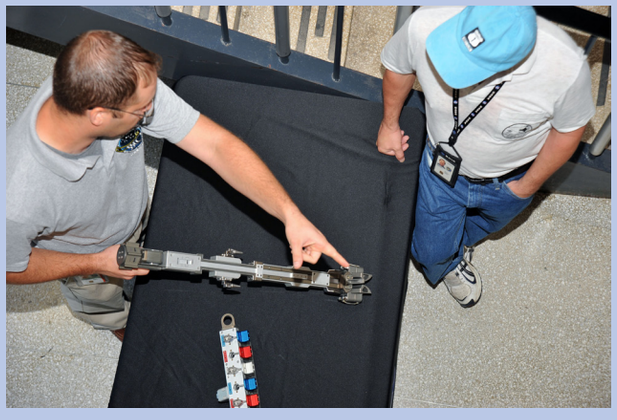
The Goddard community honored 30 years of the shuttle's exploration and discovery with a series of events held on Thursday, July 21 to mark the historic final landing of Atlantis and recognize the contributions of Goddard employees to the Space Shuttle Program.

The day began with the opening of the Building 8 Auditorium at 5:00 a.m. About 30 early risers enjoyed coffee and donuts as they watched the landing of *Atlantis* live.

Employees filled the Building 8 Auditorium to hear from a dynamic panel of speakers who shared their roles, perspectives, and memories about the Shuttle Program. A recorded showing of the STS-135 landing from earlier that morning was also featured. The entire program can be viewed at: http://mediastream.ndc.nasa.gov/gsfc/webvid/PAO/2011/PAO20110721/default.html.

All employees who worked on any part of the Space Shuttle Program were invited to come out on the Goddard Mall for a special photo opportunity. A group shot of Goddard employees who worked on any part of the Space Shuttle Program was taken.

Refreshments were served in the Building 8 auditorium that afternoon. Hardware and tools that were flown on the Space Shuttle were also on display throughout the day in the rear lobby of Building 8. More pictures from the day's events can be viewed on Goddard's flickr site: https://secure.flickr.com/photos/nasa_goddard/sets/72157627147772740. ■



OutsideGoddard: Dueling Spouses

By Elizabeth M. Jarrell

Goddard Electrical Engineer John Annen and his wife Debbie are passionate about each other and playing music together.

John Annen (JA): My parents were musicians, so I've been playing music all my life. After our kids moved out, my wife developed empty nest syndrome for about 10 minutes. She told me that we needed to find out what we will be doing instead of raising children. We wanted to find something to do together. Music was natural for us.

Debbie Annen (DA): John was so taken by the one banjo player and his music that we decided that he should take lessons.

JA: My banjo playing was so lousy that I asked Debbie to come with me to play the melody on her recorder.

DA: We were invited to a jam, which is when musical friends get together and play all at the same time.

JA: It's a musical party!

DA: I brought my crocheting. I played and sang while John played. I never did finish that crochet project. John plays almost anything with strings, but he fell in love with the fiddle.

JA: I know I'll never run out of things to learn about the fiddle which is part of the attraction.

Photo credit: NASA/Goddard/Rebecca Roth

Caption: The Annens give an impromtu concert in Building 8."

DA: I mostly play the baritone ukulele and the recorder. I'm learning the bass. I write lyrics based on whatever tune is running through my head.

JA: My favorite is Debbie's "Mauna Kea Acres," which has lyrics about the NASA Infrared Telescope Facility on Mauna Kea in Hawaii, and is set to the old "Green Acres" song.

DA: It shows his world in Hawaii while working on a NASA telescope verses my world in Hawaii as a tourist—perfect for Green Acres.

JA: The magic is in the performance, not the music or notes. You learn the notes, then you learn how to play your feelings, and then the lucky ones learn to play the audience's feelings.

DA: If you connect with the audience, everything gets bigger and brighter. The size of the audience does not matter; it is having an audience that listens that counts. Having the right person to sing with makes a huge difference. After 31 years of marriage and two grown children, you've got to have something!

DA: The first time I said "I have a headache" in our "No, Not Now" song in front of the audience, I was hooked and so was the audience.

JA: We love to argue in front of an audience because it makes the audience connect with us. One time a minister stopped us in the middle of our act offering counseling. He did not realize it was an act.

DA: We did not let on either and let him counsel us. He told us to say "Yes, dear" more often, so I put the phrase in the song. I really like jamming. You never know what's going to happen.

JA: We don't spend a lot of time practicing.

DA: We get it kind of rounded out, then take it to a jam. That's where we polish the song.

JA: You need tremendous confidence to jam in a big group especially if you are leading a song. You don't know how good you are until someone tries to dominate the tune!

JA and DA: We're out almost every night playing somewhere. Tonight we're going to jam, including Goddard's Drake Deming [previously profiled]. Monday night is housekeeping night.

JA: We love playing at assisted living centers because they really appreciate our music. Debbie and I call ourselves "DeJohn." She gets the first billing. She's the star; I'm just the fiddle player.

DA: He's the best guitar playing roadie I ever had!

JA: Part of our magic is that we both share a passion which happens to be music. It makes all the other things in life not so urgent, including conflicts.

DA: We are out having fun together. We are not so worried about getting house stuff done.

JA: Having a passion makes life easy.

DA: It helps you focus on what's important.

JA: Your decisions are always in support of your mutual passion.
DA: For many people, their passion is their work. Work is their definition and identity.

JA: I used to be like that.

DA: We are lucky to share this musical passion.

JA: Our message is this: Life is easy when you find your passion. What's great is that we share our passion and have found a balance so each of us participates and enjoys what we are doing.

DA: We're lucky we've got each other and that, through our mutual passion, we have grown together. Life is fun! ■