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Goddard View

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Bolden, Mikulski Visit Goddard After Shutdown

Curiosity's SAM Finds Water and More

New Visitor Center Exhibit Revitalizes Rocket Garden

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THE WEEKLY

Post Government Shutdown FAQs
Click on the image to get answers to your questions about return-to-work activities related to payroll, procurement, facilities and more. You can also submit questions directly to center management.

Fall Fun Run
The fall Fun Run is October 30 at 12:00 p.m. near Building 97. Day-of is $5. Preregister for $4. The 10k competition (free registration) is October 23 at 12:00 p.m. at Greenbelt Lake. Tom Winkert (6-2917) or Kent McCullough (4-5975). If you can't run, volunteer! Call Doris Pan (6-8617).

Fall Craft Fair
Mark your calendar for Thursday, November 7, from 10 a.m.-2 p.m., in the Bldg. 8 Auditorium for the 22nd Annual Fall Crafts Fair. Explore unique and one-of-a-kind items, handmade jewelry, chocolate, oils, fragrances, carved wood items, candles, pet apparel, photography and more.

Hubble Watched a Stellar Relic
Hubble captured this image of the planetary nebula NGC 2452, located in the southern constellation of Puppis. The blue haze across the frame is what remains of a star like our sun after it has depleted all its fuel. Click the image to learn more about this planetary nebula without a planet.

On the cover: NASA Administrator Charles Bolden, NASA Goddard Center Director Chris Scolese and U.S. Senator Barbara Mikulski talk to the press during their tour of the NASA Goddard facilities. They are standing outside a clean room for the Magnetospheric Multiscale Mission. Photo credit: NASA/Goddard/ Debora McCallum

GoddardView

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

News items for publication in *Goddard View* must be received by noon Wednesday of each week. You may submit contributions to the editor via e-mail at john.m.putman@nasa.gov. Ideas for new stories are welcome but will be published as space allows. All submissions are subject to editing.

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BOLDEN, MIKULSKI VISIT GODDARD AFTER SHUTDOWN

By: Claire Saravia

NASA Administrator Charles Bolden and U.S. Sen. Barbara Mikulski of Maryland visited NASA's Goddard Space Flight Center in Greenbelt, Md. Tuesday afternoon, marking their first visit since the end of the two-week government shutdown.

Bolden and Mikulski viewed several Goddard missions, including the Global Precipitation Mission, Magnetospheric Multiscale Mission and the James Webb Space Telescope. While touring the missions, Bolden and Mikulski spoke to key scientists and engineers for each mission, including GPM Project Manager Art Azarbarzin, MMS Project Manager Craig Tooley, Webb telescope Integrated Science Instrument Module Manager Craig Dunn and Webb Telescope Senior Project Scientist John Mather.

The administrator and senator received updates on each mission and learned how the shutdown, which forced the majority of Goddard employees off the job, changed their progress. Goddard Center Director Chris Scolese said the shutdown affected each of NASA's 20 missions in development, but the specific impacts for each mission were not yet known.

Mikulski, chairwoman of the Senate Appropriations Committee, said she was happy to see NASA employees back to work and wanted to make sure a shutdown forcing furloughs doesn't happen again. "How do you spell relief: it's called work," Mikulski said. "The shutdown cost us time in scientific advancements and money, and it meant all those wonderful men and women had to be furloughed."

Mikulski stopped to speak with GPM engineers about how the shutdown affected their work, calling it "a sad day." "All this talent came to work, wanted to work and we're [Congress] screwing around," Mikulski said.

Mikulski said she wanted to thank NASA employees for their service, citing both their scientific and personal responsibilities, and let them know they are important. "People work very hard here," Mikulski said. "Whether you are a facilities manager or a master physicist, I want to say thank you."

After learning about some of each mission's science, Mikulski said her goal was to ensure NASA received predictable and reliable funding for 2014 in order to carry out the complex projects. "I want to keep the ship afloat and functioning the way it should," Mikulski said.

Bolden said it was always an honor to have Mikulski at the center. "The first thing she asked about was not machines, but people," Bolden said. "She has been a supporter of all of us at NASA." ■

Above: NASA Goddard Center Director Chris Scolese, U.S. Senator Barbara Mikulski and NASA Administrator Charles Bolden receive a briefing from Craig Tooley, project manager for the Magnetospheric Multiscale Mission. Click on the image for more pictures. Photo credit: NASA/Goddard/ Rebecca Roth

> “...you’re learning about the entire planet.”

CURIOSITY’S SAM INSTRUMENT FINDS WATER AND MORE IN SURFACE SAMPLE

By: Nancy Neal-Jones, Elizabeth Zubritsky, Guy Webster and Mary Martialay

The first scoop of soil analyzed by the analytical suite in the belly of NASA’s Curiosity rover reveals that fine materials on the surface of the planet contain several-percent water by weight. The results were published in Science as one article in a five-paper special section on the Curiosity mission.

“One of the most exciting results from this very first solid sample ingested by Curiosity is the high percentage of water in the soil,” said Laurie Leshin, lead author of one paper and dean of the School of Science at Rensselaer Polytechnic Institute. “About 2 percent of the soil on the surface of Mars is made up of water, which is a great resource, and interesting scientifically.” The sample also released significant carbon dioxide, oxygen and sulfur compounds when heated.

Curiosity landed in Gale Crater on the surface of Mars on Aug. 6, 2012, charged with answering the question: “Could Mars have once harbored life?” To do that, Curiosity is the first rover on Mars to carry equipment for gathering and processing samples of rock and soil. One of those instruments was employed in the current research: the Sample Analysis at Mars instrument suite, which includes a gas chromatograph, a mass spectrometer and a tunable laser spectrometer. These tools enable SAM to identify a wide range of chemical compounds and determine the ratios of different isotopes of key elements.

“This work not only demonstrates that SAM is working beautifully on Mars, but also shows how SAM fits into Curiosity’s powerful and comprehensive suite of scientific instruments,” said Paul Mahaffy, principal investigator for SAM at NASA’s Goddard Space Flight Center in Greenbelt, Md. “By combining analyses of water and other volatiles from SAM with mineralogical, chemical and geological data from Curiosity’s other instruments, we have the most comprehensive information ever obtained on Martian surface fines. These data greatly advance our understanding surface processes and the action of water on Mars.”

Thirty-four researchers, all members of the Mars Science Laboratory Science Team, contributed to the paper.

In this study, scientists used the rover’s scoop to collect dust, dirt and finely grained soil from a sandy patch known as Rocknest. Researchers fed portions of the fifth scoop into SAM. Inside SAM, the “fines”—the dust, dirt and fine soil—were heated to 1,535 degrees F.

Baking the sample also revealed a compound containing chlorine and oxygen, likely chlorate or perchlorate, previously found near the north pole on Mars. Finding such compounds at Curiosity’s equatorial site suggests they could be distributed more globally. The analysis also suggests the presence of carbonate materials, which form in the presence of water.

In addition to determining the amount of the major gases released, SAM also analyzed ratios of isotopes of hydrogen and carbon in the released water and carbon dioxide. Isotopes are variants of the same chemical element with different numbers of neutrons, and therefore different atomic weights. SAM found that the ratio of some isotopes in the soil is similar to the ratio found in atmospheric samples analyzed earlier, indicating that the surface soil has interacted heavily with the atmosphere.

“The isotopic ratios, including hydrogen-to-deuterium ratios and carbon isotopes, tend to support the idea that as the dust is moving around the planet, it’s reacting with some of the gases from the atmosphere,” Leshin said.

SAM can also search for trace levels of organic compounds. Although several simple organic compounds were detected in the experiments at Rocknest, they aren’t clearly Martian in origin. Instead, it is likely that they formed during the high-temperature experiments, when the heat decomposed perchlorates in the Rocknest samples, releasing oxygen and chlorine that then reacted with terrestrial organics already present in the SAM instrument.

A related paper, published in the Journal of Geophysical Research-Planets, details the findings of perchlorates and other chlorine-bearing compounds in the Rocknest sample. Daniel Glavin, a Mars Science Laboratory Science Team member at Goddard, leads the paper.

Glavin notes that SAM has the ability to perform another kind of experiment to address the question of whether organic molecules are present in the Martian samples. The SAM suite includes nine fluid-filled cups that hold chemicals that can react with organic molecules if present in the soil samples. “Because these reactions occur at low temperatures, the presence of perchlorates will not inhibit the detection of Martian organic compounds,” said Glavin.

The combined results shed light on the composition of the planet’s surface, while offering direction for future research.

“Mars has kind of a global layer, a layer of surface soil that has been mixed and distributed by frequent dust storms. So a scoop of this stuff is basically a microscopic Mars rock collection,” said Leshin. “If you mix many grains of it together, you probably have an accurate picture of typical Martian crust. By learning about it in any one place you’re learning about the entire planet.” ■

Opposite: A mosaic image of Curiosity. Image credit: NASA/JPL-Caltech/Malin Space Science Systems

NEW VISITOR CENTER EXHIBIT REVITALIZES ROCKET GARDEN

By: Paul Gabrielsen

A new outdoor exhibit at the NASA Goddard Visitor Center titled the "Astrobiology Walk" displays Goddard's role in probing the origins of life on our world, in our solar system and in the deep reaches of space.

The exhibit is the culmination of nearly two years of effort by the Goddard Center for Astrobiology, a ten-year-old enterprise dedicated to studying the formation and distribution of pre-biotic chemicals throughout space. The GCA is part of the NASA Astrobiology Institute. "We don't deal with critters," said GCA education and public outreach lead Cynthia Cheung of NASA's Goddard Space Flight Center. "Not even bacteria. We deal with the ingredients of life."

In 2011, the GCA developed a series of posters for Goddard's Open House event, Explore@NASA Goddard. The posters led viewers on a walk through significant events in the history of life on Earth. Following the open house, which brought 15,000 visitors to Goddard, Cheung approached Visitor Center director Bill Buckingham about developing the concepts presented in the posters into an exhibit.

GCA principal investigator Michael Mumma envisioned the exhibit as an outdoor walk, similar to the 2001 installation titled "Voyage: A Journey Through Our Solar System" on the National Mall in Washington, D.C. "Voyage" consists of a series of stations representing the relative sizes and distances of planets in our solar system. GCA scientists sketched out a storyboard and a detailed content plan for each station along the proposed walk. After a competitive process, the GCA contracted with C&G Partners, of New York City and Exhibitology of Paterson, N.J. to design and build the exhibit. The two firms also built "Voyage."

Goddard's Astrobiology Walk consists of ten stations. Each station sits atop a stainless steel pillar and features two informational panels. One, which visitors read as they overlook the Goddard campus, describes basic science concepts in astrobiology. The other, read as visitors face the Rocket Garden's massive Delta rocket, explains Goddard's contribution to that science. Quick-response codes at each station link visitors' mobile devices directly to related web content.

Each station is also crowned with a three-dimensional icon—a visual representation of the science concepts being presented, whether an amino acid, a stromatolite rock from Australia or a detailed model of an early barren Earth. Two icons, depicting the topography of Mars and the nucleus of comet Hartley 2, are based on satellite images and laser altimetry measurements. Exhibitology fabricated these two models using 3-D laser printing, with later refinements by graphic artists. Visitors are allowed—and even encouraged—to touch everything.

Exhibit planners designed the Astrobiology Walk for durability. "When I come, as a taxpayer, I don't want to see rusted stations," Mumma said. "I want to see my tax dollars go to things that last, and that are well done." To that end, the exhibit team chose stainless steel pillars and matte high-pressure laminate coatings on the informational panels. Automobile paint coats the 3-D models, protecting them from wear over the exhibit's planned ten-year lifetime. Every component is weatherproof and child-proof.

Science is an ongoing process, so some exhibit information may become outdated and obsolete in coming years. That's why the exhibit was designed to be modular, allowing a single panel to be replaced, or a station added, as needed.

"The individual stations address active, live scientific inquiry," Mumma said. "These exhibits will change with time. And they should!" he added. "We want to present the frontiers."

The exhibit explores visitors' burning questions. Are there planets outside the solar system? Do they have life? What about planets or moons in our own solar system? How did life arise on Earth? Buckingham hears these questions all the time.

"To now have something that covers that range of questions is fabulous," he said. "It adds a huge volume of content and quality to the whole Visitor Center experience." Since the exhibit's installation in mid-August, he's noticed many more visitors spending much more time outdoors.

The Astrobiology Walk is one part of an ongoing transformation and revitalization of the 37-year-old Visitor Center, which draws around 40,000 visitors a year. Not many years ago, the Visitor Center offered tired exhibits and decidedly uninspiring views. The view out the eastern windows was just a parking lot, a bus stop and a drink machine. "When you looked out these windows, you had no feel whatsoever that you were at NASA," Buckingham said.

Now a large, high-resolution composite photo of the moon covers some of the east windows. The semi-transparent moon display, alongside photos of nearby stars and galaxies, allows enough natural light through to create a sparkling star field. Large infrared images of the southern Milky Way and the Large Magellanic Cloud cover nearby windows. Similar depictions of the Earth and sun will soon adorn the west windows, Buckingham said. Visitors will feel immersed in space—much as they do when climbing into the center's popular Gemini space capsule mock-up.

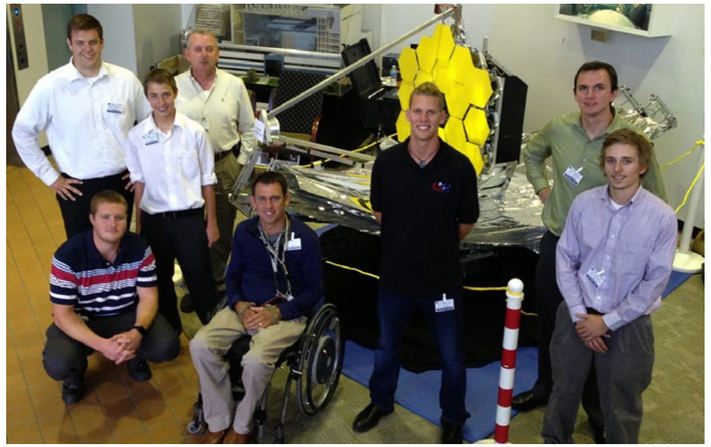
As budgets allow, GCA will update and expand the Astrobiology Walk annually. First on the wish list? A station dedicated to the Curiosity rover, whose adventures had barely commenced during the exhibit design process. Cheung also envisions a display of the dinosaur footprint discovered last year at Goddard during excavation for a new building.

Mumma hopes the addition of the Astrobiology Walk, as an effort of Goddard scientists, designers, artists and support staff, will help visitors understand the ongoing scientific endeavors at the center.

"The Visitor Center," he said, "should be a place where visitors come to learn what happens, not only within NASA, but at Goddard. What do we do here? Why is it important? What are we hoping to learn?"

The Astrobiology Walk will be formally unveiled at a ribbon-cutting ceremony at the Visitor Center. Goddard scientists who contributed to the project will stand by the stations as docents, ready to address the station content and concepts for the NASA administrators and invited guests attending the event. ■

Above: a panoramic view of the new Astrobiology Walk at the Goddard Visitor Center. Photo credit: NASA/Goddard



A car-sized model of one of the most advanced NASA projects unfolded at NASA's Goddard Space Flight Center in Greenbelt, Md. on Aug. 21, 2013. Built like a Transformer and controlled robotically by engineering students from California Polytechnic University in San Luis Obispo, the model illustrates how the James Webb Space Telescope will be deployed one million miles out in space.

"Webb will see back to the very early universe to see the first galaxies that were born after the Big Bang," said model project member Paul Innes. "Nothing like this has ever been done before."

To demonstrate the size and complexity of this mission, for the past two and a half years these students have been working with their mentors to build the first physical representation of the Webb deployment.

Audience members at NASA Goddard watched the solar array unfold behind the telescope, the sunshield open up and the 18-segmented mirrors move together to form one complete mirror. To make this happen, the student engineers even used parts of car antennas, the inside of a flashlight and garden materials to create the model.

"This is one of the most complicated and technologically advanced projects," said model project member Chas Carlson. "The purpose behind the model is to show how it's going to open up. There's no way to easily fix any mishaps with the real thing once on-orbit and this model helps to convey the complexity of everything."

Before Webb launches, it needs to be folded up tightly and meticulously. Engineer and model project mentor Joe Pitman explained why this is so important. "We are doing everything we can to fold this massive telescope as small as we can to fit it into the biggest launch vehicle we can."

Throughout their time engineering this 1/6 scale model of Webb, the team gained valuable hands-on experience in the design, fabrication, assembly, integration and test of complex space systems. Putting together the model once it was shipped from their lab in California took the team 17 hours.

"In school you learn how to make a paper design, but you don't get this sort of experience," said Carlson. "You learn how involved and how many steps there are in making something like this. We had five people and each of us took a different element. You can take as many classes as you want but you are not going to get that hands-on experience that you will from working on a project like this one."

In order to unfold the telescope robotically the team had work a lot with electronics. "I learned how to set up a network, and now I know a lot more about electronics and programming," said model project member Reed Danis. "We were able to branch out and learn knew things."

Preparing to unfold the model at Goddard, they were surrounded by engineers and scientists that have been working on the actual telescope. "Giving the presentation in front of project members was cool," said model project member Adam Chase. "To see as many people on such a high level that are excited about what we're doing and passionate about the project was definitely cool."

The teams showcased the model in the same building where the hardware for Webb is coming together and were able to see the engineers working meticulously to put the actual telescope together.

As a team, the student engineers understand how much dedication goes into Webb's engineering. The students fit work on the model around their regular schoolwork and in the summers they sometimes worked 60-hour weeks. "The amount of work that was put into this was crazy. I don't know any normal person that would have put that much time into this," said Pitman's grandson Brady Morrow, who was at Goddard during the model unfolding. "They tested every piece of this five or six times."

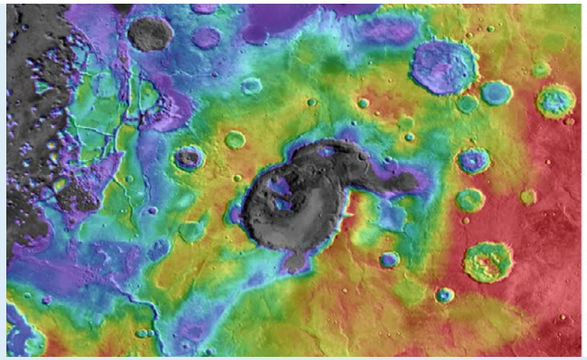
Engineers Joe Pitman and Eric Grosso guided the student team, who worked to only two requirements: work collaboratively and with only public domain information. "They succeeded in the face of many difficulties," said Grosso. "This was a definitely a team project, they had a vision and they saw it thorough."

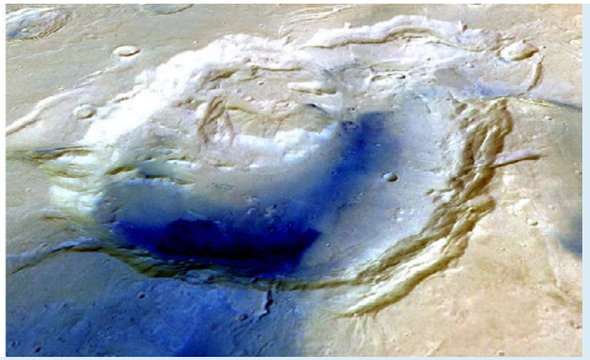
One of the biggest challenges the team encountered was shipping something so fragile across the country. They worked very hard to design and build crates that were strong enough. "Two days ago was the best day for me. I was the lead on the shipping crates, and once we opened it up it, I gave a huge sigh of relief," said model project member Colin Burt. "I was prepared for the worst and ready for the best. We brought a tool chest, ready to go to war with it. But it all worked out." ■

Above: The team from left to right: (Back row) Adam Chase, Brady Morrow, Joe Pitman, Chas Carlson and Reed Danis. (Front row) Colin Burt, Eric Grosso and Paul Innes. Photo credit: NASA/Goddard/Laura Betz

WEBB MODEL TRANSFORMS AT NASA

By: Laura Betz





Scientists from NASA and the Planetary Science Institute in Tucson, Ariz., have identified what could be a supervolcano on Mars—the first discovery of its kind.

The volcano in question, a vast circular basin on the face of the Red Planet, previously had been classified as an impact crater. Researchers now suggest the basin is actually what remains of an ancient supervolcano eruption. Their assessment is based on images and topographic data from NASA's Mars Odyssey, Mars Global Surveyor and Mars Reconnaissance Orbiter spacecraft, as well as the European Space Agency's Mars Express orbiter.

In the Oct. 3 issue of the journal Nature, Joseph Michalski, a researcher affiliated with the Planetary Science Institute and the Natural History Museum in London, and Jacob Bleacher of NASA's Goddard Space Flight Center in Greenbelt, Md., laid out their case that the basin, recently named Eden Patera, is a volcanic caldera. Because a caldera is a depression, it can look like a crater formed by an impact, rather than a volcano.

"On Mars, young volcanoes have a very distinctive appearance that allows us to identify them," said Michalski. "The long-standing question has been what ancient volcanoes on Mars look like. Perhaps they look like this one."

The researchers also suggest a large body of magma loaded with dissolved gas (similar to the carbonation in soda) rose through thin crust to the surface quickly. Like a bottle of soda that has been shaken, this supervolcano would have blown its contents far and wide if the top came off suddenly.

"This highly explosive type of eruption is a game-changer, spewing many times more ash and other material than typical, younger Martian volcanoes," said Bleacher. "During these types of eruptions on Earth, the debris may spread so far through the atmosphere and remain so long that it alters the global temperature for years."

After the material is expelled from the eruption, the depression that is left can collapse even further, causing the ground around it to sink. Eruptions like these happened in ages past at what is now Yellowstone National Park in the western United States, Lake Toba in Indonesia and Lake Taupo in New Zealand.

Volcanoes previously had not been identified in the Arabia Terra region of Mars, where Eden Patera is located. The battered, heavily eroded terrain is known for its impact craters. But as Michalski examined this particular basin more closely, he noticed it lacked the typical raised rim of an impact crater. He also could not find a nearby blanket of ejecta, the melted rock that splashes outside the crater when an object hits.

The absence of such key features caused Michalski to suspect volcanic activity. He contacted Bleacher, a volcano specialist, who identified features at Eden Patera that usually indicate volcanism, such as a series of rock ledges that looked like the "bathtub rings" left after a lava lake slowly drains. In addition, the outside of the basin is ringed by the kinds of faults and valleys that occur when the ground collapses because of activity below the surface. The existence of these and other volcanic features in one place convinced the scientists Eden Patera should be reclassified.

The team found a few more candidates for reclassification nearby, suggesting conditions in Arabia Terra may have been favorable for supervolcanoes. It is also possible massive eruptions here could have been responsible for volcanic deposits elsewhere on Mars that have never been linked to a known volcano.

"If just a handful of volcanoes like these were once active, they could have had a major impact on the evolution of Mars," Bleacher said.

NASA's Jet Propulsion Laboratory manages the projects operating Mars Odyssey and Mars Reconnaissance Orbiter for NASA's Science Mission Directorate in Washington. ■

Above: New research suggests a volcano, not a large impact, may have formed Mars' Eden Patera basin. Left: Reds, yellows show higher elevations in the basin and surrounding area; blues, grays show lower elevations. Right: The dark color indicates younger material draped across the Eden Patera depression. Image Credit: NASA/JPL/Goddard (left) and ESA (right)

MARS CRATER MAY ACTUALLY BE ANCIENT SUPERVOLCANO

By: Elizabeth Zubritsky

THE MAKER FAIRE

By: Leslee Cork

On Sunday, September 29, more than 10,000 people attended the metropolitan area's first ever Silver Spring Mini Maker Faire. Organized by Cara Lesser, founder and CEO of the Kids International Discovery Museum, and her staff, this event emphasized the do-it-yourself or do-it-together spirit of invention and creativity and welcomed a variety of makers of various ages and backgrounds.

Downtown Silver Spring's Civic Building and Veterans' Plaza were chock-full of participants from technology enthusiasts, crafters, scientists and garage tinkerers, each eager to interact with the public and cultivate the next generation of inventors. NASA, NOAA, and the Smithsonian Institution were among the exhibitors. Activities ranged from playing card crafts and tricks, an electric/solar-powered Porsche, to 3D printing and demonstrations by FIRST Robotics.

Monopolizing the lobby of the Civic Building and spilling over onto the patio of Veterans' Plaza, Goddard's presence was well known and drew a steady crowd from beginning to end. One mother commented that she attended the event with her children simply because she heard NASA was going to be there.

This family, and others, were able to see and touch real astronaut gloves and flight tools used during Hubble Space Telescope Servicing Mission 4, try their hand at fixing a satellite using a long-armed gripper tool, learn more about the Webb Telescope through infrared camera demonstrations and discover the lifecycle of a star by creating their own beaded bookmark. Participants engaged in heat pipe demonstrations, designed their own Mars Rover, and participated in a mini silicon rubber mold making and resin-casting workshop.

The 6-foot scale model of Goddard's High Capacity Centrifuge enabled hands-on learning about this facility, its unique features that enhance testing, and why it's so desirable. Kids of all ages were able to get their face superimposed into an astronaut helmet against a cool science image background via Goddard's digital photo booth exhibit. Guests walked away with a 4-by-6 inch photograph with Goddard information on the back.

At 12:40 p.m. attendees gathered around the indoor stage to hear Adrienne Alessandro, communications and public outreach lead from Goddard's Satellite Servicing Capabilities Office, talk about "NASA's Robotic Refueling Mission: Demonstrating Fix-It Technology for Space." By 5 p.m. attendees lingered around, trying as best they could to absorb that last bit of knowledge before heading home for the day.

Montgomery County Superintendent of Public Schools Joshua Starr, County Council Members Nancy Navarro and Hans Riemer, and Montgomery County Executive Ike Leggett also attended the event.

Originating in San Mateo, California in 2006, the Maker Faire expanded to places like New York, Detroit, Texas and internationally to Spain, the Netherlands and Singapore. Given the success of D.C.'s first official Maker Faire, it is likely that this will become an annual event for the metropolitan region. ■

Photo credit: NASA/Goddard/Debora McCallum

OUTSIDE GODDARD

By: Elizabeth M. Jarrell

PLANNING FOR SUCCESS

Most kids don't think too far into the future. Keenan Bowens and his father, however, always made big plans for success. As a result, at the age of 11, Bowens became an international table tennis star.

Bowens, a program analyst and lead for the Independent Verification and Validation Facility's metrics program, started playing table tennis when he was five. His father, a professional tennis coach, was Bowen's first table tennis coach.

"My Dad was my introduction to setting goals and milestones. You need a plan. My goal was to be the Junior National Champion, so my father and I made a plan," Bowens said.

From the start, Bowens' father also taught him to be mentally tough. His father kept a notebook with statistics including the "winner to error ratio," meaning good shots versus bad shots, which they reviewed after each match. His father instructed him not to dwell on past mistakes, but to focus on how to be a winner the next time.

Bowens' father also taught him to develop laser-like focus though the techniques of visualization and relaxation. His father had him visualize specific shots and serves and how he would take control of each point. He was always visualizing the positive, being successful, winning. Relaxation methods included taking deep breaths in through his nose and then exhaling through his mouth as well as meditation.

"I visualized before every match. I closed my eyes and thought and saw all the things I wanted to do, all the steps I needed to take to win, and only then the final moment of winning," Bowens said.

Extreme focus, visualization and relaxation lead to winning, and winning creates confidence. Armed with these skills, when Bowens was six, he began playing in local table tennis tournaments. Once Bowen started winning consistently, Sean O'Neill, a multiple winner of the U.S. National Table Tennis Championships who had played on the U.S. National and Olympic teams began coaching Bowen.

Bowen traveled a lot. He even had a sponsor. He spent a month with a Romanian Olympian and his family who were then living in Flint, Michigan. He also trained for a week with other Olympic coaches at the U.S. Olympic Training Facility in Colorado Springs, Colorado.

In 1994, at the age of ten, Bowen placed second in the Junior National Championship. In 1995, the Junior National Championship and Junior Olympics were held the same weekend in Des Moines, Iowa.

"I knew I was doing well because I kept winning my rounds," Bowens said. "I was used to pressure and I had the tools of visualization and relaxation plus the confidence of having done well in the past."

At the age of 11, Bowens became the Junior National Champion. "It felt pretty good," Bowens said. That same weekend, he also won gold medals in the Junior Olympics in singles and in doubles. Bowens then retired to, as he said, "do kid stuff."

Bowens currently plays a lot of pickup basketball. Talking about his table tennis days inspired him to look for local competitions. "I want to get the fire back," Bowens said.

Just as he once planned the steps for success in table tennis, he now helps set goals for programs and offices. He still relies on the skills of focus, visualization and relaxation techniques. Reminiscent of his father's notebook of statistics, Bowens uses metrics to measure progress towards those goals.

Bowens' readily acknowledges that his current success in his job is thanks in large part to his father's early lessons about planning the steps to success in table tennis. "My dad is good," Bowens said. ■

Center: A young Keenan Bowens at the Olympic training facility. Photo provided by Keenan Bowens