

National Aeronautics and Space Administration



# Roundup

LYNDON B. JOHNSON SPACE CENTER

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Engineering marvels

# JSC Director

**Every** once in a while I have to stop and remind myself to be more thoughtful about what I put in my emails and text messages, so I'm asking you to do the same as well. We all get comfortable sending seemingly informal emails, text messages, tweets, etc., that we forget anything we send out tends to live forever on some system and can be easily forwarded to the whole world.

As government employees, the job-related messages we send are official records subject to the Freedom of Information Act, meaning virtually anybody can request and receive a copy of just about any message we send or receive on any particular NASA subject. If your words would embarrass you or NASA if they showed up on the front page of a newspaper or on somebody's blog, think twice about hitting "send." It does no good to point out after the fact that your words were misinterpreted or taken out of context.

I've probably made as many mistakes as anyone, and I hope you can learn from my experiences. We are all representatives of the space program and the American taxpayer, so it is essential that we be as professional as possible in our communications.



NASA PHOTO

*Mike*



NASA/PHOTO JSC2011E018594

## On the cover:

*The PIXEL vertical test bed vehicle during a 2010 test of the Guidance Embedded Navigator Integration Environment prototype. This prototype demonstrated that the core concepts of navigation and guidance developed were feasible in real-world implementation and could be used as the basis for Morpheus flight development. Learn more about Morpheus on pages 6 and 7.*



NASA/PHOTO JSC2011E024246

## Photo of the month:

*The performance from Big Head Todd & The Monsters was the first time a shuttle crew has been awakened by a live performance from Mission Control in Houston.*

## In this edition ...

- 3** A flight for the history books
- 4** Starport presents ...
- 5** Education on station
- 6** Morpheus: Lunar lander test bed takes flight
- 8** NASA Human Health and Performance Center helps bring innovators together
- 9** Texas Twister says human talk is cheap when it comes to protecting the Earth
- 10** Meet Dana Young, Scenelister
- 11** Center Scoop
- 12** The Marangoni effect: A fluid phenom

NASA/PHOTO 526171MAIN\_ZOLTAN-KENWELL-AURORA

# A flight for the history books



By Catherine E. Williams

**NASA's** faithful bird, Space Shuttle *Discovery*, made her last voyage to space with the STS-133 mission. On March 9, she glided down back to Kennedy Space Center to begin her retirement—a well-earned one at that—having completed more missions than any other spacecraft in the agency's illustrious history.



NASA/INGALLS 201102230005HQ

**In the spotlight ... Space Shuttle *Discovery* readies for her 39th and final flight.**

But before she settled into greener pastures, *Discovery* ushered one final crew to space to complete a near-perfect 13-day mission.

Commander Steve Lindsey, Pilot Eric Boe and Mission Specialists Alvin Drew, Michael Barratt, Nicole Stott and Steve Bowen raced to the International Space Station on Feb. 24 and rendezvoused with the laboratory days later. Coincidentally, *Discovery's* docking meant



NASA/PHOTO S133-E-008849

**In the newly-installed PMM, the STS-133 crew poses while signing the STS-133 patch, which was added to the growing collection of insignias representing crews who have worked on the space station. Pictured counter-clockwise (from the center) are NASA astronauts Steve Lindsey, commander; Eric Boe, pilot; Alvin Drew, Steve Bowen, Michael Barratt and Nicole Stott, all mission specialists.**

that vehicles from the United States, Russia, Europe and Japan were connected to the station at the same time. (Along with the shuttle and Russian Soyuz and Progress capsules, the European Space Agency's uncrewed Automated Transfer Vehicle-2 and the Japan Aerospace Exploration Agency's H-II Transfer Vehicle were also high-tech barnacles.)

The crew completed the important task of moving an equipment platform out of the shuttle's cargo bay and onto the station's truss. The EXPRESS Logistics carrier had been packed with extra parts for the station, including a radiator to cool the station's systems. Many parts will not be installed, as they will serve as spares until needed.

Drew and Bowen combined in a team effort for the mission's two spacewalk excursions. For the first outing on Feb. 28, the duo put finishing touches on the outside of the Permanent Multipurpose Module (PMM) so that it could be installed on station, and they also moved a failed pump module to a stowage platform. The pump module will reside there until it can be brought back to Earth for assessment.



NASA/PHOTO ISS026-E-030716

**STS-133 Mission Specialists Steve Bowen (foreground) and Alvin Drew clock six hours and 34 minutes during the first spacewalk that, among other tasks, exposed the Japanese "Message in a Bottle" experiment to the wilds of space.**

Barratt and Stott manned the station's robotic arm the next day to attach the PMM to the underside of the station, where it will serve as a storage for equipment and supplies.

On Mission Day 7, Bowen and Drew ventured into space again. Bowen hitched a ride on the station's robotic arm to disconnect an experiment rack from outside the Columbus laboratory module, and Drew removed covers from the logistics carrier *Discovery* brought up.

For the remainder of the mission, both the shuttle and station crews worked diligently to prepare the international engineering marvel for continued research operations.

*Discovery's* return to Earth brings mixed emotions to the NASA family. However, after the Space Shuttle Program ends, this chapter of human spaceflight history will live on.

As NASA's Associate Administrator of Space Operations Bill Gerstenmaier said, "I think (*Discovery's*) legacy will be the future." And that future has some big wings to fill.

# Starport presents ...



By Neesha Hosein

**When** you hear “Starport,” what comes to mind? Is it lunch in the cafés, working out at the Gilruth Center or shopping for NASA T-shirts at the gift shops? Starport is all of those and much more.

Starport Services is a quality-of-life program that promotes the welfare and morale of the Johnson Space Center workforce. Starport directly supports the mission of JSC by providing a variety of activities and employee services. Wellness programs, fitness and recreational services, food and vending services, retail operations, employee activities and convenience services are promoted weekly. These activities and services enhance work life, promote mental and physical fitness and generally provide a working environment at JSC that helps to attract and retain quality employees.

“Starport is dedicated to serving the employees of the center,” said Natalie Saiz, director, JSC Human Resources Office. “They are charged with providing services that enhance the welfare and morale of the workforce. This effort is particularly important during times of transition.”

Among Starport’s upcoming events is the STS-134 bus trip, with buses leaving from JSC, as well as ground packages in the Orlando area for employees who prefer to get to the launch on their own. Starport will continue to partner with the JSC External Relations Office to provide employee morale activities for the remaining shuttle launches and landings at the Teague Auditorium. They also partnered with the Space Shuttle Program Office to provide refreshments for the STS-1 30th anniversary event on April 12.

“We strive to offer a wide variety of activities and services to reach as many onsite and offsite employees as we can,” said Brenda Schmalz, manager, Starport/JSC Exchange. “In addition to our

special events, we offer over 50 fitness classes a week at the Gilruth Center that are free to most employees, as well as offer recreational classes and sports leagues for a nominal charge. Stop by and see us in our cafés, retail stores and the Gilruth, or look us up at <http://starport.jsc.nasa.gov/>.”

## JSC Family Picnic happens May 1

Starport’s Annual JSC Family Picnic will take place on May 1 at SplashTown Houston. All JSC team members, retirees, family and friends are invited (ages 3 and up must have a ticket; contact the Starport Gift Shops for ticket information). Participants will experience a day at the park with an all-you-can-eat lunch, soft drinks, keg beer and afternoon snacks, including ice cream, popcorn and snow cones. Entertainment includes all-you-can-ride waterslides, line dancing, a DJ, bingo, children’s games, inflatables, face painting, a balloon artist, volleyball and basketball courts. The water park is closed to the public for this event.

## Employee events focus groups

Starport’s Employee Activities Association has hosted several events in the past, but attendance has been steadily dwindling. In an attempt to find ways of turning this around, Starport recently asked for input and creative suggestions from JSC team members about future employee events. Suggestions were considered on events for: employee morale, cultural and travel, children’s (preschool through teens) and next-gen. Once the information is evaluated, Starport hopes to bring events reaching many more employees.

“I am very proud of the Starport team,” Saiz said. “They are reaching out to better understand the needs of the workforce.”



NASA/DEHOYOS JSC2010E061642



NASA/PHOTO JSC2007E20164

*Starport will provide a complementary lunch for Innovation 2011 and host the JSC Family Picnic at SplashTown, both happening in May.*

# Education on station



By Rachel Kraft

**As** the largest and most complex engineering feat ever accomplished, the International Space Station (ISS) is ripe with opportunities for science and exploration. Johnson Space Center's Office of Education is sharing the orbiting laboratory with students and teachers who want to investigate the prospects of microgravity and learn about the principles that make Earth unique.

Educational prospects on station have been accessible to students since the first long-duration crews inhabited the lab. Expedition 1 ferried plant seeds to station. Those seeds were eventually returned to Earth and grown in classrooms around the country as part of science experiments.



PHOTO: SHERBROOKE COMMUNITY SCHOOL

**Sherbrooke Community School students use a ham radio to call the International Space Station as part of the ARISS program.**

"We've got crew members up there all the time, which really opens the doors for education," said Teaching From Space (TFS) Project Manager Cindy McArthur.

Initiatives target both large and small audiences from elementary school to college. Downlinks coordinated by TFS allow crew members on orbit to perform curriculum-based activities showing science, math, engineering and geography principles and answer real-time questions from students. Through Amateur Radio on the International Space Station, known as ARISS, students use ham radios to communicate with astronauts as the laboratory passes over them. EarthKAM—Earth Knowledge Acquired by Middle school students—allows inquisitive minds to remotely operate a camera aboard station to snap photos of the planet, which teaches orbital mechanics, science and geography.

Throughout the 10 years of continuous human habitation on station, Education has consistently revamped delivery of information and experimentation to meet student needs. Before, students conducted pre-formulated experiments, where inputs and outcomes were predetermined. Now, education-oriented science on station is largely inquiry-based and geared toward exposing students to the wonder of discovery.

Education Payload Operations (EPO) allows students and educators to explore physical principles that govern force, motion and energy or learn about life in space. In the activities, crew members use supplies

aboard station to film short demonstrations. Videos filmed on orbit used to be highly scripted and oftentimes lengthy, but NASA changed the delivery of the demonstrations to pique student interest.

"We've gone from 20- to 30-minute videos filmed on shuttle to two- to three-minute YouTube videos," said TFS's Matt Keil.

EPO also makes video clips available to students who create their own short films.

Learning about processes and applying them to problems is the aim of NASA Education initiatives. As part of Kids in Micro-g, middle school students conceive and design experiments that Expedition crew members perform. Proposals go through a similar selection process



NASA/PHOTO 174002MAIN\_EP04

**Astronaut Mike Fincke holds a bag of tomato seeds for the EPO Tomatosphere II project during Expedition 9.**

as all other payloads aboard station. Experiments selected this year will determine the direction and distance traveled by an air rocket launched in microgravity or compare the dispersal of liquid pepper in microgravity to Earth's gravity, for example.

Mark Severance, project manager for ISS National Lab Education, said it's critical to allow students to be hands-on and to provide teachable moments, no matter the result.

"Experiments provide answers, and sometimes they're not things you even meant to happen, but they're still answers," Severance said.

ISS National Lab Education initiated partnerships with industry and the International Partners to share station's resources with an ever-increasing number of students. NanoRacks collaborated with students and educators to fly a plant seed growth chamber with an internal camera that snaps photos and sends data to the ground for analysis. BioServe sponsored educational payloads that allow students to monitor the lifecycle of butterflies. Future initiatives aim to use the space station and its sophisticated systems toward furthering Science, Technology, Engineering and Math (STEM) content.

"Everyone realizes we need to grow the next generation of scientists and engineers to maintain our competitiveness," Severance said.

Education and the ISS Program have long collaborated to motivate future generations, and will continue to enrich STEM education and inspire young minds.

# Morpheus: Lunar lander test bed takes flight



**In** late April, the pasture behind Building 14 will find a new use as the flight area for a new vehicle called Morpheus. Morpheus is a lunar lander prototype that demonstrates new green propellant propulsion systems and autonomous landing and hazard detection technology. Designed, developed, manufactured and operated in-house by engineers at Johnson Space Center, Morpheus represents not only a vehicle to advance technologies, but also an opportunity to try out “lean development” engineering practices. The project will make its public debut on May 4 as part of Innovation 2011.

“Project Morpheus was about demonstrating and integrating technologies to enable the continuation of human exploration beyond low-Earth orbit. But it was also about inspiration, streamlining agency practices and processes, using unconventional partnerships and developing a workforce with hands-on opportunities,” said Matt Ondler, assistant director, Advanced Project Development, and project manager, Project Morpheus, in the Engineering Directorate.

Morpheus is an all-NASA-designed vehicle. It was manufactured and assembled on site and near Dallas at the home of Armadillo

Building 220 home, has a propulsion system comparable in size to Constellation’s Altair lunar lander ascent stage, and represents a full-scale vehicle that would be capable of landing a robot, such as Robonaut, or a similarly sized payload on the surface of the moon. It could perform all propellant burns after a translunar injection.

The primary focus of the test bed is to demonstrate an integrated propulsion and GN&C system that can fly a lunar descent profile to exercise the autonomous landing, Autonomous Landing and Hazard Avoidance Technology safe landing sensors and closed-loop flight control. Additional objectives include technology demonstrations such as tank material and manufacture; reaction control thrusters; main engine performance improvements; helium pressurization systems; ground operations; flight operations; range safety; software; and avionics architecture.

As a complete spacecraft, it has all the associated subsystems: avionics, software, GN&C, power, power distribution, structures, propulsion and instrumentation. Almost every organization at JSC has contributed, and support organizations were included and brought into the team purposely from the inception.



PHOTO/KRIS KEHE

**The main engine of Morpheus is test fired at Armadillo Aerospace.**

Aerospace, which partnered with JSC on the Morpheus precursor, Pixel—a lander literally constructed from spare parts at Armadillo. NASA converted the Pixel lander to liquid oxygen/methane, instrumented the vehicle and conducted early Guidance, Navigation and Control (GN&C) testing. Pixel was flown last year 20 times—17 times with a tether and three without—all done in a few months, and all helping to pave the way for Morpheus and NASA’s future.

“Today human spaceflight exists in a very highly constrained fiscal environment, which is presenting significant challenges to all of us at the human spaceflight centers,” said Steve Altemus, director of JSC’s Engineering Directorate. “However, with challenge and adversity comes opportunity. I believe we at the Johnson Space Center have an incredible opportunity to help the agency redefine how it builds and flies spaceflight hardware in a more affordable way. Morpheus is tangible proof that we can and are doing amazing and exciting things, advancing exploration systems with a different paradigm.”

Morpheus, which made its way to JSC in January and now calls



NASA/KRIS KEHE

**The rigging team moves the Morpheus vehicle into position for cold flow test.**

“Over the past year, with very little funding, by leveraging our facilities and commercial partners and—most importantly—by unleashing the power of our wonderful and capable workforce, we put a functioning spacecraft together,” Altemus said. “Projects like Morpheus are invigorating and infectious. They restore NASA to its technical roots.”

Morpheus’ liquid oxygen/methane propellant combination is of particular interest to innovation. It is much more capable of being stored for long periods in space, and the methane can be made from ice on the moon or Mars.

“Approximately 1,000 pounds of methane are produced on (station) and dumped overboard as waste gas every year—enough to entirely fill the Morpheus lander,” Ondler said. “It is extremely cheap and safe to operate and test, much less so than hypergols. Finally, it is higher performing than hypergols that are extensively used despite their hazards and expense.”

But the lasting value of the project, Ondler and Altemus agreed, may



Compiled by Neesha Hosein

many NASA projects get locked into vendor-proprietary tools that are extremely expensive and often less capable than the freeware much of the software industry uses. These are just a few examples of the lasting lessons that can be applied to future projects.

“If we are serious about creating a more affordable human spaceflight endeavor across the agency, we need to do much more of this kind of hands-on work,” Altemus said. “Count on seeing it in action on Innovation 2011 and in JSC Engineering.”

### Future Capability

“The Morpheus lander and Robonaut will provide NASA the building blocks for future missions,” Ondler said. “Starting from missions to the lunar surface, the lander systems can also be modified to do missions such as in-space propellant transfer, autonomous rendezvous and docking demonstrations, or send a modified lander or Robonaut to an asteroid.”

“The workforce has gained valuable experience from Morpheus that will provide the cornerstone for design of future missions,” Ondler said.

Such missions can range from development of in-situ resource utilization technology to more ambitious Robonaut missions and deployment of precursor surface system technology required for a permanent human presence. Since the initial lander could be delivered on a mid-range expendable launch vehicle, there are opportunities to scale up the lander.

“As a minimum, Project Morpheus provides a great jumping-off point for future NASA missions tied to the flexible architecture,” Ondler said.

The recent formulation of the Advanced Exploration Systems Program is designed to invigorate the agency with perhaps as many as 20 projects like Morpheus, all designed to further human spaceflight beyond low-Earth orbit and engage the NASA workforce while adopting and exercising the same kind of lean development tenets employed by the Project Morpheus team.

Please come out and watch Morpheus fly on Innovation 2011.



NASA/PHOTO JSC2011E018607

The PIXEL vertical test bed vehicle, tested in 2010, was the precursor for Morpheus’ flight development.

well be the lessons learned and the team’s skills and expertise honed by the challenging project. The Morpheus team has documented a set of “lean development tenets” that are scalable to any project. Funding austerity and the project’s ability to choose their own tools led to tremendous cost-saving solutions.

For example, the software and GN&C team used for configuration management and problem-tracking tools were freeware. In contrast,



NASA/KRIS KEHE

The Morpheus vehicle is prepped and ready for cold flow.



NASA/KRIS KEHE

Morpheus vents excess gas during cold flow test.

# NASA Human Health and Performance Center helps bring innovators together



By MaGee Johnson

**The** NASA Human Health and Performance Center (NHHPC), launched in October 2010 by the Space Life Sciences Directorate (SLSD), aims to virtually connect organizations worldwide that are interested in collaborating and advancing human health and performance innovations for spaceflight, commercial aviation and challenging environments on Earth. Membership has grown to more than 75 government agencies, academic institutions, industry and nonprofit organizations. The NHHPC provides a forum to collaborate, integrate and facilitate partnerships under the five themes: health, performance, habitability, research and education.

It was exciting to see government, industry and academia eager to find ways to work together in this area of human health and performance. The open atmosphere of the conference was just right for encouraging new connections.”

The event concluded with all members participating in multiple breakout sessions based on areas of interest. During these sessions, NHHPC members openly discussed the topics of interest and proposed collaborations, projects and future NHHPC events. The topics and themes for the tables included: healthcare delivery innovations; collaborative tools and social media; social entrepreneurship innovation; human factors; business practices in public-private partnerships; biotechnologies and utilization of the International Space Station; Challenges 101 and Projects 101; innovation and education outreach; and scientific risks communication.

This first NHHPC workshop was well attended, with about 50 NHHPC member organizations, including various NASA centers. Future events, workshops and website updates, including collaborative tools and discussion boards, will be developed based on member recommendations.

One valuable aspect of the workshop was the opportunity to network with other NHHPC members and to share project ideas. The diverse representation of member organizations brought NASA together with other entities to establish collaborations that can further human health and performance in spaceflight and terrestrial applications.

For the complete report from the Collaborative Innovations Workshop, upcoming events/workshops and more information on the NHHPC, visit: [nasa.gov/offices/NHHPC](http://nasa.gov/offices/NHHPC)



NASA/HARNETT JSC2011E006064

## NHHPC members participate in the Innovation and Education Outreach breakout session discussion.

Under the guidance of Johnson Space Center SLSD Director Dr. Jeffrey R. Davis and Deputy Director Carol W. Carroll from Ames Research Center, the NHHPC held its first event in January at JSC and included more than 100 participants. The first workshop, based on SLSD's recent success with open innovation, was themed “Collaborative Innovation: Strategies and Best Practices.” The focus was to determine how collaborative innovation helps fill the gaps between areas of knowledge or technology that are known versus what is unknown relative to human health and performance.

The workshop included speakers and a panel discussion detailing how to run effective challenges with open innovation methodologies and tools. Keynote speakers included Karim Lakhani from Harvard Business School; Pascal Finette from Mozilla Labs; Robynn Sturm from the White House Office of Science and Technology Policy; Jeff Hamaoui from Cazneau Group; and Lisa Pannell from General Mills. The panel was moderated by Beverly Godwin from the General Services Administration and included participants from yet2.com, InnoCentive, Mozilla Labs, NASA's SLSD, General Mills and Proctor & Gamble.

“NASA NHHPC did a great job of bringing together a very strong multidisciplinary group and designing a meeting that fostered connections,” said Lisa Pernell, senior principal scientist at General Mills. “I was impressed that NASA was not only open to connected innovation, but was also leading the way in the government sector.



NASA/HARNETT JSC2011E005985

## JSC Space Life Sciences Director Dr. Jeffrey Davis speaks to workshop participants.

# Texas Twister says human talk is cheap when it comes to protecting the Earth



By Texas Twister

## Save the date: April 22 is Earth Day

**While** I realize that part of this agency's mission is to seek out greener intergalactic space pastures, I wanted to mention a little something about the pastures here on Earth. Specifically, about my pasture.

Don't mess it up.

My boss also said my article is to be longer than a few sentences, so I guess I'll elaborate.

In case you happen to live under a rock, April 22 is Earth Day.

Earth Day is pretty important to us creatures. While you get to live in your protected, encased McMansions, I and many other wildlife don't have that luxury. (But if you'd like to change that, for the record, I am not opposed.)

Even so, we all know that the natural resources on Earth—the air we breathe, the water we drink, the land we live on—need to be used with care to ensure that future generations of Longhorns have as great a planet as I do.

Johnson Space Center is doing its part in nurturing the environment by putting green principles into practice already. Our buildings are being built and refurbished to meet and exceed Leadership in Energy and Environmental Design green rating standards. The system was developed by the U.S. Green Building Council, a nonprofit organization formulated to promote green building concepts. Some of these completed projects include the new Building 20 office building, the Building 2 North refurbishment and Building 27 Astronaut Crew Quarters. Concepts incorporated into green buildings include better energy and water efficiency, good indoor air quality, respecting the natural resources of the building site and the use of recycled/renewable/reused building materials. Real Earth-preserving innovation is also taking place at the JSC Child Care Center and the Gilruth Center.

Improvements made at the child care center include two 33-foot-tall wind turbines and 14 solar panels. Collectively, they generate enough power to operate eight homes for a year. A flat solar collector on the roof heats water for an 80-gallon storage tank located in the attic. Another heat source comes from a system called the GeoExchange, which uses a series of sealed piping loops buried in the ground to absorb renewable heat energy from our Mother Earth.

At the Gilruth Center, solar panels are used to heat water for use in the fitness facility, while special skylights with five layers of filters use natural sunlight to keep the gym lit. The gym's electrical lights are photosensitive and will slowly illuminate when the skylights are dimmed at the end of the day or during cloudiness, automatically saving electricity (an estimated 14,000 kilowatts per year).

But you Earthlings should not get to rest on your laurels while center management implements this amazing technology. You can try to print less and also take advantage of the many available avenues for recycling at JSC. This helpful link should answer any questions you have: <http://www6.jsc.nasa.gov/ja/ja13/recyclingfaqs.cfm>

And if you have more questions than that ... please don't come to me. Chances are I'll be napping in the sunshine—that glorious, unadulterated sunshine, right here on these green pastures.

For more on everything environmental at JSC, visit: <http://www6.jsc.nasa.gov/ja/ja13/index.cfm>



NASA/PHOTO JSC2004E2878

**Some of my friends. We mean business. Especially about taking care of the Earth.**



NASA/HARNETT JSC2011E016488

**Building 20. Pretty and energy efficient. It's a win/win.**



NASA/PHOTO JSC2007E049860

**The JSC Child Care Center harnesses the wind and the sun. I have to ask, what have you done for me lately?**



# Spotlight Dana Young

Scenelister, DB Consulting, Inc.

**Q: Coolest part of your job?**

**A:** As a scenelister, I'm 100 percent involved with all the activities that take place aboard the International Space Station and shuttle. Live video feeds linked to scenelisting and mastered by the Mission Video Department are recorded in real time. The low-resolution video is then given a brief description, or a "scenelister," using the Video Asset Management System.

**Q: Favorite hobbies or interesting things you do away from the office?**

**A:** I'm a personal trainer at the Gilruth, and I teach a strength and conditioning group exercise class called BODYPUMP. I also enjoy running, going to track meets (high school and college), painting and reading.

**Q: What was your first job (not necessarily at NASA, but ever)?**

**A:** After college, I was an art teacher for kindergartners.

**Q: If you could trade places with any other person for a week, famous or obscure, living or dead, real or fictional, who would it be?**

**A:** Michelle Obama.

**Q: What would people be surprised to know about you?**

**A:** I ran a qualifying time for the 1992 Olympic trials.

**Q: What is your favorite quote or motto?**

**A:** "Life is short, and it's up to you to make it sweet."  
— Sadie Delany

**Q: What would we find in your refrigerator right now?**

**A:** Lots of DiGiorno pizza.

**Q: What is your favorite sport?**

**A:** Track and field.

**Q: Last good book or article you read?**

**A:** "The IMPACT! Body Plan" by Todd Durkin.

**Q: Favorite travel destination (or place you'd love to go if given the opportunity)?**

**A:** New Zealand.

**Q: Favorite TV show and why?**

**A:** "I Love Lucy." I'm a big fan of the black-and-white TV shows and I loved how Lucy appeared as a scatterbrained homemaker with the matchless ability to turn an ordinary household chore into a complete and unprecedented disaster. It was pure comedy.

**Q: What was your proudest moment?**

**A:** As a 10th grader in high school, I was selected to be a part of the International Sports Exchange to run track in Budapest, Hungary; Zurich, Switzerland; and Vienna, Austria—an honor given to seniors at the time.

**Q: Describe yourself in three words.**

**A:** Tough. Adventurous. Caring.



NASA/PHOTOS

**Q: What does the term "NASA Family" mean to you?**

**A:** When I see my NASA family putting the time and effort in to improve a healthy lifestyle for better living ... that's the coolest part about family. A NASA family that has drive, commitment and a big heart.

**Q: What is your best memory at NASA or Johnson Space Center?**

**A:** My first eight months on the job, I was part of "The Event of the Year," *Discovery's* Return to Fight. And also being the videographer for the zero-g flights.

## WANTED!

Do you know a JSC colleague or team that does something extraordinary on or off the job? Whether it's a unique skill, interesting work, special professional accomplishment, remarkable second career, hobby or volunteerism, your nominee(s) may deserve the spotlight!

The Roundup shines the light on one special person or team each month, chosen from a cross section of the JSC workforce. To suggest "Spotlight" candidates, send your nomination to the JSC Roundup Office mailbox at [jsc-roundup@mail.nasa.gov](mailto:jsc-roundup@mail.nasa.gov). Please include contact information and a brief description of why your nominee(s) should be considered.



## Rodeo culture alive and well at Johnson Space Center

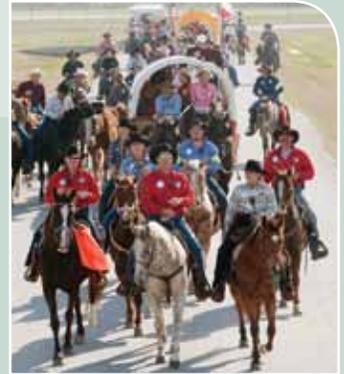
**Johnson Space Center** team members, including and especially the *Roundup's* own special Longhorn Texas Twister, got a glimpse of the Texas Independence Trail Ride as it arrived via the Space Center Houston tram road on Feb. 22. The parade hoofed it along Second Street, with the cowboys and cowgirls making a brief stop in the Rocket Park parking lot before moving to the Gilruth Center. A few of the riders swung in by the JSC Child Care Center for a close-up with the kids.



NASA/MARKOWITZ JSC2011E021434



NASA/MARKOWITZ JSC2011E021434



NASA/BLAIR JSC2011E021363

## Directorate roll call

<b>AF</b>	Space Technology Roadmaps: The Advanced Planning Office successfully hosted a series of Technology Talks to communicate available information about each roadmap and allow JSC personnel to discuss and prepare comments for the National Research Council (NRC). Individuals are encouraged to participate in the topic area discussion boards and submit comments to the NRC website. More information can be found at <a href="http://af.jsc.nasa.gov/forums/default.aspx">http://af.jsc.nasa.gov/forums/default.aspx</a> . This is a great opportunity for you to influence NASA's research and technology development investment plans.
<b>AH</b>	The Contractor Aerospace Recruiting Expo job fair conducted in late February received a lot of very positive feedback from vendors and job seekers alike! Overall, 50 employers (such as DOW, Siemens and other aerospace companies) were present and more than 600 job seekers attended. Approximately 200 interviews were immediately scheduled as a result of this fair. Thanks to JSC's contractor partners and Workforce Solutions for this great event.
<b>EA</b>	Don't forget Innovation 2011 on May 4. Engineering will have a great presence and conduct testing of a vertical test bed vehicle, Morpheus, in the field west of Building 14. Hopefully you've read about this exciting in-house design that builds on innovative partnerships on pages 6 and 7.
<b>MA</b>	STS-134 is targeted for launch on April 19. During the 14-day mission, <i>Endeavour</i> will deliver the Alpha Magnetic Spectrometer-2 and spare parts, including two S-band communications antennas, a high-pressure gas tank, additional spare parts for Dextre and micrometeoroid debris shields.
<b>OA</b>	The Soyuz TMA-01M spacecraft carrying Expedition 26 Commander Scott Kelly and Russian Flight Engineers Alexander Kaleri and Oleg Skripochka landed at 2:54 a.m. CDT in Kazakhstan, near the remote town of Arkalyk. The three crew members spent 159 days in space—157 of them aboard the orbiting complex.



NASA/PHOTO

*In the Space Station Processing Facility at Kennedy Space Center, the Alpha Magnetic Spectrometer-2 is moved from the weight and center of gravity stand to a payload canister.*



NASA/BILL INGALLS

*Russian support personnel work in turbulent conditions to help get the Expedition 26 crew out of the Soyuz TMA-01M spacecraft shortly after the capsule landed.*

## Roundup

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# The Marangoni effect: A fluid phenom



By Lori Meggs

**What** do a wine glass on Earth and an International Space Station experiment have in common? Ever heard someone say his or her wine has “legs” or “tears of wine?”

Wine legs is a phenomenon where a ring of clear liquid forms near the top of a glass above the surface of wine. Drops continuously form and fall in rivulets back into the liquid. One factor in the way the fluid moves is called Marangoni convection, or flow, and Japan Aerospace Exploration Agency (JAXA) researchers are very interested in studying it in a gravity-free environment.

Marangoni convection—named after Italian physicist Carlo Marangoni, who first studied the phenomenon in the 19th century—is the tendency for heat and mass to travel to areas of higher surface tension within a liquid. Surface tension is a property of liquid that causes the surface portion to be attracted to another facade, such as droplets of water on a well-waxed car.

“We are clarifying an unknown phenomenon, and that’s very exciting,” said Satoshi Matsumoto, a Marangoni science coordinator from JAXA. “Marangoni negatively affects the quality of crystal growth such as semiconductors, optical materials or biotechnology materials. The convection also occurs in a heat pipe for heat radiation devices in personal computers, and degrades the radiation performance. Therefore, increased understanding of Marangoni convection not only expands our knowledge of fluid behavior, but also has great significance for production of semiconductor materials and equipment development for both space and ground use.”

To study how heat and mass move within a fluid in microgravity, investigators are using a larger bridge of silicone oil between two discs. On Earth, that bridge couldn’t exist. One of the primary ways heat is transferred on Earth is by buoyancy, where warm air rises and cold air sinks. In space, there is no buoyancy. So investigators heat one disc higher than the other to induce Marangoni convection in that bridge of silicone oil. They are looking at patterns of how fluids move to learn more about how heat is transferred in microgravity.

“It is difficult to observe the effects of Marangoni convection on Earth,” added Matsumoto. “That is why space experiments of Marangoni convection in a microgravity environment are helpful.”

JAXA has been working on four Marangoni experiments, to be completed in 2015, to fully understand a surface-tension-driven flow in microgravity.



*Shadow reflection shows “tears” in a glass of wine.*

PHOTO: WIKIPEDIA COMMONS