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MARSHALL STAR

In This Week's Star ⊟ (Click to Expand)

Puerto Rico's Petra Mercado High, UAHuntsville Take Top Spots at 19th Annual NASA Great Moonbuggy Race

By Rick Smith, Lori Meggs and Megan Davidson

On April 14, America's space agency crowned its vehicular engineering victors at the close of the 19th annual NASA Great Moonbuggy Race at the U.S. Space & Rocket Center in Huntsville. The team from Petra Mercado High School of Humacao, Puerto Rico, won first place in the high school division. Racers from the University of Alabama in Huntsville Team 1 claimed the college-division trophy.

Image right: The team from Petra Mercado High School in Humacao, Puerto Rico, won first place in the high school division of the 19th annual NASA Great Moonbuggy Race. It was a winning year for Puerto Rico – second place in the high school division went to Colegio Nuestra Senora del Perpetuo Socorro in Humacao. The University of Puerto Rico at Humacao won second place in the college division. (NASA/MSFC/Fred Deaton)

The winning teams outraced more than 80 teams from 20 states, Puerto Rico, Canada, Germany, India, Italy, Russia and the United Arab Emirates. Approximately 600 student drivers, engineers and mechanics -- plus their team advisors and cheering sections -- gathered April 13-14 for the harrowing "space race."

Image left: The University of Alabama in Huntsville Team 1 crosses the finish line at the NASA Great Moonbuggy Race. UAHuntsville took the top prize in the college division, with a time of 4 minutes and 3 seconds. The race is organized and planned each year by the Marshall Center. (NASA/MSFC/Emmett Given)

Organized by the Marshall Space Flight Center, the race challenges students to design, build and race lightweight, human-powered buggies. Traversing the grueling half-mile course, which simulates the cratered lunar surface, race teams face many of the same engineering challenges dealt with by Apollo-era lunar rover developers at the Marshall Center in the late 1960s. The winning teams post the fastest vehicle assembly and race times in their divisions, with the fewest on-course penalties.

Image right: NASA Administrator Charles Bolden, second from right, and Marshall Center Acting Director Gene Goldman, right, cheer on a team from Central Connecticut State University in New Britain on the second day of the moonbuggy race. (NASA/MSFC/Emmett Given)

The team from Petra Mercado, in its second year in the competition, finished the half-mile course in 3 minutes and 20 seconds. UAHuntsville brought home another win, finishing in 4 minutes and 3 seconds.

Image left: International Space Education Institute Team 1 of Leipzig Saxony, Germany, goes airborne over an obstacle at the NASA Great Moonbuggy Race. The Germany crew took home the "Best Performance by an International Team" award. Some 25 international teams competed in this year's race, including India, Russia, Italy and the United Arab Emirates. (NASA/MSFC/Ray Downward)

Finishing in second place this year in the high school division was Colegio Nuestra Senora del Perpetuo Socorro in Humacao, Puerto Rico. In third place was Arab High School Team 1 from Arab, Ala.

Image right: A team from Christian Brothers University in Memphis, Tenn., fights its way through the challenging 17-obstacle moonbuggy course. For more images from the race, visit

http://www.flickr.com/photos/nasamarshall/sets/72157629446606344/

The University of Puerto Rico at Humacao won second place in the college division; and Purdue University Calumet Team 1 from Hammond, Ind., took home third place.

Race organizers presented both first-place winners with trophies depicting NASA's original lunar rover. NASA also gave plaques and certificates to every competing team. Sponsor Lockheed Martin Corp. of Huntsville presented the first-place high school and college teams with cash awards of $2,850 each. Individuals on the winning teams also received commemorative medals and other prizes. (For a complete list of additional awards for design, most improved and spirit, see below.)

Image left: Leland Melvin, right, associate administrator for the Office of Education at NASA Headquarters, and a former astronaut, visits with one of the moonbuggy teams from Bevill State Community College in Sumiton, Ala. One of the goals of the race is to encourage young people to pursue careers in science, technology, engineering and mathematics, which benefit NASA, the nation and all humankind. (NASA/MSFC/Tammy Rowan)

"NASA's Great Moonbuggy Race gets bigger and more exciting every year -- just like the career horizons NASA strives to open up to new generations of young engineers, scientists and explorers," said Tammy Rowan, manager of the Marshall Center's Academic Affairs Office, which organizes the race. "We seek to connect the classroom experience to a real, tangible future for every graduate -- one in which some of them, we hope, will be inspired to carry on NASA's mission of discovery and help us reap the benefits back home on Earth."

Image left: Oh, snap! A team from the Rhode Island School of Design in Providence won the "Crash and Burn" award for this aerial buggy mishap on the course's first obstacle. (NASA/MSFC/Emmett Given)

The race is inspired by the original lunar rover, first piloted across the moon's surface in the early 1970s during the Apollo 15, 16 and 17 missions. Eight college teams participated in the first NASA Great Moonbuggy Race in 1994. The race was expanded in 1996 to include high school teams, and student participation has swelled each year since.

NASA's Great Moonbuggy Race has been hosted by the Space & Rocket Center since 1996. The race is sponsored by NASA's Human Exploration & Operations Mission Directorate in Washington. Major corporate sponsors are Lockheed Martin Corp., The Boeing Co., Northrop Grumman Corp. and Jacobs Engineering ESTS Group, all with operations in Huntsville.

Image left: Jeri Buchholz, assistant administrator for the Office of Human Capital at NASA Headquarters in Washington, gives remarks at the closing ceremony of the NASA Great Moonbuggy Race. (NASA/MSFC/Fred Deaton)

For more information about the race, visit http://moonbuggy.msfc.nasa.gov and http://www.nasa.gov/centers/marshall/pdf/633342main_Moonbuggy_Layout.pdf.

For information about other NASA education programs, visit http://education.nasa.gov.

NASA's 19th Annual Great Moonbuggy Race
ADDITIONAL AWARDS AND PRIZES
Best Moonbuggy Design (for solving engineering problems associated with lunar travel):
Colegio Nuestra Senora del Perpetuo Socorro in Humacao, Puerto Rico
International Space Education Institute Team Russia in Moscow

Featherweight Award:
Academy of Arts, Careers, and Technology in Reno, Nev.
Purdue University Calumet Team 2 in Hammond, Ind.

Best Performance by an International Team:
International Space Education Institute, Germany Team 1 in Leipzig Saxony, Germany
Sharjah Colleges in Sharjah, United Arab Emirates

AIAA Telemetry and Electronics Award (for the most innovative onboard data-gathering and delivery system):
International Space Education Institute Team Russia in Moscow

Pit Crew Award (for ingenuity and persistence in overcoming problems during the race):
Elk Valley High School Teams 1 and 2 in Longton, Kan.
Cameron University in Lawton, Okla.

Crash and Burn Award (for the team that endures the most spectacular vehicle breakdown):
Rhode Island School of Design in Providence

Nancy Johnston Gibson Spirit Award (for overall team energy, enthusiasm and camaraderie):
Sharjah Colleges in Sharjah, United Arab Emirates

Rookie Award (for fastest course completion by a new race team):
Colegio Nuestra Senora del Perpetuo Socorro in Humacao, Puerto Rico
Rhodes College Dept. of Physics in Memphis, Tenn.

Most Improved Award (for the most dramatically improved engineering and performance):
Lima Senior High School of Multiple Intelligences in Lima, Ohio
University of Wyoming in Laramie

Best Report Award (technical documentation of the equipment and procedures used in design, build, test and the results obtained):
Jupiter High School Teams 1 and 2 in Jupiter, Fla.
University of Alabama in Huntsville Team 1
Honorable mention to the teams from Sharjah Colleges in Sharjah, United Arab Emirates and University of Central Florida in Orlando

Smith, Meggs and Davidson, AI Signal Research Inc. employees, support the Office of Strategic Analysis & Communications.

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Marshall Team Invited to NASA Student Launch Projects Activities April 20-21

Rocket-launching middle, high school and college students from 28 states will be in North Alabama this week to participate in the annual NASA Student Launch Projects rocketry challenge.

The two-day event kicks off with a rocket fair from 11 a.m. to 1 p.m., April 20, in Activities Building 4316. Students will showcase handcrafted rockets they designed, complete with working science or engineering payloads. All Marshall Space Flight Center team members are invited to attend. Free pizza will be served.

On April 21, the opening ceremonies begin at 7:30 a.m. at Bragg Farms in Toney. Teams will light up their rockets and

launch them to the high skies with the hope that their creation will come closest to the 1-mile altitude goal and safely return its on-board science or engineering payload to Earth.

Preliminary awards will be presented and the grand prize -- $5,000 from ATK Aerospace Group of Salt Lake City, Utah -- will be awarded in May after final post-flight analysis and review are complete. Read next week's Marshall Star for the categories and winners.

The challenge gives students engineering, science and flight operations experience that enhances their classroom learning -- and gives them a leg up on future careers that will benefit NASA and the nation.

The launch event is free and open to the public. For directions and more information, visit here, or contact Julie Clift of the Academic Affairs Office at julie.d.clift@nasa.gov. Marshall team members can also visit ExplorNet for details.

Can't make it out to the farm for the competition? Launch activities will be streamed live at http://www.ustream.tv/channel/nasa-msfc and viewers can keep up with the day's activities on Twitter at https://twitter.com/SLI_1MILEHIGH.

In the event of rain, launch day will be April 22 beginning at 7:30 a.m.

The Marshall Academic Affairs Office oversees the yearly event, which is sponsored by ATK.

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NASA to Fly Deep Space Atomic Clock to Improve Navigation Technology
By Sanda Martel

When people think of space technologies, many think of high-tech solar panels, complex and powerful propulsion systems or sophisticated, electronic guidance systems. Another critical piece of spaceflight technology, however, is an ultra stable, highly accurate device for timing -- essential to NASA's success on deep-space exploration missions.

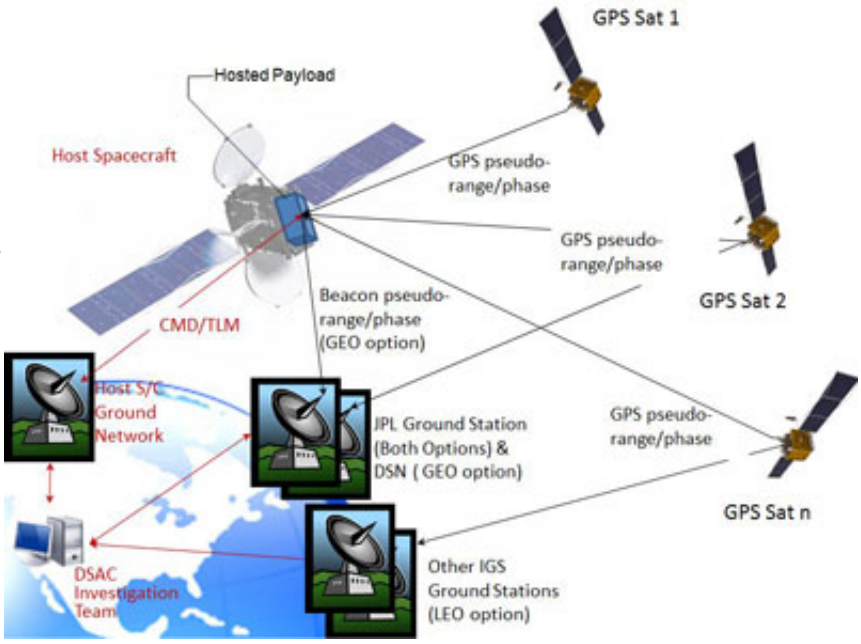

Image right: A Global Positioning System receiver and antenna will be connected with a Deep Space Atomic Clock in an integrated payload. The clock will have, on average, a view of four satellites and will measure signals transmitted by each. Together with data from a global network of dozens of ground GPS receivers, signals can simultaneously estimate the accuracy of the Deep Space Atomic Clock. (NASA/JPL)

NASA is preparing to fly a Deep Space Atomic Clock, or DSAC, demonstration that will revolutionize the way we conduct deep-space navigation by enabling a spacecraft to calculate its own timing and navigation data in real time. The project is part of NASA's Technology Demonstration Missions program, managed by the Marshall Space Flight Center for NASA's Office of the Chief Technologist in Washington.

This one-way navigation technology would improve upon the current two-way system in which information is sent to Earth, requiring a ground team to calculate timing and navigation and then transmitting it back to the spacecraft. A real-time, on-board navigation capability is key to improving NASA's capabilities for executing time-critical events, such as a planetary landing or planetary "fly-by," when signal delays are too great for the ground to interact with the spacecraft during the event.

"Adopting DSAC on future NASA missions will increase navigation and radio science data quantity by two to three times, improve data quality by up to 10 times and reduce mission costs by shifting toward a more flexible and extensible one-way radio navigation architecture," said Todd Ely, principal investigator of the Deep Space Atomic Clock Technology Demonstration at NASA's Jet Propulsion Laboratory.

The one-way deep space navigation enabled by the Deep Space Atomic Clock uses the existing deep space network more efficiently than the current two-way system, thus expanding the network's capacity without adding any new antennas or their associated costs. This is important, since future human exploration of deep space will demand more tracking from the deep space network than can currently be delivered with the existing system.

"The Deep Space Atomic Clock flight demonstration mission will advance this laboratory-qualified technology to flight readiness and will make a practical atomic clock available to a variety of space missions," Ely said.

The clock is a miniature mercury-ion atomic device the Deep Space Atomic Clock team will fly as a payload on an Earth orbiter in a one-year experiment to validate its operability in space and its usefulness for one-way navigation.

"A potential use for DSAC on a future mission would be in a follow-up to the Mars Reconnaissance Orbiter," Ely said. NASA's Mars Reconnaissance Orbiter launched to Mars in 2005 on a search for evidence that water existed on the planet's surface for enough time to provide a habitat for life. The orbiter completed its primary science phase in 2008 and continues to work in an extended mission.

Atomic clocks are the most accurate timekeeping method known and are used as the primary standard for international time distribution services -- to control the frequency of television broadcasts, and in global navigation satellite systems such as the Global Positioning System, or GPS.

Ground-based atomic clocks have long been the cornerstone of most space vehicle navigation because they provide root data necessary for precise positioning. The Deep Space Atomic Clock will deliver the same stability and accuracy for spacecraft exploring the solar system.

In much the same way that modern Global Positioning Systems use one-way signals to enable terrestrial navigation services, the Deep Space Atomic Clock will provide a similar capability in deep-space navigation -- with such extreme accuracy that researchers will be required to carefully account for the effects of relativity, or the relative motion of an observer and an observed object, as impacted by gravity, space and time. Clocks in a GPS-based satellite, for example, must be corrected to account for this effect, or their navigational fixes begin to drift.

In the laboratory setting, the Deep Space Atomic Clock's precision has been refined to permit drift of no more than 1 nanosecond in 10 days, due to the work of NASA engineers at the Jet Propulsion Laboratory. Over the past 20 years, they have been steadily improving and miniaturizing the mercury-ion trap atomic clock, preparing it to operate in the harsh environment of deep space.

For more information about Technology Demonstration Missions, visit http://www.nasa.gov/mission_pages/tdm/main/tdm_overview.html.

Martel, an AI Signal Research Inc. employee, supports the Office of Strategic Analysis & Communications.

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Lightening the Load: Composite Cryotank Technologies

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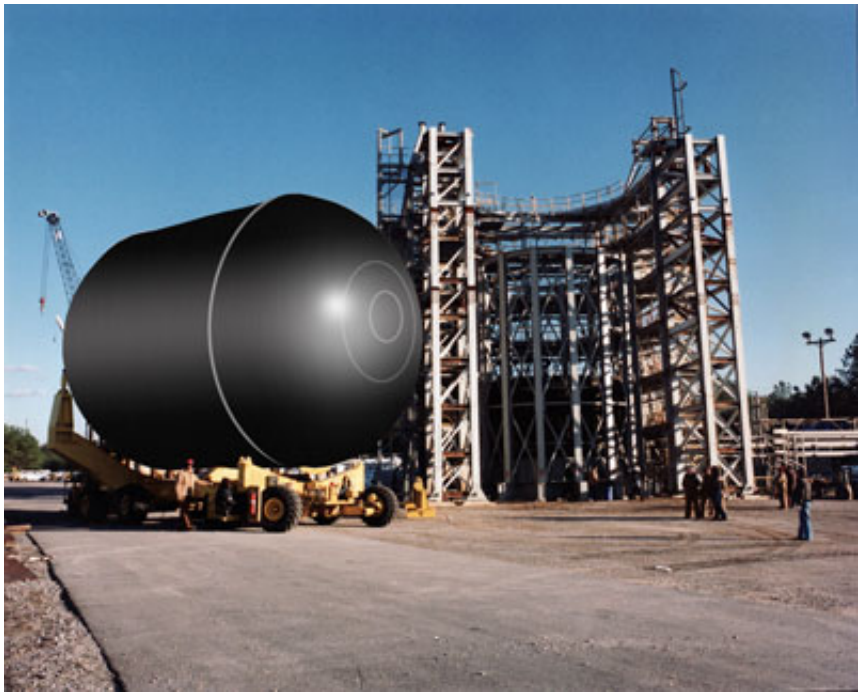

NASA is on a high-technology, weight-loss diet.

Image left: This cryotank could be used on future launch vehicles, in space propellant depots and Earth-departure exploration vehicles. (NASA)

But this watch-your-weight campaign centers on lightening the dry mass of launch vehicles, such as future, evolved versions of NASA's Space Launch System -- an advanced heavy-lift launch vehicle that will provide an entirely new national capability for human exploration beyond low-Earth orbit.

As part of the Game Changing Technology Division within the Office of the Chief Technologist, work is under way on the Composite Cryotank Technologies Demonstration effort. The term "cryotank" refers to storage of super-cold fuels, such as liquid oxygen and liquid hydrogen.

Here's the weighty dilemma:

Roughly 60 percent of the dry mass of a launch vehicle accounts for the fuel and oxidizer tanks. By using composite materials, a cryotank structure can be produced that weighs 30 percent less than aluminum -- the current state-of-the-art.

NASA and its industry partners continuously strive to reduce the weight and cost of launch vehicles. The more weight shaved off a vehicle, the more payload can be carried to space, perhaps even allowing for one less engine or strap-on booster.

The Cure: Out-of-Autoclave

"Our project was one of the original projects within the Office of Chief Technologist," explains John Vickers, NASA project manager for the Composite Cryotank Technologies Demonstration effort at the Marshall Space Flight Center.

The project centers on fabricating tanks that incorporate design features and new manufacturing processes applicable to designs up to 10 meters in diameter. These tanks could be used on future launch vehicles, in space propellant depots and Earth-departure exploration vehicles.

A key to this innovative technological push, Vickers points out, is "out-of-autoclave" -- a relatively new technology for composites. Out-of-autoclave curing composite manufacturing is an alternative to the traditional high-pressure autoclave curing process commonly used by the aerospace industry.

While it has widespread applications in producing aircraft with the material cured in large autoclaves, using composites for aerospace is a relatively new technology. "The downside of that is that autoclaves are very expensive," Vickers notes, and they are energy-hungry machines.

"So a benefit for not having to use the autoclave is that many other companies can join into the aerospace industry that, prior to this, could not," Vickers adds. "Aerospace and lightweight materials…well, they go hand-in-hand.

"Pursuing both technologies in parallel -- the composite tank and the cost-saving use of out-of-autoclave technology -- exponentially contributes to the achievement of the project," Vickers says. "It really gives the program two distinct technology advancements that are coming together."

Test Articles

The project goal is to produce a major advancement in a demonstrated technology readiness; successfully test a 5.5-meter-diameter composite hydrogen fuel tank; and achieve a 30 percent weight savings and 25 percent cost savings, compared to today's state-of-the-art.

The cryotank work can benefit multiple stakeholders, Vickers observes, be it NASA, industry and other government agencies.

Vickers says that there are two milestone-making test article structures within his program, a 2.4-meter- and the 5.5-meter-diameter composite tank. "By the way, that 5.5-meter tank will be the largest composite liquid hydrogen tank that's been designed, manufactured and tested," he says.

Last September, NASA picked The Boeing Co. of Huntington Beach, Calif., for the Composite Cryotank Technologies Demonstration effort. Under that contract, Boeing will design, manufacture and test the lightweight composite cryogenic propellant tanks.

"The work is going very well," Vickers explains. "We have a NASA team that's focused on design and they are working very closely with Boeing.

"As a NASA engineer, it's the most fun because it's the most challenging. We are encountering technical design issues that we're overcoming. And that's what engineering is really all about," Vickers says. "Who is against lighter weight and lower cost? So we're sitting in a pretty good spot."

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Lyrids Meteor Shower: 'Up All Night With NASA!'

www.nasa.gov

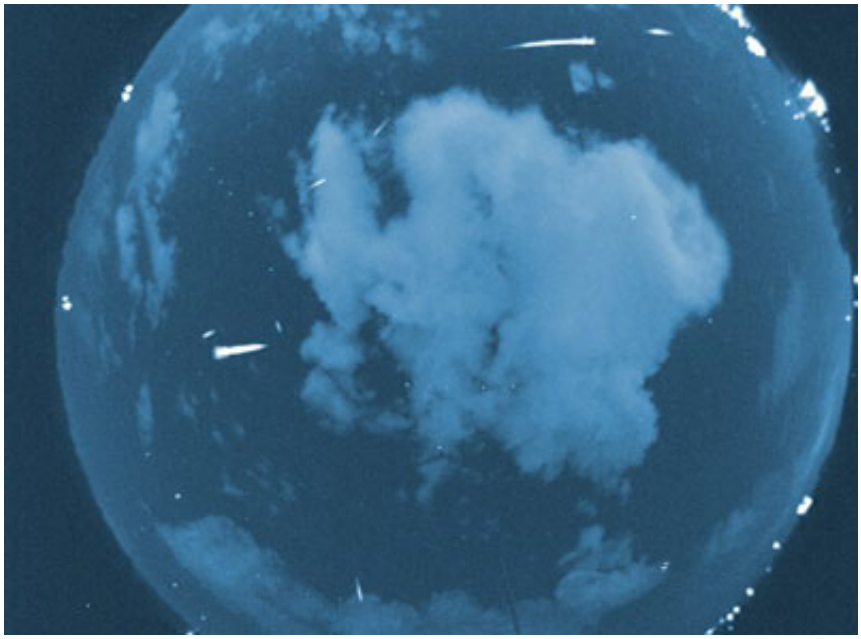
In 2011 the bright moon overshadowed visibility for many meteor showers, but now Lady Luna has decided to share the stellar stage. For the 2012 Lyrids meteor shower, a new moon will set darker skies that are ideal for meteor watching.

Image right: A Lyrid meteor crosses the night skies over Nantucket, Mass. (Copyright Greg Hinson. All rights reserved, used with permission.)

If you're looking for a fun way to spend an early spring weekend, make plans to stay "up all night" with NASA experts to watch the Lyrids brighten the skies. Overnight April 21 -- from 10 p.m. to 4 a.m. CDT, meteor experts Dr. Bill Cooke, Danielle Moser and

Rhiannon Blaauw of the Marshall Space Flight Center will answer your questions about the Lyrids via a live Web chat.

Joining the chat is easy. Simply return to this page a few minutes before 10 p.m. The chat module will appear at the bottom of this page. After you log in, wait for the chat module to be activated, then ask your questions.



A live video feed of the Lyrid meteor shower will be embedded on this page on the night of the Web chat, and there will be alternate all-sky views being streamed from this all-sky camera network.

Image left: Composite of 2009 Lyrids over Huntsville. (NASA/MSFC/Danielle Moser)

The Lyrid meteor shower will be viewable all over the world, with the best meteor rates seen just before dawn at the location where you're watching the skies. The Lyrids are very unpredictable, with peak meteor rates between 10-100 per hour. This year, Cooke estimates that the rate will be around 15 per hour, though he is hoping for a surprise increase above this!

More About the Lyrids

Lyrids are pieces of debris from the periodic Comet C/1861 G1 Thatcher and have been observed for more than 2,600 years. In mid-April of each year, Earth runs into the stream of debris from the comet, which causes the Lyrid meteor shower. You can tell if a meteor belongs to a particular shower by tracing back its path to see if it originates near a specific point in the sky, called the radiant. The constellation in which the radiant is located gives the shower its name, and in this case, Lyrids appear to come from a point in the constellation Lyra.

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Davidson Center to Offer Free Documentary Screening of 'The City Dark' April 20

To celebrate International Dark Sky Week, NASA, the Von Braun Astronomical Society and the U.S. Space & Rocket Center are sponsoring a free screening of "The City Dark: a Search for Night on a Planet that Never Sleeps" on April 20 at 6 p.m. as a part of the "Pass the Torch" lecture series at the Space & Rocket Center's Davidson Center for Space Exploration theater.

In his documentary, filmmaker Ian Cheney ponders the idea that as we lose our ability to see beyond our own planet and turn our attention further inward, society may lose the ability to dream, to innovate and to explore. Light pollution is easily addressed by the intelligent placement of lighting only where needed and by using shielded designs for fixtures. Indeed, fixing light pollution is one way to reduce electricity costs, while protecting birds, nocturnal wildlife and human health.

After the screening, the outdoor lights will be dimmed, so that viewers can recall warm summer nights spent gazing at the night sky, wondering about all those little lights, and enjoy stellar views of the universe through telescopes.

For more information, visit here.

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'Some Like it Fat' Team Wins 9th Annual Weigh to Win Competition

Hours of sweat and exercise have paid off for one team that recently competed in the 9th annual Weigh to Win contest at the Marshall Space Flight Center's Wellness Center. The team, whose members all work in Marshall's Engineering Directorate, picked the name "Some Like it Fat" based on the Marilyn Monroe movie "Some Like it Hot." Standing from left are Jonathan Stephens, team lead Karen Berry, Rob Berry and Jake Kilborn; on the yoga ball is Kathryn Henkel. Counting calories, exercising diligently four to five times a week and holding each other accountable took the team across the finish line first -- 96 pounds lighter, with 30 percent less body fat. Karen Berry also emailed a weekly comic or quote to give support. "When you know your co-worker did better over the Super Bowl weekend than you did, it forces you to work harder at your weight-loss goal," she said. The winners received a gift certificate to Sports Authority. Thirty-five teams participated in the competition, which began Jan. 23 and finished March 18. In an initiative toward a healthier NASA workforce, the Wellness Center developed this yearly program that is fun, motivating and rewarding. To learn more about the Wellness Center and how to join, contact Bill Stafford at 544-0252, or team members can visit here. (NASA/MSFC/Emmett Given)

Find this article at:

http://www.nasa.gov/centers/marshall/about/star/index.html