



**Saturn V Special  
Points of Interest:**

- Saturn V is 18 meters (60 feet) taller than the Statue of Liberty
- Fully fueled for liftoff, it weighed 2.8 million kilograms (6.2 million pounds)—the same as 400 elephants
- It had 4.5 million newtons (7.6 million pounds) of thrust at launch—more power than 85 Hoover Dams
- A car getting 48 kilometers (30 miles) per gallon could drive around the world 800 times with the fuel used in one lunar mission.

Source: Dream Rocket Project website

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## Dream Rocket Project melds art, science and visions for the future

Washburn University art professor Jennifer Marsh wanted a project to link art across the board with science and other fields. And one in which communities could get invested.

The resulting Dream Rocket Project began in 2009 and culminates in 2015. Using the theme of “Dare to Dream,” it encourages individuals and groups worldwide to use art to express their dreams and aspirations.

The goal is to collect between 5,000 and 8,000 artwork panels which will be pieced together into a 32,000 square-foot quilt to fully wrap the 111 meters (363-feet) tall Saturn V moon rocket replica at the U.S. Space and Rocket Center in Huntsville, Ala. Permission to do so in 2015 has already been obtained from NASA. This will then be a 60-day exhibition running May 1 thru June 30, 2015.

As tall as a 36-story building, the Saturn V Rocket was built by NASA to send people to the moon. This work-horse rocket provided the thrust for nine Apollo missions to the Moon, six of which landed on its surface, the first being in 1969

“The Saturn V is a monumental icon. It took over 500,000 people to build it. That it took astronauts on the Apollo missions and returned them safely is

pretty remarkable,” said Marsh, the Catron Professor of Art at Washburn University.

“The resulting Dream Rocket Project is a wonderful metaphor for achievement through collaboration, [of] working together to do problem solving,” Marsh says.

Though the catalyst for the project is the Saturn V, a myriad of subjects besides space are included in this vision of the future, including peace, equality, community, conservation and patriotism.

So far, there have been almost 1800 submissions with another 1800 in progress. The 2 x 2 foot cloth panels have come from at least 17 countries, 46 states and 363 communities. In Kansas, over 60 schools, community organizations or individuals have sent artwork.

Panels have come from as far away as England and Poland. More are coming from Italy as a result of an impromptu presentation made by Augusta art teacher Charlene Jesser while doing course work in Venice this past summer.

“This project is bigger than I ever

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The Saturn V moon rocket replica is located at the U.S. Space and Rocket Center in Huntsville, Ala. The real Saturn V is displayed inside the adjacent Davidson Center.

## In its fifth year Galaxy Forum Kansas 2013 continues to give educators cutting edge information

On July 27, six weeks before the official NASA announcement that Voyager 1 had crossed into interstellar space, attendees at the Ad Astra Kansas 2013 Galaxy Forum heard it from an A-1 source, a co-investigator who helped design and has worked with the Voyager spacecraft for the last 35 years.

Now in its fifth year, The Galaxy Forum Kansas event tries to make cutting edge information about space available to teachers and others interested in space.

The Forum, sponsored by the Ad Astra Kansas Foundation, and held in recent years at the Kansas Cosmosphere and Space Center in Hutchinson, focuses

on 21st Century education—getting to know our place in the Universe. This exciting topic holds the keys to many of the scientific mysteries of our time—and is a topic which can excite youth. The event is free and open to the public. Teachers may use the forum for professional development credit.

Using our Milky Way as a starting point, Kansas experts in fields such as astrophysics, galaxy research, even biology and chemistry have given about 20 presentations since 2009. Topics have ranged from interesting students in astronomy to how the chemistry around us is related to the elements and compounds found in the stars and planets to NASA’s longest-

running project (Voyager) to the first clear evidence of dark matter.

The event has seen about 150 attendees over the last five years.

Jose Vigil, Derby High School science teacher, was a repeat attendee in 2013. For him the forums have been useful in a number of ways. In addition to the up-to-date scientific knowledge and the media materials provided for classroom display, the Galaxy Forums have “introduced me to scientists and their research, validated my interest in science by meeting other teachers of like profession and inspired me to be an expansive explorer,” he says.

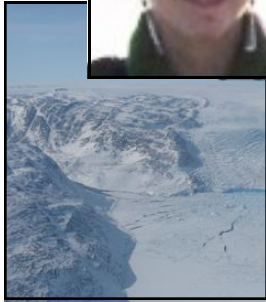
See “Galaxy” page 2

## NASA fellowship will help KU student develop better polar ice radar

LAWRENCE — A three-year, \$90,000 NASA fellowship will allow a University of Kansas School of Engineering graduate student to design tools that will help more precisely predict future sea level rise based on the impact of climate change on the polar ice sheets.



Theresa Stumpf, a doctoral student in electrical engineering at KU's Center for Remote Sensing of Ice Sheets (CReSIS) was awarded a fellowship to NASA's Earth and Space Science Program to conduct research on a new type of ice penetrating radar designed to gather data from a much wider area and provide a much clearer picture of the conditions where the ice meets bedrock.



Theresa Stumpf's field work will be in places like the Helheim Glacier in Greenland. Photo credits this page KU College of Engineering

Much of the data used by the scientific community, particularly Greenland data, is gathered with radar developed by CReSIS at KU and flown on aircraft over the ice sheets in Greenland and Antarctica. This data represents images and information from the surface of the ice sheet to the bedrock. The formal name of Stumpf's NASA fellowship application is "Ultra-Wideband, Wide-

Swath Radar Imaging of the Ice-Bed Interface for Generating Fine Resolution Bed Topography and Quantifying Basal Conditions."

"That essentially means that the ice sheets are mapped out over a very wide swath, providing more accurate and abundant data about the conditions at the bedrock. Current information on that is very sparse," Stumpf said. The conditions where the ice meets rock at the bottom of the ice sheet – whether it's solid ice, melting ice or water – have a major influence on the speed of the ice flow to the oceans. The faster the ice flows, the more it affects sea level rise.

"Another important aspect of wide-swath imaging is that you can collect this data in a single pass from the aircraft," Stumpf said. "You don't have to fly multiple lines over the same area and then piece the data together to get fine resolution. You're getting it in just one pass and that's the objective."

Data used by CReSIS have traditionally been gathered solely from the

area directly beneath the aircraft. Stumpf's research will analyze data from three separate antennas that gather information from a much wider patch of ground. While it can be more challenging to filter out interference and convert data to an accurate map, once Stumpf interprets all the information, the result can provide a more thorough and revealing picture of the conditions beneath the surface.

"Detailed descriptions of hydrological channels below the ice allow scientists to make more accurate predictions about future sea levels," Stumpf said.

She says the outstanding work done on ice sheet research at KU over the years certainly helped earn her the NASA fellowship.

"They recognize the University of Kansas, here in the heart of the country, as a true leader in ice sheet research, and our track record and reputation definitely put me in a position to do research that I think a lot of other graduate students wouldn't have the opportunity to do. I'm excited to see what we can do."

## Kansas student spends summer internship at NASA JPL

LAWRENCE — Massive amounts of data generated by the Mars rover Curiosity can pose a challenge for the NASA scientists and engineers tasked with the daily operations of the spacecraft. Each day Curiosity is on the Martian surface, the NASA team learns more about how the rover responds to commands and how to control it with more precision.



Ryan Endres

That leads to an enormous amount of data that provides a valuable roadmap for an engineer looking for specific details on how Curiosity performed during a certain task. The challenge to ensure operations run efficiently has been locating those details in a scattered patchwork of individual workstations or stockpiled in diverse computer servers.

Enter Ryan Endres. The University of Kansas School of Engineering student from DeSoto spent the summer of 2013 as an intern at NASA's Jet Propulsion Laboratory in Pasadena, Calif., compiling this data and writing computer code to create a searchable, centralized database readily available for NASA engineers seeking specific information on any of the rover's previous activities.

"I created a wiki page and wrote programs that allow users to easily search data on every aspect of Curiosity's operations," Endres said. "Say a user wants to know how far the rover drove on a certain day. They scan use-cases for mobility, which provides them with a specific link. They click on it, and all that information is right there. The programs link to several locations, so a user can find information in several ways from different places. It's simple and easy."

Endres' program continuously pulls the latest data from Curiosity, ensuring the most recent information is available for the project team. "The rover project could go on for a decade. If you're a worker who comes in during year four, you won't know the history of what the rover did, or the commands that ran it, so by providing this database, that worker can easily search for all the different data sets and tailor the information to their needs," Endres said.

Endres, a junior in aerospace engineering, was one of 500 students from across the nation selected for JPL's summer internship program.



"Cont. "Galaxy" page 1

The first Galaxy Forum Kansas was held in 2009. It is an offspring of the international Galaxy Forum program begun in 2008 as an educational project by the International Lunar Observatory Association / Space Age Publishing Company, Kamuela, Hawaii and Palo Alto, California. Over the last six years there have been over 100 presentations in a dozen countries around the world.

To access the 2013 Galaxy Forum Kansas presentations as well as other 2013 presentations go to <http://galaxyforum.org/galaxy-forums-2013/#kansas13>

To view past Galaxy Forum presentations from around the world, go to <http://galaxyforum.org/archives/>



## Kansas BEST robotics tournament offers ingenuity and excitement

Fall is Kansas' BEST time of year. BEST as in the annual Kansas Boosting Engineering, Science and Technology robotics competition to be held November 2.

In this sports-like technology contest, high school teams are challenged to build remote control robots to do a specific task in a contest setting. Actually, in an arena setting—Hartman Arena in Park City. Expect 25 schools and plenty of activity.

"One of the best parts is getting to cheer on the teams at Game Day as they compete. Everyone is so excited about their robot and what it can do," says Sarah Harms, 17, a member of the defending champion Wichita Homeschool Warrior Robotics team.

Having participated for 13 years, the Warriors have had multiple wins in this tournament and also in the Frontier Trails BEST Regional in Fort Smith, Ark.

As is the scenario each year, each participating school receives the identical parts and has six weeks to brainstorm, use engineering logic to design, develop, test and revise a working robot according to game rules.

Each school is assigned five mentors—experienced engineers, technicians and professionals.

There are two sides to the competi-

tion—the robot side and the BEST side. In a process that simulates real life, the team also has to write an engineering notebook, create a marketing presentation and exhibit booth as well as handle other details, such as the scheduling that would go into such a project.

"BEST isn't just for students who know about programming or making robots. There are so many different aspects of the competition that require so many different skill sets and personality types. There are also a lot of opportunities to learn new skills," says Sam Burk, 17, a Homeschool Warrior team leader.

Harms, one of 13 females on the 45-person Homeschool team, agrees. "I have learned so much, not only in learning about the engineering process but also in leadership, the ability to give speeches and much more."

This year's theme is Gatekeeper 2013. Each team has to design a prototype robot which will construct a cpu over the course of three production stages. This is the high point, after all the work—"being able to watch a bunch of parts come together into a working robot," says teammate Mason Ryel, 17.

The results are often quite ingenious.

"I am constantly amazed at the ability young people show in this program. [Before getting involved in BEST] I

never thought I'd see a tenth grader design his own touch table or see high school students program and wire a robot to run a course all on their own," says team member Hudson Parris, 15.

"I really enjoy seeing how different teams approached the same problem with the same materials in so many different ways," says Burk.

This year, Game Day will be Nov. 2 at Hartman Arena in Park City from 9:30 a.m. to 3 p.m. The event is open to the public and free.

"We will have over 500 students competing. It will be quite an active scene. We strongly encourage people, we would love to have people come and watch," says Karen Reynolds, BEST Team Coordinator from the WSU School of Engineering.

"We get outstanding students. It's one of the highlights of our year," says Reynolds. This is the 15th year of the BEST competition at WSU. "With BEST we seem to have a nice tradition of students going through the competitions and then [when they age out] mentoring afterwards," says Reynolds.

For more on the Kansas BEST program, go to <http://webs.wichita.edu/?u=kansasbest&p=index>



**Wichita Homeschool competes in the Kansas BEST 2012 contest themed "Warp XX Space Elevator"**

Photo courtesy WSU School of Engineering

### Cont. "Dream" page 1

thought it would be," says Jesser, K-5 art teacher for the Augusta USD 402 school district. "It's like we're making the whole world aware of science and the importance of science."

All four public elementaries in Augusta are participating. Panels from two of the schools were on display at the 2013 Kansas State Fair.

Jesser's 4th and 5th grade art classes at Lincoln and Robinson Elementaries will use the Mars rovers as their subject for the Dream Rocket Project. When she told the students at Robinson about the Mars rovers, most of them knew nothing about it.

"I told them, 'You are going to enjoy so much learning about science.' I told them to check out a book and do some research on the rovers," says Jesser.

Her students are excited. "You mean me? I get to be on the Dream Rocket!" are typical responses.

Their submissions will be part of a Dream Rocket display at the Kansas Cosmosphere and Space Center Feb. 1 thru March 30, 2014.

Panel displays have traveled to 134

venues of all sizes across the nation. Current displays are at the Tecumseh South Elementary School, Tecumseh, Kan. And the Renaissance Center in Dickson, Tenn.

In 2014, displays will be at the Strategic Air and Space Museum, Ashland, Neb.; at the annual Ad Astra Kansas Day Space Celebration in Topeka in April as well as at the Coffey County Library in Lebo.

The project recently reached a fundraising goal of \$12,000, enabling the hiring of Topeka-based engineers Bartlett & West to handle the logistics of NASA's very specific guidelines in the wrapping process. The quilt cannot actually touch the rocket, it must be independently supported and framed around the rocket.

The idea behind the project seems to be working. "Getting a lot of people of different types working together is a good way to bridge arts and science or other fields," says Marsh.

Submissions continue to be welcome though March 2015. To learn more about the project, go to <http://www.thedreamrocket.com/>

**Upper right: Submissions like this one from Laura Grover of Bellevue, Wash., have come from all over. Center and lower right: "Peace is Universal" is a favorite topic as illustrated by students at Merriam Park Elementary in Merriam and Joshua Schraad, Nemaha Valley High School, Nemaha. Below: Jennifer Marsh**



Photos courtesy of the Dream Rocket Project



# INTERSTELLAR R & D

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**AD ASTRA KANSAS  
FOUNDATION**

This "Interstellar R&D" feature in the Ad Astra Kansas News twenty-fourth issue continues an enterprise to research and gather information on the most important developments preparatory to humanity's greatest adventure—voyaging to the stars. Now, at the millennium's turn, is an appropriate time for grand vision and forward thinking, and there are strong signs of a renaissance in interstellar travel thought and activity. This new feature and newsletter, thus, now set forth to develop a national / international / global clearing center and storehouse of knowledge and know-how for travel to the stars: **Ad Astra—Steve Durst, Michelle Gonella**

## Observation

### ILOA Hawai'i 2013

The International Lunar Observatory Association, based on Hawaii Island, seeks to expand human understanding of the Galaxy, Cosmos and Solar System through observation from our Moon.

The first of the ILOA 4 Moon Missions, collaboration with the National Astronomical Observatories of China to use the Ultra-Violet 15-cm Telescope aboard the China Chang'e-3 Moon Lander this December, should result in advancing International Cooperation, in Galaxy First Light Imaging and in the development of Galaxy 21st Century Education through the ILOA Galaxy Forum Architecture in Hawaii, across the USA and around the Earth.

The two intermediate ILOA Moon Missions ILO-X and ILO-1 should expand Galaxy First Light Imaging and Galaxy / Astronomy exploration, pioneer Lunar Broadcasting of both astrophysical and commercial data, and establish a toe-hold for lunar base build-out at the Moon South Pole / Malapert Mountain area.

The last of the ILOA 4 Moon Missions, the Human Service Mission to the International Lunar Observatory ILO-1 in this Decade, should result in first astronaut servicing of the ILO-1 and of near-by instruments and labs, of validation of Golden Spike Company, Shackleton Energy Company, and / or other Earth-Moon, Cis-Lunar human transportation systems, and in amplification and build-out of permanent Moon South Pole human settlement.

The ILOA main outreach vehicle for Astronomy / 21st Century Education is the global Galaxy Forum Architecture, which should enable many enterprises, such as the Ad Astra Kansas Foundation and the Interstellar R&D Center, to flourish on all 7 or 8 Continents of Earth.

## Communication

### Civilization Sends Its Own Signal

When the home next door appears vacant -- and you really want to know whether or not you have neighbors -- you may start by watching the trash cans. Like the nosy neighbor, we constantly watch and wonder if anyone else is "at home" in our Galaxy. And like the nosy neighbor, we may not have the nerve to rap on the door and expose our nosy nature.

Earlier this year, the article "How to Find ET with Infrared Light" was published by Jeff Kuhn, Svetlana V. Berdyugina, David Halliday and Caisey Harlinton. They are convinced that a survey out to 60 light years could offer a definitive answer as to whether other civilizations exist in our vicinity, and they plan to do it by examining waste heat radiation.

To accomplish such a broad survey, they are looking at creating a telescope called "Colossus," with a primary mirror of 77 meters.

Through their company, Innovative Optics Ltd., new technologies will enable this sensing giant, including fire-polishing (in place of abrasive-based techniques) and controlled slumping of the hot glass to desired shapes which are incredibly thin and lightweight. Also employed are new "Live Mirror" technologies which provide adaptive optics to neutralize atmospheric distortion.

Once completed, Colossus would be able to sweep hundreds of planets in the habitable zone which are Earth-size and larger -- to determine if civilizations are present -- without announcing our own presence.

## Transportation

### PLT: Photonic Laser Thruster

In the 1990s, Geoffrey Landis suggested the beautiful image of a "light bridge" which would connect nearby solar systems. Today, physicist

Young K. Bae sees that "light bridge" as a photonic railway that would "... bring about a quantum leap in the human economic and social interests in space..." Bae hopes to realize this concept via his work on a Photonic Laser Thruster, or PLT, and then use the concept to build a Space Railroad to the stars.

Laser propulsion has long been a promising concept. In 2005, The Planetary Society funded COSMOS, a solar sail which would test the effects of a microwave beam from the Deep Space Network bouncing off the sail. A launch failure scuttled the test. Also, laser propulsion has always been hindered by diffusion of the laser beam, and for interstellar travel, lenses the size of Texas would have to be installed beyond the orbit of Saturn to maintain a fine enough focus for interstellar travel.

Bae's innovative photon thruster, however, exploits a resonant optical cavity which is formed between two mirrors to create the laser. This gives a thrust to power ratio comparable to electrical thrusters and a specific impulse which is orders of magnitude greater than other conventional thrusters. Carried by dual spacecraft, the laser source can be taken anywhere.

Bae envisions the photonic railway as having a permanent infrastructure which would link nearby stars with a transportation system. Self-directed robotic spacecraft would put together and activate the system at destination locations, utilizing structural parts from Earth.

The Space Trains would be very lightweight and consist mostly of human transport habitats and safety systems, with small thrusters for attitudinal control. Each would require four thrusters: one pair for acceleration and one pair for deceleration. New developments in X-ray laser and material sciences will reduce engineering requirements.

Young K. Bae believes the propulsion systems could be within reach by the end of this century.