



**Special points of interest:**

- GALAXY FORUM August 13, 2016
- At Kansas Cosmosphere and Space Center, Hutchinson
- 1-3 p.m.
- Free / open to public
- To register: send name and number attending to contact@adastra-ks.org

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**Kansas scientist to feature KEPLER at Galaxy Forum**

The Kepler Space Telescope's discovery this spring of 1284 more exoplanets exploded the tally of its finds to more than 2000 since its launching in 2009.

At the upcoming Galaxy Forum, Kansas native Dr. Penny Warren will share her expertise and that of her colleagues on this bonanza of scientific discovery. Warren has worked on Kepler as a Principle Engineer for Ball Aerospace & Technologies, Corp., the Colorado aerospace company that built Kepler's instrument and spacecraft for NASA.

The Ad Astra Kansas Galaxy Forum will be held August 13 at the Kansas Cosmosphere and Space Center, Hutchinson, from 1-3 p.m. Also on the line-up is a presentation by the Kansas Astronomical Observers about the

highly anticipated reopening of the Lake Afton Observatory near Wichita. Also on the agenda are updates on Mars, Jupiter and Pluto.

This educational event is free, geared towards teachers, students, astronomers of all kinds and the interested public.

Warren is currently the Area Manager for Ball's Detector Engineering group, which designed, built, and tested the focal plane array in the Kepler photometer. She also is a technical contributor for Ball's electro-optical instruments.

A Winfield native, Warren earned a B.S. degree from K-State in physics in 1987, plus M.S. and PH.D degrees from Purdue University.



Cassiopeia: A Sup

**Above: Dr. Penny Warren.** Photo courtesy of Ball Aerospace & Technologies  
**Below: Kepler Space Telescope.** Image credit NASA



**Space travel opens new field of inquiry in genetics says KU prof**

One doesn't usually connect genetics and space exploration. But International Space Station (ISS) scientists do.

In March, KU assistant professor Jennifer Raff was invited to speak on genetics for ISS scientists at Johnson Space Center (JSC).

Raff covered the history of genetics as a scientific discipline, what is genetics, how the field emerged as a scientific discipline, and the types of questions geneticists address.

Space travel opens up a new field of inquiry. Genetics is a component of the ongoing study of twin astronauts Mark and Scott Kelly.

Mark stayed on the ground while Scott spent one year in the ISS, returning in March. And astronaut Kate Rubins, the ISS Flight Engineer on Expedition 48, will be conducting the very first genome sequencing project in space.

There are several areas of genetics research relevant to space. "One is the effects of microgravity and the increased radiation on the human genome. What are the long term effects of these factors?"

"Also, the microbiome. This is all the organisms associated with the human body: bacteria, fungi, virus which are all part of the human flora.

How does microgravity and radiation affect us, affect our microbiomes and in turn, how do these changes affect the whole?" said Raff.

One of Raff's specialties at KU is human migration and its effects on human genetic diversity. She studies modern and ancient DNA in order to understand details of human prehistory. She focuses her research on the initial peopling of the Americas, because this was the last major migratory event of humans into a previously unoccupied continent. She is

**"Genetics" cont. page 4**

## Support AAKF through the AmazonSmile program

Friends of the Ad Astra Kansas Foundation can now support our mission of STEM education outreach with the click of a mouse.

We are now registered with AmazonSmile community re-

wards program which will donate a small percentage of your purchase to a non-profit organization.

All one has to do is purchase their Amazon items through

the AmazonSmile program and designate our organization as recipient. Proceeds will be used to expand outreach activities.

To start, go to [AmazonSmile](#)

**“These novel lasers use a hollow fiber with a honeycomb structure to hold gas and guide light....”**

## K-State researchers invent, patent new type of laser

MANHATTAN — A new class of lasers developed by a team that includes K-State physics researchers could help measure distances to faraway targets, identify the presence of certain atmospheric gases and send images of the earth from space.

These energy-efficient lasers also are portable, produce light at difficult-to-reach wavelengths and have potential to scale to high-powered versions.

The new lasers were invented by associate professors of physics Brian Washburn and Kristan Corwin, along with Andrew Jones and Rajesh Kadel, 2012 and 2014 doctoral graduates in physics, respectively, plus three University of New Mexico researchers.

The new lasers are fiber-based

and use various molecular gases to produce light. They differ from traditional glass-tube lasers, which are large and bulky, and have mirrors to reflect the light. These novel lasers use a hollow fiber with a honeycomb structure to hold gas and to guide light. This optical fiber is filled with a molecular gas, such as hydrogen cyanide or acetylene. Another laser excites a molecule of gas, causing it to spontaneously emit light. Other molecules in the gas quickly follow suit, which results in laser light.

“By putting the gas in a hollow core, we can have really high intensities of light without having to put such high amounts of power into the laser,” Corwin said. “If you had a glass tube of that size and put light in it, the light would escape through the sides. It’s the structure that

makes it work.”

The structure also allows for portability. Traditional lasers are fragile and cumbersome to move, while this more durable fiber laser is about the thickness of a single strand of hair and can wrap around itself for compact storage and transportation.

“The smallness is nice,” Washburn said. “You can wrap up the coil like a string.”

The inventors’ lasers use gas, the popular method before manufacturers moved to solid-state materials. For example, up until the mid-1990s, grocery store scanners were gas lasers, while present-day ones are solid-state.

“What we’ve done is use an old-school technology medium in a new-school package,” Washburn said.



**Christopher Oline accepts his team’s Ad Astra Kansas Award from Dr. Scott Miller at the 2016 WSU Engineering Open House.**

**RANDALL CHAMBERS  
AD ASTRA KANSAS  
AWARD WINNERS  
2016 WSU  
Engineering Open House**

Project:  
“Team Shock Drop”

Team Members:  
Kevin Hagen, Wei Yew Khoo,  
Christopher Oline, Miro Penheiro  
and Mitchell Thompson

Award in honor of the late  
Dr. Randall Chambers,  
NASA pioneer, WSU  
Distinguished Professor  
Emeritus in Engineering and  
co-founder of  
Ad Astra Kansas Initiative,  
now Foundation.

## Smithsonian universe exhibit comes to southwest Kansas

Through awe-inspiring photographs, visitors to the Smithsonian exhibit “The Evolving Universe” at the Stauth Memorial Museum in Montezuma through August 14 will learn how scientists study the far reaches and evolution of the universe.

The traveling exhibit’s three main sections Our Solar System, Our Galaxy and Galaxies Far, Far Away will trace the

history of time and space with special sections geared both to the novice as well as the technically savvy.

Montezuma is on Highway 56 midway between Dodge City and Sublette. Free admission, donations are accepted. For more info go to [Stauth](#)

**Correction:** The Banner Creek Observatory’s 20-inch main telescope was made by RC Optical Systems of Flagstaff, Ariz. It did not come from Kitt Peak Observatory, as was reported in the spring newsletter.

## Kansas students attend Honeywell space camp

John Tran learned not to wave his arms during the centrifuge ride at the Honeywell Leadership Challenge Academy (HLCA) this past spring. "I did not pass out, [but] I did start seeing black and ended up with a small headache," said the Overland Park student.

In March Tran and 14 other Kansas students aged 16-18 joined 320 students from around the world to attend the HLCA at the U.S. Space and Rocket Center (USSRC) in Huntsville, Ala.

During the six-day camp there were 45 hours of classroom, labs, simulated astronaut training, interactive flight dynamics programs and challenges. All activities focused on developing STEM leadership skills and abilities.

Rachel Maurer of Lawrence's team of 16 included students from Australia, Singapore, Mexico, Ireland, South Korea, the

Czech Republic and Switzerland as well as the U.S. "While most kids' English was fairly good, language was still a barrier," said Maurer.

Challenges such as designing, building and testing their own rockets put their team skills to the test. Could the diverse groups follow the specifications and instructions given to accomplish the task? They could. Teamwork was one of the things that impressed Tran most. Impressed by the intellect, the leadership, the friendliness of his team members, "I could never have been happier to work with any other people anywhere," said Tran.

A highlight was the mock-up of a space mission. On her team, Maurer was in the mission control as the Emergency Environmental Commission (EECOM) and "we had to get the crew

back down from space after we fixed the ISS." Tran was an astronaut on his team and did a moon walk using a simulated 1/16th gravity apparatus. Dealing with the bouncy situation while trying to put together a rover was hard, he said.

"Prior to camp I was struggling [with] what I wanted to go into but [now] aerospace engineering is exactly what I want to do, said Maurer. Tran may be leaning, also. "I wanted to be a doctor at first, but now I may be interested in becoming an engineer where I get hands-on activity with cool stuff."

The HLCA program, which gives scholarships to children of Honeywell employees has given them to more 1770 students since 2010. Honeywell does have two other STEM educational programs which are open to anyone. (see below)

All of these programs are part of the Honeywell Hometown Solutions program, which focuses on impacting communities in five critical areas, one of which is science and math education.

**Honeywell's FMA Live!** is a STEM education programs geared at middle schools.

A traveling show of hip-hop music and audience interaction is used to illustrate science principles. Each presentation focuses on Newton's Universal Law of Gravity and the Three Laws of Motion.

The programs are given regionally across the U.S. Last October, Mission Trail Middle School in Olathe received a performance.

For info about applying for this free event for your school, go to [fmalive.honeywell.com](http://fmalive.honeywell.com)



**Above: Yanni Martin of Kansas City, Kan., experiences the gyroscope at the HLCA. Below: Rachel Maurer experiences micro-gravity.** Photos courtesy HLCA



## Space education programs available for middle school teachers and students

For teachers there is the **Honeywell Educators Space Academy (HESA)**, held in June this year. Over 200 teachers from 25 countries and 36 states attended the camp at the USSRC in Huntsville Alabama.

The camp was created by Honeywell in partnership with USSRC to advance middle school math and science.

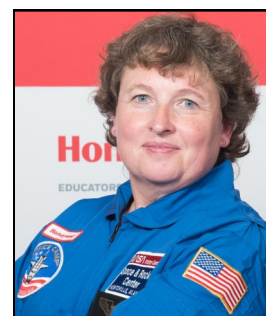
Two Kansas teachers, Jeanette Bosch of Christ the King School, Wichita, and Jenny Wilcox, Washburn Rural Middle School, Topeka, were in this summer's group.

They received 45 hours of classroom and lab instruction focused specifically on space science exploration, giving them new and unique lessons to bring back to students.

"They were all highlights," said Bosch when asked. "Just being able to experience the training astronauts do." That included re-entry simulations like dropping into water from a parachute harness to a spinning multi-access trainer.

"[This is] a great immersion program for teachers to collaborate with teachers from all over the world and to understand how the space program is put together. It is not just one big team doing a lot of stuff, it's many little teams doing a lot of little things. We've got to get this [idea of teamwork] across to kids," said Bosch.

Expenses are fully paid and this is open to any middle school teacher. For more info, go to [educators.honeywell.com](http://educators.honeywell.com)



**Middle school teacher Jeanette Bosch of Christ the King School in Wichita was one of two Kansas teachers to attend the Honeywell Educators Space Academy in June.** Photo credit: HESA

# INTERSTELLAR R & D

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## We're on the web

Also, look for us on  
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This "Interstellar R&D" feature in the Ad Astra Kansas News 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

### Observation

### Communication

### Transportation

The popular Interstellar R & D section will return in the Fall issue.

## Wichita State awarded NASA biomedical research grant

WSU researchers Drs. Kim Cluff, Anil Mahapatro, and Jeremy Patterson have been awarded a \$750,000 three-year NASA EPSCoR (Experimental Program to Stimulate Competitive Research) grant to develop a health monitoring system for astronauts.

The innovative bio-monitoring sensor, being developed through the collaborative efforts of the Departments of Biomedical Engineering and Human Performance Studies, may serve as a simple yet sophisticated method for monitoring multiple mission critical physiological factors such as blood flow, intracranial pressure, body temperature or blood gas concentration.

Being able to measure many health systems in a single sensor is important because of the lack of auxiliary resources in a space station. This sensor may enable monitoring critical health issues in point-of-care fashion.

"We are excited about it. The project is a transforming one and there are a lot of medical applications for this [as well] on

Earth which NASA is interested in," said Cluff, assistant professor of biomedical engineering.

The goal is a sensor that is passive (need no batteries), robust and lightweight (no electrical components), and able to wirelessly monitor critical factors related to astronaut health and performance.

The idea is that biological electrical and magnetic properties can be leveraged to detect these parameters using a novel micro-coil skin patch sensor—applied like a small adhesive bandage or woven into garments, according to Cluff.

The sensor's single baseline component is a thin conductive trace of copper shaped as a planar spiral. When impinged upon by a radio frequency wave, the micro-coil develops electrical current flows in the trace and magnetic field-line formulated around the sensor. Fluctuations in the magnetic field lines will be correlated with changes to physiological parameters. Each factor (blood

flow, body temperature, etc.) will cause its own unique reaction. The sensor's capability to detect various physiological parameters and intracranial pressure will be investigated by fashioning an array of micro-coils, each tuned to detect a specific physiological parameter.

After optimizing the sensor design parameters to work on human tissue and investigating the sensor capability to measure multiple factors, then "the question is can we still make these measurements when the subject is wearing a Liquid Cooling Ventilation Garment (LCVG)?" said Cluff. Another goal of the project.

Further impacts of this research may be education sessions at the Kansas Cosmosphere and Space Center, a partnership with Project Lead the Way to provide a research experience for underrepresented high school students and new partnerships with industry and NASA.

### "Genetics" cont. from page 1

curious as to what parallels there might be. "[There are] lessons that can be drawn from the past as to what might be expected as our species expands out into space on the long term," says Raff.

Raff also was privileged to tour the HERA (Human Exploration Research Analog) at JSC. This mock-up studies human long-duration space flight (think "The Martian"—only much smaller quarters) Her informative blog on that project can be found [here](#).