



**NOTE:** Though the focus currently is on the first woman on the Moon, there are brilliant women involved in many areas of the space arena. We would like to highlight some of them.

This is the first of a series of articles featuring Kansas women currently in the space field.

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## Annual Galaxy Forum update

Due to the uncertainty surrounding the coronavirus situation, the annual Ad Astra Kansas Galaxy Forum usually held at the Cosmosphere in August has been postponed until this fall—likely late October.

This fall event will likely be a hybrid event with in-person speakers plus a virtual element to enable many more interested persons to access our event. Watch our Facebook page for the latest information.

## Spacesuit design—engineering put to a stellar use

Mallory Jennings has always loved math and science exploration.

A native of Wichita, Jennings graduated from Goddard High School in 2005 and from Wichita State University in 2010 with a bachelor's degree in mechanical engineering. "In asking around and figuring out what career I wanted to pursue, it seemed like engineering was the right fit," she said.

Studying at WSU included internships at NASA Johnson Space Center (JSC). "I would work one semester and then go back to Wichita for school the next semester." She worked for four semesters in the Engineering Directorate working on the ventilations subsystem of the Portable Life Support System (PLSS), which is worn like a backpack and supplies the space suit with oxygen and other vitals to sustain an astronaut outside the spacecraft.

Jennings worked in the Mission Operations Directorate (MOD)—known as Mission Control—during one of her intern semesters, but most of her time at NASA has been working in spacesuit engineering. She has worked on both the future and current suits.

Jennings is currently the System Manager for the Extravehicular Mobility Unit (EMU). "I am in charge of the current spacesuit, making sure it is working / fits the astronauts. If there are any problems, I lead the team to find an engineering solution to provide the astronauts on the International Space Station (ISS)."

For example, during the July 1, 2020, spacewalk she worked from a room at JSC's Mission Control monitoring the space-suit performance of astronauts Chris Cassidy and Bob Behnken while they were outside the ISS replacing aging nickel-hydrogen batteries with new lithium-ion ones.

As to the future—with plans to stay on the Moon for long periods, a spacesuit has added requirements.

"One of the main things is that the new suit is being designed to walk on a planetary surface like the Moon or Mars, changing the design needed and the materials used. For example, the spacesuit pants have to have added bearings to aid with their ability to walk. New materials are needed for the more extreme temperatures or for the dust on the Moon or Mars. My team is



Photo credits: NASA



Mallory Jennings, along with Heather Paul, demonstrate space suit parts and tools.

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## Spinning galaxies have unexpected possibilities

Got a **STUDENT INTERESTED** in **SPACE?**



Find out what it takes to be a part of the Artemis Generation and NASA's steps toward the Moon and beyond! Geared specifically for students.

**Virtual Q +A with NASA Astronaut Nick Hague**

Also including  
Cosmosphere Camp  
alumni  
Teresa Sindelar and  
Charlie Garcia

**Tues. July 21**

**10:30- 12 p.m  
CDT**

To register, email [HQ-Virtual@mail.nasa.gov](mailto:HQ-Virtual@mail.nasa.gov) and indicate your interest. Participation information will be sent to you. Spots are limited.



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MANHATTAN —There are unexpected links between the spin directions of galaxies, suggesting that the early universe could have been spinning, according to a K-State study.

These findings are significant because they conflict with previous ideas about the large-scale structure of the universe.

Since the time of Edwin Hubble, astronomers have believed the universe is expanding with no particular direction; and that its galaxies are distributed with no particular structure.

Recent observations of geometrical patterns of over 200,000 spiral galaxies suggest the universe could have a defined structure and that the early universe could have been spinning.

Patterns in the distribution of these galaxies suggest that spiral galaxies in different parts of the universe, separated by both space and time, are related through the directions toward which they spin, according to the study.

"Data science in astronomy allows us to observe the universe in a completely different way," said K-State computational astronomer Lior Shamir, also an associate professor of computer science, who presented the findings at the 236th American Astronomical Society meeting in June. "The geometrical pattern exhibited by the distribution of the spiral galaxies is clear but can only be observed when analyzing a very large number of astronomical objects."

A spiral galaxy is a unique astronomical object because its visual appearance depends on the observer's perspective.

For instance, a spiral galaxy that spins clockwise when seen from Earth, would seem to spin counter-

clockwise when viewed from the opposite side of that galaxy.

If the universe has no particular structure — as previously predicted — the number of galaxies spinning clockwise would be roughly equal to the number spinning counterclockwise. Shamir used data from modern telescopes to show this is not the case.

Modern robotic telescopes are able to image many millions of galaxies automatically as they survey the sky. Machine vision can then sort millions of galaxies by their spin direction.

When comparing the number of different spin directions, the number of galaxies that spin clockwise and counterclockwise is not equal. The difference is just over 2%, but with the high number of galaxies, the probability is less than 1 in 4 billion to have such asymmetry by chance, according to Shamir's research.

The patterns span over more than 4 billion light-years, but changes occur over time. The study found this imbalance higher with galaxies more distant from Earth (further back in time) which shows that the early universe was more consistent and less chaotic than the current universe.

Not only do the patterns show that the universe is not symmetric, but also that the asymmetry changes in different parts of the universe, and the differences exhibit a unique pattern of multipoles.

"If the universe has an axis, it is not a simple single axis like a merry-go-round," Shamir said. "It is a complex alignment of multiple axes that also have a certain drift."

The concept of cosmological multipoles is not new. Previous earth and space-based observatories have shown that the cosmic mi-

crowave background, which is electromagnetic radiation from the very early universe, also exhibits multiple poles.

Shamir is confident in the findings. "There is no error or contamination that could exhibit itself through such unique, complex and consistent patterns," Shamir said. "We have two different sky surveys showing the exact same patterns, even when the galaxies are completely different. There is no error that can lead to that."

### Spacesuit cont. from page 1

working the new suits," said Jennings.

How does she find her work? "I LOVE my job and it is stressful, challenging, and VERY rewarding, sometimes all in the same day (sometimes within the same hour!)" said Jennings.

Jennings said the thing she likes most besides her job is talking to people (mostly kids) about it. "I have a really cool job working on the spacesuit and I just want to keep inspiring kids!"

To students interested in STEM, Jennings said, "AWESOME! We are going to need to continue to get people in STEM...[so I tell them] figure out what they really like in STEM and then study really hard."



**Jennings gives a space suit presentation to 3rd graders in the Maize district. Photo source: USD #266 website**

## FHSU 2020 VEX national robotics championship teams include KAMS / AMS students

HAYS—Not only did the VEX Robotics team from Fort Hays State University's (FHSU) chapter of the Technology & Engineering Education Collegiate Association (TEECA) win its third national title in four years at the International Technology and Engineering Educators Association (ITEEA) national competition in Baltimore in early March—

Second place went to the 15-member VEX robotics team from FHSU's Kansas Academy of Mathematics and Science (KAMS) and Academy of Mathematics and Science (AMS).

These KAMS / AMS students are high school juniors and seniors studying under the Early College Programs umbrella at FHSU.

"It is incredibly impressive that a team comprised of all early college students defeated high-ranking college teams of traditional college students from Purdue and State University of New York (SUNY)," said Abby Anderson, KAMS Director of Marketing .

KAMS hosts Kansas students and AMS those from other states or countries. Its residential program integrates students into the academic community at FHSU. Student tackle over 60 hours of coursework. The college credit they receive flows back to their sending high schools for graduation. Established by the Kansas legislature in 2006 to promote STEM in Kansas, 2019 enrollment was 50 Kansans and 33 out-of-state students.

The entire FHSU college TEECA team competed in nine events against 12 other universities, winning five individual national championships and the all-around 2020 national title.

## KU juniors awarded 2020 astronaut scholarships

LAWRENCE — Two University of Kansas juniors are the latest to earn scholarships from the Astronaut Scholarship Foundation.

Angelica Lang, who studies molecular, cellular & developmental biology and Jonah Stiel, who studies chemistry, earned the awards of up to \$15,000.

Lang, a graduate of Manhattan High School, started conducting research at Kansas State University while still in high school.



**KAMS/AMS team (black shirts with shoulder stripes) compete at the ITEEA competition in March. Photo courtesy of ITEECA —[www.iteea.org](http://www.iteea.org)**

At KU, she works in the lab of Erik Lundquist, professor in the Dept. of Molecular Biosciences. There, she works on neuron migration, increasing the understanding of how genes control how nerve cells move from one place to another.

Stiel, from Topeka, is a graduate of Washburn Rural High School.

He began working in the lab of James Blake-more, associate professor of chemistry, while still in high school. His interest is how catalysis – the speeding up of chemical reactions – can play a role in solving the world's energy problems.

Astronaut Scholarships are awarded to students in their junior or senior year of college studying STEM with the intent to pursue research or advance their field upon completion of their final degree. This year 56 scholarships were awarded to students from 41 universities.

The foundation's Astronaut Scholarship was founded in 1984 by the six surviving members of the Mercury program as a means to encourage students to pursue scientific endeavors. Astronauts from the Mercury, Gemini, Apollo, Skylab and Space Shuttle programs have joined the foundation, which has awarded more than \$4 million to more than 400 of the nation's top scholars.



**Photos: KU press release**

# Kansas planetariums display the universe

By Jodi Spindler

Looking at the night sky across Kansas is an educational experience like none other. Almost any evening one can look about and identify many celestial features. However, in order to know what you are looking at in our night sky, it is good to stop at a local planetarium and be educated on what you observe in the night time sky.

Planetariums are a nice get-away for families to educate themselves on the beauty of what lies above and to understand that our galaxy is billions and billions of years old and that we may not be alone. If you are looking for a planetarium, here are some across Kansas and just outside of Kansas to consider visiting once we get past the COVID crisis:

**Barton Planetarium** on the campus of the **Barton County Community College** received a full reboot in 2014. The renovation included a high definition digital projection system for the 360 degree dome. It is able to do educational videos and interactive learning games as well as the usual programs. Free and open to public. For information contact Brian Howe, Dean of Academics [howeb@bartonccc.edu](mailto:howeb@bartonccc.edu) <https://www.bartonccc.edu/community/planetarium>

**Boeing Dome Theater & Planetarium** – in Wichita is part of **Exploration Place Science Center**. Considered the largest dome in the state with a 60 ft. screen and booming sound, you can immerse yourself in this theater. It is \$5 to get in and if you have questions, call (316) 660-0600 or go to <https://exploration.org/theaters/dome-theater/>. Located at

300 North McLean Boulevard,  
Wichita, KS 67203.

**Fort Hays State University** – FHSU has a Digitarium portable planetarium with a capacity of about 25 people. G.G. Launchbaugh, Director of Makerspace and Markervan Science & Mathematics Education Institute is willing to travel throughout the state and make presentations with the planetarium. In some cases, it can be loaned out to other groups. He can be reached at FHSU, 600 Park Street, Hays, KS 67601 and by voice mail or text at (785) 675-1499.

**Justice Planetarium** - Probably one of the more well-known places to study all-things-space is the **Cosmosphere** which houses this planetarium. A trip here will delight the entire family. Tickets to this theatre can be purchased online or in advance by calling the box office at (620) 665-9312. Any questions can be directed towards Carla Stanfield, Public Relations Coordinator. The Cosmosphere is located at 1100 North Plum, Hutchinson, KS 67501, <https://cosmo.org/>.

**L. Russell Kelce Planetarium** – Nestled on campus of **Pittsburg State University** campus, this planetarium provides both public and private programs. Admission is \$3 for adults, \$2 for students. David Pearson, Director of the PSU Planetarium can be reached at [dwpearson@pittstate.edu](mailto:dwpearson@pittstate.edu). PSU is located at 1702 S. Joplin Street, Pittsburg, KS <https://www.pittstate.edu/physics/Planetarium.html>.

**Peterson Planetarium** – **Emporia State University** offers an experience for those seeking an education on our solar system. The theatre seats 38 under a 24-ft projection screen dome. A Spitz 512 star projector was installed in 1996 and the entire facility was renovated in 2014, adding a hemispherical mirror projection for full dome audio video programming and a digital projector for digital media interaction. This is part of the outreach of the Math and Science program. <https://www.emporia.edu/about-emporia-state-university/campus-organizations-and-attractions/peterson-planetarium/> Inquiries on upcoming programs can be directed to [scimathc@emporia.edu](mailto:scimathc@emporia.edu).

**The Arvin Gottlieb Planetarium** – just over the Kansas border in Kansas City, this planetarium was recently updated with a state-of-the-art projection system. It is part of the bigger **Science City**, which is located in the old historic Union Station at 30 West Pershing Road, Kansas City, MO 64108. <https://www.unionstation.org/sciencecity/about>.

With all these locations of planetariums around the State, it is easy to find the one to visit and learn more about the sky and the galaxy that lies above you. Take advantage of one of these places and explore our universe.

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INTERSTELLAR R & D will return in Fall 2020 issue