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They were only expected to last five years...



The Voyagers have exceeded all expectations, according to JPL senior propulsion engineer Todd Barber at the Aug. 27 Galaxy Forum in Hutchinson.

"Before Voyager, we'd never had a spacecraft last more than a year—and to get to Jupiter and Saturn we needed it to last five years. That was NASA's stretch goal," says Barber.

Voyager came about because in the 1960s some smart grad students at JPL realized there would be a rare cosmic lineup of Jupiter, Saturn, Uranus and Neptune on the same side of the Sun in 1977. This happens every 176 years. The last time was in 1801. "Jefferson blew it, so they didn't want to blow it this time," said Barber. A

spacecraft could fly by all of them in only 12 years versus the 30 it would usually take to get to Neptune.

Voyager was launched in 1975 with 69 k of memory each. Today's iPhone 5 has 240,000 k of memory. "What are the chances your cell phone will still be working in 45 years?" said Barber.

One of the biggest surprises of the early flybys was at Jupiter...

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## More views of the Galaxy Forum..



Learning about the DART mission from Dr. Paul Adams



AAKF board member Kay Neill introduces speakers



## AAKF adds to board

AAKF welcomes a new board member, Sarah Lamm.

"I want to use my position to help uplift current students and encourage new students to pursue space sciences in Kansas," said the Colby native.

She certainly has a good start on it. Since 2013, she has held over 50 successful science events for more than 2,500 participants.

Lamm is a PhD student in geology at KU studying aqueous minerals with Raman spectroscopy. This after graduating with her master's in geology from K-State in 2021, having previously earned triple bachelor of science degrees in chemistry, geology, and geography there in 2018.

As an undergrad, she was a team member on the Mars Curiosity Rover and worked at Los Alamos National Lab for three summers. She also interned at NASA JPL in 2021 & 2022 studying iron minerals with lasers.

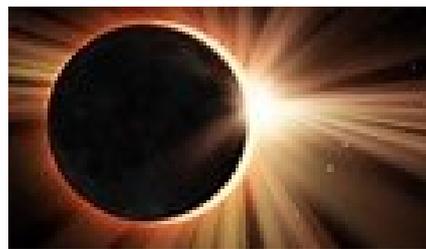
Her goal for the future is to work for NASA or another national lab researching Mars and/or Titan, Saturn's Largest moon.

Lamm was selected as a 2019 Mars Generation 24 Under 24 Leader in STEAM & Space, and the 2020 K-State Student Science Communication Award winner.



## And thank-you to...

Dr. Craig McLaughlin, who is stepping down from the AAKF board. He has been a board member since 2016.



## NASA Eclipse Ambassadors wanted for 2023 & 2024

UNDERGRADUATES and AMATEUR ASTRONOMERS--"Do you love eclipses and want to share the wow of space science with your community? Apply to become a NASA Partner Eclipse Ambassador!

In October 2023 and April 2024, two eclipses will be happening across the United States. In an exciting new partnership, undergraduate students and amateur astronomers will partner to engage their local communities, providing solar viewing glasses as well as science context for underserved communities off the central paths" across all 50 states.

Any undergraduate student / amateur astronomer with an interest in eclipses and sharing science with the public is asked to apply. Applications are being accepted now. Five hundred teams of two will be selected across the US.

Ambassadors and their partners will train with a 3-week virtual workshop (12 hours total). And learn the tools and techniques for engaging the public and be supplied with educational materials. The goal is to have at least 50% of participants be from underserved communities. Find information here: <https://science.nasa.gov/.../eclipse-ambassadors-off-the-...> <https://astrosociety.org/.../eclipse.../program.html>



## High Altitude Ballooning at Fort Hays State University...

*...gives students a view from 30 km (100,000 ft)*

By Dr. Paul Adams

How often have you looked up and thought – “I want to fly to space!” If you are reading this in Ad Astra, you are likely in the group wanting to get out and up there. Space exploration is so intrinsically exciting that it draws people of all ages and backgrounds. While few of us will have missions that cross the Kármán line at 100 km (~60 mi) to earn astronaut wings, we can fly payloads to near-space with high altitude balloons.

The Fort Hays State University (FHSU) Science and Mathematics Education Institute (SMEI) has supported high-altitude ballooning (HAB) opportunities since 2011. Since then, FHSU has launched over 100 HAB research missions reaching heights upwards of 30 kilometers (~ 18 mi) for elementary, middle, high school and college students in Kansas...

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Widely known as a "genius grant"

## KU physicist receives a 2022 MacArthur Fellowship

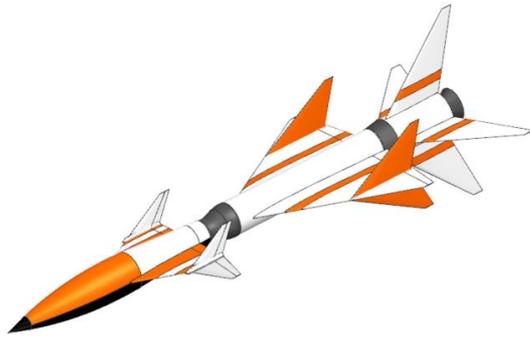
LAWRENCE — The MacArthur Foundation [announced](#) Steven Prohira, [assistant professor](#) in the Department of Physics & Astronomy, as a Class of 2022 MacArthur Fellow.

The [fellowship](#) — widely known as a “genius grant” — is an \$800,000, no-strings-attached award to extraordinarily talented and creative individuals as an investment in their potential.

As a physicist, Prohira is advancing the study of cosmic rays and ultra-high energy neutrinos through a rare

combination of expertise in three distinct areas: theory, engineering and experimental design.

[Continue reading here](#)



## KU aerospace engineering students excel in national design competition

*This makes 41 AIAA awards in a decade*

LAWRENCE — A team of student engineers from the University of Kansas took second place in the prestigious American Institute of Aeronautics and Astronautics design competition, continuing KU's long history of success at the event.

The students won recognition from the AIAA for their design of an unmanned hypersonic spy plane, (see illustration) which they named the "Hyperhawk" system. Ron Barrett-Gonzalez, professor of aerospace engineering, said the award is the 41st that KU students have received in AIAA competition over the last decade.

"Our department is not exactly like the basketball team, but if you keep posting win after win after win, eventually people take notice," he said

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## NASA engineer returns to WSU as Innovator in Residence

WICHITA--Dr. Ryan Amick, a Wichita State University alumnus and NASA engineer, has been selected as one of the Innovators in Residence for the College of Innovation and Design during the 2022-23 academic year.

Amick is a principal human factors engineer at NASA Johnson Space Center in Houston. He serves as the extravehicular activity (EVA) human factors lead, where he provides human factors and human-systems integration guidance to the NASA community as applied to the development of the Exploration EVA

System, and its integration with the larger NASA Spaceflight System Architecture.

[Continue reading here](#)



## K-State doctoral student awarded prestigious Ford Foundation fellowship

MANHATTAN-- [The National Academies of Sciences, Engineering and Medicine](#) have selected K-State chemistry doctoral student Arnaldo X. Torres-Hernandez, to receive one of 77 Ford Foundation Postdoctoral Fellowships in 2022. A native of Puerto Rico, his award is in organic chemistry.

[Continue reading here](#)

### Quick Notes

- NASA's Planetary Defense September 26 DART mission was a success. NASA confirms the spacecraft's impact altered asteroid Dimorphos' orbit around Didymos by 32 minutes. FYI: The head of the NASA Planetary Defense Office is [Lindley Johnson](#), a 1980 KU grad in astronomy. He also has an asteroid (#5905) named for him.



[Thru the Wichita Space Initiative \(WSI\)](#)

## Pioneering course on interstellar science, communities and civilization to be offered

WSU is offering a course on interstellar science with a humanities bent in the spring of 2023. This non-technical course (no deep science) will cover space travel and technologies as well as human issues of interstellar travel. Interstellar missions, if they're peopled, could be multi-generational. What's life going to be like in a multigenerational ship? What kind of culture are you going to have? How do you keep healthy, both physically and mentally? What about life support systems? Effects of long-term space exposure?

This one-credit hour course is relatively accessible, very broad. It will include

several panel discussions on these topics with expert speakers from all over the U.S. and Kansas. (We are, after all, the Ad Astra State.)

For more info contact [mark.schneegurt@wichita.edu](mailto:mark.schneegurt@wichita.edu)

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FALL 2022

## Interstellar R&D

By Steve Durst

### Ad Astra Kansas News—Fall 2022, Vol. 21 No.3—Interstellar R&D #42

This “Interstellar R&D” forty-second feature continues a 21-year enterprise to research and gather information on important developments preparatory to humanity’s greatest adventure – voyaging to the stars. Now, at 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 feature and newsletter, thus, now set forth to develop a 21st-century national / international / global clearing center and storehouse of knowledge and know-how for travel to the stars. Ad Astra, Galactically – Steve Durst

### Observation

#### *Two New Astronomy Frontiers: Sun-Earth L2 and Moon*

Two prominent extraterrestrial sites host the two pioneering 21st century astronomical observatories noted in the previous “Observation”: Sun-Earth L2 for JWST 1.5M km from Earth, and Earth Moon Luna for projected ILO-X 400K km from Earth.

Lagrange L2 provides stable point where Sun plus Earth combined gravity balance to keep JWST in halo orbit about L2, while its instruments in this solar orbit are shaded from Sun, Earth, Moon heat and light having unimpeded view allowing super cool science operations 24/7. At L2, JWST joins Gaia and Spektr-RG, after Planck, Herschel, WIND, WMAP observatories.

The Moon / Luna provides stable platforms of immense size and variety, with vast material and energy resources to enable astrophysical observatories that rise naturally with developing settlements, as they do on Earth; ILO-X astronomy observations would follow Chang’e-3 LUT 2014 and Apollo-16 FUVS 1972, and would be followed by ILO-1, ILO-2, and many international and independent astronomical enterprises; astronomy on and from the Moon enables unimpeded universal view with global placement of telescopes and observatories to operate under 1/6-G in ultra-thin exosphere.



Graphic credit: STSci

### Communication

#### *Ongoing Radio, Laser, Optical Interstellar Transmissions*

Interstellar travelers, Voyager 1 (beyond 158 AU) and Voyager 2 (beyond 131 AU), are the farthest communicating spacecraft, having crossed the Heliopause in 2012 (V1) and 2018 (V2). One-way light time to Earth takes V1 ~22 hours and V2 ~18 hours. Their 23-watt radios transmit messages in 8 GHz frequency using 14-foot diameter transceivers which are received by directionally-pointed Earth-based Deep Space Network (DSN). DSN 100-230 foot antennas are situated 120° apart in longitude at 3 locations, running 24/7/365. Europe, China, India, Japan and Russia also have deep space radio networks.

Soon to assist lunar missions are Goonhilly Earth Station (32-meter antennas) and Swedish Space Corporation (10 stations with 2 facilities being built). Lasers, however, offer accelerated data transmission rates 10-100 times faster than radio. LADEE lunar orbiter used a pulsed laser to downlink to Earth from 239,000 miles, setting a record of 622 Mbps and an 'error-free' upload rate of 20 Mbps. Breakthrough Listen, spanning 2016-2026, is using radio wave and optical observations to search for intelligence throughout the Milky Way and 100 closest galaxies.

by Prof. Mark Schneegurt begins Wednesday January 18 from 2:30-3:20pm.

Interstellar Research Group is holding 8th Interstellar Symposium with Program Chair Les Johnson at McGill University in Montreal, Canada July 10-13, 2023 on topics Physics & Engineering, Astronomy, Human Factors, Ethics, and Astrobiology.

Prominent USA and China researchers are pursuing new mission concepts for interstellar transportation achievable with current flight-ready technology. Ralph McNutt (JHUAPL) champions US\$3.1B Pragmatic Interstellar Probe with nominal launch date NET 2036 - utilizing a heavy-lift vehicle (SLS or Super Heavy) with multiple additional upper stages and Jupiter gravity assist to attain speed of ~7 AU / year and a mission lifespan including comms with Earth out to 1,000 AU.

Wu Weiren (CNSA) advocates Interstellar Express, including probes IHP-1 and IHP-2 launching NET 2024 and 2026, reaching 100 AU by PRC Centennial 2049. Both concepts rely on advanced radioisotope thermoelectric generators once deployed.

To achieve human interstellar transportation, novel solutions must be considered – the 4.25 LY distance to Proxima Centauri could be completed in 42.5 years at 0.1c – such as an Alcubierre warp drive, which could theoretically bend spacetime around a vessel in accordance with Einstein field equations, harnessing exotic / antimatter, the quantum Casimir effect, or micro-gravity engine as proposed by Nghi Nguyen at IAC 2022.

### Transportation

#### *Near-Term Initiatives and Far-Out Propulsion Theories*

Launching from 'An Interstellar University in the Ad Astra State' initiative, the 1-credit hour 2023 Interstellar Seminar at Wichita State University 'LASI 150G' led

See full-sized version

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