AD ASTRA
KANSAS
FOUNDATION

AD ASTRA KANSAS

Volume 12, Issue 1 Spring 2013

AD ASTRA KANSAS DAY 2013:

- **April 27, 2013**
- **Stoffer Science Hall Washburn University Topeka**
- **5:30—10 p.m.**
- **Fun for all ages**
- **Free**
- **For more information go to www.adastra-ks.org**

Inside this issue:

Ad Astra Kansas Day travels from Earth to the Van Allen Belt to Curiosity to Voyager

Why are we studying the Van Allen Radiation Belt?

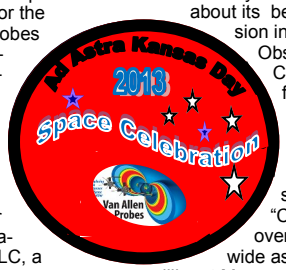
Voyager (Are we there yet?)

How did a Kansas high school get an observatory and what's coming next?

How do you name a spacecraft?

Answering those questions at the 2013 Ad Astra Kansas Day Space Celebration in Topeka will be:

Dr. Jerry Manweiller— He is Co-Investigator and Science Operations Center Lead Engineer for the Radiation Belt Storm Probes Ion Composition Experiment (RBSPICE) instrument on NASA's Van Allen Probes mission, which is exploring Earth's radiation belts. A physicist and software engineer for over 30 years, Dr. Manweiler is a co-founder of Fundamental Technologies, LLC, a software development and data analysis firm in Lawrence, Kansas. Fundamental Technologies is currently participating in six NASA satellite missions including Van Allen Probes and Voyager I & II.



Van Allen Radiation Belt is two donut-shaped regions encircling earth where high-energy particles are trapped by Earth's magnetic field. Space events affect the number of particles and speed. Find out how this extreme space weather can affect us.

Dr. Tom Armstrong—He has been a co-investigator on Voyager for the past 35 years. He has Voyager updates, a Voyager video and plenty of other NASA and space information.

Mike Ford— He instrumental in the start of Elk Creek Observatory, Holton, the only high-school owned observatory in Kansas. He will tell about its beginnings and expansion into Banner Creek Observatory/Science Center, and its potential for science education in northeast Kansas.

Clara Ma—She is the Kansas high school student whose entry "Curiosity" was chosen over 9,000 others nationwide as the name for that diligent Mars rover. She will share what an exciting experience it has been seeing the rover being built , launched and landing.

In addition to all this the ever popular event held at Washburn University Stoffer Science Hall on April 27, from 5:30 until 10:00 p.m., will include games and activities for all ages, model planes demos, space ice cream, telescopes, planetarium shows and stargazing at the Crane Observatory.

This free event is open to the public, and geared for all ages. It is put on through the cooperation of the Ad Astra Kansas Foundation, the Washburn University Department of Physics and Astronomy, the Washburn University Chemistry Club, Northeast Kansas Amateur Astronomy League, Children's Discovery Center, Foundation for Aeronautic Education, American Society of Civil Engineers Kansas Section, Space Age Publishing Company, Mike Ford and Fundamental Technologies, Inc.

Stargazing at the Crane Observatory is always a popular activity at the Ad Astra Kansas Day event

Kansan discovers asteroids to rival Russian one

In September 2012, while doing observations from his back yard observatory south of Topeka, amateur astronomer Gary Hug discovered an asteroid comparable to the meteorite that would hit Russia in February 2013.

Hug's find is a little bigger than the Russian one, (which NASA info says was 18 meters) almost 60 feet across. He reported it immediately to the Minor Planet Center (MPC) at the Smithsonian Astrophysical Observatory. During the next 30 hours, dozens of other observatories around the world confirmed the object.

The rough mathematical estimate gives Hug's asteroid, name 2012 SY49, the potential to orbit as close as 20,000 miles above the Earth—which is underneath the high satellites. "We're not in any immediate danger. Virtual mathematics gives the chance of a hit at 77,000 to 1, but the chance over several centuries that something could occur is there," says Hug.

The drier and clearer winter months are good for observing, and in January 2013, Hug discovered asteroid 2013 AS27. An educated guess is that it is 160-340 meters across. This take-out-a-country-sized asteroid is, fortunately, about 5 million miles away this time around the Sun according to Hug.

An amateur astronomer for the last 40 years, Hug made these discoveries while doing follow-up observations on other asteroids listed on a scientific data bank, the Near Earth Object Confirmation Page (NEOCP) of the Minor Planet Center. He takes one with an orbit that is only vaguely known and by tracking it over the course of several nights helps refine the data and project its orbit with more accuracy. There are not a lot of people worldwide working on asteroids—a half-dozen surveys and about two dozen universities. "We can always use more help," says Hug.

Asteroids generally are in a belt between Jupiter and Mars. Over 99.9 percent are well-behaved, following a basically circular orbit. "A few renegades bump around or are affected by some gravitational influence and veer off into different orbits or directions. It's these less than one percent that

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Meet Our Board

Above: Steve Durst (left) with former Kansas state senator Steve Morris

Steve Durst is editor and publisher at Space Age Publishing Company in Hawai`i and California, and a founder and director of its affiliated International Lunar Observatory Association / Galaxy Forum, Stanford on the Moon, and Ad Astra Kansas initiatives.

Steve's appreciation for Kansas – mid-way USA, the heartland and the breadbasket – provides support for interstellar R&D, inspired by the Ad Astra Per Aspera state motto and by considerations for America and Humanity's long-range future.

Heather Mull assists with business development and project documentation at Fundamental Technologies, LLC, a software development and data analysis firm in Lawrence, Kansas. Prior to joining Fundamental Technologies in 2009, she owned a successful marketing communications company, taught business communications for National Seminars, a Division of Rockhurst University Continuing Education Center, Inc., and was Editor-in-Chief of The Colorado Real Estate Journal.

Mark Smith: "I am a father of four, a proud Kansan, a Marine Corps veteran and a graduate of Washburn University. I earned a PhD in experimental particle physics from Kansas State University. Since 2009, I've been a faculty member at Washburn University."

Smith has been instrumental in the annual Ad Astra Kansas Day Space Celebration at Washburn since its start in 2010, contributing his time, astronomy expertise and administrative skills to this successful event.

Right: Mark Smith, Heather Mull. Far right: Margaret Hennessey-Springe

Margaret Hennessey-Springe is the Director of Education at the Kansas Children's Discovery Center (KCDC) in Topeka. She is responsible for the creation and implementation of educational curriculum and programs at KCDC.

Prior to her work at KCDC, Ms. Hennessey Springe owned and operated "Art to Educate," an art-based educational program for children grades Pre-K – 5. She has created and taught hundreds of multi-disciplinary classes throughout the region that utilize art to reinforce the K-12 Kansas Standards. She serves on the Kansas Next Generation Science Standards (NGSS) review committee, a lead state agency, to provide leadership to the writers and to other states as they consider adoption of the NGSS.

KU researchers seen on Weather Channel series "Forecasting the End"

The KU group has become the world leader in analysis of possible damage to Earth by radiation bursts.

LAWRENCE--Three KU faculty members appeared in the March 21 episode of the new Weather Channel series "Forecasting the End." The episode was entitled "Gamma Ray Burst."

The researchers are Bruce Lieberman, professor of ecology and evolutionary biology; Adrian Melott, physics and astronomy; and Brian Thomas, associate professor of physics and astronomy at Washburn University and adjunct associate professor at KU.

The series chronicles natural disasters that occur only occasionally, but cause severe problems, including extinction of species. Each episode is devoted to one kind of catastrophic event.

The KU group has focused on the kinds of events caused by influences from outside the Earth, particularly bursts of radiation. The researchers said gamma-ray bursts are going off all the time, several per day in the observable universe. Such bursts accompany the death of a star, but in some unusual cases the radiation goes out in narrow jets that can cause damage to a planet thousands of light years away.

"One can show that the Earth should have been hit by such a jet multiple times during the geological past, from such a distance as to likely cause mass extinction [or] the sudden loss of a large fraction of the species that live on Earth,"said Melott.

Melott said mass extinctions have come on average around once per 25 million years.

The KU collaboration has advanced the idea that at least one mass extinction that occurred 445 million years ago "and one of the worst" fits the profile of what would be expected from a hit by a nearby gamma-ray burst. This involves the selective death of species that would be exposed to sunlight during part of their lives, a sudden glaciation, and a pattern of extinction that fits a burst that went off over the Earth's South Pole. The biggest effect damaging life on Earth is a great increase in ultraviolet radiation brought about by damage to the ozone layer resulting from the radiation.

The KU group has become the world leader in the analysis of possible damage to Earth by radiation bursts. In a January report on possible global disasters, the British journal *Nature* devoted one-third of its citations to the KU work.

Thomas added that televising results of these kinds of scientific investigation has special value.

"TV is a great way to get science out of the lab and into people's homes," he said. "This gives them an opportunity to see scientists talking about our work in our own words, supported by engaging graphics and a story line. It's vitally important that the public, which supports scientific research through their tax dollars, have an idea of what it is that we as scientists do."

Cosmic ray observatory provides hands-on experience for WSU senior

Wichita State University physics major Kristyn Harpool never thought she'd be in the middle of a ranch surrounded by cacti. Never expected to be climbing into a water tank, sucking out water and patching with sealer. And loving it.

It was this opportunity to do hands-on physics work on the Pierre Auger (pronounced oh zhay) North Observatory project in eastern Colorado that drew the senior to a physics major two years ago—and to the rangeland.

A graduate of Moundridge High School, "I always kind of liked science, how or why things worked. I planned on going into medicine, then went to Max Planck Institute for Nuclear Physics in Germany one summer, and got to work with the mass spectrometer in physics," she says. That sold her on physics. As a sophomore , she found out about the hands-on experience available with Auger from Dr. Nick Solomey, WSU lead scientist on the project.

This observatory is different from the usual optic one, both in appearance and purpose. This one studies the highest energy level and rarest cosmic rays from outside our galaxy.

In the first stage of this 25-year project, ten sealed water-filled tanks, 12 feet in diameter, each spaced about a mile apart, are located a few miles south of Lamar, Colo. These surface detector tanks detect shrink-off radiation as it hits the ground. Shrink-off radiation occurs when high energy cosmic ray particles break up as they hit the earth's atmosphere. Also sensitive photomultiplier tubes will detect little blue flashes of shrink-off light particles. This data is relayed to WSU, the data headquarters. The goal is to collect information to help explain high energy situations in the universe--for example the high energy emitted by black holes.

As with all new projects, adjustments are being made, solutions devised for concerns such as protection from freezing--a problem not present at the companion Auger South Observatory in Argentina. Hence, the hands-on work inside the water tank.

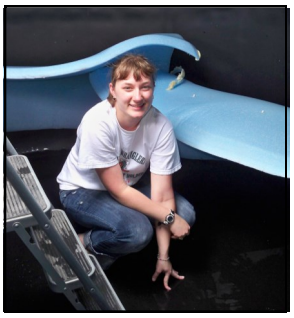
Each of the six universities participating in this project has specific duties. WSU is currently redesigning the electronic data boards for transmitting data. Michigan Tech will build them. As WSU designed the software program collecting the data, its lab is the readout headquarters, and will interpret the information when received, to disseminate to the other collaboration members. "It makes it a big team project rather than one team running it," says Harpool.

"It exciting to collaborate with other scientists," says Harpool. The WSU team has been Solomey, Dr. Holger Meyer and engineering student Nathan Alexander.

"Definitely don't rule out science because you are a minority or think you might be ignored," says Harpool. "This one of the best decisions I have made. It has opened opportunities. If you are willing to work, and interested in learning new things, go for it. Everyone is willing to help you to learn and get better."

NOTE: This project is in transition, according to a just-received e-mail from Dr. Solomey—

"We are not calling [the project] Auger North any more because we are doing research now for the next large cosmic ray experiment which might not look anything like Auger South since better technology is available. And with groups outside of Auger interested to join with the new detectors we want to keep the design unfixed and hence leave off the word Auger. The Department of Energy has made a call for a major new project. A group of about 1200 scientists are putting in a plan for a 100 mile x 100 mile detector on the Colorado-Kansas-Texas-Oklahoma border."



Harpool repairing the inside of a surface detector tank

"Discovers" cont. from page 1

we're interested in because they may affect us," says Hug.

The main asteroid belt has about 6000,000 asteroids whose orbits are known. Probably another 600,000 down to 100 meters wide have yet to be discovered, according to Hug. Asteroids can range from about 700 miles in diameter (and are called dwarf planets) down to a few meters. About 70 percent are a mixed bag of silicates and carbon materials with small amounts of iron. About 25 to 30 percent are near totally iron. Tons and tons of asteroid dust or small meteorites shower the Earth daily, unseen by us.

Hug, a retired machinist, built his Sandlot Observatory (see right) in rural Scranton. The 1500 pound remote controlled telescope has a circle drive and a 22 inch diameter lens. "It's all about diameter size in optics," he says. His telescope can see to a 21-21.6 magnitude. "A 6 magnitude is barely visible to the naked eye. We go 2 1/2 times dimmer with each magnitude," says Hug.

Hug is a member of the Northeast Kansas Amateur Astronomy League (NEKAAL) and was principal investigator for a NASA Near Earth Object Following Program for three years at Farpoint Observatory, Eskridge.

What is the difference?

Asteroid: A small, inactive, rocky body orbiting the sun

Meteroid: A small particle from an asteroid orbiting the sun

Meteor: A light phenomena occurring when a meteorite burns up in the Earth's atmosphere—a shooting star

Meteorite: A meteoroid that survives its passage through the Earth's atmosphere and hits the ground

Source: NASA facts

Where can I see meteorites in Kansas?

Kansas Meteorite Museum, Haviland—Meteorite fragments scattered thousands of years ago around Brenham, Kansas. First discovered by settlers in the 1880s, well-known by the 1920s, fragments are still found every year.

Big Well Museum, Greensburg—The "Space Wanderer", a 1000 pound pallasite meteorite was uncovered in 1949 in Kiowa County. It is on display at the museum

Kansas Meteorite Museum owner Don Stimpson with a large Brenham meteorite fragment found in 2009

Northeast Kansas Amateur Astronomers League, Inc. (NEKAAL)

Founded 1978

Welcomes amateur astronomers of all expertise levels

Owns and runs Farpoint Observatory, Eskridge

History of discovering asteroids—participated in NASA Near Earth Object (NEO) Following Program for three years. Nearly 5,000 NEOs turned into MPC by Farpoint Asteroid Search Team (FAST)

Cool item: the observatory houses the 27" Clyde Tombaugh mirror on permanent loan from KU

Outreach:
Presentations
Star Parties
Observatory Open Houses
Asteroid Research

Interested? Go to www.nekaal.org

INTERSTELLAR R & D

Ad Astra Kansas News

This "Interstellar R&D" feature in the Ad Astra Kansas News twenty-third 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—

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AD ASTRA KANSAS FOUNDATION

Observation

Kansas, USA Astronomy Resources

Ad Astra State Kansans mindful of the State Motto naturally look up to the sky and to the Galaxy Stars beyond.

The ample number of Kansas astronomy societies, observatories, university astrophysics centers, and astro-related activities reflect general public awareness and appreciation for the State's inspiring, directional motto.

Astronomy clubs in Kansas that feature meetings, star parties and astronomy programs include Astronomy Associates of Lawrence, North Central Kansas Astronomical Society of Manhattan, Salina Astronomy Club, Heartland Astronomical Research Team and Northeast Kansas Amateur Astronomers League of Topeka, and Kansas Astronomical Observers of Wichita.

Many of the clubs, colleges and universities own and / or operate astronomical facilities such as Mabee Observatory at Bethel College, Earl Bane Observatory at Cloud County Community College, Farpoint Observatory at Eskridge, Pittsburg State University – Astronomical Observatory of Greenbush, Banner Creek Science Center / Observatory in Holton, Powell Observatory in Louisburg, Crane Observatory of Washburn University in Topeka, and Lake Afton Public Observatories of Wichita State University.

Higher and professional astronomy education is offered by the Physics and Astronomy departments of the University of Kansas in Lawrence, Washburn University in Topeka, and Fort Hays State University, and related Aerospace education by Wichita State University.

The Kansas Cosmosphere and Space Center of Hutchinson is astounding both for its very existence in the modest farm town, and for its extraordinary world class collections and exhibits of space transportation, space suits, and space-age technologies.

Communication

Optical Communications Steadily Improve

Interstellar communications is clearly one of the key technologies required for humans to explore and populate deep space. The signal received from Voyager 2 – as it passed Neptune – would have been 81 million times weaker if it had been sent from Alpha Centauri. Already, the Voyager spacecraft's 23-watt signal has spread to over 1,000 times Earth's diameter by the time it reaches us.

"Optical", or "Laser" Communication systems offer a number of benefits for interstellar travel. First, data could be transmitted as much as 100 times faster, while antennas could be reduced to be only 1% of their current size. The reduction in weight alone makes the laser systems attractive for deep space missions.

Laser data transmissions also offer enhanced security, due to the narrowly focused beam. It is this same narrow beam that requires additional fine tuning however, as the pointing mechanism must be highly accurate. For interstellar applications, pointing may be based on the Sun-illuminated Earth or background stars. An even greater benefit may be gained from deploying a FOCAL probe, which would utilize the natural gravitational lens of the Sun.

Recent testing on the Moon has yielded encouraging results. NASA's LRO (Lunar Reconnaissance Orbiter) recently received an image of the Mona Lisa via laser transmission. Additional testing will be done with the Lunar Atmosphere and Dust Environment Explorer (LADEE) and the Laser Communications Relay Demonstration (LCRD) is scheduled for 2017.

Transportation

Kansas: An Interstellar Exploration Center?

There's a spot in Lebanon, Kansas which is marked as the geographic center of the contiguous United States of America; the creators of Google Earth have chosen Lawrence, Kansas as the center point of planet Earth. While these designations are to some extent arbitrary, there is no doubt that Kansas is central – both historically and geographically – to the dreams, hopes and aspirations of this country.

The Kansas Historical Society lists eight major industries in Kansas, including aviation, mining and railroads. These particular industries seem to complement the State Motto – "Ad Aspera Per Aspera" – and almost form a natural framework for interstellar exploration to eventually be the defining industry of the State of Kansas, especially with Wichita producing the most aircraft in the world.

Someday, interstellar spacecraft will carry humans to a new frontier of opportunity – as did the railroads – and mining along the frontier will provide sustenance.

A mathematician at Kansas State University, Dr. Louis Crane, believes the ability to create and control black holes may be the key to interstellar transportation. He wonders how one might convert radiation output from a black hole into an exhaust stream with useful properties.

Already, the first spacecraft to leave the solar system and traverse deep space is being closely monitored by Kansas Professor Emeritus Tom Armstrong, who worked with Van Allen and designed one of the key science instruments on Voyager, which launched in 1977. Today, his Lawrence-based company, Fundamental Technologies, still analyzes Voyager's transmissions.

The 100-Year Starship Project features these words on its website: "All the capabilities needed to accomplish human interstellar travel are the same ones required for successful human survival." With the future of the human race in the balance, a central repository – such as Kansas – may be the key to the future. The 100-Year Starship Project might look to Kansas as a resource and consider holding their next major conference there.