



NASA awards \$1.9 million to KU Center for polar studies

The amount of data to be gathered by researchers from CReSIS (Center for Remote Sensing of Ice Sheets) at KU as they take part in NASA's Operation ICE Bridge program is staggering.

"The mission will gather two TeraBytes (1,000 GigaBytes) of information a day," says William Blake, KU Ph.D. student in electrical engineering, whose job it will be to turn data into color-coded images to be looked at and analyzed within 24-48 hours after recording.

CReSIS at KU has been awarded \$1.9 million to participate in the Operation ICE Bridge program.

NASA's Ice, Cloud and land Elevation Satellite (ICESat), used since 2003 to gather data for climate research of the polar regions, will cease operations by the end of 2009. As ICESat II will not be launched until 2014, Operation ICE Bridge will handle data gathering during the interim.

KU has a history of working with NASA to collect climate data, according to project principal investigator and KU professor of electrical engineering and computer science Christopher Allen. "KU researchers, specifically Professor Prasad Gogineni, have participated in these missions for more than fifteen years," he says.

CReSIS is a Science and Technology Center established by the National Science Foundation in 2005 to develop new technologies and computer models to assess the relationship between sea level changes and the changing mass of polar ice sheets and glaciers. CReSIS is a partnership of six universities with KU being the lead institution.

Involvement in Operation ICE Bridge, which is managed out of NASA's Earth Science Project

Cont. page 3 "Polar"

Space physics on the radar at Fort Hays State

Location. Location. Location.

Being less than 100 miles from the geographic center of the continental United States and having the ability to maintain such a project, Fort Hays State University will be the site of a space radar system now being built a few miles west of Hays, in Ellis County.

Virginia Tech University approached FHSU well over a year ago to partner with them on a ten-year project which is part of the Super Dual Radar Network (SuperDARN), according to Dr. Gavin Buffington, chair of the FHSU Department of Physics. SuperDARN is an international network of over twenty high-frequency radars used by scientists and engineers to study how the space environment affects the Earth.

This project is funded by the National Science Foundation with FHSU providing the land and an intern for support services.

The ground was broken in August and the system will be up and running by the end of the year. It will have two antennas. Each antenna is made up of a set of two lines of aluminum poles, one row 50 feet tall, the second about 20 feet tall, a total of 72 poles looking like flagpoles. Antenna cables will run the length of each radar row. Tall poles are the radar. The shorter ones serve as reflectors that improve the directionality of the radar. One antenna will point northeast, another northwest. Both will operate in a 20-meter MHZ wavelength.

The study focus will be the ionosphere, the highest layer of the Earth's atmosphere which extends up about 350 miles. The ionosphere is made up of a layer of charged particles, electrons and ions or electrically-charged gasses (also called plasma.) This charging is caused by the Sun's radiation.

This gets into space physics, the effect of the sun on the atmosphere. "This feeds in in two ways—the basic knowledge of the atmosphere and in the area of communications—sunspots, for example, can affect atmosphere and satellite communications. So this is an area [to learn] both basic and applied knowledge," says Buffington.

SuperDARN uses the Doppler effect radar to see the motion in the ionosphere in much the same way Doppler radar can see into the interior of a tornado or the raindrops in a storm.

Scientists want to know more about the interaction of solar winds, sunspots, solar flares on the atmosphere. This interaction causes the auroras

among other things. "Many of the big power outages in the United States in recent years have been caused by the effects of solar winds and geomagnetic storms," says Dr. John Heinrichs, chair of the FHSU Dept. of GeoSciences. "These geomagnetic storms can induce currents in long conductors such as power lines. These lines can only take so much current which can act as current breakers, tripping the power."

Another concern is that these also put space craft at risk. "It's a big question. What do you do if the astronauts are on a flight to Mars and a big solar flare occurs?" says Heinrichs.

There are radars situated at northern latitudes to monitor the pole areas and the auroras, but what scientists are really interested in is what happens with really severe solar flares. In those cases the auroral arc will be too big to be captured by those northern radars. The arc will go over and behind them (further south), according to Heinrichs. Radars at more southern latitudes like Kansas will capture that data.

Cont. page 3 "FHSU"

NSF awards \$20 million for Kansas energy and climate research

A \$20 million 5-year National Science Foundation grant will further establish Kansas as an internationally recognized leader in renewable energy and global climate change.

The EPSCoR (Experimental Program to Stimulate Competitive Research) grant for The Climate Change and Renewable Energy Initiative links four universities, the Kansas State University, the University of Kansas, Wichita State University and Haskell Indian Nations University; three Kansas based companies: Abengoa Bioenergy, MGP Ingredients and Nanoscale; and two companies outside of Kansas ADM (Illinois) and NetCrystals (California) in a massive research effort. The initiative will also receive \$4 million in matching funds from KU,

Cont. page 3 "NSF"

In this issue

2 Galaxy Forum informs
Wichita is site of SAMPE conference
KCSC receives prestigious grant

3 Kansas R & D

4 Interstellar R & D



photo credits Ken Moum



Above: Panelists for the Galaxy Forum discussion on science education in Kansas were teachers (l. to r.) Jennifer Sinsel, Wichita USD 259; NASA Fermi educator Mike Ford, Holton; and Brian Bird, Hutchinson Community College. **Left:** Steve Durst of the International Lunar Observatory Association speaks about his organization's efforts to put an observatory on the moon.

Wichita soaring with advanced materials conference

Advanced materials. It's a sector expected to grow exponentially over the next 20 years. Applications are forecasted to grow 14 percent per year in aerospace alone.

Wichita's prowess in both these fields is one reason SAMPE's Fall Technical Conference on October 19-21 at Century II Convention Center is expected to be its largest ever.

With over 120 companies exhibiting and 800 to 1,000 attendees expected, "Wichita's vibrant business community and reputation for advanced materials have contributed greatly to the appeal of the show," says SAMPE International president Steve Rodgers. The Society for Advancement of Materials and Process Engineering (SAMPE) is an international professional society of 5,000 members. "The industry's leading innovators from around the world are participating in this event," says Melanie Violette, Wichita State University Department of Aerospace Engineering, research engineer at NIAR and SAMPE conference general co-chair.

The same assets that made Wichita one of Business Facilities Magazine's "sparkling gems of eco-development" in its 2008 annual Editor's Location Picks are some of the reasons for Wichita's high standing in this field.

That includes WSU's number three ranking nationally in aerospace engineering research and development. NIAR, WSU's research arm in this area, has 17 laboratories. One of them, the National Center for Advanced Materials Performance (NCAMP) was originally assigned by NASA and FAA to develop national standards for aircraft composite materials. Another, NIAR's Center of Excellence in Composites and Advanced Materials (CeCam), established by the FAA, is part of a consortium with NIAR being the lead.

Educational project available to inspire students in STEM

According to the Kansas 2008 K-12 STEM (science, technology, engineering and mathematics) Education Report Card, over the next ten years demands for scientist and engineering occupations are expected to grow four times faster than for any other field.

In keeping with STEM initiatives for youth, a free project "SUPER SCIENTISTS—You can be one!" is available to educators in Kansas. Sponsored by the Ad Astra Kansas Initiative, it strives to give students role models with whom they can connect.

Once a month during the 2009-2010 school year a mini-biography of a Kansas scientist's work, at a level suitable for middle school on up, will be e-mailed to teachers signing up for this program, ready for class or bulletin board use.

Scientists featured will be diverse in ethnicity and will be *current* KANSAS scientists working in KANSAS. In Kansas in 2007 about one in four students were of a racial or ethnic minority. There also is a gender gap in the math and sciences.

Science fields include astronomy, geology, aerospace engineering and chemistry. This project connects with Kansas science education standards. Scientists talk about such things as the scientific process, properties of matter, motion and forces, technology.

To sign up contact jeanettesteinert@att.net or download each month's SUPER SCIENTISTS bio at www.adastra-ks.org

Galaxy Forum informs

Close to 30 educators and other interested parties attended the Galaxy Forum sponsored by the Ad Astra Kansas Initiative at the Kansas Cosmosphere and Space Center on August 22.

The two-hour program with the purpose of promoting science education in Kansas contained presentations on the Milky Way and also outreach materials. For example, if our solar system (11 light years across) was the size of a quarter, our Milky Way Galaxy (100,000 light years across) would span the width of North America, according to Fred Gassert of the Kansas Astronomical Observers, Wichita.

Four presentations were followed by a panel on science education in Kansas. Kansas teachers are allotted only 42 minutes a week for elementary school science education, according to Jennifer Sinsel, Wichita, who is on the teacher's advisory board to the National Academy of Science.

Speakers also gave contact information for astronomy outreach resources/presentations available for teachers and educators:

*Joel Walker, KCSC: joelw@cosmo.org

*Mike Ford, NASA Fermi-Glast educator: mford@holtonks.net

*Fred Gassert, Kansas Astronomical Observers: homeelevator@msn.com

Prestigious grant awarded to the Kansas Cosmosphere

Hutchinson—Thanks to a grant from the federal Institute of Museum and Library Sciences (IMLS), the Kansas Cosmosphere and Space Center will be updating its museum over the next two years to take guests from the past to the present and even glimpse the future of space exploration. The \$137,000 Museums for America grant will allow the Cosmosphere to add several new interactive simulators throughout the museum, and to extend exhibits to include much more on the shuttle era, the International Space Station, Mars exploration and a peek at the new Moon, Mars and Beyond project, Constellation.

The Cosmosphere will be actively searching for funds to match this grant award over the next 6-12 months and will begin construction on these improvements this winter.

Museums for America is the IMLS' largest grant program for museums. It provides grants to strengthen a museum's ability to serve the public by supporting high-priority activities that advance the institution's mission and strategic goals. The KCSC grant was one of 167 projects selected. Source: KCSC press release

In 2008, WSU's Center for Economic Development and Business Research counted 133 firms in the advance materials and composites field employing more than 40,000 workers in the ten-county region around Wichita. Since 2000, the region has had more than 40 federal grants to support research in these areas.

Composites are advanced materials made by combining two unlike materials to come up with a third which is lighter and/or stronger than the first two. One example is GLARE, a composite with alternating layers of fiberglass and aluminum which is being used structurally on the Airbus A 380. Not all advanced materials though, for example bio-based adhesives, are composites.

The following is part of an ongoing reference directory featuring representative research projects in Kansas. Ad Astra Kansas' goal is to serve as an information hub in Kansas focusing on different areas of high-tech and space research for networking and educational purposes.

AEROSPACE

"Aeroelastic Modeling Effect and Flight Test Demonstration of Resilient Adaptive Flight Controls on a General Aviation Testbed: Dynamic Inverse and Adaptive Critical Methods," L. Scott Miller and James Steck, WSU Dept. of Aerospace Engineering, NASA EPSCoR funding awarded 6-'09. scott.miller@wichita.edu 316-978-6334 james.steck@wichita.edu 316-978-6396

"Unmanned Aerial Systems (UAS) Mission Planning," \$380,000, Kurt Barnhart and Eric Shappee, Salina Applied Aviation Research Center. U.S. Dept. of Defense funding awarded 4-'09. 785-826-2630

ASTRONOMY / PHYSICS

"Structure and Dynamics of Atoms, Ions, Molecules and Surfaces," \$1,485,334, Itzhak Ben-Itzhak, KSU Dept. of Physics. U.S. DOE funding awarded 5-'09. itzik@ksu.edu 785-532-1636

"Multi-Disciplined Research into Nuclear Detection," \$759,140, Douglas McGregor, KSU Dept. Mechanical/Nuclear Engineering. U.S. DOD funding 4-09 mcgregor@ksu.edu 785-532-4093

Cont. from page 1 "NSF"

KSU and Kansas Technology Enterprise Corporation (KTEC).

"This is a tremendous opportunity for the state of Kansas," said Kristin Bowman-James, principal investigator and project director of Kansas' NSF EPSCoR program. "With this funding we will be able to harness the talents of researchers across the state... under the umbrella of a single integrated initiative."

About 40 scientists are currently involved in the collaborative consortium, representing over a dozen disciplines including agronomy, geography, sociology, engineering, biology, chemistry and physics. Among the five team leaders will be Charles Rice, KSU Distinguished Professor of Agronomy, who was a member of the Intergovernmental Panel on Climate Change that won the Nobel Peace Prize in 2007; and Judy Wu, KU Distinguished Professor of Physics, who will explore the use of nanotechnology to harness solar energy. WSU projects will revolve around energy with a focus on the development of solar-based renewable energy and establishing a critical energy research infrastructure.

"We envision that this interdisciplinary research effort bridged across the natural and social sciences and engineering, will ultimately allow Kansas to be a key leader in research that addresses serious global challenges," says Bowman-James.

ENERGY

"REU Site: Earth, Wind and Fire: Sustainable Energy for the 21st Century," \$269,445, Larry Erickson, Keith Hohn, KSU Dept of Chemical Engineering. NSF funding awarded 3-'09. lerick@ksu.edu 785-532-4313 hohn@ksu.edu 785-532-4315

"Supramolecular Nano Assemblies for Energy and Electron Transfer," \$374,867, Francis D'Souza, WSU Dept. of Chemistry. Funding by National Science Foundation from 8-'08 to 7-'11. francis.dsouza@wichita.edu 316-978-7380

Cont. from page 1 "Polar"

Office, began in January 2009 with the KU team's visit to NASA Dryden, Palmdale, Calif., where the DC-8 aircraft being modified for use as a flying laboratory is based.

KU will provide three radar systems.

An ultra-wideband radar (called Snow Radar) is used to determine the depth of snow over sea ice. "The sun reflects off sea ice differently than it reflects off snow-covered sea ice," says William Blake, a Ph.D. graduate student in electrical engineering, who is part of the mission team.

The Ku-band radar, a wideband altimeter providing very precise surface elevation measurements of the ice over both land and sea ice, delineates the surface topography of the ice.

A Multichannel Coherent Radar Depth Sounder (MCoRDS) can penetrate up to 4 ½ kilometers into the ice to map its thickness and also the terrain underneath.

"All of these radars are the first of their kind," says Allen. "KU is one of very few educational systems that designs and builds their own radars," adds Blake.

Many project aspects were challenging. The development of the entirely new MCoRDS system electronics was difficult. But Allen believes the design, development and installation of the MCoRDS antenna and aerodynamic fairing was the most difficult because of technical and time constraints.

"The MCoRDS requires a rather large antenna system. Integrating a large antenna structure on a jet aircraft is a major effort. Add the requirement to introduce as little additional aerodynamic drag as possible and the job just got a lot harder. Finally, mix in the fact that we had just a few months from concept to installation," says Allen.

Many design changes and tradeoffs in both electrical and aerodynamic aspects were required. "This single accomplishment was made possible by an extraordinary amount of time and effort by the aerospace engineering team led by Professor Rick Hale and his Ph.D. student Emily Arnold. The NASA team in Palmdale noted their fantastic job," says Allen.

MANUFACTURING and ADVANCED MATERIALS

"Study of Part Deformation and Tool Thermal Mass in Curing of Large Composite Structures," L. Scott Miller, WSU Dept of Aerospace Engineering, and Bob Minaie, WSU Dept. of Mechanical Engineering." NASA EPSCoR funding awarded 6-'09. scott.miller@wichita.edu 316-978-6334 bob.minaie@wichita.edu 316-978-5613

Sources: KSU Research and Sponsored Program Awards, NASA 2009 EPSCoR Awards and NSF Awards

Cont. from page 1 "FHSU"

Another question is how the weather in the ionosphere affects weather in the troposphere (which extends from the Earth's surface for about 5-9 miles) and the stratosphere (up to about 31 miles.) Very little is known. Heinrichs says he is very interested in what connection there might be between El Niño and these atmospheric influences, what effect there might be on climate oscillation.

People don't realize that radio communications, anything any farther than the line of sight, are a result of signals bouncing off the plasmas in the ionosphere, according to Heinrichs.

This radar is part of a \$6 million Mid-Size Infrastructure (MSI) project funded by the NSF. Currently there are two lower latitude radars in Virginia; Kansas will add two more. Others are planned in Oregon, Alaska and the Azores. The project is a partnership of four universities with the lead being Virginia Tech. Others are Dartmouth, University of Alaska and Johns Hopkins University Applied Physics Lab.

This project will expand physics research at FHSU. "I am excited. It adds a great new piece to what students can be involved in," says Buffington.

More than thirty CReSIS-affiliated faculty, staff and students worked feverishly through the summer to meet the deployment schedule for the project which begins for six weeks in mid-October. From the operations base in southern Chile, up to eleven 17-hour missions will be flown over Antarctic regions. The team includes Allen, Blake, three other KU graduate electrical engineering students and a computing technology specialist from Indiana University. They will operate and maintain the three systems, producing and sharing the data with NASA, publishing results and giving presentations to the science community.

"Work of this kind benefits KU and CReSIS as it allows us to advance the state-of-the-art while training the next generations of scientists and engineers. Also, because of this work we will be well-positioned for future opportunities requiring these technologies and capabilities," says Allen.

Interstellar R&D

Ad Astra Kansas News



This "Interstellar R&D" sixteenth-time feature in this *Ad Astra Kansas News* sixteenth 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 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

GigaGalaxyZoom Takes Breathtaking Dive into the Milky Way

As part of the International Year of Astronomy 2009, GigaGalaxyZoom, a 3-image project of the European Southern Observatory in Chile, aims to "help people rediscover their place in the Universe through the day-and night-time sky," notes ESO project coordinator Henri Boffin, and "to link the sky that we can all see with the deep 'hidden' cosmos that astronomers study on a daily basis."

The first immense image is a magnificent 800-million-pixel panorama of the sky from ESO observatories at La Silla and Paranal by astro photographers Serge Brunier and Frederic Tapissier. The view is at the front of our Galaxy with the Galactic Plane running horizontally through the image — as if looking at the Milky Way from the outside. The general components of our spiral galaxy come clearly into view, including its disc marbled with both dark and glowing star-studded nebulae, and the Galaxy's central bulge with its satellite galaxies.

A second image for GGZ is a 34-by-20 degree wide 340-million-pixel remarkable true-color mosaic of the heart of the Milky Way Galaxy Center. Using his personal 10-cm telescope from Paranal for more than 200 hours over 29 nights to take 1,200 images, ESO engineer and amateur astronomer Stephane Guisard enthuses, "The area I have depicted in this image is an incredibly rich region of the sky, and the one I find most beautiful."

Completing the GGZ trio of images, the Lagoon Nebula offers an eye-opening dive into our galactic home through the Wide Field Imager of ESO's 2.2 meter MPG telescope at La Silla — a gorgeous starscape more than 1.5 degree square, an area 8 times larger than the full Moon. "With the trilogy complete," affirms Boffin, millions of viewers "will be able to explore a magnificently detailed cosmic environment on many different scales."

COMMUNICATION

Hello From Earth!

Last summer, COSMOS Magazine celebrated National Science Week in Australia and the International Year of Astronomy by inviting people around the world to post greetings to the HelloFromEarth.net website for an active SETI transmission to the Gliese 581 solar system. The actual SETI transmission was done by NASA, using the 70 meter main antenna at Canberra Deep Space Communications Complex in Australia.

Gliese 581 is a low-mass red dwarf star which is 194 trillion km (20.3 lightyears) from Earth in the Libra constellation. Gliese 581d is an earthlike planet discovered by Stephane Udry of the Geneva Observatory in Switzerland and considered one of the most likely possibilities for harboring life. On Friday August 28th, 25,878 messages traveling at a frequency of 7.145 gigahertz headed off to Gliese 581. They should be arriving in a little over 20 years, but considering the return trip, a response can't be expected until 2051.

Participants don't need to worry about hanging on till 2051 to reply to a response, though. It's strictly prohibited. The SETI Post-Detection Taskgroup of the International Academy of Astronautics chairman, Paul Davies, points out, "The protocol says nobody on Earth should attempt to reply until international consultations have taken place. To safeguard this, the sky coordinates of the transmitting planet should be kept secret."

One thing that is not a secret, however, is the interest and adoration Earthlings have for ET. And while we may not be allowed to reply to a nonhuman transmission, there seems to be "no holds barred" when it comes to what can be sent out. Take Katelyn, in Australia, who wrote: "I just want to know what's with all the abductions? If you need a volunteer, please take my brothers!" And wouldn't she be surprised if they did...

But the majority of messages were very "neighborly" in nature, often making comparisons and asking advice.

Richard from Houston, Texas, asked: "Does your society live in an environmentally sustainable manner? Are you, like us, living beyond your ecological means?"

A New Zealander named Jodie, got right to the point with, "Bet you didn't think we actually existed aye."

And, perhaps in the Gliese 581 system, some angst-filled poetic ET will find a cosmic connection with Jeff from Australia, who quoted Oscar Wilde: "We are all lying in the gutter, but some of us are looking at the stars."

TRANSPORTATION

Keeping Up With the Expanding Universe

Juliana Kwan, a researcher at the University of Sydney in New South Wales, Australia, wonders how far deep space exploration can go in our constantly expanding universe. In a recently published paper, Kwan points out that even an astronaut traveling close to light speed would be left behind by the expansion.

Kwan's team estimates that changes in dark energy and other parameters—such as total density of matter—would cause a 15 billion light year journey to take only 30 years, from the perspective of the astronaut traveling nearly the speed of light. Due to relativity, however, a return trip would be out of the question; the passage of time on Earth would approximate 70 billion years.

Even our view of the universe will be diminishing, as cosmologists believe that distant regions are accelerating so quickly that they will eventually not even be visible through telescopes, since the light will no longer be able to reach us.

Published through the Ad Astra Kansas Initiative of

Space Age Publishing Company, 480 California Avenue, Palo Alto, CA 94306
to promote and publicize Kansas high tech / space tech research and development.

Editor and Publisher: Steve Durst 650-324-3705 news@spaceagepub.com
Managing Editor: Jeanette Steinert 620-669-8558 jeanettesteinert@att.net
Michelle Gonella, Space Age Publishing Co. 650-324-3705
Ken Moum, Ad Astra Initiative
Web site: adastra-ks.org
Submit information/event items to jeanettesteinert@att.net