



AD ASTRA KANSAS NEWS

Spring 2009

To the stars through high-tech / space-tech R&D

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In our continuous effort to give science its due in Kansas, we have submitted to the governor and received approval of the following proclamation:

TO THE PEOPLE OF KANSAS, GREETINGS

WHEREAS Kansas' Economic Renaissance plan encourages an "environment for opportunity," especially in manufacturing and aerospace, scientific & technical services, energy, bioscience & technology innovation, and

WHEREAS these areas are all dependent on excellence in the science, technology, engineering or math fields, and

WHEREAS in 2007 Kansas boasted 26,000 computer and math occupations, 20,000 engineers, 2,900 scientists and 3,000 science teachers and professors educating the hungry young minds who will be our future, and

WHEREAS Kansas is in the forefront in new and bold areas such as wind energy, bioagriculture, the National Center for Aviation Training, construction of a 100-percent green community, and

WHEREAS Kansas' rich science history began in 1868 with the Kansas Academy of Scientists, and has seen native Kansans discover Pluto, invent the microchip, touch the stars through the Hubble in the 20th century, and become leaders in areas such as composites and ultra-fast laser science in the 21st century, and

WHEREAS in this International Year of Astronomy, the world is doing what we Kansans have always done—look to the stars, we poise ourselves for the future.

Now therefore, I, Kathleen Sebelius, Kansas governor, do hereby proclaim April 24, 2009

AD ASTRA KANSAS DAY

And urge citizens to celebrate the contributions being made in our state in the science and technology fields and to recognize their importance to Kansas' future.

UAS technology advancing in Kansas

Imagine traffic shut down at an accident. Rather than waiting for a helicopter to fly in to take the aerial shots required in many states before traffic lanes can be reopened, a small helicopter is taken out of the patrol car, sent up into the air to take photographs. Traffic flows again.

Unmanned aerial systems (UAS) or vehicles (UAVs) have applications that range from the scene described above to a Mars flyer and can range in size from ones that fit in hand up to that of a large corporate jet. The definition of a UAS is very broad, but generally it refers to a pilotless aerial vehicle, either fixed- or rotary-winged, which can be remotely controlled or fly autonomously. It also carries a payload or equipment and has an engine.

The UAS area "is just exploding," says Tom Aldag, director of research and development at Wichita State's National Institute for Aviation Research (NIAR). "Until now the focus has been military. But the potential is there in civilian uses for monitoring, gathering data, surveying, and in a case like another Greensburg, to assess damage."

NIAR's UAS program is about three years old. Its role is to support Federal Aviation Administration research for airframes and different design requirements to keep UAVs safe in the national airspace.

The program also works with materials property development in connection with NIAR's National Center for Advanced Materials Performance

(NCAMP). Consulting work is done for about six UAV entities nationally, most recently using the Beech Wind Tunnel for Boeing UAS testing.

K-State at Salina's UAS program is less than a year old and works on two fronts. One is a planning and evaluation center to evaluate hardware and off-the-shelf equipment used in disaster response. "The focus is saving lives in

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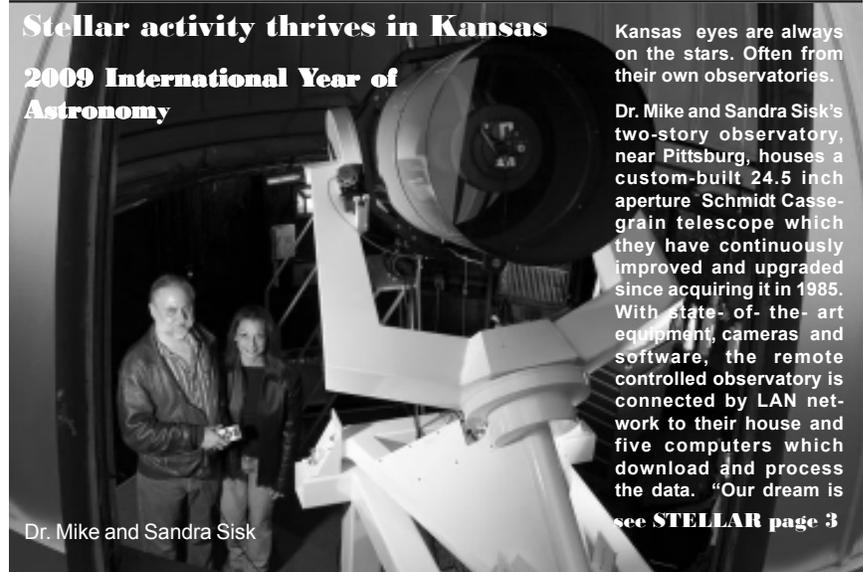
International physics convention to be at KSU

Kansas is in the major leagues when it comes to physics.

Kansas State University will be hosting about 200 scientists for the second International Conference on Attosecond Physics July 28-August 1, 2009 in Manhattan. Attendees are expected from around the world including Canada, China, Japan and Europe.

The world of the high energy laser light pulse, which enables researchers to study the interactions of atoms, molecules and light, includes split seconds of time like the nanosecond, the picosecond and the femtosecond (which takes research down to the level of whole atoms and molecules.) Enter the attosecond, which is one

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Stellar activity thrives in Kansas

2009 International Year of Astronomy

Kansas eyes are always on the stars. Often from their own observatories.

Dr. Mike and Sandra Sisk's two-story observatory, near Pittsburg, houses a custom-built 24.5 inch aperture Schmidt Cassegrain telescope which they have continuously improved and upgraded since acquiring it in 1985. With state-of-the-art equipment, cameras and software, the remote controlled observatory is connected by LAN network to their house and five computers which download and process the data. "Our dream is

see STELLAR page 3

Dr. Mike and Sandra Sisk

Photo courtesy Mike and Sandra Sisk

Wichita aerospace magnets attract students

It soon will be possible for a student in Wichita to have twelve years of engineering principles before even reaching college.

Beginning next fall Mueller Elementary, with its enrollment of 545, will become an aerospace engineering magnet school. Located in a disadvantaged area of Wichita, where forced bussing ended recently after some 30 years, the school wanted something unique that would make people come back to Mueller.

"Twenty-first century skills are a must-have and we started looking in the direction of aerospace. A survey was sent out to parents about the idea. Forty-nine percent were returned and all but three were excited about the possibility," says Principal Anne Clemens.

The school will follow the Engineering is Elementary Program which deals with four points: the engineering design process, science and technology, principles of flight and science in space. The set curriculum for flight studies covers the four principles of flight and begins with windsocks in kindergarten and tackles rockets and space by 5th grade. Fourth and fifth grades are also active in Lego robotics competitions.

Resources for Mueller include Starbase, the Kansas Cosmosphere and Wichita State University.

WSU is the Kansas university affiliate of the Project Lead the Way Program, a national program for grades 6-12 in engineering. Larry Whitman,

director of engineering education at WSU, is also director of the Lead the Way Program. According to Whitman, there will soon be 5-8 middle schools in Wichita focusing on pre-engineering. "Late elementary and middle school is when we lose them in science and math. It's good to see schools [doing this so students] see applications and don't lose interest," says Whitman.

Currently, in Wichita there are two certified Lead the Way Programs, one at West High School and one at Northeast Arts and Science Magnet High School. Soon to be certified are North West and Southeast High Schools. The other certified school in Kansas currently is Shawnee Mission South, according to Whitman.

Northeast Magnet has close to 300 students in the science magnet. Last year the school received 400 applications, some even from out of district, for 100 student available student slots, according to magnet science educator Troy Criss.

It's a rigorous curriculum. Through the course of four years students study intro to engineering design, autoCAD, principles of engineering, robotics, aerospace engineering. Seniors are expected to design, invent, build a prototype and present to panel of engineers. One student had his independent research published in a scientific journal.

"They are doing things that I took years of college before I was allowed to do," says Criss.

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natural and man-made disasters," says director Dr. Kurt Barnhart. This unique center trains operators, payload specialists, sensor integrators—the whole crew that would be used. "You can count on one hand the training centers across the country," says Barnhart.

The second focus is advanced avionics miniaturization. Developing technology to miniaturize electronic technology—taking technology that might weigh 10-20 pounds and taking it down to ounces.

"There is the potential to build on Kansas'core competencies in aviation. With the economy like it is this could help shore some of that up," says Barnhart.

The University of Kansas' UAS program does work under the auspices of the National Science Foundation which sponsors the two-year old Center for Remote Sensing of Ice Sheets (CRESIS). The Meridian, a 17-foot long 26.5-foot wingspan UAS with ice-penetrating radar that measures ice thickness in the polar regions for global climate study, has been developed. Flight testing begins this spring with flights expected over Antarctica in late 2009 and early 2010.

Viking Aerospace, Lawrence, also works with CRESIS. Viking's number one item currently is an all-electric 25 pound helicopter used for purposes like the traffic scenario mentioned above. The company's speciality is flight control and the integration and adaptation of that control system into the vehicle they obtain from a manufacturing partner. With 60-100 units projected for 2009, "we've been getting hammered with business over the last year," says Lance Holly, a managing partner in the firm. "This is a rapidly growing

business with advanced technology. Kansas' geography is ideal to test and evaluate these systems."

All agree that one obstacle is Federal Aviation Authority regulations, or rather development of FAA regulations that enable UASs to co-exist with current aviation corridors and flight patterns.

"The FAA has the keys to the gate to the airspace system. For the FAA, this is very new, there's very little guidance. We are helping formulate guidance," says Barnhart.

Also working with the FAA is Gene Kelly of CertTech, Overland Park, a firm that works with software verification/validation. He is on a national government / industry group helping draft regulations which may have a technological side such as development of sense-and-avoid systems.

"The upside to this is the development of innovations and entrepreneurship that support these [regulations.] This is exciting, a leading edge of the next phase of aviation. Industry, the FAA and the DoD are working together [and we] expect a full set of regulations within the next few years," says Kelly.

Currently, the only site in Kansas with clearance for testing is a military one, the Smoky Hill National Guard Range near Salina. A partnership between KSU and Flint Hills Solutions, Augusta, expects a site adjacent to the range to obtain a civilian certificate of authority (COA) from the FAA soon. This site will be the first in the nation to follow the new online FAA process for a civilian COA. Jarnot Aerospace, the city of Herington and the Herington airport are also working together for a COA for a civilian UAS center. Herington has a WWII airbase

On the Horizon...

April 24-26 Kansas Association of Teachers of Science (KATS) annual meeting @ Rock Springs <http://kats.org/>

NSF STEM grant enables Pittsburg State engineering scholarships

As the recipient of a \$598,000 National Science Foundation (NSF) STEM grant Pittsburg State University will award scholarships to enable underrepresented groups, women and minorities the opportunity for careers in engineering technology.

The five year program, which begins this fall, will enable a minimum of 13 grants awarded annually, specifically in engineering technology. Included in this program will be support services, mentoring and tutoring for recipients.

"We are excited about the fact that we are recruiting students who for one reason or another never thought a four-year degree in technology was one of their options," according to Randy Winzer, assistant professor of engineering and principal investigator for the STEM grant.

Outcomes from the Nov. 20, 2008 Kansas Space Initiative meeting in Topeka can be found at

<http://www.adastra-ks.org/112008Outcomes.pdf>

on 1700 acres with 6700 feet of runway length 75' wide. That, plus its being off the vector airway system makes it a natural as a site for flight testing. This site is waiting on final FAA approval.

UAS is a promising field. "This is a new industry. The improvements with high-speed computers and GPS in the last 15 years has made this industry boom. Even with the economy like it is experts expect a 15-20 percent annual growth," says Chuck Jarnot, president of Jarnot Aerospace

A long-term graduate project under the auspices of Dr. Richard Colgren at KU involves a Mars flyer program for a small UAV that could be carried on a Mars probe and be released. The current stage of development is to test it under circumstances replicating Mars conditions, which means going over 20 miles into the earth's atmosphere to get applicable conditions.

From April 20-21 the Kansas 2009 Unmanned Aerial Systems (UAS) Symposium will be held in Wichita. <http://fhssymposiums.com>

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.

ASTRONOMY / PHYSICS

"Gamma-Ray Burst Models for GLAST," Mikhail Medvedev, KU Dept. of Physics / Astronomy. NASA funding Fall '08. 785-864-4025 medvedev@ku.edu

"International Collaboration in Chemistry: Control Of Ultrafast EUV-Induced Chemical Reactions," \$397,901, Itzhak Ben-Itzhak, KSU Dept. of Physics, Funding by National Science Foundation 8-08 785-532-1636 itzik@ksu.edu

"Understanding the Diffuse X-Ray Background: The Extragalactic to Solar System Environment," Thomas Cravens, KU Dept. of Physics / Astronomy. NASA funding Fall '08. 785-864-4739 cravens@ku.edu

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for colleges and schools to be able to use it through the internet," says Sandra. "It started as a hobby, became an obsession," says Mike, a recently retired physician. His astrophotography has been published in about a dozen astronomy-related books and magazines over the years.

Walt Robinson's Robinson Lunar Observatory of three telescopes ranging from 14.5 inch to 6 inches is portable. An astronomer since 1964, his primary interest is lunar and solar work.

The Bonner Springs resident is vice-president of the International Occultation Timing Association (IOTA) Their primary activity is timing the disappearance of stars by the moon, asteroids and other solar system bodies. "This activity helps refine the limb of the moon, shape and size of asteroids and aids in detecting errors in stellar catalogues," he says. He has personally timed over 1,000 of these disappearances. In 2006, Robinson co-authored a book on the topic with retired NASA engineer Hal Povenmire. He is very active in outreach with scouts, schools and has done public programs.

C.W. Robertson's Setec Observatory near Goddard received an American Astronomical Society grant of \$7,000 about two years ago to buy a 16-inch telescope to track delta scuti stars, which change luminosity several times over the course of a night. "This telescope gathers light about twice as fast [as his previous 12" one] does more science, gathers more data," he says. This data is sent to the theorists around the world who use it to figure out how stars evolve, grow old and die. His group of amateur and professional astronomers have had papers published in Astronomy and Astrophysics Journal.

The number of private observatories in Kansas is uncertain. A recent listing of Clear Sky Charts sites in Kansas listed 45 clear sky locations in Kansas with about ten specifically private. The state has another nine observatories run by educational entities or astronomy organizations. This chart is a 48-hour forecast provided by the Canadian Meteorological Center for amateur astronomers as to when to expect clear dark skies for viewing at specific place. These requested charts sites in Kansas span from

AEROSPACE

"CAREER: Upper Atmospheric Density from Precision Orbit Determination," Craig McLaughlin, KU Dept. of Aerospace Engineering, NSF funding Fall '08. 785-864-2974 craigm@ku.edu

INFORMATION TECHNOLOGY

"Lunar and Martian Surface Communications Systems with Efficient Miniature Antenna," Erik Perrins (PI) KU ITTC in collaboration with WSU and University of Alabama. Funding 7-08 NASA EPSCoR, KTEC. 785-864-7370 perrins@ku.edu

Goodland and the Cimmaron Grasslands in western Kansas to the populous central and eastern regions. Keep in mind that one clear sky site, for example Wichita, provides information for any number of observers/observatories.

Mark Logan of the Science Education Center of Wichita and a member of the Kansas Astronomical Observers (KAO), estimates about 500 people in the south central Kansas area have telescopes 8 inches or above. He's seeing more of the 16-20-24-inch telescopes. "I know of one regular [customer] who moved out to the country to Cheney for the darker skies. He has telescopes ranging from a 20- down to a 4-inch," says Logan. Logan also knows of a McPherson man who remodeled an ambulance into a portable observatory.

The Astronomical Society of Kansas City (ASKC) has about 300 members with their primary observatory in Kansas being Powell Observatory in rural Louisburg. Tired of packing up his gear, in 2003 Ron Abbott built his Land of Oz Observatory in Linn County, about an hour south of his home in Overland Park. "The main thing you need for observing are dark skies. Kansas has good dark skies," says Abbott.

He opens the 12x20 roll-off roof for deep sky observing, which is looking at faint star clusters or galaxies outside our solar system. The closest star to our solar system is alpha centauri, 4 light years away. A lot of the things Abbott observes are 100 million light years away. His 11-inch scope enables sight of galaxies/ stars through the 14 th magnitude. The brightest star is Sirius. Its magnitude is 0. The faintest star that can be seen by the naked eye is only a 6.

Fred Gassert, president of Wichita's Kansas Astronomical Observers sees a trend towards increased interest especially by those in their thirties and forties. "I attribute the increase to ease of use due to the amazing digital cameras and computer access available over the last ten years. And prices have come down to half of what used to be or a person gets the electronics and software added for the same price as the telescope alone."

One person who is set is Sisk. With his 24.5 aperture he has a huge quality field. In his last upgrade he put sixty fiber optic lines down. "I'm ready for life, [just] waiting on bigger detectors."

ENERGY

"Growth and characterization of Li Ternary Compounds for Solid-State Neutron Detectors," \$698,040, Douglas McGregor, KSU Dept. of Mechanical / Nuclear Engineering. U.S. DOE funding 9-08. 785-532-5284 mcgregor@ksu.edu

MANUFACTURING and ADVANCED MATERIALS

"Application of Digital Element Approach in Textile Mechanics," \$505,187, Youqi Wang, KSU Dept. of Mechanical / Nuclear Engineering. U.S. DOE funding 8-08. 785-532-7181 youqi@ksu.edu

"Attosecond Optical Technology Based on Recollision and Gating," \$1,071,867. Zenghu Chang, Charles Cooke, KSU Dept. of Physics; Lei Shuting, KSU Dept. of Industrial / Manufacturing Systems Engineering. U.S. DOD award 2-09. 785-532-1621 zchang@ksu.edu

Sources: KU Office of Research and Graduate Studies—Fall 2008; KSU Research and Sponsored Program Awards, ITTC program listings.

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billion billionth of a second. (One attosecond to one second is like one second to the age of the universe.) Laser pulses of such an infinitesimal increment of time excite the atom, enabling physicists to observe and understand the activities and processes of the even smaller electrons.

Since electronic motion plays a fundamental role in physical, chemical and biological processes, by manipulating attosecond pulses scientists may eventually be able to control chemical reactions.

Attosecond science is still in its infancy. To reach the goal of actual applications, further progress in the technology of generating and manipulating attosecond pulses is needed, according to Dr. C.D. Lin, K-State distinguished professor of physics and local chair of the conference. Since KSU is one of the leaders in this field, the only institution in North America that had produced attosecond pulses so far, it was decided that the second conference of this series be held there.

According to its website, KSU boasts one of the largest group of atomics, molecular and optical physics (AMOP) faculty at U.S. universities. In 2006, K-State AMOP physics was ranked 14th in the U.S., by the *U.S. News and World Report*.

The AMOP program is organized around the J. R. McDonald Lab (JRML) which includes the recent addition of the Kansas Light Source, a laser lab which has helped put JRML at the forefront of ultrafast, intense laser science. The research in JRML is supported by the U.S. Department of Energy in the amount of about three million dollars annually.

"It is great if Kansans realize that we are actually competing with big institutions from big cities all over the world," says Lin.

Interstellar R&D

Ad Astra Kansas News

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

Galaxy Zoo as Citizen Science

More than 200,000 internet explorers have participated in galaxy observation and classification since the July 2007 launch of what has grown to be the biggest citizen science experiment on the web. Inspired by the NASA Stardust@home Project, Galaxy Zoo is a collaboration between Oxford, Portsmouth, Johns Hopkins and Yale Universities and Fingerprint Digital Media, Belfast, and utilizes data compiled by the Sloan Digital Sky Survey, SDSS.

Galaxy Zoo 2 began in February 2009 to focus on some 250,000 of the brightest, most interesting galaxies of the tens of millions in the Galaxy Zoo 1 database. Beyond classification of galaxies into elliptical, spiral or merging, and clockwise or counter-clockwise, Galaxy Zoo 2 observers are adding detail of shape and intensity of the galactic core, and on galaxy distribution, evolution and behaviour. The goal of 30 individual classifications per galaxy greatly enhances accuracy and reliability of the database.

Individual participation is encouraged and facilitated by a 5-10 minute online tutorial, which, according to Oxford astronomer and Galaxy Zoo co-founder Chris Lintott, enables each galaxy classification in about 30 seconds on average. Galaxy Zoo core member Anze Slosar, a UC Berkeley cosmologist, confirms public response "astounding" from what MSNBC's Cosmic Log Alan Boyle terms "galaxy zookeepers".

To date, Galaxy Zoo has produced 7 or 8 published scientific papers with more to follow. Kitt Peak Observatory in Arizona and the IRAM millimeter antenna in Spain, among other observatories, are being used to further Galaxy Zoo discoveries.

COMMUNICATION

METI?

Chances are that if the house next door is vacant, you are keeping an eye out for who might move in. You may plan to take over a pitcher of lemonade as a friendly gesture, but would you leave off a dinner invitation or an extra key to your house before you had even seen the new occupants?

METI (Messaging to Extra-Terrestrial Intelligence) is also referred to as "Active SETI." METI typically involves radio transmissions, such as Cosmic Call 1999, Teen Age Message 2001 and Cosmic Call 2003, which are all transmitted from the Evpatoria Planetary Radar facility in the Ukraine.

Broadcasting scientific information--hoped to be a universal language--as well as personal messages from the public, these transmissions were aimed at constellations such as Andromeda, Orion, Ursa Major and Sagitta. The earliest projected arrival of these messages is 2036. Interstellar spacecraft such as Pioneer and Voyager also carry messages.

METI is surrounded by controversy for a variety of reasons. Some would say that it is not scientific, but highly qualified researchers spend time creating codes and messages that transcend any need for language. Like the Rosetta Stone, the same message is repeated in different formats to facilitate abilities to decode and interpret. The transmissions are carefully planned, evaluating the best wavelengths and the most likely targets for success.

Some also question the time frame for METI. Is there any value in a response that is received 200 years after the message has been sent? Carl Sagan would describe it as "an optimistic and far-seeing act" which expresses hope about the future, however he also notes "for those who have done some-

thing they consider worthwhile, communication to the future is an almost irresistible temptation." So it seems that even Sagan is uncertain as to whether METI is an act of altruism or vanity.

METI is also questioned as a possible danger. While METI researchers sneer at this concept, calling it the "Darth Vader Scenario," questions have been raised. A 2005 survey found that 78% of respondents were in favor of METI. Did any of these respondents speak for cultures which were decimated by invasion from other cultures? Had any of the respondents ever lived in an environment where they might be considered food or property?

In 2007, the SETI Permanent Study Group of the International Academy of Astronautics adopted the San Marino Scale, developed by Professors Ivan Almar and H. Paul Shuch, to quantify the importance of these transmissions based on the information they contain and the strength of the signal. This suggests that some future parameters might be considered regarding METI.

TRANSPORTATION

Shielding Innovation

Transportation of water is a concern in space due to the expense of its weight, but interstellar travel might see a reversal on this issue, thanks to the innovative thinking of Oleg Semyonov of the State University of New York at Stony Brook.

Shielding from high energy cosmic rays and dust is imperative and now it has been suggested that frozen water (an ice bulge) in front of the starship may be the best strategy. A metal shield would become brittle via bombardment of nucleonic radiation, but ice would not be subject to this problem. The ice would even be lighter than metal and serve double duty as a water transport.

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