

# AD ASTRA KANSAS NEWS

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

Spring 2003

Vol. 2, No. 1

Photo courtesy of the Office of the Governor



**Standing behind Governor Kathleen Sebelius** for the signing of a governor's proclamation naming April 25, 2003, as AD ASTRA KANSAS DAY were (l. to r.) Jane Fortin, KCAE; George Howard, Heart of America Chapter NSS; Jeanette Steinert, Ad Astra Kansas News; Brenda Culbertson, Washburn University; Mary Jane Chambers, Wichita; Randall Chambers, Wichita State University, Wichita Chapter NSS; and Paul Fortin, KCAE.

## TO THE PEOPLE OF KANSAS, GREETINGS:

WHEREAS, Kansans have always used science and technology, whether it be iron plow, barbed wire or airplane, as catalysts for growth and development in our state; and

WHEREAS, We are now at the dawn of the 21st century with all its accumulated and potential advances in technology, space exploration and associated disciplines; and

WHEREAS it is in the interest of its citizens that Kansas remain up-to-date, contemporary and future-striving in scientific education, research, development and commercialization in order to provide increased knowledge, a vibrant economy, improved quality of life and global competitiveness; and

WHEREAS, The State of Kansas demonstrates its commitment to science and technology through its quality educators, research universities, legislative initiatives and commercialization programs; and

WHEREAS, Kansas is fertile with hungry young minds, dedicated educators and professionals who impart, inspire and mentor scientific knowledge and innovation, renowned researchers who plumb mysteries from those of the smallest atom to the awe-inspiring constellations of space; and

WHEREAS, Kansas' scientific legacy counts two native sons as Nobel prize winners and three as astronauts as well as numerous engineering scientists who have helped train the astronauts, and its stature includes being one of the top states in the number of graduate-level scientists and engineers educated; and

WHEREAS, Kansans have always set sights high, even in selecting our state motto "Ad Astra Per Aspera" or "To the Stars Through Difficulties":

NOW THEREFORE, I, KATHLEEN SEBELIUS, GOVERNOR OF THE STATE OF KANSAS, do, hereby proclaim April 25, 2003, as

## AD ASTRA KANSAS DAY

and encourage all citizens, businesses and government leaders to look literally to the stars and celebrate, encourage, recognize and promote scientific achievement within our state so that Kansas may reach its potential to harvest the bounty of science, technology and space for the good of the state, country and people everywhere.

## Ad Astra Kansas Day proclaimed--celebration event scheduled

By Jeanette Steinert

Kansans have long had January 29 to celebrate the past. Now we have a day for anticipating the future.

On March 25, Governor Kathleen Sebelius signed a proclamation declaring April 25, 2003, as Ad Astra Kansas Day.

The aim of the day is to promote public awareness of the importance of science and technology to Kansas' growth, to credit scientific achievement and inform the public of outstanding work being done in Kansas.

The date is symbolic in that it marries "to the stars" technology with a Kansas connection--on April 25, 1990, Salina native Steve Hawley deployed the Hubble Telescope from the Space Shuttle Discovery.

An Ad Astra Kansas Day event will be held from 7-9:30 p.m. at Stoffer Science Hall on the Washburn University Campus, Topeka. It will be free and open to the public.

Bruce Twarog, Ph.D. of KU will speak on "New Ways of Looking at the Universe," a focus on two KU projects--RICE, a neutrino observatory operation at the South Pole, and ULTRA, a new technology telescope proposal by three Kansas universities.

Mr. Mike Ford, a 2000 Christa McAuliffe Fellowship Award recipient for building Elk Creek Observatory at Holton High, will talk about the observatory and projects he and his students are working on.

A pioneer in the field of human factors in aerospace engineering, Randall Chambers, Ph.D. of WSU, was a NASA chief life scientist for the Mercury, Gemini and Apollo programs. His topic, "Evolution of Space Technology, Research and Training," will include highlights from 1957 to now and a look at what's going on in Kansas now.

This evening is sponsored by the Ad Astra Initiative, a group of citizens and educators interested in raising Kansas' scientific profile in the 21st century.

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# HUMAN FACTORS ENGINEERING: Enhancing work efficiency and safety in space and on earth

By Randall Chambers, Ph. D., DABFM, DABPS, BCETS

Human factors in human orientation and movement control in high gravity, weightless, micro- and artificial gravity environments have made many contributions to earth-bound human movement, orientation, biomechanics, work ergonomics, [and understanding] the consequence of the absence of continuous contact forces on orientation and posture.

Eye, head, arm, leg and whole body movements distinguish between immediate adaptive compensations to weightlessness and those of longer time courses in adapting to microgravity conditions, as a way of maintaining sensory motor and structural integrity in transitions between different force environments. Variables involved are otolith-dependent effects, spinal activity and reflexes, bone and muscle structure, motorneuron properties and brain functional organization, spatial orientation and illusions, vestibular thresholds and vestibulo-ocular reflexes, and anticipatory postural compensations for voluntary movements.

Space human factors in crew performance, ergonomics, and life support for human-machine interfaces are also helpful in earth-bound work situations. NASA is providing high-tech human factors models of human perceptual and cognitive processes, interfacing with complex hostile space environments. Please see <http://human-factors.arc.nasa.gov/>. To find human factors guidelines for manual interfaces for multisensory virtual simulators and teleoperation displays, contact <http://vision.arc.nasa.gov/IHH>. The examination of human perception and manual task performance through psychophysical discrimination and manual target acquisition is presented within virtual imagery and visual displays within a combined virtual environmental testbed.

Also, NASA is providing human fatigue countermeasures to minimize decremental effects on performance and alertness in space, and to maintain duty/rest cycles. See <http://human-factors.arc.nasa.gov/ihs/index.html>; and <http://human-factors.arc.nasa.gov/zteam/>. Human factors and integration with human-automation and aerospace safety optimize performance capabilities of astronauts to minimize adverse consequences of human error or other human limitations. Cognitive architecture is related to human-automation and auditory displays for speech and communications. See: <http://human-factors.arc.nasa.gov/ihi/>. Enhancing the

intelligibility of multiple communication channels into existing space systems is customized for individual human-machine systems. Contact <http://vision.arc.nasa.gov/IHH>; and <http://human-factors.arc.nasa.gov/>.

Another area of major application for human factors and ergonomics are autogenic feedback training exercises in high stress environments. These enhance operator performance, health and safety through psychophysiological monitoring and control of autonomic nervous system functions, training people to monitor and control their own physiological responses and to reduce symptoms of motion sickness and orthostatic intolerance. See <http://human-factors.arc.nasa.gov/ihh/psychophysio/>.

[Another area is] cognitive task analysis of the complex skills involved in robotic arm maneuvering for extra-vehicular activities and space walks, and including data collection on the technology interface, and psychomotor and cognitive task performances during spaceflight operations and microgravity research. Contact <http://commercial.nasa.gov>.

Many new human factors innovations have been accomplished using artificial intelligence, hyperspectral imaging and sensors, and high performance computing. Contact <http://spaceflight.nasa.gov>; also, <http://nctn.hq.nasa.gov/success.index.html>.

Ground processing scheduling systems use artificial intelligence to manage thousands of overlapping activities, providing real-time planning and optimization of operations and integrated production and supply chains, including interactive multimedia computer training to train astronauts and operations personnel. They upgrade worker skills and engage all six senses. Also, through telepresence experience of human activity within computer-generated environments, laser surveying controls and expert system design graphics utilizing human factors engineering and the Virtual International Space Station Web Site. Contact <http://commercial.hq.nasa.gov>; <http://spaceflight.nasa.gov/station/reference/index.html> or <http://nike.larc.nasa.gov/viss.html>. For human factors engineering in the real time virtual environment and database management systems, using expert system software, advanced eye protection devices, shock-absorbing helmets, flat panel television, and quartz crystal timing equipment, contact <http://spaceflight.nasa.gov/station/reference/index.html> and <http://index.html> and <http://nctn.hq.nasa.gov/success/index.html>.

## Looking Ahead...

### April

**11,12** Kansas Academy of Science  
135th annual mtg at Pittsburg State

**24** Wichita NSS chapter meeting

**25** Ad Astra Kansas Day

**25-27** Kansas Assoc. of Teachers Of  
Science mtg at Rock Springs

### May

**1** Speech by Mercury astronaut  
Wally Schirra for the Dillon  
Lecture Series, Hutchinson

**3** KCAE Meeting at Kansas Air  
Museum, Wichita, from 3-5 p.m.

**10-11** Wings Over Topeka, Forbes  
Field with the Blue Angels

**16-19** Combat Air Museum Aviation  
Camp for youth.  
[camtopeka@aol.com](mailto:camtopeka@aol.com)

**Through May 26**, "The Lost  
SpaceCraft and Liberty Bell 7  
Recovered" interactive exhibit at  
KCSC, Hutchinson. 620-662-2305  
800-397-0330 [www.cosmo.org](http://www.cosmo.org)

### July

**7-10** Combat Air Museum Aviation  
Camp for youth. See above.

### August

**4-7** CAM Aviation Camp for youth,  
contact [camtopeka@aol.com](mailto:camtopeka@aol.com)

### September

**21-26** KCSC Elderhostel Astronaut  
Training Program for ages 55 and up

### Oct.

**5-10** KCSC Elderhostel Astronaut  
Training camp for 55 and over.

**22-25** Ntl. Council of Space Grant  
Directors Annual Meeting, Wichita

Send calendar listings for upcoming scientific  
meeting, conferences, and other events in Kansas  
to [steinj@ourtownusa.net](mailto:steinj@ourtownusa.net)

## National Space Grant Directors Meeting to be held in Wichita

LAWRENCE, KS—The annual Fall National Council of Space Grant Directors Meeting will be held October 22-25, 2003. This meeting is a gathering of all the Space Grant Directors in each state and Puerto Rico. With the celebration of the Centennial of Flight this year, the Air Capital of the World, Wichita, Kansas, has been chosen for the meeting site.

The meetings will offer a variety of activities to keep guests busy. There will be tours of Cessna Aircraft and Raytheon/Beech Aircraft. The welcome reception will be held at Exploration Place, which offers an exhibit room, "Exploring Flight and Design." The following evening will be spent exploring the Kansas Cosmosphere.

### Published through the Ad Astra Initiative of

Space Age Publishing Company, 220 California Avenue, Palo Alto, CA 94306  
to promote and publicize Kansas high tech/space tech research and development.

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The following list is part of an ongoing reference directory featuring representative research projects in Kansas. Ad Astra Kansas News' aim 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

**"Studies of Planetary Aeronomy,"** \$50,000, Thomas E. Cravens, KU Dept. of Physics and Astronomy. Awarded 7-02 by NASA Goddard Space Flight Ctr. 785-864-4739 cravens@ku.edu

## AVIATION

**"Continued Electromagnetic Protection Integrity for Aircraft and Systems-Phase III"** \$200,000. J. O'Loughlin and S. Skinner, WSU Dept. of Electrical/Computer Eng. FAA award in Fall '02. 316-978-6197 steven.skinner @wichita.edu

**"Low-Cost Fly-by-Wire Control Algorithm Development,"** \$69, 563, J. Steck, WSU Dept. of Aerospace Eng. Funding by Raytheon Co. in Fall '02. 316-978-6396 steck@ae.twsu.edu

**"Experimental Study of SLD Impingement on Ice Shapes,"** \$270,000, M. Papadakis, WSU Dept. of Aerospace Eng. FAA funding in Fall '02. 316-978-5936 michael.papadakis@wichita.edu

## BIOTECHNOLOGY

**"Development of NanoParticle Superlattices for Biological Applications,"** \$40,000, George Marchin, BioServe Space Technologies affiliate, KSU Dept. of Biology and Ken Klabunde, KSU Dept. of Chemistry; commercial development supported by NanoScales Materials, Inc., Manhattan. 785-532-6635 gmarchin@ksu.edu

**"Control of Translation Initiation in Fission Yeast,"** \$25,000, KSU Dept. of Biology. Kansas Biomedical Research Infrastructure Network (K-BRIN) funding. kasano@ksu.edu

## ENERGY

**"Research into Heavy-Ion Nuclear Physics,"** \$92,000, Stephen J. Sanders, KU Dept. of Physics and Astronomy. U.S. Dept. of Energy funding 7-02. 785-864-4933 ssanders@mail.ukans.edu

**"STTR: Carbon Fiber Composite Aeroelastically Tailored Rotor Blades for Utility-Scale Wind Turbines,"** \$44,838, J. Locke, WSU Dept. of Aerospace Engineering. Dept. of Energy/K. Wetzell & Co. funding awarded Fall of '02. 316-978-3410 james.locke@wichita.edu

**"Structure and Dynamics of Atoms, Ions, Molecules, and Surfaces,"** Spring 2003

\$2,395,000, Patrick Richard, KSU Dept. of Physics, US Dept. of Energy funding awarded 3-02. 785-532-6783 richard@ksu.edu

**"Cation Exchange: Synthesis and Epitaxy of Volatile Compounds Via Atomic Perturbation,"** \$121,000, Judy Wu and JiCong Shi, KU Dept. of Physics and Astronomy. US Dept. of Energy funding in 10-02. 785-864-3240 jwu@ku.edu

## INFORMATION TECHNOLOGY

**"ITR/RC: Fast Superconducting Qubit and Qugate for Quantum Computing,"** \$181,530, Siyuan Han and Shih-I Chu, KU Dept. of Computer and Information Science and Eng. National Science Foundation funding awarded 6-02. 785-864-5831 han@ku.edu

**"An Inventory of Dams for the State of Kansas Using Remotely Sensed Satellite Imagery,"** \$57, 247, Stephen Egbert, Kansas Biological Survey, and Jerry Whistler, KU Dept. of Kansas Applied Remote Sensing (KARS) Funding 9-02 by Kansas Dept. of Agriculture. 785-864-7719 segbert@ku.edu

**"Theoretical and Experimental Investigation of Quantum Neural Computing,"** \$400,000, E. Behrman, WSU Dept. of Physics; S. Skinner, WSU Dept. of Electrical Engineering and Computing; J. Steck, WSU Dept. of Aerospace Eng. National Science Foundation funding in Fall '02. 316-978-6197 steven.skinner@wichita.edu

**"Model-Based Signal Processing**

**Algorithm for MIDP GPR,"** \$50,000. Muhammad Dawood and S. Prasad Gogineni, KU Dept. of Electrical Engineering/Computer Science/ ITTC Research. Algorithm will interpret information from the Mars Smart Lander Mission scheduled for 2007-2009. NASA funding awarded 1-03. 785-864-7796 dawood@ittc.ku.edu

**"Scaling up the Ecosystem Consequences of Forest Expansion in the Great Plains Region,"** \$194,762, Loretta Johnson and John Blair, KSU Dept. of Biology. NASA funding. 785-532-6921 johnson@ksu.edu

## MANUFACTURING and ADVANCED MATERIALS

**"Generation of Forming Limit Curves and Friction Coefficient Data for Use in FEA of Sheet Metal Forming,"** \$35,000. V. Madhavan, WSU Dept. of Industrial Engineering. ADMRC funding awarded Fall '02. Viswanatha.Madhavan@wichita.edu 316-978-5913

**"Laminate Statistical Allowable Generation for Fiber Reinforced Composite Materials,"** \$161,000, J. Tomblin, WSU Dept. of Aerospace Eng. FAA funding awarded Fall '02. 316-978-5234 john.tomblin@wichita.edu

**"Crystal Growth of New Families of Ferroelastic Materials,"** \$45,000, Mark D. Hollingsworth, KSU Dept. of Chemistry. Funding by NASA 5-02. 785-532-2727 mdholl@ksu.edu

Sources: K-State, Wichita State and University of Kansas research and sponsored program reports

The telescope inside Crane Observatory at Washburn University was built in 1889 by Warner-Swasey and is still in use for public viewing.



Photo by Brenda Culbertson

## KANSAS OBSERVATORIES

★ **Clyde W. Tombaugh Observatory**, University of Kansas, Lawrence; 785-864-3166; 785-864-4016

★ **Lake Afton Public Observatory**, part of WSU's Fairmount Center for Science and Mathematics Education at WSU; 1-316-978-3191; <http://webs.wichita.edu/lapo/>

★ **Farpoint Observatory**, Topeka. [www.kansas.net/~farpoint/farpoint/index.htm](http://www.kansas.net/~farpoint/farpoint/index.htm)

★ **Powell Observatory**, Louisburg, [www.askconline.org/powell.htm](http://www.askconline.org/powell.htm)

★ **Pittsburg State-Greenbush Astrophysical Observatory**, Greenbush; 620-724-6281

★ **Crane Observatory**, Washburn University, Topeka 785-231-1010, ext. 2264

★ **Elk Creek Observatory**, on the Holton High campus. [www.holton.k12.ks.us/hhs/astronomy/elkcreekobservatory](http://www.holton.k12.ks.us/hhs/astronomy/elkcreekobservatory)

★ **Mabee Observatory**, Bethel College, North Newton 316-284-5568 <http://galileo.bethelks.edu/~mo.htm>

# Interstellar R&D

## Ad Astra Kansas News



This "Interstellar R&D" third-time feature in this **Ad Astra Kansas News** 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 millenium'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, Jennifer Valcov

### OBSERVATION

#### The Galactic Center of Our Milky Way

Fairly typical of the countless billions of galaxies expanding throughout the cosmos, our local Milky Way galaxy, about 100,000 lightyears in diameter, consists of 200-300 billion stars revolving about every 250 million years around its central core.

The center of our galaxy, some 25-30,000 lightyears from our star(solar) system, has become an area of intense interest in recent years to astrophysicists and astronomers worldwide. Scientists observe in far-infrared and radio wavelengths to image through the dust and gas that block optical telescopes. Using Wide Field Radio Imaging of the National Radio Astronomy Observatory's Very Large Array to observe the galaxy's "central parsecs" (about 1,000 lightyears), scientists from the Naval Research Laboratory noted unusual phenomena at the Galactic Center—including a compact, yet extremely strong radio source Sagittarius A\* (Sgr A\*) at the exact center of our galaxy. Astronomers increasingly believe this point-like source to be a massive black hole, equivalent to millions of Suns.

Many astronomical instruments, both space-based (Hubble, Chandra, Compton, RXTE, ROSAT, MSX) and Earth-based (Gemini North and South, Keck, Subaru, NRAO VLA and VLBA, ESO VLT) operate in a great variety of wavelengths (from radio, millimeter, submillimeter, infrared, and optical to ultra-violet, x-ray, gamma-ray, and neutrino) observing such Galactic Center phenomena as dark matter annihilation, central star orbital accelerations, molecular gas and stellar iron abundances.

An electronic newsletter, launched at a Galactic Center workshop in La Serena, Chile, in 1996 is available at [gcnnews@astro.umd.edu](mailto:gcnnews@astro.umd.edu) and at [www.astro.umd.edu/~gcnnews](http://www.astro.umd.edu/~gcnnews). A Galactic Center international conference meets biannually, and galactic consciousness is growing around the globe.

### COMMUNICATION

#### Seth Shostak: A Scientific Approach to Listening for Signs of Life in the Universe

As a senior astronomer with the Mountain View CA-based SETI Institute, Dr. Seth Shostak's job involves always having one ear tuned to the sky. Dr. Shostak oversees the Phoenix Project, a comprehensive survey examining signals from space in an attempt to determine if those signals arise from potential intelligent sources.

Dr. Shostak earned a BA in physics from Princeton and a Ph.D. in astronomy from Caltech. He spends much of his time educating the public about SETI, always emphasizing the scientific basis for the work rather than the more speculative or fringe aspects. While he believes it is quite possible that other intelligent civilizations exist somewhere within the vast universe, Shostak does not think that ETs have actually visited Earth. "Few scientist are convinced that the ETs are joy-riding through our atmosphere," he said during an ABC sponsored Q&A.

With Project Phoenix, Shostak and his colleagues can observe Sun-like stars for relatively long periods of time at a wide range of frequencies and signal types. This allows them to follow up on any interesting signals within minutes of first detection — an advantage not found in other observing programs where researchers must sometimes wait weeks for a second look.

However the most exciting and effective work in looking for signs of intelligent life is still to come. The \$40 million Allen Telescope Array to be built in the Cascade Mountains in California is a joint project with UC Berkeley that will be 100 times quicker than the search being done now. It will have a total collecting area of about 10,000 square meters, and its frequency range — from 0.5 to 11 gigahertz — will be wider than any previous SETI telescope. It will be able to image segments of the sky 2.5

degrees wide at a time, instead of just a single point. Whereas current operations allow scientists to search a few thousand stars, the Allen Array will allow hundreds of thousands and possibly millions of stars to be searched. Speaking with *New Scientist* about the Allen Array Shostak said, "This is the first instrument I think has a real chance of detecting a signal within our lifetimes. This instrument changes the rules of the game."

### TRANSPORTATION

#### NASA Head Promotes Nuclear Propulsion

Dubbed *Project Prometheus*, the program to develop a nuclear reactor and propulsion system is receiving support from NASA Administrator Sean O'Keefe. In a NASA TV address, O'Keefe denied rumors of plans to use the technology for a human mission to Mars in the near future. Instead, the government has signed off on *Jupiter Icy Moons Orbiter* mission slated for 2009/2010. The mission will use nuclear-powered electric propulsion to allow the craft to "jump" between the orbits of the jovian moons. The cost of Jupiter Tour is expected to be at least \$3 billion.

#### Antimatter Propulsion for Interstellar Travel

NASA Institute for Advanced Concepts is studying the use of antimatter propulsion for space voyages. Researcher Steve Howe is working on a sail which generates energy in 2 ways: it can trap ions and trigger matter-antimatter explosions, and the antimatter can also react with the sail's coating of uranium-235 to generate nuclear fusion. "We're trying to find an architecture to do really deep space exploration, technology that might allow interstellar missions," Howe told space.com recently.