



AD ASTRA KANSAS NEWS

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

Fall 2002

Vol. 1, No. 2

You are cordially invited to an

AD ASTRA DAY

Focus Meeting
Saturday, Nov. 2

at the

Kansas State Capitol Bldg

300 S.W. 10th, Topeka
in Committee Room 123-S
10 a.m. to 12 noon

Topics: Possible statewide Ad Astra
Day proclamation in 2003 to recognize
the role of science in Kansas' future.

Corresponding Ad Astra Day
at 2003 state fair.

Possible web site.
Ad Astra Foundation.

Looking Ahead...

October

- 4,5,25,26** How Far is Far? A visual journey of 3 million light years-Lake Afton Public Observatory 316-978-3854 <http://webs.wichita.edu/lapo/>
- 5** Life and Death of Stars, Powell Observatory, Louisburg. 913-438-3825 dyoung8@kc.rr.com
- 6-11** KCSC Elderhostel Astronaut Training ages 55 and up. 1-800-397-0330 ext 319
- 13-16** Camp Tech, Rocks Springs Ranch, Junction City
- 17** Wichita Chapter NSS meeting at WSU. "Ergonomics and Space Engineering" rchamb8342@aol.com
- 26** Kansas BEST Robotics Competition for grades 9-12 at "WSU Heskett Center 316-684-2745

November

- 7-10** KCAE 4-H Aerospace Encampment, Hutchinson, for ages 12 up. Contact wbarker@oznet@ksu.edu
- 8** Open House Farpoint Observatory, SW of Topeka.
- 9** KCAE meeting 10 a.m. at KCSC, Hutch
- 15,16,22,23** Solar System Potpourri-Lake Afton Public Observatory.

December

- 3-4** Kansas Technology Leadership Conference, Topeka. 785-296-7922

Why Kansas?

by Jeanette Steinert

Networking for our 21st-century vision of Kansas as the Ad Astra State—a leader in high-tech and space- tech R & D—one of our editors handed out our humble newsletter at last May's International Space Development Conference in Denver. People were very interested, he says. "But," they asked (and you've heard this before), "Why Kansas?"

"Hmmp!" says this native Kansan. It's time we get credit due in matters of science and technology. We weren't just clod-busting in the 1860s. Founded in 1868, the Kansas Association of Scientists is the oldest society of its kind west of the Mississippi and the second oldest in the U.S. (after Connecticut).

And, as I once heard a Kansan say, "Flight may have been born somewhere else, but it grew up here." Dreamers William Purvis and Charles Wilson, two railroad mechanics from Goodland, patented the first helicopter ever in 1909. Thanks to pioneers like Beech, Cessna and Stearman, since 1921 Kansas companies have built more than 70 percent of the world's general aviation aircraft—a statistic still accurate today.

Forward-thinkers Patty Carey and Max Ary took Wernher Von Braun's quote "Whatever we have in space is because of flight" and forged a visible link between those two eras with the world-renowned Kansas Cosmosphere and Space Center.

Of course, that's the past. What about the present?

Kansas is still forward-thinking. Though we want and need more federal funding for research, Kansas doesn't twiddle its thumbs waiting for it. According to KTEC's 1999 *Kansas Innovation Index*, we rank first in the nation in state government R & D expenditures per capita. In overall state money spent, we're 10th in the nation, with the largest support, 44.1%, going for science and technology. In this past legislative session, another \$120 million has been committed for additional research facilities in engineering at WSU, life sciences at KU and food safety at KSU.

National Science Foundation statistics for fiscal year 2000 (the most recent available) show Kansas with well-established research strengths. Wichita State University ranks 7th in the nation in total funded R&D in aeronautical/astronautical engineering.

For that same year, Kansas State University ranks 42nd in the U.S. for federally-funded physics research. Four engineering sub-fields are in the Top 100 nationally for the level of funded research. K-State also boasts BioServe-KSU, one of 17 NASA-sponsored Commercial Space Centers (CSC) in the country.

The University of Kansas' rankings nationally for federally-funded research at public universities for the year 2000 are impressive. KU ranks 33rd in electrical engineering and 34th in aerospace engineering, with three other engineering sub-fields in the top 100; 33rd in chemistry; 56th in Mathematics and Statistics and 44th in Life Sciences. Also, KU-Lawrence campus is a NASA Center of Excellence in environmental remote sensing (one of 14 in the U.S.)

We rank only 32nd in population, but we do a lot with what we've got.
As to the future—Why not Kansas?

NASA headquarters comes to Kansas

The NASA manager of NASA's Space Grant Consortium and EPSCoR Programs held reviews with Kansas science education and research officials in June. Dr. Julius Dasch, Program Director of the NASA Space Grant College and Scholarship Program, visited Kansas for four days of meetings.

The review consisted of Dr. Dasch's report on the national NASA programs. Dr. David R. Downing, Director for Kansas Space Grant Consortium (KSGC) and Kansas NASA EPSCoR (KNEP), presented the statewide aspects of the two programs. Member repre-

sentatives from academia and industry highlighted their organizations' activities.

Dr. Dasch also met to discuss the orga-

[See NASA page 2](#)

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Space serendipities and spinoffs-- opportunity knocks

by Dr. Randall Chambers, Ph. D., DABFM,
DABPS, BCETS

Space explorations, with their technologies, serendipities and spinoffs, have provided special application and benefit to planet Earth, its architecture and composition, its occupants and productivity.

Since 1976, over 1,300 NASA technologies have been documented which benefit industry, life quality, industrial ergonomics, biomedical and health care systems, education, new occupations, engineering and manufacturing technology, plus provide new goals and horizons for humanity. Space programs, such as the International Space Station, along with Apollo, Gemini, Mercury, Skylab, Viking, Sojourner and the Hubble Space Telescope are responsible for improving and changing our way of life on planet Earth. Today, business is being encouraged to bring the benefits of space down to Earth.

The International Space Station's New Opportunity for Commerce and NASA's Research and Development Space Product Development Division have opened many new product development and commercial opportunities on Earth. For info on the worldwide laboratory for research which focuses on spinoff utilization for return-to-Earth commercialization contact: <http://spd.nasa.gov>; International Space Development Conference, <http://www.isdc2002.org>; Aerospace Medical Association, <http://www.asma.org>. Another site is <http://commercial.nasa.gov>. The latter also provides info on the Space Product Development Program and how to take advantage of unique opportunities resulting from space and microgravity research. Also, contact <http://nctn.hq.nasa.gov/success/index.htm>; the American Astronautical Society, <http://www.@astronautical.org>; and the Artemis Society, <http://www.asi.org>. Emphasis is being provided also by National Space Society Online, at <http://www.nss.org>; and by America Online's Space Exploration Online, on space exploration benefits to mankind.

Through NASA's Space Product Development Program, and its Commercial Space Centers and Space Power Programs, innovations have included an international consortium of private and corporate firms to produce cutting-edge infrared lasers and photodetectors; new cutting-tool hardness by combining diamond with titanium, nickel, carbon, and self-propagating high-temperature synthesis. Also, development of complex metal castings and software for producing cores and molds at much faster rates; development of special camera systems for medical and industrial use which pull weak images from strong ones allowing medical imaging which may detect early stages of disease and injuries; the development of new supercapacitors and composite electrodes for electromechanical actuator systems and hybrid electric vehicle drive systems and hyperspectral imaging and hyperspectral sensors. Information on NASA Commercial Space Center R & D may be obtained from <http://spd.nasa.gov>.

The International Space Station (ISS) provides a world-wide lab for research in fields such as agriculture, chemistry, biology, health care, pharmacology, multimedia education, electric and automotive products, food flavors and fragrances. Entrepreneurial opportunities include partnering with one of NASA's Centers to develop new capabilities, working through the New Opportunity for Commerce Office or with a single NASA Office. Details are in web sites for space commercialization, power, telecommunication, and platform for Earth observation: <http://commercial.hq.nasa.gov>. The Office of Biological and Physical Research (OBPR) also provides information on ISS commercial opportunities.

The Virtual International Space Station (VISS), was developed by the NASA Langley Research Center Spacecraft and Sensors Branch. Website is <http://nike.larc.nasa.gov/viss.html>. For research capabilities, contact <http://spaceflight.nasa.gov/station/reference/index.html>. One may walk around in a true, real-time virtual environment and VISS, Version 1.00, Internet VISS, on your windows PC. Sixteen countries worldwide participated in building the lab module system configuration. Contact <http://commercial.hq.nasa.gov> or write: Director, Research Integration and Product Development Division, OBPR, Code UM, NASA Headquarters, 300 E. Street, Washington, D.C. 20546.

BioServe seeks life science knowledge

Bioserve Space Technologies is a non-profit, NASA-sponsored Commercial Space Center.

BioServe Space Technologies at KSU continues its aggressive ground-based commercial research program with an interdisciplinary focus on drug discovery for both natural products and synthetic compounds. Several BioServe faculty scientists with research backgrounds in chemistry, biology, developmental and molecular genetics, oncology and biology are working on new compounds that show potential in the treatment of cancer, diabetes, Alzheimer's and high cholesterol.

For example, one BioServe sponsored scientist at KSU collaborates with Merck and Paratek Pharmaceuticals and screens newly developed pharmaceuticals in vitro against the parasitic protozoan, *Cryptosporidium parvum*. This ground-based research program assists companies in developing novel anti-infectious disease compounds. BioServe's goal is to apply knowledge gained from these ground-based studies to space life science research. In this study, scientists learn more about the activation of latent infections that

NASA continued from page 1

can occur during long-term space missions and propose life-threatening situations for crew members.

nization of the Kansas research enterprise with Tracy Taylor, President and CEO of the Kansas Technology Enterprise Corporation; Dr. Peter Sherwood, Director of the Kansas DoD EPSCoR Program, and Dr. Charles Rice, Director of the Kansas EPA EPSCoR Program.

The future of the national space program was presented by Dr. Pat Dasch, a consultant to the space industry on space policy and public outreach issues.

Sue Suhler--KSGC



During functions at the Kansas Cosmosphere and Space Center, Ann Birney, left, of the Ride into History Project in Admire, Kans., portrayed Amelia Earhart. Dr. Dasch, right, lectured on "Searching for Mars in Antarctica."

can occur during long-term space missions and propose life-threatening situations for crew members.

BioServe is also involved in a yeast genetics research study using microarray technology, which is scheduled to fly on a future shuttle mission. These studies seek a better understanding of the changes in gene expression, which may be related to the genetic damage that occurs during spaceflight. How genetically stable will humans, experimental animals, plants and microorganisms be in long duration space flights?

BioServe's sponsored yeast genetics studies will help answer this by following changes in gene expression and by measuring mutation rates and plasmid/chromosome loss rates in suitably marked yeast strains with both normal and impaired DNA repair abilities. The knowledge gained from the space research may also help in finding new targets against diseases like cancer, or answer questions like what genes play a role in cancer progression.

Laurine Speights--BioServe

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.

AVIATION

"Innovation in Aircraft Manufacturing Through System-wide Virtual Reality Models and Curriculum Integration," \$398,751, Dennis Siginer, WSU College of Engineering, and V. Madhavan, WSU Dept of NSF funding. Siginer@enr.twsu.edu 316-978-3400.

"Estimation of Unsteady Aerodynamic Models from Flight Test Data," \$56,973, C. Edward Lan, KU Dept. of Aerospace Engineering. Funded by NASA-Langley Research Center 4-02. 785-864-4267

"Effect of Critical Ice Shapes on Finite Wing Geometrics," \$50,000, M. Papadakis, WSU College of Aerospace Eng. Kansas Technology Enterprise Corporation funding award. michael.papadakis@wichita.edu 316-978-5936

ASTRONOMY

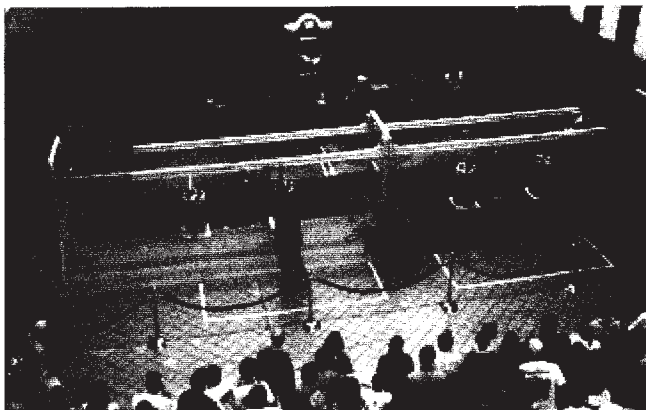
"U.S.-India Cooperative Research-Morphological Properties of the Supercluster-Void Network in the Universe," \$21,000, Sergei Shandarin, KU Dept. of Physics/Astronomy. NSF funding awarded from June 2002-05. 785-864-5274 sergei@ku.edu

"UvbyCaH β CCD Photometry of Clusters. III. The Most Metal-Rich Open Cluster, NGC 6253," Bruce Twarog, Barbara Anthony-Twarog and Nathan De Lee, KU Dept. of Physics/Astronomy. Studying photos brought back from Cerro Tololo Inter-American Observatory in Chile, they have indentified star cluster NGC 6253 as the most metal-rich in our galaxy-referring to all elements except hydrogen and helium present in a star's atmosphere. These metals help in studying the evolution of the galaxy. Funding by KU's General Research Fund and Dept. of Physics/Astronomy. 785-864-3910

ENERGY

"New Vistas for Functionalized Polyoxometalates," \$108,000, Eric Maata, KSU Dept. of Chemistry. Research works with synthesizing new types of materials to be used for conducting electricity when light shines on them. Collaboration with the University of Paris. U.S. Dept. of Energy funding awarded 2-02. 785-532-6687

"Design and Analysis of Twist-Coupled Wind Turbine Blades," \$53,178, James Locke, WSU Dept. of Aerospace Engineering. U.S. Dept. of Energy/Sandia Ntl. Labs funding awarded Spring 2002. 316-978-3410



Robotics are the challenge of the Kansas BEST game set-up at a trial run demo for the public at Towne East Mall, Wichita, last October. Though the Kansas BEST Competition is only in its 4th year, 26 high school teams competed in 2001.

Science education / competition flourishes in Kansas

★ **Kansas BEST** (Boosting Engineering, Science and Technology) Competition for high schoolers. Student teams, under the guidance of volunteer professional engineers and teachers have six weeks to design, build and operate a robot able to do specific tasks, using set materials and criteria. This year's event is October 26. The winning team advances to regionals at Texas A & M in November. Affiliated with the WSU College of Engineering. Dick Holloway 316-684-2745 engr66@aol.com

★ **Kansas FIRST** (For Inspiration and Recognition of Science and Technology) Robotics Competition for grades 9-12. Grants available through the KSGC. Competition begins in January. Contact: Sue Suhler SSuhler@kucr.ukans.edu 785-864-7401

★ **Kansas Junior Academy of Science**—For students grades 7-12 interested in taking science and math to the next level by working on long-term science projects. <http://webs.wichita.edu/kjas> scott.kardel@wichita.edu 316-978-3991

★ **STARBASE** (Science and Technology Academies Reinforcing Basic Aviation and Space Exploration.) Sponsored by the Kansas Air and National Guard, this nationally-recognized math, science and technology program for grades 4-6 has programs in Wichita, Topeka, Salina and Kansas City. 785-274-1480 www.kansasstarbase.org.

"100 Femtosecond X-Ray Detector," \$100,937, Zenghu Chang, KSU Physics Dept. Development of a super-speed camera capable of filming movement of molecules and atoms to facilitate understanding the dynamics of matter. Awarded 2-02 by U.S. Dept. of Energy. 785-532-1621

INFORMATION TECHNOLOGY

"Validation of AMSR Snow Depth on Sea Ice Retrievals Using An Airborne Pulse Radar," \$121,584, Gogineni, S. Prasad and Glenn E. Prescott, KU Dept. of Electrical Eng. and Computer Science. NASA Goddard Space Center funding awarded 3-02. prescott@ku.edu 785-864-8804

"Advanced Information Subsystems for Next Generation General Aviation Aircraft," \$101,324, J. Garth Thompson, KSU Dept of Mechanical and Nuclear Engineering, and John J. Uhlarik, KSU Dept of Psychology. NASA funding awarded 3-02. 785-532-2614 jgt@ksu.edu

"Incubating Commercial Remote Sensing Products," \$150,000, Kevin Price, Dept. of Geography, KU Center for Research. NASA Goddard funding from 4-1-02 to 3-31-03. 785-864-5542 price@ku.edu

BIOTECHNOLOGY

"Flow and Distribution of Fluid Phases Through Porous Plant Growth Media in Micro Gravity," \$92,609, Gerard Klutenberg, KSU Dept. of Agronomy. NASA funding awarded 4-02. 785-532-7215 gjk@ksu.edu

MANUFACTURING and ADVANCED MATERIALS

"Methods for Drilling Precision Holes in Aerospace Metals and Composites," \$55,066, B. Bahr, WSU Dept. of Mechanical Engineering. Aircraft Design Manufacturing Research Center funding. 316-978-6319 behnam.bahr@wichita.edu

"Managing Tight Binding Receptors for New Separations Technologies," \$225,000, Richard Givens and Daryle Busch, KU Dept. of Chemistry. Research aims are to develop a reusable compound that will capture radioactive elements and then release them, by exposure to light, into a safe storage environment. Specific concerns are the Hanford, Wash., and Savannah River, S.C. clean-up sites. U.S. Dept. of Energy funding awarded 4-02. 785-864-4904 rgivens@ku.edu

Interstellar R&D

Ad Astra Kansas News

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

Earth-based, Space-based and Lunar-based observatories provide varied and comprehensive capabilities for studying our stellar environs and learning about the cosmos.

Earth-based Observatories

★Hawaii Island — Mauna Kea Summit 4,206 m; Keck I and II, Gemini North 'cyber observatory', and Subaru -Japan pioneer Adaptive Optics; AO developed by Jerry Nelson; produces "eightfold improvement" in image, say Keck's Frederick Chaffee; AO 'laser guide stars' being perfected.

★Chile, North - Atacama Desert; European Southern Observatory four 8.2m optical telescope interferometers make Very Large Telescope VLT "able to see a man on the Moon"; 64-dish Atacama Large Millimeter Array ALMA at 5,400m+ by 2011; 100m Overwhelmingly Large Telescope OWL may follow.

Space-based Observatories

★Space Infrared Telescope Facility to launch 9 Jan 2003 and follow Chandra X-ray and Hubble Optical in NASA Great Observatory program, as reported in "Interstellar R&D", Ad Astra Kansas News #1.

★Gamma-ray Large Area Space Telescope 2006 launch to measure intergalactic magnetic fields, and help understand how galaxies form and evolve, and how little-understood origins of powerful Cosmic rays determine production of gamma rays.

Lunar-based Observatories

★Any and all astronomical and astrophysical observations are superior from the Moon compared to Earth, and one of the first elements of a lunar base will be an international lunar observatory. A Lunar Optical Interferometer proposed by Kondo, Oliversen, Lowman and Chen in 2002 could search for "those cold, dark rocks" that threaten Earth, says Moonwalker John Young, and for ExtraSolar Planets.

COMMUNICATION

SETI: The Search for Extraterrestrial Intelligence.

The SETI Institute is a non-profit organization founded in 1984 by Thomas Pierson and Dr. Jill Tarter. Its origin was partly inspired by work done in the early '60s by Dr. Frank Drake, now a SETI trustee, who created the Drake Equation to calculate the likely prevalence of life in the universe. The Institute's two branches are: the SETI Center, led by Tarter, and the Center for the Study of Life in the Universe, led by Dr. Christopher Chyba, who also holds the Carl Sagan Chair. There are over 100 scientists working on the SETI project. The organization has administered over \$150 million in funds during its 18 year history.

The first grant, received by SETI in 1985, was from NASA for a targeted search program using microwaves to detect signs of intelligent life. The ongoing search uses a transportable system that can be moved between telescopes around the world. It is currently housed at Arecibo Observatory in Puerto Rico. The \$26 million Allen Telescope Array to be built in the Cascade Mountains is a joint project with UC Berkeley that will aid in the search for life's origins. SETI is working on establishing a \$100 million ongoing endowment.

Many disciplines are involved with SETI. The work of social scientist Dr. Doug Vakoch is but one example. Vakoch studies cultural aspects of contact with an extraterrestrial civilization, especially communications. He focuses on ways an alien culture might try to create messages suitable for travel across interstellar space and also possible psychological and religious responses to detecting a signal from extraterrestrial intelligence.

TRANSPORTATION

What's Ahead for Space Propulsion?

One of the most forward looking projects at NASA may be the In-Space Propulsion Program (ISP) focusing on developments that will advance propulsion technologies by significantly reducing cost, mass, and travel times. Ground has been broken on the New Propulsion Research Laboratory at Marshall Space Flight Center in Huntsville, Ala., slated to open in April 2004 and the NASA office of Space Flight has given the go-ahead to several development ideas in advanced propulsion. Major areas of research include:

★**Nuclear Electric Propulsion / Power Conversion:** Uses nuclear reactors to generate heat which is converted to electrical power for high-performance electric thrusters. Projected budget is \$33 million Through 2004.

★**Aerocapture:** Uses a planet's atmosphere to slow spacecraft and capture it into orbit. This means there is no need for on-board propulsion; saves mass and requires a smaller, less expensive launcher.

★**Solar Sails:** Membrane-thin sails made of strong composite material; requires no fuel; propelled through space by solar wind, the photons emitted by the Sun. Projected budget for Aerocapture and Solar Sails combined is \$37 million through 2004.

★**Maglev Technology:** Used to give initial boost to craft; can accelerate a craft up to 965 km/hour on a specially designed track prior to firing traditional rockets. Significantly decreases amount of propellant needed for launch, thus reducing mass or allowing for heavier payloads.