

AD ASTRA KANSAS NEWS

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

Spring 2004

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Astronaut Steve Hawley to speak at second annual Ad Astra Kansas Day event

With the future of the Hubble Space Telescope uncertain due to NASA budget and safety concerns, thoughts from the astronaut who deployed it and who has been involved with much of its research are especially timely.

On April 24, Kansas astronaut Steve Hawley will share with fellow Kansans some of the discoveries made by the Hubble and some of his experiences participating in the HST missions when he headlines the second annual Ad Astra Kansas Day celebration at Washburn University, Topeka.

This date coincides with the anniversary of his deployment of the Hubble Space Telescope (HST) on a five-day mission from April 24-29, 1990.

The Hubble is considered one of NASA's Great Observatories along with the Chandra X-ray Observatory (which Dr. Hawley helped deploy also), the Compton Gamma Ray Observatory (now de-orbited) and the recently orbited Spitzer InfraRed Telescope.

A 1973 University of Kansas graduate with degrees in physics and astronomy, Hawley earned his Ph.D. in astronomy and astrophysics from the University of California in 1977. Less than a year later he was selected as a NASA astronaut. Since then he is a veteran of five space flights and has logged a total of 770 and 27 minutes in space.

The Kansas native, whose hometown is Salina, currently serves as Associate Director for Astromaterials Research and Exploration, Science and Life Sciences Directorate at Johnson Space Center, Houston. Among his numerous honors are the NASA Distinguished Service Medal and 1992 Kansan of the Year.

The aim of Ad Astra Kansas Day is to promote public awareness of the importance of education, science and technology to Kansas' growth, to credit scientific achievement and to inform the public of the outstanding work Kansans are doing in the science fields. The event is free and open to the public.

Leading into Dr. Hawley's presentation will be five other Kansas researchers.

Washburn University astro-physicist Karen Camarda will speak about her research into black

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Insert: Ad Astra Kansas Day schedule

Hawley space flight highlights

Since being selected as a NASA astronaut in 1978, Steve Hawley has logged the equivalent of 32 days in space.

1984--Served as mission specialist on the maiden flight of the Space Shuttle Discovery STS-41D

1986--On the six-day flight of the STS-61C Columbia, the crew deployed the SATCOM KU satellite and conducted experiments in astrophysics and materials processing.

1990--During STS-31 Discovery five-day mission (April 24-29, 1990), the crew deployed the Hubble Space Telescope (HST) and conducted experiments.

1997--On the STS-82 Discovery second HST maintenance mission, Dr. Hawley's primary role was to operate the Shuttle's 50-foot robot arm to retrieve and redeploy the HST following completion of upgrades and repairs.

1999--Dr. Hawley served as flight engineer on the STS-93 Columbia shuttle mission. The primary mission objective was successful deployment of the Chandra X-ray Observatory.



NASA photo

Source: NASA official website

holes.

Graham Bell of the Northeast Kansas Amateur Astronomy League (NEKAAL) will explain how his club discovered one of the faintest comets ever discovered by amateurs. The research has also resulted in more than 300 asteroid discoveries.

Kevin Price, associate director of the Kansas Applied Remote Sensing (KARS) program at the University of Kansas, will speak on the fact that Kansas scientists are known nationally and internationally for their environmental remote sensing work. Among other things, they are on the cutting edge in research dealing with the greenhouse effect. Price will explain how KARS is studying the potential of the Great Plains to be part of the solution to global warming.

Daniel Bateman, community outreach manager of the Kansas Cosmosphere and Space Center, will tell how research work on the International Space Station is improving life here on earth and working towards the exploration of Mars.

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

"Hawley" cont. page 3

Ad Astra Kansas Day poster contest blasts off

Over 200 students entries were received for the first-ever Ad Astra Kansas Day science poster contest held for grades 5 and 6. Themed "SUPER SLEUTHS--Researching for the Stars" contest brochures included mini-biographies on current Kansas scientists for role model purposes.

Winners will be announced at the Ad Astra Kansas Day event April 24. Cash prizes will be \$20, \$10 and \$5 for the top three posters. Thanks to the Kansas Cosmosphere and Space Center, the winner's school will also receive an outreach presentation from the KCSC.

Funding for this educational activity, which seeks to inspire tomorrow's scientists, was provided by the Kansas Space Grant Consortium.

Thanks also go to role model scientists James Aber, ESU Dept. of Earth Sciences; Barbara Anthony-Twarog, KU Dept. of Physics and Astronomy; Youqi Wang, KSU Dept. of Mechanical and Nuclear Engineering; Scott Miller, WSU Dept. of Aerospace Engineering; and Mario Rivera, KU Dept. of Chemistry, who shared their work with students.

In astronaut training, most roads lead back to NASA

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

Internationally, professional astronauts/cosmonauts, spaceflight participants or International Space Station (ISS) crew members go through a rigorous selection process.

Being selected as an astronaut includes the consideration that, in addition to criteria specified by NASA and FAA panels, there is also a Multilateral Coordination Board (MCB) and an ISS Multilateral Crew Operations Panel (MOP) which specifies criteria at the international level. These boards and panels, along with Space Station Memoranda of Understanding, define the processes and criteria for selecting, assigning, training and certifying space station crews.

Professional astronauts/cosmonauts are eligible to be assigned as crew commanders, pilots, flight engineers, station scientists or mission specialists. Mission specialists have two categories: expedition or visiting crews. Expedition crews often do physiological, physics or bio-astronautics research or study the effects of prolonged weightlessness. Visiting crews can include visiting scientists, commercial users, government or military or civilians with special assignments.

Advanced training for astronauts and astronaut candidates is provided by NASA, the European Space Agency, the Canadian Space Agency, Russia's Yuri Gagarin Cosmonaut Training Center and China. Most roads in space training lead back to NASA, except in connection with China, which has, up to now, been independent in its space program.

ISS crew members receive basic training at their respective space agencies before proceeding to advanced training. The Canadian Space Agency's CSA Advanced Training Program prepares for entering the International Astronaut Corps at the Johnson Space Center. Members of the European Astronaut Corps (EAC) have been trained by the European

Space Agency (ESA) with requirements being similar to those of NASA.

Increment specific training is job-oriented and team-oriented training, involving tasks and systems knowledge, concentrating on multiple crew member training on multiple jobs. Multi-segment training is provided, putting together payload and systems operations for the entire space station. On-board training is also provided, enabling the crews to retain proficiency in skills and knowledge gained in ground training. In general, the training will cover medical core drills, servicing, robot operations and specific skills. On-board training may require special on-board simulators. Refresher training is also provided. On-board training also allows crew members to train while in flight for the next flight.

During ISS advanced training, expedition astronauts receive training in all space station on-board systems and participate in cross-cultural training. Each international partner provides training for their contribution to the ISS to the other expedition astronauts.

Each country's space agency submits proposals for the specific training or projects they wish to be involved in. Proposal acceptance and sponsorship runs through the MCB and MOP boards.

Those who participate in the Russian Space Station MIR program receive Russian language training, transfer to the Yuri Gagarin Cosmonaut Training Center for 13 months, and then return to JSC to train to be part of the shuttle crew during the final phase of flight preparation.

Each expedition astronaut begins ISS advanced crew training approximately 12 months before the start of expedition-specific training. Meanwhile, all visiting crew members and spaceflight participants undergo a basic customized ISS training program.

Looking Ahead...

April

10 KCAE meeting, 10 a.m. at Kansas Aviation Museum, Wichita

16-17 Kansas Academy of Science 136th annual meeting at UMKC and Rockhurst University, KCMO. This is a joint meeting with the Missouri Academy of Science.

16-17 34th annual Mid-America Regional Astrophysics Conference (MARAC), KCMO

23-24 WSU College of Engineering Open House--Awards include Ad Astra Space and Technology Award for best research contribution in aerospace and industrial engineering technology and Ad Astra Engineering and Science Award for best technical contributions in aerospace engineering, human factors and aerospace ergonomics. Awards given by Wichita Chapter NSS and Great Plains Chapter of Ergonomics and Human Factors Society.

23-25 Kansas Assoc. of Teachers of Science (KATS) Kamp at Rock Springs

24 AD ASTRA KANSAS DAY, Topeka

24 Sy Lierbergot, lead EECOM flight controller for Apollo lunar missions and author of *Apollo EECOM: Journey of a Lifetime*, will be giving a free presentation and book signing at KCSC, Hutchinson

Send calendar listings for upcoming scientific meeting, conferences, and other events in Kansas to steinj@ourtownusa.net

Kansas high schools earn FIRST robotic competition awards

Competing against over 40 teams, three Kansas high schools earned special honors at the Lone Star Regional of the recent U.S. FIRST (For Inspiration and Recognition of Science and Technology) robotics competition.

Number one in the standings at the end of competition held April 1-4 in Houston, Tex. was Lawrence High School. They also won the General Motors Industrial Design Award.

Winning the Regional Chairman's Award and the Xerox Creativity Award was Paola High School. Earning the Kleiner Perkins Caulfield and Byers Entrepreneurs Award and the Rookie All-Star Award was Parsons High School.

These three teams all move on to national competition which will be held April 15-17 in Atlanta, Ga. The FIRST competition is a member activity of the Kansas Space Grant Consortium.

Summer science opportunities abound at all levels

★ Kansas has one slot out of fifteen in NASA's new 2004 weeklong workshop for new high school graduates. For info call 785-864-3999.

★ The Physics Teaching Resource Agents (PTRA) program of the American Association of Physics Teachers (AAPT) is offering a workshop at Emporia State University specifically for physical science and physics teachers in rural schools. Funding for the July 19-23 program is through the National Science Foundation. Info at www.emporia.edu/physics/ptra/home.htm.

★ Pittsburg State will offer its third RET (Research Experience for Teachers) program. Seven K-12 teachers from the four-state region will be selected for a summer materials research program and will receive 2-month annualized salaries. For information on this NSF-PSU/NSF-RET program, go to www.pittstate.edu/services/nsfret/retbrochure.doc

★ KU's engineering program's Project Discovery, a weeklong summer program will give girls grades 9-12 an intro into engineering. Call 785-864-2934.

★ May is the start of the Kansas Cosmo-

sphere and Space Center's Future Astronaut Training Programs for grades 7-10. The five-day programs, which have three levels, continue throughout the summer. Other summer programs include the Adult Astronaut Adventure for those aged 18-54. Call 1-800-397-0330 or go to www.cosmo.org

Ad Astra Per Aspera

Settlers came by horse and wagon
Seeking homes in Kanza land
With only stars to chart the pathway
Through nameless streams, tallgrass
and sand.

Sparked by man's inventive genius
The motor soon replaced the horse.
That helped us feed a hungry world
And launched us on another course.

Ad astra per aspera,
We're still looking to the stars
To direct our troubled pathway
Beyond the present terrorist wars

Which threaten to disrupt the progress
We have made toward outer space,
Toward technologies envisioned
To make the world a better place.

Ad astra per aspera
Lord, keep us reaching for that star
That leads beyond the current limits
Of where we've been and who we are.

Lily D. Angle

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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

"HPNC in Support of Low Temperature Astrophysics Studies and Other Collaborative Research," \$150,000, John Ziegler, Emporia State University. NSF HPNC funding through 9-04.

"Ultra-Light Technology for Research in Astronomy," \$10,875, Jorge Ballester, ESU Dept. of Physical Sciences, and Chuck Pheatt, ESU Dept. of Math/Computer Sciences. NASA EPSCoR funding through KU Center for Research through 11-04. 620-341-5971 ballestj@emporia.edu

BIOTECHNOLOGY

"Nano Crystal Superlattices: Synthesis and Properties," \$36,000, Kenneth Klabunde and Christopher Sorenson, KSU Dept. of Chemistry/Biochemistry. Awarded by NASA 8-03. 785-532-6849 kenjk@ksu.edu

ENERGY

"Creation of an Enhanced Geothermal System through Hydraulic and Thermal Simulation," \$27,503, Daniel Swenson, KSU Dept. of Mechanical and Nuclear Engineering. U.S. Dept. of Energy award in 11-03. 785-532-2320 swenson@ksu.edu

"Optical and Electrical Properties of III-V Nitride Wide Band Semiconductors," \$146,502, Hongxing Jiang and Jingyu Lin, KSU Dept. of Physics. U.S. DOE funding 12-03. 785-532-1627 jiang@ksu.edu

"Compact Muon Solenoid Sensors," \$23,442, Eckhard von Toerne, Timothy Bolton, KSU Dept. of Physics. Awarded by U.S. DOE and NSF 10-03. 785-532-1638 evontoer@ksu.edu

"Semi Conductor Radiation Detectors with Frisch Collars and Collimators to GammaRay Spectroscopy and Imaging," \$116,265, Douglas McGregor and Dale Schinstock, KSU Dept. of Mechanical and Nuclear Engineering. U.S. Dept. of Energy funding awarded 8-03. 785-532-5284 mcgregor@ksu.edu

"Kansas Advanced Semiconductor Project (KASP)," 747,786, Timothy Bolton, et al. KSU Dept. of Physics. U.S. Dept. of Energy funding 8-03. 785-532-1664 tbolton@ksu.edu

INFORMATION TECHNOLOGY

"Cryospheric Advanced Sensor (CAS): A Spaceborne Microwave Sensor for Sea Ice Thickness and Snow Cover Characteristics Instrument Incubator Spring 2004

Program (IIP)," Torry Akins (P.I), KU ITTC Research. NASA JPL-funded project began 9-12-03. 785-864-7739 tlakins@ittc.ku.edu

"Model-Based Data Inversion to Estimate Accumulation Rate of Polar Ice Sheets," Prasad Gogineni, KU Dept of Electrical Engineering/Computer Science. NASA Goddard funding, project start 9-1-03. gogineni@rsl.ku.edu

"Design, Analysis and Implementations of CaTS: Carrier Tracking System," \$115,339, David Ben-Arieh, KSU Dept. of Industrial and Manufacturing Systems Eng. Awarded by NASA 10-03. 785-532-3724 davidbe@ksu.edu

"Development Multilink PPP Technologies from Iridium [satellite system]," Victor Frost (PI), KU Dept. of Electrical Engineering/Computer Science. Harris Corporation funding 8-28-03. frost@eecs.ku.edu 785-864-4833

"KU High Altitude Balloon Experiment System and the KUBESat-1 Project," Trevor Sorenson, KU Dept of Aerospace Engineering. Honeywell funding 8-15-03. tsorensen@ku.edu

"Optimal Space-Time Waveform Design of Adaptive, Multi-Mode Radar," James Stiles, KU Dept. of Electrical Eng./Computer Science, Science Applications International Corp. funding, 8-01-03. jstiles@rsl.ku.edu

"Hawley" cont.

Mercury, Gemini and Apollo programs. His overview of astronaut training technologies will span from 1957 and extend to the present day and beyond.

The event runs from 11 a.m. to 6 p.m. with Hawley's presentation "The Hubble Space Telescope-14 years of Servicing and Service" scheduled for 4:30 p.m. An evening viewing session will be held at

MANUFACTURING and ADVANCED MATERIALS

"Predicting Useful Life of Payload Carrier Hardware," \$24,000, David Ben-Arieh, KSU Dept. of Industrial and Manufacturing Engineering. NASA funding 8-03. 785-532-3724 davidbe@ksu.edu

Development of Soy-based Polyols for the Urethane Industry, Pittsburg State University Kansas Polymer Research Center (KPRC) alliance with Cargill. Partial U.S. D OE funding in '03

"Neutron and X-ray Reflectometry Study of Surface Critical Phenomen," \$143,423, Bruce Law, KSU Dept of Physics. U.S. DOE funding 12-03. 785-532-1618 bmlaw@ksu.edu

Sources: KSU Research and Sponsored Programs, ESU Research and Grant Center, PSU News Service and Media Relations and KU ITTC project listings.

KCAE applications are being accepted

Applications for the Kansas Commission on Aerospace Education Kansas 2004 Aviation Teacher of the Year are now being accepted. Deadline is Aug. 1, 2004. Download applications from www.KCAE.org or contact kam3350@juno.com

the Crane Observatory on the Washburn Campus.

The Ad Astra Kansas Day event will be held in Rooms 101 and 103 in Stoffer Hall on the Washburn University Campus. Sponsoring is the Ad Astra Initiative, a group of citizens and educators intent on raising Kansas' scientific profile in the 21st century. Hosting will be the Washburn University Department of Physics and Astronomy.

Rocketry soars in the Kansas skies

(KCAR) Kansas City Association of Rocketry is a member of the National Association of Rocketry. It holds ten organized launches each year, two with NAR sanctioned competition events. Also assists with the Team America Rocketry Challenge. Source: www.angelfire.com/mo2/kcar/index.html

(KOSMO) Kansas Organization for Space Modeling, NAR section #3427, Wichita. Contact: 316-733-4804

K.L.O.U.D.BUSTERS, Inc., in south-central Kansas is a non-profit organization and member of the Tripoli organization. Launch site is Argonia, southwest of Wichita. It hosts three major launches each year and a monthly fun fly. Has hosted the annual Tripoli Rocketry Association national launch four times in the last ten years. Also hosted the Discovery Channel "Rocket Challenge" in 2003. Launches are from a 40 acre all-weather field. Has a constant 25,000 ft. FAA waiver and at the most recent Tripoli launch in 2003, there were launch windows available for up to 34,500 ft. Source: www.kloubusters.org

(SMART) Shawnee Mission Area Rocketry Team #644, Topeka. Contact: 785-286-1077

Teeniemunde Rocketry Club in the Mo-Kan area of southeast Kansas. Club flies everything from 1/2-A Modroc to High Power level-2. Source: www.teeniemunde.org



Rocket launch at Argonia in this undated photo by the K.L.O.U.D.BUSTERS Rocketry Club.

Interstellar R&D

Ad Astra Kansas News

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

Astronomy From the Moon/ Lunar-Based Astrophysics

The human quest to the stars, that begins with observation, takes a giant leap forward and upward with our return to the Moon, robotically at first, permanently and for good. Every single astronomy or astrophysics observation made from Earth is superior from the Moon, and the reasons for this advantage are well known: Absence of obscuring and distorting atmosphere; stable surface; long cool nights (1/2 lunation, or 14.5 days), low gravity (1/6 Earth g), far side radio frequency silence.

From Luna's surface, a large variety of astronomical and astrophysical instruments and observations are possible — radio, infrared and optical telescopes and interferometers; interferometry from ultraviolet to submillimeter wavelengths and for very long baselines, including Earth-Moon VLBI; X-ray, gamma-ray, cosmic ray and neutrino detection; very low frequency radio observation; and more.

Celestial research of special interest for lunar-based observation includes detection of Extra Solar Planets and of Earth / Moon Approaching Objects, the Search for Extra Terrestrial Intelligence SETI, and the study of our Galaxy and its Center.

Astronomical technologies with special advantages for lunar-based observation include interferometry of all kinds benefitting from lunar stability, infrared enhanced by crater cold trap cooling, radio free of interference through far-side lunar shielding, optics' capacity increased through ultra light-weight materials in low gravity. Submillimeter, as well as high-energy ultraviolet, x, gamma and cosmic ray wavelength technologies, among others, all have enhanced atmosphere-free performance on the Moon.

Interstellar R&D grows through astronomy and astrophysics development, and in turn, astrophysics and astronomy progress through the growth of interstellar R&D. To the Stars via the Moon, and to the Moon via the Stars.

COMMUNICATION

SETI: The Search Intensifies

The Search for Extra Terrestrial Intelligence (SETI) Institute in Mountain View, California, announces that the Allen Telescope Array (ATA-32) will be conducting scientific research by the end of this year. The ATA is a private-public partnership between the SETI Institute and the Radio Astronomy Laboratory of the University of California, Berkeley. The first step in the three phase project, with the two initial phases funded by Paul G. Allen, ATA-32 will expand to ATA-206, and then to ATA-350 by the end of the decade. Dr. Jill C. Tarter, ATA project leader and Director of the Center for SETI Research at the Institute states, "Finally, our tools are becoming commensurate with the size of our task."

But even with 300 times the observational capabilities available, what are the possibilities that life exists elsewhere in the universe? Dr. Christopher Chyba, principal investigator for the SETI Institute lead team of the NASA Astrobiology Institute (NAI) heads a team which examines the interaction between life and planetary evolution. If the potential for life can be ascribed to planets other than earth, that potential may be noted in bodies within a proximity to Earth which would facilitate investigation, such as Europa, one of Jupiter's icy moons, which likely has a subsurface of water.

Cynthia B. Phillips of the SETI Institute, started her "change comparison" analysis of Europa as part of her Ph.D. thesis. Phillips' comparison of 1979 Voyager images with Galileo's images of the late 1990's was limited by low resolution from Voyager and revealed no geological changes. She conjectures that there is a greater likelihood of detecting smaller changes by comparing the much higher resolution Galileo images, over their five-year timespan.

Kevin Hand, Dr. Chyba's graduate student at Stanford University, is conducting related research by finding abiotic ways that electron donor and

acceptor pairs could theoretically be produced through the action of radiation on the surface of Europa. Microbes utilize that energy which is liberated by combining electron donors and acceptors. Hydrothermal activity, as well as organics and oxidants provided by radiation chemistry on the surface, could reach the liquid substrate through geological movement as electron donors and acceptors needed to fuel an ecosystem.

Proximity allows the examination of Europa, research into possible ecological scenarios and contemplation of that which maybe occurring throughout the universe—the synthesis of life.

TRANSPORTATION

Power Issues Heating Up

Recent discoveries raise demands for increased power to propel more sophisticated exploratory equipment to distant sites of interest. Engineers at NASA Marshall Space Flight Center are looking to nuclear- powered propulsion to satisfy these demands. In a series of non-nuclear tests utilizing small stainless steel pipes, structured in a hexagonal configuration, which are superheated in a vacuum chamber, engineers evaluate material reactions which will occur when excess heat must be dissipated in outer space.

"Heat has to be turned into electricity and whatever excess dumped off the spacecraft. We have to find materials that can stand up to the massive heating," says Marshall engineer Ron Porter. For the first time in 45 years of space travel, spacecraft sensor design must also be modified to accommodate the immense heat of nuclear reactors.

Gene Austin, retired Marshall manager, says, "If we go to Mars in any meaningful way, then I don't see how we can do it without bringing nuclear propulsion and research back. We brought it to a very high state of readiness in the late 1960s, and then the mission went away. It can be done again"