National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA
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# The Astrogram
Communication for the Information Technology Age

## O'Keefe, Creedon express strong support for Hubbard, Ames

In an upbeat ceremony with a distinctly 'One NASA' theme, Administrator Sean O'Keefe and Associate Administrator for Aerospace Technology Dr. Jeremiah Creedon came to Ames recently to officiate at the installation of new center director G. Scott Hubbard. It was a smooth and seamless transition of a reassuringly positive and forward-looking nature.

*photo by Tom Reddy*

*Ames Center Director Scott Hubbard (center) shares a light moment with NASA Administrator Sean O'Keefe (left) and Aerospace Technology Associate Administrator Jerry Creedon (right).*

O'Keefe began by lauding the accomplishments of outgoing director Dr. Henry McDonald, who led Ames through challenging circumstances for the past six-and-one-half years. He praised McDonald's leadership and said that he had undoubtedly left Ames "a better place than he found it." Then O'Keefe wasted little time in assuring the rank and file that he had selected a very capable and worthy successor to build upon Ames' 60-year-plus legacy.

"He's going to do a remarkable job here," O'Keefe said of Hubbard, addressing the capacity crowd gathered in the main auditorium and watching on Ames TV. "He's got some big shoes to fill, but I know he's up to the challenge. No doubt about it!"

Hubbard was named as Ames' center director on Sept. 19, succeeding McDonald, who accepted a newly created faculty position as Distinguished Professor of Computational Engineering at the University of Tennessee (UT) at Chattanooga.

Since assuming the NASA leadership mantle a mere nine months ago, O'Keefe has demonstrated a strong commitment to reinvigorate 'this storied agency,' as he frequently refers to NASA. He has crafted new vision and mission statements, while striving to put the agency back on a sound financial footing and build support in the Congress. He has worked tirelessly to lead the breakdown of institutional and other barriers, to create an environment of respect, to forge a One-NASA approach, and to bring in new leadership at the senior management level throughout the agency, and most recently at NASA Ames.

Describing Ames as a "crown jewel" of NASA, O'Keefe acknowledged the center's difficult journey from a predominantly aeronautics center conducting wind tunnel research, through the decommissioning of the Moffett Field Naval Air Station, to what today has become internationally recognized as one of the world's pre-eminent research institutions.

Creedon, former director of NASA's Langley Research Center, also praised McDonald's leadership and "excellent legacy." In looking forward, he predicted that, based on their interaction to date, Hubbard will prove to be a "very thoughtful and effective advocate" for Ames. "He has the right background and the right talents to lead this great institution to even greater heights," Creedon observed.

"I think we have an extraordinary future ahead of us," Hubbard proclaimed in his opening statement. "The bar has been raised, but we LIKE challenges," he said. "That's what this center is all about -- advancing the frontiers of research and development."

Hubbard began by presenting a broad-brush picture of the ways in which Ames is actively engaged in efforts to fulfill NASA's new vision and mission priorities. With unconcealed enthusiasm, he proudly cited Ames' research projects, including the Stratospheric Observatory for Infrared Astronomy (SOFIA) and Kepler. Such missions not only will allow us "to explore the universe and search for life," they promise to reveal new answers to longstanding astrobiology questions, such as "Are we alone in the universe?" and "How do living things survive and adapt in the environment of space?"

Hubbard next recounted Ames' research in air traffic management and air traffic control, with such nationally recognized facilities as FutureFlight Central -- all dedicated to helping us, as human beings, "to understand and protect our home planet."

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## Successes from af2m...

The recent kick-off of the Ames Freedom To Manage (af2m) campaign has already proven to be a success. Many suggestions have been submitted and some quick resolutions are improving Ames processes and procedures.

As an example, the Ames Geographical Information System (GIS) has problems printing graphics from a MacIntosh platform using Netscape as a browser. After some research, the problem was found to be with the browser. The simple fix is to either switch the browser to Internet Explorer, which prints the graphics correctly, or convert the desired graphics to jpeg files to print them. This message has been posted on the GIS homepage to guide users in avoiding this problem.

One obstacle to efficiency sent in to af2m concerned the inability of NASA researchers to use an existing contract set up primarily for the Army. The use of this contract may avoid setting up a new

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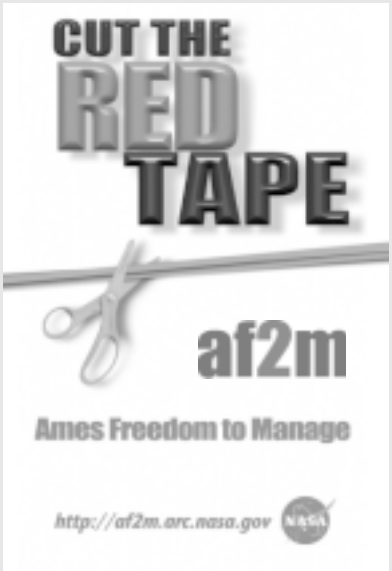


# Student-designed video system watches as the worms turn

Enduring spinning forces that would kill a human being, tiny worms are being observed by a student-designed video system in NASA studies seeking to explore how life adapts to gravity beyond Earth.

Miniature worms, only 1 millimeter long and so small they are hard to see with the naked eye, are being spun in a centrifuge for as long as four days-- withstanding forces of 20- to100-times that of Earth's gravity (1 G). In contrast, human pilots not wearing anti-G suits can black out at as low as 3 Gs, and prolonged exposure at higher Gs can be life threatening.

*A miniature camera is used to observe worms spinning at 100-times Earth's gravity.*

To examine the worms as they spin, scientists are using a video system designed and constructed by students at Harvey Mudd College, Claremont, Calif. The studies are taking place at Ames.

"By looking at what changes occur in the worms when they transition from high-G forces to normal gravity, we think we can predict what will happen to them when they experience near weightlessness during space flight," said principal investigator Catharine Conley, of Ames Code SLR. "In the future, we want to fly the worms in space, subjecting them to microgravity to see if our predictions are correct." Microgravity is close to 'zero gravity.'

"Radiation levels in space are much higher than they are on the Earth's surface," Conley said. "We know that elevated radiation increases the mutation rate of living things. Because these worms reproduce every four days, we can look quickly at many worm generations in space to see how radiation and microgravity may cause changes later," she explained.

"Worms have already flown aboard the space shuttle and it was found that they went through several generations without gross structural changes to their bodies," Conley said. "We want to test the gene expression in worms that have flown in space versus those that have not, to see if changes in worms are similar to changes seen in vertebrates that have experienced space flight." Expression is how a gene affects a characteristic such as eye color, or susceptibility to a disease or condition.

During preliminary tests, scientists spun the tiny worms (technically soil-dwelling nematodes called Caenorhabditis elegans) in a large 20-G centrifuge at Ames for four days. But they could see what happened to the worms only after the centrifuge, designed to carry human passengers, stopped. At 20 Gs, the worms are subjected to forces that are 20 times their normal weight.

"Should our hypothesis prove correct, it will validate Caenorhabditis elegans [nematode] as an extremely useful and cost-effective model organism for studying responses to space flight at the molecular, genetic and whole-organism levels," Conley said.

When Conley was planning her current experiments that utilize a smaller, desktop centrifuge, she realized she would need a camera no bigger than an ice cube that could broadcast signals from the spinning apparatus to a TV monitor and recorder in real time. So she turned to the student engineering clinic at Harvey Mudd College to produce the camera system. Five Harvey Mudd students spent an academic year on the project. They bought off-the-shelf components, but they had to overcome several engineering challenges to enable the system to work well.

"The camera had to be supported to withstand the 100-Gs force," said Professor Joseph King, director of the clinic. "All this stuff is designed so it is compatible with the geometry of the centrifuge." The equipment also has two broadcast systems, an infrared system to control the camera and a wireless, video transmission system to broadcast movies of the worms.

"During spinning, there are changes in the worms' gene expression that seem to help them compensate for the increased apparent gravity, allowing them to survive," Conley said. The worm has about 19,000 genes, and it has nerves, muscles and some of the same types of organs in people that are affected by weightlessness.

Astronauts can suffer from motion sickness, bone loss, muscle degeneration (atrophy) and blood vessel problems during weightlessness. "By studying how the worms produce different levels of proteins that help the tiny organisms cope with high-G situations, we think we eventually can develop treatments, perhaps even oral drugs, for astronauts to serve as countermeasures to problems due to weightlessness," said Conley.

After the worms endure high G forces riding in a centrifuge, the animals' behavior alters. That is part of what the scientists look for to find out how the creatures handle changes in gravity's force. Normally, under 1-G conditions, the miniscule creatures look like small, clear wiggly rods that swim snake-style through a thin layer of water and nutrients in which they live in a laboratory environment. The worms commonly are found in soil and rotting vegetation, and have about a thousand cells.

In addition to Conley's work, the Harvey Mudd student engineering clinic program was involved in about 40 projects from various companies, institutions and sponsors this year. During past years, the clinic has participated in about 10 NASA projects, according to King.

More information about the clinic is available on the World Wide Web at: http://emat.eng.hmc.edu. King may be reached at e-mail Joseph_King@HMC.Edu.

Conley's research is detailed on her Web site at: http://lifesci.arc.nasa.gov/conley/home

The NASA Fundamental Biology program and the NASA Astrobiology Institute fund the worms-in-space project. Life sciences research at Ames is supported by NASA's Office of Biological and Physical Research, which promotes basic and applied research to support human exploration of space and to take advantage of the space environment as a laboratory. More information is available at: http://spaceresearch.nasa.gov/

BY JOHN BLUCK

## Holton's pioneering research recognized

**photo by Roger Brimmer**

*Dr. Emily Holton, winner of the 2001 H. Julian Allen award, is presented with her plaque by Jack Boyd, executive assistant to the center director.*

# NASA Ames celebrates Hispanic heritage and culture

During Hispanic Heritage Month, the Hispanic Advisory Committee for Employees (HACE) hosted an array of functions and events in celebration of the diversity of the Hispanic culture. On Sept. 5, HACE sponsored a Hispanic luncheon at Shenadoah Plaza.

On Sept. 17, young folklorico dancers (ages 7-10) from Washington Elementary came to the center to exhibit their dance step at the cafeteria patio area.

Also, on Sept. 27, Eric Kristich and HACE hosted the First Annual Hispanic Heritage golf tournament at the Moffett golf course. Many attended and had an excellent time. The tournament was focused on supporting HACE in its endeavors to out reach to Hispanic youth. The winners of the tournament were Ricardo Lagman, Dave Lagman, and Presentacion Dominguez.

photo by Roger Brimmer

*From left to right: Dr. Miguel Navarez, keynote speaker and president of Texas Pan Am University; Jack Boyd executive assistant to the center director; and Manual Romero, a San José native singer/entertainer at the Hispanic Heritage luncheon.*

photo by Roger Brimmer

*Folklorico dancers (ages 7-10) from Washington Elementary came to the center to exhibit their dance steps in the Mega Bites Cafe patio area.*

photo by Roger Brimmer

*Many Ames employees participated in the Hispanic Heritage luncheon and shared in the entertainment, food and community-inspired messages.*

*Bobby Jackson warming up to compete in the golf tournament.*

*From left to right: Bob Lopez, Seth Carter, Reny Sumalpong, Eric Kristich, Monica Mendoza, Vivian Torres and Bobby Jackson.*

# OPM announces new disability employment Web site

To assist in the effort of President Bush's New Freedom Initiative, the Office of Personnel Management (OPM) has worked closely with key agencies having disability employment responsiblities to develop a new Web site. Individuals with disabilities collaborated in the development of this comprehensive and user-friendly Web site. The site is considered to be a one-stop source of information for applicants, managers and human resources professionals. It also serves as an excellent avenue in helping federal agencies achieve the president's objectives.

Highlights of the site include:

- A training module for managers on reasonable accommodation;
- New guidance to make it easier for people with disabilities to apply for federal jobs by obtaining an initial certification of disability;
- Information about telework;
- A recruitment brochure for people with disabilities (can be reproduced locally);
- Frequently asked questions;
- An annotated list of federal agencies with leadership responsibility on disability employment; and
- A current version of People with Disabilities in the Federal Government: An Employment Guide.

You may access this valuable Web site at: file://www.opm.gov/disability.

The NASA Office of Equal Opportunity Programs (OEOP) will be incorporating a link to the OPM Web site on the OEOP home page. They will also share the information with disability organizations and educational institutions involved in OEOP research and internship programs. Finally, they will include an announcement on NASA TV.

# Network upgrades in progress

The Applied Information Technology Division (Code JT) is in the process of upgrading components of the Remote Access (RAS) and Virtual Private Network (VPN) systems. After these upgrades are implemented, users who have RAS and VPN accounts will be able to use one "simplified" login name to access both accounts.

Users will no longer need the suffix that was appended to their names for the purpose of service identification. For example, if Jane Doe currently has a RAS login name of "jdoe@ras.arc.nasa.gov," and a VPN login name of "jdoe@vpn.arc.nasa.gov," she will be able to use "jdoe" as her login name for both RAS and VPN accounts.

The upgrade will occur sometime in November 2002. The exact date of the transition will be communicated to users via email. In addition, a town hall meeting for RAS and VPN users is scheduled for Oct. 28 in the N245 Auditorium from 1:00-2:30 p.m. to give users more information about the upgrade. This meeting will be of special interest to VPN users who will eventually upgrade their client software.

# Center Briefs

### Hubble discovers black holes in unexpected places

Medium-size black holes actually do exist, according to the latest findings from NASA's Hubble Space Telescope, but scientists had to look in some unexpected places to find them.

The previously undiscovered black holes provide an important link that sheds light on the way black holes grow. Even more odd, these new black holes were found in the cores of glittering, 'beehive' swarms of stars -- called globular star clusters--that orbit our Milky Way and other galaxies.

The new findings promise a better understanding of how galaxies and globular clusters first formed billions of years ago.

### U.S. Centennial of Flight commission announces four new alliances

Dec. 17 will mark the start of a year-long celebration honoring the 100th anniversary of the Wright brothers' first powered flight and the century of aviation milestones that followed. Four organizations have recently signed memoranda of agreement with the U.S. Centennial of Flight Commission to become a part of the national 'Centennial of Flight: Born of Dreams--Inspired by Freedom' campaign. As a result of the agreements, the commission will provide outreach support to the Space Day Foundation, Challenger Center for Space Science Education, Aviation Foundation of America and Chicago Centennial of Flight Commission. The organizations, in turn, will promote the national commemoration.

### Students can soar to new heights in NASA's student rocket contest

High school students from across the country may soon soar to new levels -- thanks to a partnership between NASA and the sponsors of the Team America Rocketry Challenge.

The Team America Rocketry Challenge is a first-of-its-kind, national, amateur competition for high school students.

It is co-sponsored by the Aerospace Industries Association and the National Association of Rocketry. The challenge is being held in conjunction with the nationwide Centennial of Flight celebration in 2003.

### Space movie reveals shocking secrets of the Crab Pulsar

Two of NASA's great observatories have produced their own action movie. Multiple observations made over several months with NASA's Chandra X-ray observatory and the Hubble Space Telescope captured the spectacle of matter and antimatter propelled to nearly the speed of light by the Crab Pulsar, a rapidly rotating neutron star the size of Manhattan.

"Through this movie, the Crab Nebula has come to life," said Jeff Hester of Arizona State University in Tempe, lead author of a paper in the Sept. 20 issue of The Astrophysical Journal Letters. "We can see how this awesome cosmic generator actually works."

# Runnegar to lead Astrobiology Institute

Recently, NASA announced the selection of Dr. Bruce Runnegar of the University of California, Los Angeles, as the next director of NASA's Astrobiology Institute (NAI). He succeeds Nobel Laureate Dr. Baruch S. Blumberg, who last year declared his intention to step down from the position.

Runnegar currently is a professor in UCLA's Department of Earth and Space Sciences and the Institute of Geophysics and Planetary Physics (IGPP). For the past four years, he also has served as the director of the IGPP's Center for Astrobiology, one of the 11 original lead teams of the Astrobiology Institute. Educated in Australia at the University of Queensland, Runnegar became a Fellow of the Australian Academy of Science in 1987.

"Dr. Runnegar's research excellence and teaching prowess are well known and respected throughout the scientific and academic communities," said G. Scott Hubbard, Ames center director. "We are thrilled to have an internationally renowned paleontologist and astrobiologist of Bruce's caliber take on this important leadership position."

"I am as impressed with Dr. Runnegar's credentials and experience, as with his vision for the role the NASA Astrobiology Institute could play in meshing leading-edge research directions with NASA's unique exploration opportunities," said NASA senior scientist for astrobiology, Dr. Michael Meyer.

As director of the institute, Runnegar will lead the consortium in efforts to answer the three big questions central to astrobiology: How does life begin and evolve? Does life exist elsewhere? What is life's future on Earth and beyond? "The answers to these questions will not come quickly," said Runnegar. "That's why NASA needs to attract bright young people to the field of astrobiology." Part of his role, Runnegar said, will be to develop educational opportunities in parallel with new astrobiology science objectives.

"Dr. Runnegar's appointment represents another major step in the evolution of the Astrobiology Institute and the work that it sponsors," concluded Hubbard. "Runnegar's long-established leadership in the field will provide the NAI with continuing momentum and research growth."

Established in July 1998, the NAI is a virtual organization composed of NASA field centers, universities and research organizations that collaborate to study the origin, evolution, distribution and future of life in the universe. The institute brings together astronomers, biologists, chemists, geologists, paleontologists, physicists and planetary scientists. It comprises 15 lead teams selected from competitive, peer-reviewed proposals submitted in response to NASA cooperative agreement notices or CANs. Leadership of the institute, the director's office and associated staff are located at Ames. NAI's first director was G. Scott Hubbard, followed by Blumberg in 1999.

"Good things come in threes," said NAI Deputy Director Dr. Rosalind Grymes. "In the next several months, the NAI will release its third call for collaborative research grants, hold its third general members' meeting and welcome its third director."

Runnegar and his wife, Maria, a biochemist at the University of Southern California, have one daughter, who is a lawyer in Brisbane, Australia. He enjoys geological fieldwork, old furniture and botanical gardens.

The NAI currently has 15 member institutions: Arizona State University, Tempe; University of Colorado, Boulder; University of Washington, Seattle; NASA Ames Research Center; Scripps Research Institute, La Jolla, Calif.; University of Rhode Island; Pennsylvania State University; Harvard University; University of California, Los Angeles; Michigan State University; Marine Biological Laboratory, Woods Hole, Mass.; Carnegie Institution of Washington; NASA Johnson Space Center, Houston; and two research teams located at the NASA Jet Propulsion Laboratory, Pasadena, Calif.

For additional information about the NASA Astrobiology Institute, visit http://nai.arc.nasa.gov

*BY KATHLEEN BURTON*

# Successes from af2m...

*continued from front page*

contract to accomplish similar purposes. With help from the Acquisition Office, it was determined that although there are some restrictions for NASA use, it is a suitable procurement vehicle to fill many NASA needs.

Other suggestions received by af2m centered on processes associated with travel paperwork, bank card reconciliation, and hardcopy overtime forms. While the af2m team has not solved these problems, information has been gathered and posted on the af2m Web site explaining how these processes will be simplified with the implementation of the Core Finance Module of the Integrated Financial Management Program (IFMP) scheduled for February 2003.

The Freedom To Manage Initiative is part of the President's Management Agenda. The NASA Administrator and Center Director Scott Hubbard are serious about using this opportunity to "cut the red tape" to improve efficiency and productivity while cutting costs and frustration. If you have experienced a "broken" process at Ames, submit the problem to the af2m team at: www.af2m.arc.nasa.gov.

The Agency Freedom To Manage Task Team is scheduled to visit Ames on Nov. 14 to promote the NASA F2M effort. They intend to hold an all-hands' meeting with Ames staff as well as financial management, human resources, procurement and other meetings. The NASA F2M effort began in February 2002 and has resolved many Agency-wide problems. Participation in the events on Nov. 14 will enable free and open conversation on the problems encountered in the daily conduct of NASA business.

# Contractor team takes trip to the cutting edge

An elevator into space, missions to Mars, and thinking computers were just a few of the topics of an unusual all-hands meeting held by Quantum Services this September.

"It was inspiring," said multimedia developer Brian Day of the Education Office. "It was a good reminder of why I came to NASA in the first place."

Day and fellow Quantum contract and subcontract staff got an overview of the latest research in Ames' core competencies: information technology, nanotechnology and biotechnology.

Tony Gross, associate director of Code I, talked about information technology; research scientist Lance Delzeit, Ph.D., discussed Code A's developments in nanotechnology; and Lynn Harper, lead of integrative studies for Astrobiology and Space Research, Code S, spoke about biology research and development.

The Quantum management team came up with the idea of having researchers speak to their staff, because they feel it's important for everyone to be knowledgeable about what is happening at Ames. Even though Quantum employees don't perform research at Ames, their work supports research at the center.

Quantum project manager Doreen Cohen said the management team hopes that a greater understanding of Ames research will give people new meaning and purpose in their daily tasks. Quantum appears to have succeeded in reaching their goal. Many employees were very enthusiastic about the meeting and would like to see more like it.

Gross and Delzeit said they really enjoyed the experience. They said that many researchers like to present their work to groups like this.

Delzeit said these kinds of relaxed presentations give him an opportunity to present his work in a fun atmosphere where he can go beyond the dry facts and really show his enthsiasm for his work. Gross and Delzeit encourage more groups to take advantage of NASA researchers' willingness to talk about their research.

Day said the overview was especially helpful for him in his job, because the presentations helped him know what contacts his group should be making and in which areas they should be focusing.

Quantum employees support Ames research in a wide range of administrative and technical positions, in areas such as commercial technology, development and library services.

photo by Rebecca Sims

*Lynn Harper, lead for integrative studies for the Astrobiology and Space Research Directorate, Code S; Tony Gross, associate director, Code I; and Lance Delzeit, nanotechnology research scientist, Code A, were speakers at Quantum Services' September all-hands meeting.*

BY SONJA JONES-SHIN

# Science fair approaches

The academic year is finally underway at Bay Area schools and teachers are beginning to prepare their students for this year's science fair to be held March 12, 2003 at the San José McEnery Convention Center.

Once again billed as the Synopsys Silicon Valley Science and Technology Championship, science fair organizers will host preparatory clinics and workshops for parents, teachers and students in grades 6 – 12 at local schools in the coming weeks. In addition to fielding a NASA judging team to the competition next spring, Ames researchers may be interested in helping more directly by mentoring students on their projects using Science Buddies, an e-mentoring program designed to encourage greater participation in science fairs. (See page 7 for more details.)

The science fair calendar follows. The first two dates are clinics for prospective championship participants. Students, teachers, families and other interested parties are welcome to attend.

- Oct. 5 (Saturday), 3:00 - 4:30 p.m. at the Los Altos High School, small gym, 201 Almond Avenue, Los Altos
- Oct. 19 (Saturday), 9:00 -10:30 a.m. at Oak Grove High School, Theater, 285 Blossom Hill Road, San José

For more information, visit: http://www.science-fair.org/

The Synopsys championship is set for March 12 - 13, 2003, 11:00 a.m. - 6:00 p.m. Judging will be March 13, 2 p.m. - 6 p.m. at the San José McEnery Convention Center.

The Intel International Science and Engineering Fair is scheduled for May 11-17, 2003, Cleveland, Ohio. Visit the Web for more information at: www.sciserv.org/isef

The California State Science Fair is scheduled for May 19-20, 2003, in Los Angeles, Calif. For more information about the state fair, visit: www.usc.edu/CSSF

BY TOM CLAUSEN

## Fun runs set

The 2-mile Fall Fun Walk and Run is scheduled for Oct. 22 at 12:00 noon starting at DeFrance Road near the Fitness Center. Cost to enter is $2.

The 10K Fall Run is set for Oct. 29. at 11:30 a.m. starting at the Fitness Center. There is no cost to participate.

# NASA recognized for completing e-government security program

The White House recently honored NASA for its successful completion of a program to ensure the security of federal e-government initiatives.

NASA was honored at a cross-certification ceremony sponsored by the Federal Public Key Infrastructure Bridge Certification Authority (FBCA). By 'cross certifying,' NASA and three other agencies--the Department of Agriculture's National Finance Center, the Department of Treasury and the Department of Defense--will be able to send and receive secure e-mail across organizations. Secure government-wide information systems, and the secure exchange of information within the government, are essential elements of homeland security, according to Paul Strassmann, NASA's acting chief information officer.

The cross-certification is one part of the administration's e-Authentication Initiative, which in turn is part of the electronic government initiatives of the president's 2002 Management Agenda. The e-Authentication initiative provides authentication services to the other 24 initiatives, which are designed to better link the federal government to citizens, businesses, and state and local governments, as well as improve the federal government's internal efficiency.

For NASA, recognition by FBCA culminates the agency's four- year effort to build a public key infrastructure to strengthen and secure its information systems. The event clearly demonstrated NASA's success in implementing multiple pieces of information technology-related legislation, said Strassmann.

# Ames holds 2002 honor awards ceremony

On Sept. 24, Ames held its annual Honor and Senior Executive Service Presidential Rank Awards Ceremony, held in the N201 auditorium. Following is a list of the awardees.

## 2002 Presidential Rank Awards

**Distinguished Executive Rank Award**
William E. Berry

**Meritorious Executive Rank Award**
Steven F. Zornetzer

## 2002 Ames Honor Awards

**Administrative Professional**
Karen C. Bradford

**Best First Paper at Ames**
Wendy L. Holforty

**Community Service/Volunteer**
Henry Schwoob

**Commercialization/Tech Transfer Award**
Michael McGreevy

**Craftsman/Technician**
Gary Buob
Daniel P. Gundo

**Equal Employment Opportunity**
Mark Leon

**Engineer**
Nelson Hsu

**Headquarters Employee**
Wavalene N. Barnes-Hill
Joseph O. Watson

**Mentor**
Barbara J. Navarro

**Student**
Chau Bui
Janessa M. Langford
Jose Navarrete

*Steven Zornetzer (left) and former Ames Deputy Center Director William Berry (right) both received presidential rank awards at the recent ceremony.*

*Center Director Scott Hubbard presents an honor award to security guard Johnny Green.*

**Safety and Environment**
Sandra Olliges

**Secretary/Administrative Support**
Gina Fox

**Scientist/Researcher**
Philip R. Russell

**Contractor Employee**
William W. Chung, Northrop Grumman Information Technology Inc.
Mark Erdos, Affiliated Computer Services
Michael Forsman, Quantum Services, Inc.
John E. George, Raytheon ITSS
Johnny J. Green, SecTek Inc.
Esther Johnson, Quantum Services, Inc.
Gabrielle Meeker, Lockheed Martin Engineering & Sciences Co.
Bobbie Williams, SecTek Inc.

**Technical Support**
Samuel Caires
Jonas G. Diño

**Supervisor/Manager**
Barry R. Lakinsmith

**Technology Development**
Doug Greaves

**Group/Team**
En Route Data Exchange (EDX) Team
Mark III Wind Tunnel Network Security Group
PITEX Group
Space Station Biological Research Project (SSBRP) Ground Data Systems Team
Traffic Flow Automation System (TFAS) Team
Vertical Motion Simulator (VMS) Digital Mode Control Unit (MCU) Development and Installation Team

*photos by Tom Trower*

*The 2002 presidential rank and honor awardees shown during the recent awards ceremony at Ames.*

# Student projects featured during Ames' science day

A wealth of research posters about astrobiology, physiology and the virtual glove box was in evidence, and much discussion and academic exchange were enjoyed in the patio and ballroom areas of Ames Building 3 recently. Scientists and students discussed and shared their research involving interviews, note taking and the excitement of learning and discovery in the eyes of students. It was Science Day at Ames.

*photo by Roger Brimmer*

*Students and scientists discuss research projects during Science Day at Ames.*

Science Day celebrated this summer's great work done by student interns, visiting faculty and scientist mentors. The event, administered by Emily R. Morey-Holton, research scientist, Natalie LeMar, administrative assistant and Mary Walsh, assistant branch chief of the Gravitational Research Branch, gave everyone an opportunity to present his/her research, discuss it with others and learn about other research at the center.

"The goal of Science Day is to display research that goes on at the center during the summer. Students from any educational program at Ames and visiting faculty are welcome to be the first authors on the poster," said Holton. "The Science Day gives students a taste about what is involved in doing research," she said.

There were 45 posters presented with 56 student names on them, as several students participated in more than one research project. The posters displayed research in advanced techniques and instrumentation, altered gravity, developmental and fundamental biology, information technology and neurophysiology. The students came from a variety of educational programs such as the Summer High School Apprenticeship Research Program (SHARP), Education Associates Program (EAP), Minority University Research and Education Programs/NASA Scholars (MUREP), Foothill - DeAnza NASA/Ames Internship Program, Undergraduate Student Research Program (USRP) and the Ames Astrobiology Academy.

"It is definitely an incredibly valuable and exciting day for students and mentors. Students had a chance to present results of their research and mentors as well as the rest of NASA got to see exciting work their colleagues are doing," said Jeffrey D. Smith, deputy director of BioVIS Technology Center, with a record number of students this year --19. Smith has been a mentor for five years and has worked with 20 students. "We had students from high school to graduate school and the quality of their work is high. I hope next year we can include other directorates as well," he added.

"It was very encouraging as a student to see so many scientists interested in my research. It was also useful to explain my research to others, because it made everything come together in a way it never did before. In addition, I loved learning about what other students were doing," said Diana David of USRP, who did her research in analyzing spacecraft-based laser altimeter data using bayesian statistics.

"It [Science Day] is a good way for students to build confidence by showing off their work. It also allows for fresh feedback from other people at the center. Finally, it allows students to get a glimpse into other areas of research being conducted at Ames by other students," said Louis Mazziotta of MUREP, who did his research on collision detection of rigid bodies for virtual environment simulation.

"Science Day was very important to me because explaining my project to other people helped me to learn and get deeper understanding of my research," said Genny Pang of SHARP, who did her research in a spectroscopic instrument for monitoring arcjet performance.

Science Day began at Ames in 1997 and since then grew from only 14 posters presented by students at the Gravitational Research Branch to 45 posters presented by students from many different branches and programs.

"The Science Day has been expanding and continues to be a high point for students," said Holton. "The purpose of the day is not to give out awards, but to enjoy each other's projects and have fun. It is a day for students," she said.

*By Veronika Soukhovitskaya*

# Students seek science fair mentors

Science Buddies is an online peer mentoring program for Bay Area middle and high school students with a hands-on approach to science and access to science-related career role models. The goal is for students to complete a science fair project and to enter it in a local science fair. Volunteer 'advisors' spend less than one hour per week online with their teams, from approximately November to March.

Each Science Buddies team consists of three people: an investigator, a mentor and an advisor. The strength of the program is in its peer mentoring model. High school mentors are trained to take the lead in guiding the middle school investigator. Advisors oversee the team, but allow the students to help each other first.

The Science Buddies online mentoring environment, called the 'command center,' provides safety and structure for the students. The site is password protected and secure, ensuring that only participants, teachers, parents and program staff can access the students' work and view their discussions.

Each Science Buddies team has its own private area in the command center. The dialog among the students and their adult advisor takes center stage. During a typical 12-week science fair season, mentors and advisors provide lots of guidance and encouragement to their eager Investigator.

The command center includes a customized timeline for each student's project, a place to upload and store work to be reviewed by the mentor and a wealth of how-to information, tools and other resources for the students.

*photo by Tom Trower*

*Local engineer Greg Brown tests his eye-hand coordination under the watchful gaze of a science fair participant at the Synopsys Silicon Valley Science and Technology Championship.*

On Thursday, Oct. 17 from 11:00 a.m. to 1:00 p.m., representatives from Ames Education Office and Science Buddies will be available in the Ames Mega Bites cafe to explain how the system works and answer questions. For more information, go to: www.sciencebuddies.org. Applications are due Oct. 18.

*by Tom Clausen*

# NASA exhibits are big hit at Reno air races

Ames hosted a series of NASA exhibits at this year's Reno Air Races Sept. 11 - 15. Hot weather, brisk winds and blowing sand didn't stop the crowds of people from checking out the displays or dampen their enthusiasm.

On display was a model rocket booster, a concept developed at Ames to put wings on the shuttle SRBs (solid rocket boosters) to allow them to fly back to a landing at Kennedy rather than parachute into the ocean for retrieval. There were displays on nanotechnology, astrobiology, Earth science projects, intelligent flight controller, aviation systems capacity, fluid mechanics lab research, examples of wind tunnel tests and models, as well as a summary display of Ames ongoing research areas and an overview of the NASA enterprises. About 10,000 people visited the Ames exhibit, including 40 classrooms of students. During the weekend, there were occasions when the tent was filled to capacity causing people who had walked to the entrance of the tent to turn around and come back later. Ames employees staffed the table, handing out NASA publications and answering questions. Working the event were Jeffrey Cross of Code DXC; Wendy Holforty of Code AFC; Don Durston of Code APS; Kristine Navarro of Code DL; Anil Jindia of Code DXC; Jonas Diño of Code DXC and Astrid Terlep of Code DXC.


*Jeffrey Cross of Ames' Public Affairs Office is shown beside the NASA Ames exhibit tent at the recent air races.*

*Kristine Navarro of Code DX and Wendy Holforty of Ames' Code AFC helped staff the NASA exhibit in Reno.*

*Jonas Diño, public affairs officer in Ames' Code DXC, hands out NASA stickers to kids visiting the Ames exhibit, and speaks to them, hoping to inspire them to become involved with NASA.*

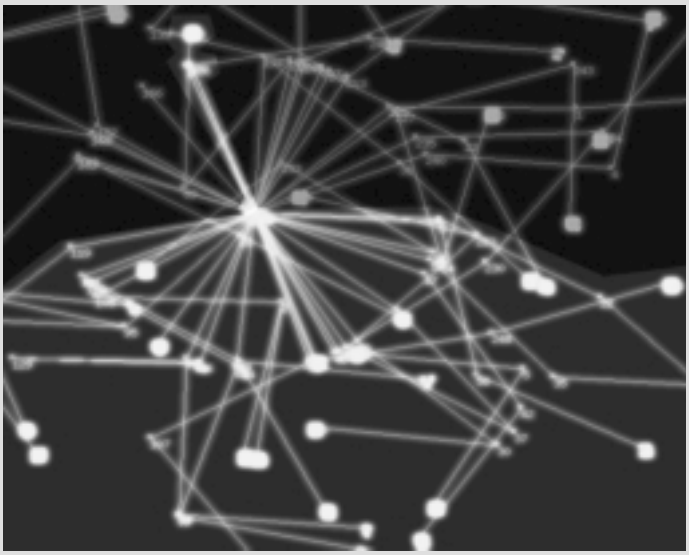
*photos by Astrid Terlep*

*Anil Jindia responds to questions from kids visiting the NASA Ames exhibit at the Reno Air Races.*

*Photo left: The Reno Air Race bleachers are filled to capacity with airshow onlookers. The apparent haze in the background is actually sand being blown by the wind.*

# New information system provides multiple data source access

NETMARK, a new computer information system recently developed at Ames, is a powerful new tool for managing and accessing NASA's enormous storehouse of complex, constantly changing, unstructured and semi-structured data. NETMARK automatically provides a single-format virtual database view of heterogeneous data sources, without user-supplied database code.



*The above image illustrates the NETMARK internal storage mechanism--a structure that adapts dynamically to information.*

"Knowledge management analysts believe that as much as 80 percent of NASA's mission-critical information is stored in semi-structured formats such as text documents, spreadsheets and graphic formats, and the rate of their production is increasing exponentially," explained David Maluf, Ph.D., the NETMARK project's principal investigator. "But the problem is that the current solution sets have been evolving at a much slower rate. Traditional data warehousing techniques have only offered partial solutions, and their implementation can be expensive, time-consuming and risky."

Yuri Gawdiak, Engineering for Complex Systems program manager, added, "We've got information graveyards with terabytes of data, because the need to manually reverse engineer the schemas for providing standard interface access would cost at least dozens of millions of dollars. NETMARK can do this automatically without human intervention."

The current NETMARK Web-interface provides easy, single-query access to various data views, making it easy to perform context-plus-content searches on vast collections of documents and multimedia information.

"Any computer configured with NETMARK does not require any particular structural schema from any foreign or heterogeneous data," explained Peter Tran, a computer scientist working on the project. "This is why the system is described as schema-less."

When responding to a query, NETMARK uses COTS (commercial off-the-shelf) standard applications to convert incoming documents to an interchange format such as HTML or XML (extensible markup language) or other proprietary format. Once a successful interchange is achieved, the document structure is abstracted automatically and is added to a dynamically adaptive data model. NETMARK's power is in its dynamic schema-less capability to create and adapt the data model in real time, while the data or information is streamed in.

With NETMARK, "you now can wander through millions of information fragments with the tip of your finger," said Maluf. "Users enter a single query that then generates multiple context-plus-content queries through the multiple data sources, enabling a 'two-way dialogue' zeroing down on the information." The power of the system derives from its ability to absorb heterogeneous information--hundreds of records per minute--without user-supplied database code, while at the same time allowing immediate context-plus-content search capability. Managers and scientists can search over hundreds of databases, using personal computers connected to much larger machines, and can examine details and views from unstructured information, sensor data, document content and even Powerpoint slides.

The team that developed NETMARK was inspired by HAL, the computer from the film 2001: A Space Odyssey. The original objective of the NETMARK project was to generate NASA 7120 formatted documents from fragments of arbitrary data the computer would have recoded with time. Ames computer engineers are now extending NETMARK to handle additional data types from other complex data sources. Additional plans are underway to use NETMARK within the NASA Information Power Grid (IPG) project. "All that NETMARK needs now is a good speech recognition interface." Maluf said.

In pursuit of that goal, project engineers are starting to develop advanced human/machine interfaces to provide access to NETMARK. Speech capability would enable information access from peripherals other than computer terminals.

The NETMARK system promises to grow in power as human/computer interfaces become better over the years. The amount of information NETMARK can hold is tremendous, taking advantage of today's advances in networking and storage space. NETMARK is currently being prepared for a test using one terabyte of information. Over the last few months, an early release of NETMARK has been in use by the developing team and has been handling over 100 gigabytes of daily operational data mostly derived from other projects. "We put to practice what we develop," said Peter Tran.

NETMARK had its first birthday in July 2002, and to facilitate the technology transfer, NASA has recently filed a NETMARK intellectual property disclosure with the US Patent Office.

NETMARK is a highly scalable, open-enterprise solution developed by the Aerospace ExtraNet (AEN) Intelligent Information Laboratory within the Computational Sciences Division at Ames. AEN is an information hub with projects connecting different NASA centers and other government agencies. NETMARK has been partially funded by the NASA Information Technology-Base Program in 2001, and by the NASA Computing, Information and Communication Technologies (CICT) program.

More information about NETMARK is available at: http://aen.nasa.gov/netmark/

*BY BOB DUFFY*

## Computer History Museum presents

Event: Architects of Change
2002 Fellow Awards Banquet

Honoring John Cocke, Charles Geschke, Carver Mead and John Warnock.

Come celebrate the accomplishments of four new Fellows whose creativity, persistence, vision and influence in the field of computing have helped reshape our everyday lives.

Date: Tuesday, Oct. 22
Time: 6:00 p.m. - Reception
7:30 p.m. - Banquet and Ceremony
Place: Imperial Ballroom, The Fairmont Hotel, San José

For ticket information, call ext. 4-0345 or visit the Web site at: www.computerhistory.org/events.fellows

# NASA airborne observatory's telescope assembly zooms in

NASA's Stratospheric Observatory for Infrared Astronomy (SOFIA), the largest airborne observatory in the world, received a key component recently when its telescope assembly arrived in Waco, Texas, completing a 7,000-mile journey from Germany.

Developed by DLR, the German Aerospace Center, located in Bonn, the 98.4-inch (2.5-meter) diameter telescope has spent the past

*An important component of the SOFIA Observatory, its 2.5 meter telescope, landed in Waco, Texas in September.*

five-and-a-half years being designed and built. MAN Technologies AG, Mainz and Augsburg, Germany, built the telescope and its optics were supplied by Kayser-Threde Corp., Munich, Germany. Other European subcontractors helped fabricate the complex telescope.

"We're very excited to be taking delivery of the world's largest airborne telescope, provided by our German partners," said NASA SOFIA project manager Chris Wiltsee of Code S. "They've done a first-rate job in its development and should be very proud of their accomplishment. We're looking forward to working closely with them to complete this magnificent observatory," added Wiltsee.

"This event is a key step on the way to completing a unique and very versatile astronomy facility, which will reveal hidden regions of space and open the door to new vistas of discovery," said SOFIA program manager Cliff Imprescia of Ames.

Owing to their size, the telescope's 3 largest components were transported aboard a huge Airbus Beluga cargo aircraft. The largest component, the suspension assembly that provides the telescope's center support structure, weighs approximately 25,000 pounds and measures 15 feet in diameter in its shipping fixture. The primary mirror assembly weighs approximately 4,500 pounds and the metering structure, which holds the telescope's secondary mirror assembly, weighs approximately 2,000 pounds.

Workers will first store the telescope assembly's components in a large hangar and separate them into 'kits' for installation and integration into the aircraft. Over the next nine months, engineers and technicians from L-3 Communications Integrated Systems with help from German contractors, will carefully install the telescope assembly into its new home aboard the SOFIA, a modified Boeing 747SP aircraft. Installation is scheduled to be completed by the spring of 2003, followed by a series of ground tests conducted at L-3 Communication's Waco flight test facility until the late fall of 2003. Flight tests will follow in Waco until spring of 2004.

SOFIA will be based at Ames. Operational and scientific management of the observatory will be conducted for NASA by prime contractor Universities Space Research Association (USRA). United Airlines will be responsible for maintenance and flight operations.

SOFIA is scheduled to arrive at Ames in June 2004 for its final flight tests and will begin full-scale astronomical observations in late 2004. Astronomical observations normally will be conducted several nights per week from altitudes of about 41,000 feet and higher, above about 99 percent of the infrared-obscuring water vapor in the Earth's atmosphere.

"The whole world is waiting for SOFIA, because this is going to be such a unique observatory and a major advancement over anything we currently have," said Dr. Thomas Greene, NASA SOFIA project scientist at Ames. SOFIA will be considerably larger and more sophisticated that its predecessor, the Kuiper Airborne Observatory, a remodeled C-141 cargo transport aircraft based at Ames from 1971 to 1995 whose telescope was 36 inches (0.91 meters) in diameter.

"SOFIA will make observations that are impossible for even the largest and highest of ground-based telescopes," Greene said. "The telescope will be unique in being able to observe star-forming regions, the center of our galaxy, and also disks around young stars, where planets have recently formed or are likely to have formed. The telescope will be able to observe very obscured regions of space where visible light isn't able to penetrate, and as such, will complement NASA's Hubble Space telescope that operates in visible light."

"The telescope has a hard job to do, because it will be operating in an aircraft while flying at 600 miles per hour," said Greene. As a result, the telescope has to be securely mounted and rigid to be able to track stars precisely. "Also, since it's an airborne observatory, the entire telescope is extremely lightweight," Greene said.

"SOFIA will be a world-class airborne observatory, and we're looking forward to the day when it will become operational," said USRA astronomer Eric Becklin, SOFIA's chief scientist and designated observatory director. "We expect it to help us make major contributions to our understanding of many important phenomena in the universe."

"The modification of SOFIA, one of the largest, most complex and challenging modifications to any 747, further underscores the capability of Integrated Systems," said Frank Lanza, chairman and chief executive officer of L-3 Communications. "The L-3 IS team has undertaken this challenge without the assistance of the original equipment manufacturer, which is even more remarkable than the modification itself."

NASA awarded a $484.2 million contract to Universities Space Research Association, Columbia, Md., in December 1996, to acquire, develop and operate SOFIA. Other team members include L-3 Communications Integrated Systems, Waco, Texas; United Airlines Services, San Francisco and United Airlines, Chicago; the University of California in Los Angeles, Berkeley and Santa Cruz, the Astronomical Society of the Pacific, San Francisco; and the SETI Institute, Mountain View, Calif.

NASA and DLR, the German space agency, are sharing SOFIA's project costs, with NASA funding 80 percent of the costs and DLR the remaining 20 percent. Annual operating costs of SOFIA are anticipated to be about $40 million. For SOFIA images and more information on SOFIA , visit these three Web sites at: http://sofia.arc.nasa.gov; http://sofia.arc.nasa.gov/News/headline5/headline5.html; and also http://www.amesnews.arc.nasa.gov/releases/2002/02images/sofia/sofia.html

*BY MICHAEL MEWHINNEY*

# O'Keefe, Creedon

*continued from front page*

Hubbard also noted Ames' efforts "to inspire the next generation of explorers," with projects such as JASON, the California Air and Space Center and NASA Research Park. He singled out the seven-week robotics course conducted this summer at NASA Ames by Carnegie Mellon University that afforded 30 high school students, many minorities, the opportunity to learn to build robots and operate them autonomously.

Hubbard then took his audience on what he called "a conceptual dream journey into the future." Weaving together animated segments depicting technologies crafted by all of the various NASA field centers, his imaginary futuristic mission to Mars proved to be the highlight of the session and a delight to the Administrator and researchers alike.

The animated adventure featured a small, biologically inspired, winged robot that, after landing on the planet encased in a cocoon of protective balloons, lifted off from its Mars rover base. It flapped its wings and flew off to take samples, relay imagery and explore the mysteries of the red planet, all the while searching for the "fingerprints of life."

Hubbard's entire presentation was very warmly received. He was given a rare standing ovation at the conclusion of his remarks. Many said later that his whole approach and sense of fun and adventure reminded them that NASA is a very special place to work and made them remember why they came to work for the agency in the first place.

In closing his remarks, Hubbard vowed to return to his constituents and stakeholders with updates and progress reports. He reiterated his commitment to continue to build upon Ames' legacy of accomplishments and service to NASA and the nation.

Acknowledging his deep and profound sense of pride and humility in assuming his new position, Hubbard closed by assuring the Ames community, "I promise to do my very best to lead you into the future." The loud and sustained applause left no doubt that his message had hit a responsive and receptive chord with those in attendance.

*BY MICHAEL MEWHINNEY AND DAVID MORSE*

# Ames joins the nation in remembrance . . .

NASA Ames held a 'Remembrance Ceremony' on Sept. 11 for those who lost their lives last year during the terrorist attacks on our nation. The ceremony was held in the main auditorium, Bldg. 201. The event was a dignified and respectful remembrance of the past, and a celebration of the way our nation handled the terrible events of that day and responded with courage, strength, determination and will.

*photos by Dominic Hart*

# NHU visionary founder/president succumbs to cancer

Dr. B. Roberto Cruz, a dynamic and visionary educator who was the founder and president of the National Hispanic University, San José, Calif., died of cancer at his home on Sept. 4. He was 61.

Cruz, whose untimely demise caught many people by surprise, was generally acknowledged as the driving force or 'soul' of

*Dr. B. Roberto Cruz*

the National Hispanic University, the man whose guidance and leadership made it what it is today.

"Roberto Cruz was a man of vision and incredible determination," said Ames' Nancy Bingham. "He was a pillar of the Hispanic community, a tower of strength and a role model. His enthusiasm, spirit, never give-up attitude and commitment will be missed by everyone, Hispanic and non-Hispanic alike."

Founded in Oakland in a two-room building in 1981, the National Hispanic University graduated its first class in 1985 and has since graduated 17 classes serving more than 13,000 students. In 1991, the university moved to its South Bay campus.

This year, the Western Association of Schools and Colleges granted accreditation to the National Hispanic University, the first Latino four-year university to be accredited by the association. In August, the San José City Planning Commission approved Cruz's proposal to transform the private college from its location in an old elementary school, to a three-story, $18 million university on an 11-acre campus.

Over the past 10 years, NASA Ames maintained an informal association with the Hispanic university. In 1997, Ames formalized that association by signing a memorandum of understanding to provide education and collaborative research opportunities for Hispanics in an effort to encourage them to take up careers in aerospace and technology.

This year, Ames took additional strides to strengthen and build upon that relationship. On Feb. 1, Ames and National Hispanic University officials signed an agreement to collaborate toward motivating Hispanic youth to pursue science and engineering careers. The agreement also provided resources and career development for science and mathematics teachers, field trips to NASA, and research in 'distance learning' by the use of the Internet and other information technologies.

In announcing the agreement earlier this year, NHU Provost and Vice President Monte E. Perez pointed out that the university's partnership with Ames "has been longstanding and demonstrates how education and government can work closely to address the pressing needs of our society."

This summer, the National Hispanic University, along with Carnegie Mellon University co-sponsored a 7-week 'Robotics Autonomy' program at NASA Ames. Hispanics comprised 17 of the robotic program's 30 attendees. The program was judged a resounding success by program participants, as well as most observers. A graduation ceremony featuring demonstrations of the student-built robots attracted considerable attention in the local news media.

A native of Corpus Christi, Texas, Cruz relocated to California after receiving a bachelor of arts degree in Spanish and social studies from Wichita State University in Kansas. He received a master of arts degree in curriculum and instruction in 1968, and in 1971 earned his Ph.D in policy, planning and administration, both from the University of California at Berkeley. During the course of his 38-year academic career, Cruz taught elementary, secondary and college students.

He also served as president of the National Association for Bilingual Education and the California Association for Bilingual Education. Cruz was appointed by the U.S. secretary of education to a national advisory council that dealt with the education of language minority students. He also was a member of the Vision 2010 Leadership Team of Silicon Valley and served as a commissioner of the American Council of Education, Minorities in High Education Commission.

Cruz, who received more than 200 awards and honors from a variety of educational and other organizations throughout the nation during his distinguished career, was also inducted into two educational leadership Halls of Fame. He is survived by his widow, Guadalupe Rojas Cruz of San José; three sons: Bernard Roberto Cruz II, Marco Antonio Cruz and Fernando Rey Cruz; and three brothers, Antonio 'Tony' Cruz, Richard Cruz and Raymond Cruz. A memorial service for Dr. B. Roberto Cruz will be held on Saturday, Oct. 12, from 1:00 p.m. to 3:00 p.m. in the National Hispanic University campus auditorium, 14271 Story Rd., San José.

BY MICHAEL MEWHINNEY

# Ames' Health Unit receives accreditation

In July, Ames' Health Unit underwent a Joint Commission on Accreditation of Healthcare Organizations survey. The purpose of the survey was to ensure that the Health Unit was complying with national quality standards and to improve the safety and quality of patient care. The goal continues to be to achieve the highest level of performance, to reduce patient risk for undesirable outcomes and to create an environment for continuous improvement.

The Ames Health Unit received a score of 98 and was awarded accreditation with full standards compliance. In 20 years of conducting ambulatory care surveys, this is the highest score awarded by the surveyor in an initial accreditation.

"In becoming accredited, the Ames Health Unit was evaluated against a set of national standards by a joint commission surveyor experienced in the delivery of ambulatory health care services," said Michael Kulczycki, executive director, ambulatory program, joint commission. "Achieving accreditation demonstrates Ames Health Unit's commitment to provide high quality and safe care to its patients."

The joint commission is an independent, not-for-profit organization that is the predominant standards-setting and accrediting body in health care. Since 1975, the joint commission has developed state-of-the-art standards for outpatient ambulatory care organizations. More than 1,100 freestanding ambulatory care organizations maintain joint commission accreditation.

"This was a great experience for the staff of the Ames Health Unit," said chief nurse Liesel Short. "We found that by going through this process we increased our ability to work as a team, improved the level of care we provide to our patients and received very useful training from the surveyor during the process."

BY MICHAEL MEWHINNEY

# NASA tests human/robotic interactions at Arizona crater

Scientists, software engineers and researchers, spacesuit and robotics engineers and communications experts trekked into the desert near Flagstaff, Ariz., in early September. Their goal was to study how robots and humans can best interact using spoken language, and to gather data for comparing human and robotic performance.

Humans wearing an advanced Mark III spacesuit worked alongside an extra vehicular activity robotic assistant (ERA) rover to perform tasks representative of future exploration at two sites in the Arizona desert during the first two weeks of September. Exploration tasks included geophone instrument deployment and field mapping and photography. These tests were part of NASA's strategy to apply cooperative information technology to improve scientific productivity at a variety of locations.

*The advanced Mark III spacesuit is demonstrated at the Arizona crater test site.*

The investigations are intended to gather metrics to compare the effectiveness of machines and humans for each of the tasks performed, and to identify an appropriate combination of human and robotic explorers for future missions. Field testing advanced exploration technologies allows development of new tools for planetary surveys. Studies like these provide information to aid long-range planning and future decision-making for a wide variety of science-driven applications and destinations.

The expedition was a joint effort by spacesuit, robotics and control center experts at NASA Johnson; communications experts at NASA Glenn and NASA Langley, information technology researchers and engineers at NASA Ames and geology experts at the University of Texas, El Paso, the University of Cincinnati, Bowling Green State University, Ohio, Stanford University and the U.S. Geological Survey (USGS) in Flagstaff, Ariz.

Ames' role in the field test featured mobile agents, a collaborative project with NASA Johnson, industry and universities, supported in part by the Intelligent Systems Program. Managed by principal investigator William J. Clancey and project director Maarten Sierhuis, the mobile agents project integrates several advanced computing and communications components with the spacesuit and the rover. These components include a wireless 'biovest' that transmits the astronaut's physiological signs and location, a 'voice-commanding' interface based on speech recognition and technology and 'software agents' that monitor and facilitate interactions between people and robots. Detailed models of these various components, as well as people and their work practices, are integrated into a 'workflow' system using the Brahms 'multi-agent' programming software.

Because the various components are actually controlled by software running on different computers, an 'agent operating system' is required to enable the agents to communicate with each other. This service is provided by the KAoS agent framework from the Institute for Human and Machine Cognition (IHMC) at the University of West Florida.

'Workflow' in surface exploration refers to both the human processes of gathering samples, taking pictures, navigating or making annotations, and the system processes of life support, transportation, communication and data storage. Using Brahms, Ames researchers simulated the entire workflow of the spacesuit, biosensors, astronaut and the ERA prior to the field test, and then converted this simulation into a software program that automated certain operations. The mobile agent system can interpret voice commands by using Brahms models of exploration activities to anticipate human needs and detect problems. For example, the astronaut could tell the Capcom agent, "Name this location Okra. Create a voice note and associate it with this location." The astronaut could then tell the ERA, "Return to the hab and then go to location Okra."

A model-based approach previously has been used to control spacecraft such as navigation by Deep Space-1. Brahms brings model-based software to human-robotic interactions. Significantly, the mobile agents project shows that not all agents need have physical bodies, such as the ERA. Many agents, such as Capcom, help coordinate the work, but they are not physically participating in the exploration activities. Understanding these various relations was made possible by analyzing Apollo lunar traverses and by observing geologists and biologists doing authentic field work in analog environments over the past five years at Haughton Crater in the High Canadian Arctic and the Mars Desert Research Station near Hanksville, Utah. The mobile agents project is also informed by a collaboration between the JSC Exploration Office and the Institute for Human and Machine Cognition in a NASA NeXT study called "Human-Centered Mars Exploration."

The mobile agent's voice commanding capability was provided by the Ames RIALIST speech recognition group led by Jim Hieronymus and John Dowding. Advanced recognition algorithms were coupled with natural language processing to provide robust speaker-independent commands to the ERA from the person inside the space suit. The speech recognition engine and Brahms were hosted on the mobile exploration system (MEX), which provided computing and communications on a rugged all-terrain vehicle capable of remote field deployment. The MEX field team consisted of Rick Alena and John Ossenfort.

Another collaborative effort within the mobile agents project involves Stanford University's National Biocomputation Center. Physiological sensors, including electrocardiogram and respiration, were worn by a person inside the space suit and transmitted wirelessly to a personal data assistant (PDA). The astronaut can view the data directly using the handheld device; the data is also transmitted to Brahms agents for interpretation. Sekou Crawford, a graduate student at Stanford University, led the field effort, with technical development provided by Kevin Montgomery and Carsten Mundt.

During the field tests, data from the science instruments and from several video cameras mounted on the spacesuit helmet, science trailer and the rover were relayed via local wireless networks back to the field team and eventually to a team of scientists led by Kelly Snook at NASA Johnson's Exploration Control facility (ExPOC).

"The team's primary goals in the ExPOC were to demonstrate the feasibility of scientific planetary exploration remotely from Earth, and to experiment with communications and operations protocols to optimize overall scientific productivity," Snook said. "Video, audio, digital photography and ascii data files were successfully transmitted to Houston and viewed by the science team. The final day of the exercise opened the communication lines to the public at the visitor center of meteor crater, allowing them to experience 'Mars delayed' interactions with the science team. It was a technical first, and a novel experience for everyone."

During the field tests, Ames' Center for Mars Exploration conducted field surveys for future remote science experiments led by Geoff Briggs and Brian Glass. Samantha Domville took 360-degree panoramic images in the field for evaluation of these sites. Mary Chapman from the USGS in Flagstaff and Spencer Lucas from the New Mexico Cultural Affairs Department helped identify suitable sites for more intensive investigation during future field studies.

*BY WILLIAM CLANCEY*

# Core Financial update

In the September issue of the Astrogram, the Core Financial project was introduced to Ames. The Core Financial project is one of several projects included in the Integrated Financial Management Program (IFMP). The Core Financial project will implement a standardized set of processes and a common tool for performing work in the areas of budget execution, cost management, accounts payable, accounts receivable, purchasing and the standard general ledger across all NASA centers. Current activities that the project team is working on include system integration testing and practicing data conversion from the current finance and acquisition systems into the new system. This month's article will describe several activities that are currently underway or scheduled to begin shortly that impact end users at Ames.

**Role mapping activities**

Users of the Core Financial system will be assigned one or more system roles. The system roles determine what functions a user can 'do' in the system, such as opening a purchase request or updating a phasing plan, and what data a user can 'see' in the system, such as printing a report.

The project team has defined 59 end-user roles associated with the Core Financial project. Each end user will be 'mapped' to one or more of these roles. These roles will support the 'day-to-day' work performed by each end user. The project team is currently in the process of meeting with supervisors to identify who the end users of the system are and to what roles they should be mapped. The role mapping activity will also determine what training a user is invited to and what security access a user is assigned

**Pre-training workshops**

Once users have been mapped to roles, the project team will conduct several pre-training workshops. These workshops will communicate the new process steps for completing the functions impacted by the Core Financial project, such as purchasing or reporting. During these workshops, process experts will describe the new processes and terminology to those users impacted in that area. For example, people with budget roles will attend the budget execution workshop, people with purchasing roles will attend the purchasing workshop, etc.

The pre-training workshops will be conducted at Ames starting in the late October/early November timeframe. Invitation to these workshops will be determined based on the roles assigned to the end users during the role mapping activities.

**End user training**

Finally, users will participate in end-user training. During training, end users will learn how to use the Core Financial system to perform their 'day to day' job activities. Some training will be Web based and some will be instructor-lead classroom training. All training is based on the role the user is assigned during the role mapping activities. Users that are assigned multiple roles may need to attend several training classes.

Once all end users have been mapped to the appropriate roles, the Core Financial project team will create a training schedule and communicate it to impacted users. End user training will be conducted at Ames beginning in mid-November and is scheduled to be complete by the Core Financial system 'go-live' date February 2003.

The project team is committed to communicating the training schedule by Oct. 30, to allow impacted end users maximum flexibility in scheduling their holiday vacation around the training schedule. Currently, no training is scheduled from Nov. 26-29 (Thanksgiving holiday) or during the period from Dec. 20 until Jan. 2 (Christmas and New Year holidays).

Next month, we will begin exploring how Core Financial will impact each of the functional areas.

For more information about Core Financial, visit the Core Financial Web site at: http://ifmp.arc.nasa.gov, or send questions to CoreFinancial@mail.arc.nasa.gov.

*BY NATALIE LEMAR*

## Ames Public Radio & Phone

1700 KHz AM radio -- information announcements and emergency instructions, when appropriate, for Ames employees. The emergency information phone number for Ames is (650) 604-9999.

## Flu shots available

NASA Ames Health Unit is pleased to announce the flu immunization schedule for 2002. This year we are providing outreach immunization clinics to make getting a flu shot more convenient than ever before. We will be giving immunizations in 14 different locations in addition to the Health Unit. There will be both morning and afternoon clinics available. Look for the centerwide e-mail outlining the dates, times and locations of these clinics.

## Teachers of migrant farm worker children visit Ames

*Chris Maese of Ames' Code SLO explains life sciences flight hardware in the N240A high bay to the migrant teachers tour group during their recemt workshop at Ames.*

*photo by Eric James*

California teachers in schools with a higher-than-average percentage of students from migrant farm-worker families recently participated in a unique workshop featuring the exciting educational resources available from NASA. This was in collaboration with the National Hispanic University, San José, and Integrated Space Technologies, Huntsville, Ala. Ames sponsored the event. Sixteen teachers of grades 4 through 6 from disadvantaged rural school districts with significant numbers of students from Spanish-speaking migrant farm-worker families attended. This was a first-of-its-kind, one-week-long professional development opportunity offered by NASA.

# Event Calendar

**Ames Amateur Radio Club**, third Thursday of each month, 12 noon, N-T28 (across from N-255). POC: Michael Wright, KG6BFK, at ext. 4-6262.

**Ames Ballroom Dance Club.** Classes meet Tuesdays. Begin classes start at 6:15 p.m. Higher-level class meets at 5:15 p.m. Held in Bldg. 944, the Rec. Center. POC: Helen Hwang, hwang@dm1.arc.nasa.gov.

**Ames Bowling League**, Palo Alto Bowl on Tuesday nights. Seeking full-time bowlers and substitutes. Pre-league meeting at Palo Alto Bowl on Tues, August 28 at 6 p.m. Questions to sign up: Mike Liu at ext. 4-1132.

**Ames Child Care Center Board of Directors Mtg**, every Thursday (check web site for meeting dates: http://accc.arc.nasa.gov), 12 noon to 1 p.m., N-218, Rm. 212. POC: Joan Walton, ext 4-2005.

**Ames Contractor Council Mtg**, first Weds ea. mon, 11 a.m., N-200, Comm. Rm. POC: Bob Javinsky, ext. 4-5301.

**Ames Diabetics (AAD)**, 1st & 3rd Weds, 12 noon to 1 p.m., at Ames Mega Bites, Sun rm. Support group discusses news affecting diabetics. POC: Bob Mohlenhoff, ext. 4-2523/email at: bmohlenhoff@mail.arc.nasa.gov.

**Ames Federal Employees Union (AFEU) Mtg,** third Wednesday of ea. month, 12 p.m. to 1 p.m., Bldg. 19, Rm 1042. Info: http://www.afeu.org. POC: Marianne, ext. 4-4055.

**Ames Model Aircraft Club**, flying radio-controlled aircraft at the north end of Parsons Ave. on weekend mornings. POC: Mark Sumich, ext. 4-6193.

**Ames Sailing Club Mtg**, 2nd Thurs of month, 11.30 a.m. -1 p.m. POC: Diane Purcell ext.4-3232. Check Web site for calender of events, http://sail.arc.nasa.gov

**Environmental, Health and Safety Information Forum**, first Thursday of each month, 8:30 a.m. to 9:30 a.m., Bldg. 19/Rm 1040. URL: http://q.arc.nasa.gov/qe/events/EHSseries/ POC: Julie Quanz at ext. 4-6810.

**The Hispanic Advisory Committee for Excellence HACE Mtg,** first Thursday of the month in N255 room 101C from 11:45 a.m. to 12:45 p.m. POC: Eric Kristich at ext. 4-5137 and Mark Leon at ext. 4-6498.

**Jetstream Toastmasters**, Mondays, 12 p.m. to 1, N-269/Rm. 179. POC: Cathy Payne at ext. 4-0003.

**Model HO/HOn3 Railroad Train Club**, Bldg. 126, across from south end of Hangar One. Work nights: usually Fridays, 7:30 p.m. to 9:30 p.m. Play time: Sundays, 2 p.m. - 4 p.m. John (408) 735-4954 (W) or (408) 281-2899 (H).

**Nat'l Association of Retired Federal Employees, (NARFE)**, 1st Fri. of ea. month. Join to protect your fed. retirement. Sept. 6, S. J. Chptr #50. HomeTown Buffet, 2670 El Camino, S. Clara, 11 a.m. lunch $6.70, 12 noon spkr on "Rep's of League of Women Voters will explain Nov. Ballot." POC Earl Keener (408) 241-4459 or NARFE 1-800-627-3394.

**Native American Advisory Committee Mtg,** 4th Tues each month**,** 12 noon to 1 p.m., Bldg. 19, Rm 1096. POC: Mike Liu at ext. 4-1132.

# Ames Classifieds

Ads for the next issue should be sent to *astrogram@mail.arc.nasa.gov* by the first Friday following publication of the present issue and must be resubmitted for each issue. Ads must involve personal needs or items; (no commercial/third-party ads) and will run on a space-available basis only. First-time ads are given priority. Ads must include home phone numbers; Ames extensions and email addresses will be accepted for carpool and lost and found ads only. Due to the volume of material received, we are unable to verify the accuracy of the statements made in the ads. Caveat emptor!

## Housing

Furnished room for rent in lovely home, quiet area. One mile to Hwy 280 and 85. Priv. bath, kitchen & laundry privileges. View, quiet, pool (until mid-Oct.) $650/mo. 1/3 of utilities, N/S, $300 deposit. Call 252-0488.

I'm looking for rent/or rent-to-own 3 bdrm house in Mtn. View area. Email: falcon7777_2000@yahoo.com

Wanted: French research scientist being assigned to work at Ames for a year around Sept. 1. He, his wife and two small children need 2 (pref. 3) bdrms w/some open area for the children, convenient to Ames & shopping. Limit $1,800/mo. Irv (650) 960-6003 or (650) 966-1364.

For rent, 2bd/1ba unit, private yard, garage, free laundry room, all new appliances and vinyl flooring, just cleaned and painted throughout. Triplex, 4375 Hamilton Ave. San José, call for appointment. Call (650) 369-0578.

Mtn. View unit for rent. 2 bd/1ba with hardwood floors, stove, refrig, laundry rm, garage & patio. Pets OK. $1,750 mo. Call (650) 967-0420 or (650) 302-7550.

Master bdrm/ba in 3 bd San José home w/yard. Female household only. $550. (Includes utils) plus dep. Kitchen privileges. W/D. Near public transportation, bus and light rail. Near San José State, N/S, no drugs. Pets there. One cat OK. Call (650) 210-7551 days or (650) 864-8603 eves. Call (408) 972-8222 days/eves.

Beautiful Santa Clara Location 3 bd/2 ba duplex w/2 car garage. Central heat and AC, nice backyard. Avail. Nov. 1st. $1,000 deposit. Must see. Rent negotiable. Call Connie or Joe (408) 246-5295.

For sale: Courtside executive townhouse in Los Gatos, very private end unit, rdwd trees; next to the Rinconada Golf Club, remodeled kitchen, priv. spa, living rm fireplace, wet-bar, central vac & A/C, priv. ofc, skylight. 109 Oakland Pl, Los Gatos. Willing to rent to the right family. Easy access to HWY 85. Easy commute to Ames. Call (256) 508-0437.

## Miscellaneous

Adobe GoLive 5.0 for the Mac, professional web authoring and site management, unopened, still in shrink wrap, $200, or B/O. Call (408) 267-6635 lv. msg.

California King bed, extra long. Serta Perfect Sleeper. Mattress, bx springs, frame. Exc. cond. B/O. Call (650) 210-7551 days; Call (650) 364-8603 eves.

6400 PowerMac, oldie but a goody, Everything but the monitor, great condition, $100 or B/O. Call (408) 267-6635 lv. msg.

Hartke 210 XL bass guitar speaker cabinet and acoustic bass amp head, $250. Dan (650) 967-8849.

Truck tires, 29in. w/ steel wheels, 6 lug, plenty of tread, B/O. Call (408) 267-6635 lv. msg.

Hammond organ A100 and Tone cabinet. $45. Don (408) 984-5675.

Bed, extra long twin. Mattress, box spring, frame, and mattress cover. Clean. $150. Peter (408) 245-7457.

Patio set, 4 chairs, and 42 inch round, glass top table by Brown & Jordan; $50. Susan (408) 255-4451 .

Moving sale: 5pc dining table $100; solid oak desk $500; entertainment center $100; bookshelf $35; 5-drawer chest $50; diaper changing table $50; crib $75, desk $25; desk $15; queen mattress set $75. Call (650) 210-8861.

3 carats diamond engagement ring. Gd quality and color. Viewing/price call Jenette Griggsby (408) 745-1583.

Student piano. Hobart M. Cable upright. good condition. $500. Linda (408) 262-6136.

14' Starcraft bass boat. 25 hp motor, auto ignition and hand crank, low hours. Two deep cycle batteries. Auto pilot trolling motor and fish finder. $5,000 or B/O. Call (408) 265-8316.

## Transportation

'81 Ford Econoline Club Wagon, white, 351 V8 automatic, 66.5k mls. Gd body/inter. cond, A/C (nds rechrge), trans. shifts late into high gear. KBB value $1,580 still rates as gd condition. $1,050. Call (408) 737-0988.

'85 Volvo 240 GL wagon, at, ac, pw, pdl, cd, rack, 186k mls, runs great, gray/tan int., $2,000. Email jackollila@yahoo.com 408 973-1319.

'89 Plymouth Colt Vista wagon, silver, 3rd row folding seat, A/C (nds recharge), 4-cyl automatic, 82.5k mls, KBB value: $2,240, gd cond. $1,750. Call (408) 737-0988.

'91 Honda Civic DX hatchback, good condition, 84K mls, $3,000. Sue (408) 779-4647.

'91 4 dr Mercury Grand Marquis, 98K mls, leather, pwr seats/windows, runs gd, $2,950. Call (650) 369-0578.

'92 Chrysler Twn & Cntry minivan, 7 pass, Champagne w/woodgrain appliques, 131 K mls, V-6, quad seating, leather, A/C, PS, PB, PW, PDL, tilt, cruise, AM/FM stereo, cass., more, runs gd, clean interior, no dents, good paint and tires, one owner, $3,500. John (408) 731-1391.

'92 Ford Aerostar AWD ext'd van, Eddie Bower trim, at, ac, cc, tilt, pw, pdl, ps, dual ac, tow pkg, rack, 187k mls, $2,500. Email jackollila@yahoo.com. Call (408) 973-1319.

'93 Ford T Bird, 106K mls., 6-cyl. $5,200. Kelly Blue Book, $4,050 - $6,350. Don (408) 984-5675.

'96 Jimmy 4 x 4; 4.3L; V6; tow pkg; pwr seats, windows; rf rack; cd/cass; new A/C.; rebuilt trans; 48K mls. engine w/warr; $9,000. E-mail: Donti@Mindspring.com

'97 GEO Tracer SUV, 10,000 mls only, like new. $5,900. or B/O. Call (408) 733-1906.

'97 Yamaha Virago XV 1100 Special, black & chrome, 5,300 mls, windshield & saddlebags, 'T' Bag storage, service records, immaculate, $5,200. Call (408) 846-1016.

'99 Passat GLS, black with beige leather and wood trimmings, sunroof, CD changer, 53K highway mls, $15,000 or B/O. Call (650) 274-3133 or (650) 654-9237.

'00 Honda motorcycle,Sabre VT1100C2,5000 mls, has DG Hard Krome kickers, jet kit and Dyno tuned. Bob (408) 736-4039 or during day (408) 348-4039 cell.

'00 Chevy Impala , fully loaded,am/fm cd,a/c, pwl, pww, tilt, pw seats front, 3 computers, ABS, plus much more. Assume lease or buy. Bob (408) 736-4039,cell# during the day (408) 348-4039.

# Exchange Information

Information about products, services and opportunities provided to the employee and contractor community by the Ames Exchange Council. Visit the web site at: http://exchange.arc.nasa.gov

## Beyond Galileo N-235 (8 a.m. to 2 p.m.) ext. 4-6873

Ask about NASA customized gifts for special occasions. Make your reservations for Chase Park.

## Mega Bites N-235 (6 a.m. to 2 p.m.) ext. 4-5969

See daily menu at: http://exchange.arc.nasa.gov

## Visitor Center Gift Shop N-223 (10 a.m. to 4:00 p.m.) ext. 4-5412

NASA logo merchandise, souvenirs, toys, gifts and educational items.

## Tickets, etc...(N-235, 8 a.m. to 2 p.m.) ext. 4-6873

Check web site for discounts to local attractions, http://exchange.arc.nasa.gov and click on tickets. Sept. 8, Mamma Mia; Sept. 28, SF Giants

## NASA Lodge (N-19) 603-7100

Open 7 days a week, 7:00 a.m. to 10 p.m. Rates from $40 - $50.

## Vacation Opportunities

Lake Tahoe-Squaw Valley Townhse, 3bd/2ba, Balcony view, horseback riding, hiking, biking, golf, river rafting, tennis, ice skating, and more. Equipped. Summer rates. Call (650) 968-4155, DBMcKellar@aol.com

South Lake Tahoe Cottage w/wood fireplace and hot tub. Rates from $50 to $130 per night. Call (650) 967-7659 or (650) 704-7732.

Vacation rental, Bass Lake CA 14 mls south of Yosemite. 3bd/1.5 ba, TV, VCR, MW, frplc, BBQ, priv. boat dock. Sleeps 8. $1,050/wk. Call (559) 642-3600 or (650) 390-9668.

Big Sur vacation rental, secluded 4bd/2ba house in lovely canyon setting. Fully eqpd kitchen. Access to priv. beach. Tub in patio gdn. Halfway between Carmel & Big Sur. $175/night for 2; $225 for 4 and $250 for more, plus $150 cleaning dep. Call (650) 328-4427.

Incline Village: Forest Pines, Lake Tahoe condo, 3 bd/2 ba, sleeps 8. Fireplc, TV/VCR, MW, W/D, jacuzzi, sauna, pool. $120/night low season; $155/night high season. $90 cleaning fee and 12% Nevada room tax. Charlie (650) 366-1873.

Tahoe Donner vacation home, 2 bd/2ba. trees, deck, sun, fun. Access to pools, spa, golf, horseback riding, $280 wkend, $650 week. Call (408) 739-9134.

## Fire Safety Prevention Week underway

Fire tragedies have touched the lives of people everywhere in all age groups and all walks of life. As the statistics make clear, the fight against fire is a fight we are all in together. This year's message for Fire Safety Prevention Week reminds us that teamwork is the key to winning this fight. It's a message that your fire department practices every day and one that everyone in the Ames community can support by promoting and practicing fire safety on the job and at home. Together, we can make a difference.

This year, the Ames Fire Department is holding its annual Fire Prevention Week open house on Oct. 11 from 10:00 a.m. to 2:00 p.m. Take a tour of the Fire House (be sure you bring the kids) and pick-up some brochures that can help you in your efforts to make your home and job place fire safe.

During the week, at least two members of the fire department will be stationed at the Ames Megabytes café during lunch handing out brochures and answering any questions you might have. Stop by and check your blood pressure while there.

During Fire Prevention Week voluntary home inspections will be conducted at Ames Moffett housing residences.

For a fire prevention checklist, contact William Fierro, Ames fire compliance and safety officer at: wfierro@mail.arc.nasa.gov

## Fitness Center holds open house

The Fitness Center was filled with interested newcomers during the open house and volunteer appreciation day ceremony held on Sept. 18. With the help of volunteers, the Fitness Center has been able to offer 38 classes per week, sponsor a minimum of 14 race events per year, and provide training wall instruction to those interested in developing their climbing skills. Recognition was given to John Durr, Rick Serrano, Sandy Olliges, Joe DeMaio, Ed Chan and John Francis Nguyen for volunteering time as class instructors. Shirley Burek, Jeff Johnson and Paul Espinosa were acknowledged for providing instruction and maintenance on the Fitness Center training wall. Doris Chow, Martie Peterson and Rick McIlmoil were honored for assisting with the monthly 5K/2mile races. The Health, Safety and Medical Services Division has appreciated the many hours of service and talent that have been contributed to enhance the programs of the Ames Fitness Center.

Contact Nancy Dunagan at ext. 4-5804 for more information about Fitness Center programs.

*photos by Roger Brimmer*

*Fitness center volunteers were recognized by Health, Safety and Medical Services management and fitness center employees at the recent open house.*

the Astrogram

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