

NASA's Kepler Mission wins 2010 Software of Year Award

BY MICHAEL MEWHINNEY

NASA's Kepler Mission Science Operations Center software system was named winner of the 2010 NASA Software of the Year award by the NASA Software Advisory Panel.

Designed, developed and operated by the Kepler Science Operations Center (SOC) at NASA Ames, the SOC software system is used to find Earth-size planets using photometric data acquired from the Kepler spacecraft.

The SOC software system is a suite of 22 custom-designed tools for processing, analyzing, and storing transit photometry and engineering data for the Kepler Mission. The Kepler Mission is the first NASA mission capable of finding Earth-size planets in the "habitable zone," the region in a planetary system where liquid water can exist on the surface of the orbiting planet.

Kepler is a space observatory that looks for the data signatures of planets by measuring tiny decreases in stars' brightness when planets cross in front of, or transit, them. The size of the planet can be derived from the change in the star's brightness.

On June 15, the Kepler Mission released data that could double the amount of known planets outside of the solar system. Of the 165,000 stars that the Kepler Mission has been monitoring for planetary transits, approximately 750 of them reveal planetary candidates. All of these discoveries were made possible by the SOC software system and the team that developed and manages it.

"Their outstanding work has made a significant and lasting contribution to Ames' technology development portfolio and to NASA's leadership in astronomical research," said Ames Center Director S. Pete Worden. "I am absolutely delighted that the NASA Kepler Science Operations Center has been honored with this prestigious award. As a center, we have enjoyed great success in previous NASA Software of the Year competitions, and this award adds to our proud legacy."

Ames has won or been a co-winner of the NASA Software of the Year award nine times since it was initiated in 1994. For this year's award, there were two runner ups – LEWIS ICE accretion program (LEWICE), Version

3.2.2 from NASA's Glenn Research Center in Cleveland and International Polar Orbiter Processing Package (IPOP) from NASA's Goddard Space Flight Center in Greenbelt, Md.

A formal ceremony to present the 2010 Software of the Year award will be held Feb. 9-10, 2011 at the NASA Project Management Challenge Conference in Long Beach, Calif.

The Office of Safety and Mission Assurance and the Chief Information Officer sponsor the NASA Software of the Year competition to identify innovative software technologies that significantly improve the agency's exploration of space and maximize scientific discovery on Earth. A NASA Software Advisory Panel assesses and ranks

entries and reports its findings to NASA's Inventions and Contributions Board.

Ames is responsible for the ground system development, mission operations and science data analysis. NASA's Jet Propulsion Laboratory in Pasadena, Calif., managed the Kepler mission development. Ball Aerospace and Technologies Corp. in Boulder, Colo., developed the Kepler flight system, and supports mission operations with the Laboratory for Atmospheric and Space Physics at the University of Colorado in Boulder. The Space Telescope Science Institute in Baltimore archives, hosts and distributes the Kepler science data.



Kepler with distant solar system. Artist's rendition of the Kepler spacecraft. Credit: NASA/Kepler Mission, Wendy Stenzel

Kepler scientists honored by the American Astronomical Society

The American Astronomical Society (AAS) awarded the first Lancelot M. Berkeley - New York Community Trust Prize for Meritorious Work in Astronomy to William J. Borucki and David G. Koch of NASA Ames.

Borucki serves as principal investigator and Koch as deputy principal investigator of the Kepler Mission, which -- in the words of the prize committee's citation -- "is discovering new exoplanets while making major advancements in the search for terrestrial planets

around other stars." The two scientists shared \$8,000 in prize money and their expenses were covered for travel to the 217th AAS meeting in Seattle, Washington, where they jointly presented the Lancelot Berkeley Prize Lecture on Jan. 13, 2011.

In 1992, the two scientists began collaborating on what eventually became known as Kepler. The 0.95-meter-aperture (38-inch) space telescope was launched into

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NASA's Kepler Mission discovers its first rocky planet

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were not disappointed. Keck was able to measure tiny changes in the star's spectrum, called Doppler shifts, caused by the telltale tug exerted by the orbiting planet on the star.

"The discovery of Kepler-10b, a bona fide rocky world, is a significant milestone in the search for planets similar to our own," said Douglas Hudgins, Kepler program scientist at NASA Headquarters in Washington. "Although this planet is not in the habitable zone, the exciting find showcases the kinds of discoveries made possible by the mission and the promise of many more to come," he said.

"Our knowledge of the planet is only as good as the knowledge of the star it orbits," said Batalha. Because Kepler-10 is one of the brighter stars being targeted by Kepler, scientists were able to detect high frequency variations in the star's brightness generated by stellar oscillations, or starquakes. "This is the analysis that really allowed us to pin down Kepler-10b's properties," she added.

"We have a clear signal in the data arising from light waves that travel within the interior of the star," said Hans Kjeldsen, an astronomer at the Kepler Asteroseismic Science Consortium at Aarhus University in Denmark. Kepler Asteroseismic Science Consortium scientists use the information to better understand the star, just as earthquakes are used to learn about Earth's interior structure. "As a result of this analysis, Kepler-10 is one of the

most well characterized planet-hosting stars in the universe next to our sun," Kjeldsen said.

That's good news for the team studying Kepler-10b. Accurate stellar properties yield accurate planet properties. In the case of Kepler-10b, the picture that emerges is of a rocky planet with a mass 4.6 times that of Earth and with an average density of 8.8 grams per cubic centimeter -- similar to that of an iron dumbbell.

"This planet is unequivocally rocky, with a surface you could stand on," commented team member Dimitar Sasselov of the Harvard-Smithsonian Center for Astrophysics in Cambridge and a Kepler co-investigator.

"All of Kepler's best capabilities

have converged for this discovery," Batalha said, "yielding the first solid evidence of a rocky planet orbiting a star other than our sun."

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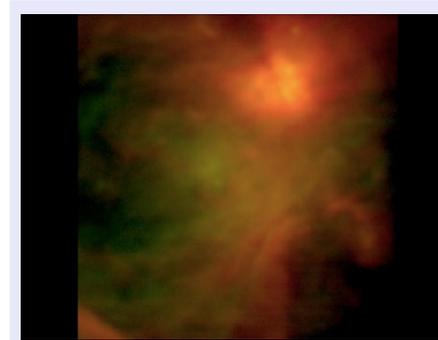
SOFIA completes initial science flights

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demonstrated the excellent collaboration between the U.S. and German partners and the intense work of the teams during the past weeks."

In February 2011, the German Receiver for Astronomy at Terahertz Frequencies (GREAT), developed by the Max-Planck-Institut für Radioastronomie, Bonn, Germany, will be installed in the observatory for three additional flights during the second phase of the program.

NASA's Ames manages the SOFIA science and mission operations in cooperation with the Universities Space Research Association in Columbia, Md., and the Deutsches SOFIA Institut at the University of Stuttgart, Germany.



This infrared image of the heart of the Orion star-formation complex was taken from SOFIA using the FORCAST mid-infrared camera. (NASA/SOFIA/USRA/FORCAST Team)

Kepler scientists honored by American Astronomical Society

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Earth orbit on March 6, 2009, almost exactly 400 years after its namesake, German astronomer-mathematician Johannes Kepler, published the first two of his three laws of planetary motion in *Astronomia Nova* ("The New Astronomy.")

AAS president Debra M. Elme-green of Vassar College in Poughkeepsie, New York, informed Borucki and Koch of their selection as winners of the 2011 Lancelot Berkeley Prize. Borucki recalls, "When I got the call from Debra I felt a burst of joy and happiness that Dave and I were being recognized for developing the Kepler mission. It's been a privilege to lead the team to determine the frequency of Earth-size planets in the habit-

able zone of other stars. The Kepler Mission is a critical step in mankind's exploration of the Milky Way," Borucki said.

"It is a great honor to receive an award from the AAS," said Koch. "It has been 18 years since we started down the road to an operating Kepler mission, with all the hundreds of dedicated scientists, engineers, programmers, and managers, and it has been a fantastic journey. Finding habitable planets will surely serve as an inspiration for future generations to continue to explore the cosmos."

This prestigious new AAS prize was established in 2010 by the New York Community Trust, which administers the estate of Lancelot M. Berkeley, a New York lawyer and astronomy

enthusiast. The Lancelot Berkeley Prize will be awarded annually for highly meritorious work in advancing the science of astronomy published in a peer-reviewed journal during the previous year. It is given without distinction as to nationality. Nominations were evaluated by a committee of three AAS vice-presidents and the editors in chief of the *Astrophysical Journal* and *Astronomical Journal*. The judges reported a "unanimous, wholehearted recommendation" that the 2011 Lancelot Berkeley Prize be awarded to Borucki and Koch "for the discovery of new worlds and for taking a major step in determining the extent of life in our galaxy."

Ames honors 2010 H. Julian Allen award recipients

BY STEPHANIE LANGHOFF

Dr. Andrew Pohorille of Ames recently presented the 2010 H. Julian Allen award colloquium entitled "The Quest for Efficient Methods to Calculate Free Energies: Bridging Statistical Mechanics and Molecular Biology." Professor Eric Darve of Stanford University and Pohorille were awarded the H. Julian Allen Prize for 2010 for their paper entitled "Calculating Free Energies Using Average Force," published in the *Journal of Chemical Physics*, Vol. 115, pp. 9169-9183 (2010). The H. Julian Allen award recognizes the best technical paper for a given year.

In his lecture, Pohorille showed how proteins fold into their native three-dimensional structures, enzymes interact with candidate drugs, proteins in muscles stretch in response to the applied force, or channels mediate permeation of ions and nutrients across cell walls, all depend on a common feature, namely how the free energy of the system changes during the process. The award winning 2010 paper provided a general solution to this problem.

The initial step involves deriving formulas for calculating statistically averaged forces acting on the system along arbitrary coordinates that describe chemical or biological processes of interest. Then, the paper provided a prescription how these forces can be rapidly adjusted in an adaptive manner such that, on average, there is no force acting on the system along the selected reaction coordinates. Without sacrifice of theoretical rigor, this guarantees uniform sampling of all relevant states of the system, which in turn implies optimal efficiency of free energy calculations. The method is being used by a rapidly increasing number of researchers, always yielding significant improvements in efficiency and accuracy.

Pohorille received a Ph.D. in theoretical physics and structural biology from University of Warsaw. He did his postdoctoral work at the Institut de Biologie Physico-Chimique in Paris under Prof. Bernard Pullman. Since 1992, he has been professor of chemistry and pharmaceutical chemistry at the University of California



photo by Jeff Cuzzi

Professor Eric Darve (second from right) of Stanford University and Dr. Andrew Pohorille of Ames (second from left) were awarded the H. Julian Allen Prize for 2010 for their paper entitled "Calculating Free Energies Using Average Force," during the H. Julian Allen award colloquium. Associate Center Director Steven Zornetzer is on the far left and Ames' Chief Scientist Stephanie Langhoff is on the far right.

San Francisco. In 1996, he joined the staff of NASA Ames. In 2002, he was awarded the NASA Exceptional Scientific Achievement Medal. His main interests have been focused on modeling the origins of life, computer simulations of biomolecular systems, modeling genetic and metabolic networks, and statistical mechanics of condensed phases.

Darve received a Ph.D. in applied mathematics from Pierre et Marie Curie University in Paris under Prof. Olivier Pironneau. Between 1999 and

2001, he held a postdoctoral position in the Center of Turbulence Research at Stanford and at NASA Ames, working with Pohorille. Since then, he has been a faculty member at the Department of Mechanical Engineering at Stanford. His research is focused on the development of numerical methods for large scale scientific computing with applications in biomolecular simulations, fluid and solid mechanics, and electromagnetics.

Executive retreat and culture survey discussed at recent All Hands



NASA photo by Kyle Cavallaro

An All Hands meeting with Ames employees on the status of both the agency and Ames was held on Jan. 19 in the Main Auditorium. Topics discussed included information from the recent Executive Council retreat that focused on Ames' results in the OPM culture survey. Ames' senior management is taking these results very seriously and will discuss the next steps in the plan to move forward with the areas of concern. The objective is to make NASA Ames a great place to work, and also to make it one of NASA's premier centers. To do that, it is critical to continue to have information and communication flow between all.

NASA addresses water needs of California growers

BY RUTH DASSO MARLAIRE

NASA satellites soon will provide California growers in the San Joaquin Valley with important information about crop growth, irrigation demands and forecasts, as well as imagery of their fields throughout the growing season.

To support irrigation management decisions by agricultural producers, NASA has launched a project that uses the Terrestrial Observation and Prediction System (TOPS), a software application that processes imagery from Earth-observing satellites and delivers new sources of information to California growers. TOPS combines data from NASA satellites, with local weather observations to provide information about crop water needs. The project is an example of NASA's efforts to address needs outside the science community, such as water management in California and the western United States.

"Growers have the best understanding of how much water is needed for their crops, based on the unique conditions associated with each field," said Forrest Melton, a project scientist at NASA Ames. "Our goal is to provide additional information from NASA satellites to help growers get the most value out of the water they have available."

This new version of TOPS builds on technologies developed by prior NASA-supported research to optimize

irrigation management and quality control in California vineyards. The project now is designing new ways to link satellite observations with measurements from wireless sensor networks installed in agricultural fields.



Image of the city of Salinas (upper left) and the agricultural fields in Salinas Valley as seen by the Landsat satellite.

By combining these two sources of information, scientists will develop a highly accurate picture of the water balance across each field, providing participating growers with a new source of information to manage their irrigation systems. The prototype system is undergoing beta-testing in collaboration with growers in the San Joaquin Valley.

The project uses data from the Landsat program, a series of Earth-observing satellites built and launched by NASA and managed by the U.S. Geological Survey. Landsat satellites have taken digital images of Earth's continents and coastal regions for more than three decades, broadening our understanding of natural processes and human-induced changes in the landscape.

"Satellites like Landsat have a resolution of about one quarter of an acre, a meaningful scale to growers," said Lee Johnson, a senior research scientist at California State University, Monterey Bay working on the project. "The two Landsat satellites currently operating, collect new observations for every location approximately once a

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Chris Lund and Forrest Melton, both research scientists at NASA Ames, check data from a wireless soil moisture monitoring network. The data will help interpret satellite estimates of crop water demand. NASA photo by Forrest Melton.

NASA Kuiper Airborne Observatory's past unearthed

BY CATHY WESELBY

Fifteen years after its final flight, veterans of the Kuiper Airborne Observatory, KAO, gathered at NASA Ames on Nov. 10, 2010 to witness the opening of a time capsule.

The KAO is a highly modified Lockheed C-141A cargo transport fitted with a 36-inch telescope. The observatory was based at NASA Ames for operations that began in 1974 and ended in 1995.

Wendy Dolci, associate director for operations at NASA Ames' Astrobi-

Results from observations made with the KAO, including images of the comet Halley and super nova SN87A, were rediscovered. Diane Wooden, an Ames astrophysicist, was on board in April 1986 when those images were taken and recalled "how much fun it was." She flew on KAO missions for 16 of the 22 years the aircraft was in operation.

More practical items included a flight map from the final flight, meeting minutes, a guest book and a package of Lipton's Cup of Soup – "a typical

collaborators to "ward off evil occultation spirits."

One item that KAO veterans recommended be passed on to KAO's successor, the Stratospheric Observatory for Infrared Astronomy, SOFIA, crew was a talisman representing "the blame." Consisting of a simple feather bearing a message, it was bequeathed to SOFIA staff with the instructions that it "is to be used during times when things have gone wrong, awry, amok (yes, this will happen on SOFIA, too) and blame is being randomly cast about. Just take the blame and pin it on someone (it seems to work best when it's pinned on the person who is least to blame). Then, for the rest of the day, that person is blamed for everything." The blame talisman was one example of how scientists working long hours under pressure vented steam with humor.

That item was among several that Dolci brought to the Dryden Aircraft Operations Facility in Palmdale, Calif., to present to SOFIA program staff. Just after the crew briefing for the SOFIA's first dedicated science flight on Nov. 30, 2010, Dolci presented SOFIA program manager Bob Meyer with the kiwi and koala. Meyer passed the items along to Nancy McKown of the Universities Space Research Association, mission manager for the first series of SOFIA's science flights, to be carried on board the airborne observatory. The mascots, Meyer said, "need to go flying."

The tiny stuffed mascots brought some of the KAO's charm to SOFIA and, scientists hope, some KAO karma that will enable the SOFIA program to carry on the important and successful work of its predecessor.

The SOFIA team is off to a good start, with the help of the artifacts inherited from the KAO, three short science 1-series flights were completed Dec. 8, 2010 marking "a significant milestone in SOFIA's development and ability to conduct peer-reviewed science observations," said Meyer.



NASA photo by Eric James

Wendy Dolci holds up two mascots from the Kuiper Airborne Observatory during the KAO time capsule opening ceremony on Nov. 10, 2010. The kiwi and koala were given by friends in New Zealand and Australia to the KAO crew members. It's estimated that the koala mascot flew four million miles on the KAO.

ology Institute, served as mission director when the time capsule was assembled in 1995. Dolci wasn't certain what the group would find upon the capsule's opening, but she did remember a pair of mascots: a stuffed kiwi and a stuffed koala, given by friends from New Zealand and Australia. The koala was a constant companion of crewmembers, flying four million miles on the airborne observatory.

As the crowd waited, anticipation built and when the capsule was finally unlatched, it revealed an intact koala and kiwi, along with the rest of the items, which had been stored in an ice chest. A cricket bat signed by friends from New Zealand also was among the memorabilia.

Kuiper gourmet meal," recalled one of the former crewmembers.

Items of a less scientific nature included the lyrics to "The Kuiper Blues," along with a harmonica and a poem written by Tom Connors, a former mechanical engineer.

"We had a rich culture with the KAO," quipped Dolci.

On a humorous note, there was a penny-filled jar labeled, "Save the KAO Fund;" a "smile" lipstick sticker, for "when everything's wrong and you need to be pleasant;" and an alleged witch-doctor bone. The artifact had been acquired by KAO scientist Jim Elliot in Maseru Lesotho, South Africa, in 1971, and was used by Elliot and fellow scientists Ted Dunham and their

Science Q&A with Scott Sandford, NASA space scientist

BY RUTH DASSO MARLAIRE

Scott Sandford grew up in Los Alamos, N.M., which may have fostered his early interest in science. "I've been surrounded by scientists most of my life," he said. After earning a doctorate degree in physics from Washington University, St. Louis, Mo., he accepted a position in 1986 at NASA Ames. Over the years, he has had a diversified career path, including performing research in seismology, accelerator particle physics, meteoritics, infrared astronomy, and laboratory astrochemistry. In 2010, he was awarded a Fellowship by the American Planetary Society.

Q: You are an internationally recognized and highly respected expert on the chemical make-up of extraterrestrial and early solar nebular matter. When a tiny asteroid exploded over the Nubian Desert in Sudan on October 7, 2008, it left a field of stone fragments. Scientists now are reporting on their analyses. What are the significant findings of that meteorite, now named Almahatta Sitta?

A: Scientists learned quite a few things. We found that the meteorite belongs to a relatively rare class of meteorites called ureilites. Scientists generally agree that ureilites look a lot like primitive meteorites called carbonaceous chondrites that have been significantly heated. But we still don't understand the exact nature of the original chondrite material, or the manner in which it is heated.

We also learned that the asteroid wasn't made of just one type of material. It also contained at least some fragments of other asteroids, suggesting that the original asteroid had suffered collisions with other bodies in the past.

Q: Meteorites classified as ureilites are very rare. This suggests the origin of the collected samples is different than most meteorites. Are there theories that explain this phenomenon?

A: While ureilites are rare meteorites found on Earth, this does not necessarily imply they are derived from a rare type of asteroid. There are hundreds of thousands of asteroids in our solar system, but only a small fraction are favorably located so their fragments find their way to Earth. So, ureilites could be rare because they come from a type of asteroid that is



NASA photo

Scott Sandford (right) talks to various audiences about the Stardust mission. Here he shows a Foothill Community College audience a piece of aerogel, which contained dust samples from Comet Wild 2.

intrinsically uncommon, or they could be rare because most of their parent asteroids are not ideally located to deliver meteorites to Earth.

Q: Considering the violent impacts, friction and extreme heat these meteorites endure, how are compounds like amino acids and polycyclic aromatic hydrocarbons (PAHs), both considered building blocks of life, able to survive?

A: While the collision of two aster-

oids is a fairly violent and energetic event, not all of the materials in both asteroids see the same degree of processing. During a collision, some materials, for example, the materials at the point of initial contact, may be heated enough by the shock to be utterly vaporized. However, materials further from the collision site, including amino acids and PAHs, may be largely unaffected.

NASA addresses water needs of California growers

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week, making the information useful to growers in drawing up irrigation schedules, and for water managers tasked with ensuring that enough water is available to meet the demand from agriculture."

Processing the vast volume of satellite data needed to produce information for agricultural producers and water managers across millions of acres of irrigated land in real time is a major challenge. To address this challenge, the project is leveraging the NASA Earth Exchange, a new resource at NASA Ames that brings together global Earth observation datasets and NASA supercomputing resources to support both fundamental and applied research.

"With the advanced computing resources at NASA Ames, we can quickly process terabytes of data and make it available to growers almost immediately," says Rama Nemani, a senior research scientist at NASA Ames, and lead scientist for the NASA Earth Exchange project.

As residential, industrial, agricultural, and environmental demands compete for limited water supplies, new sources of information will help consumers, water managers, and policy makers manage water supplies more effectively. NASA's computing and data management infrastructure provides new capabilities to maximize the benefit of water supplies throughout California and the western United States.

Ames hosts Martin Luther King celebration

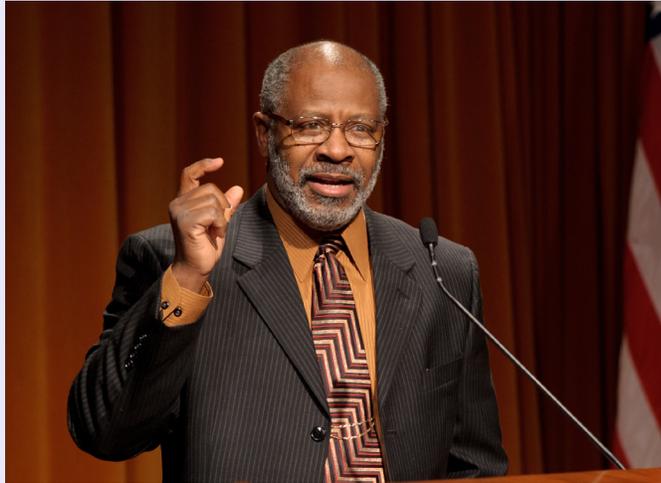
In recognition of the Martin Luther King Holiday, the Ames African American Advisory Group invited Ames employees to participate in the Martin Luther King Celebration in the Main Auditorium at Ames on Jan. 12. This year's theme is "Why We Celebrate."

The guest speaker this year was Dr. Arlando Smith, assistant professor of Educational Leadership at San Jose State University. Smith received his B.A. and M.A. in political science from California State University at Fullerton, and his doctorate in Educational Leadership and Organizational Management from the University of LaVerne.

Prior to becoming a college instructor, Smith was a high school teacher, high school and middle

school principal, and a district office administrator. He has served as a facilitator at the Stanford School Redesign Network and as a consul-

tant with WestEd using best practices in school reform in underperforming schools and districts.



Dr. Arlando Smith, assistant professor of Educational Leadership at San Jose State University, was the guest speaker at the recent Martin Luther King celebration held at Ames this month.

NASA photo by Dominic Hart

ACC holds 2010 Contractor Excellence Awards ceremony

BY KATHLEEN STARMER

The Ames Contractor Council (ACC) recently held its annual Contractor Excellence Awards Ceremony in the Main Auditorium. This event celebrated and acknowledged the contributions that both individuals and teams have made to Ames' activities.

The event was hosted by Master of Ceremonies Timothy Steiger; presentations were made by Elisa Taube, ACC president, and Jack Boyd, senior advisor to the Ames center director.

A total of 22 individuals and 14 teams were recognized for their outstanding performance during the past year.

The ACC also presented its Safety Excellence Awards at the event, recognizing IAP Worldwide Services, Inc., for the Team category and Bruce Foutch for his individual contributions.



NASA photo

Left to right: ACC members Terrance Reichert (vice President), Josefina Serrano (secretary), Elisa Taubem (president), Timothy Steiger (awards chair), Herb Finger (treasurer) and Christopher Youngquist (awards co-chair).

Astronaut Jose M. Hernandez presents “Mission to Success”

The Hispanic Advisory Committee for Employees (HACE) hosted a visit to Ames by Astronaut Jose M. Hernandez. As part of HACE's "Mission to Success" educational outreach event, Hernandez addressed the Ames community and the 8th grade class from East Palo Alto's Ronald McNair Middle School at the Main Auditorium in October. He also addressed high school students at San Jose's Latino College Preparatory Academy.

In May 2004, NASA selected Hernandez as an astronaut candidate. In July 2008, he became a mission specialist for the STS-128 mission that launched on Aug. 28, 2009 and returned Sept. 11, 2009.

Hernandez has come a long way from his days working in the fields of California to becoming one of few Hispanics to participate in a space flight mission. His efforts and determination to succeed has made Hernandez an inspiration to minorities, especially within the Hispanic community.

HACE is proud to be able to showcase stories of success, like that of Hernandez, to the youth of America.

That's why HACE invited Hernandez to lead the "Mission to Success" educational outreach event.



Astronaut Jose M. Hernandez (right) receives a certificate of appreciation from Ames Center Director S. Pete Worden (left) during the Hispanic Advisory Committee for Employees "Mission to Success" educational outreach event.

NASA photo by Dominic Hart

NASA Collaborates with CAL FIRE for Wildfire Management, mitigation

BY KAREN JENVEY

NASA Ames has entered into a five-year Non-Reimbursable Space Act Agreement with the California Department of Forestry and Fire Protection (CAL FIRE) to use NASA technology and capabilities to help support the management and mitigation of wildfire disasters.

"The two entities have had an ad-hoc partnership for the last 25 years and this agreement formalizes our working relationship and allows the two agencies to explore new and exciting technology developments and capabilities that support the needs of the people of California," said Vince Ambrosia, NASA Ames' principal investigator and senior scientist of the collaborative effort.

"CAL FIRE is proud to formalize its partnership with NASA," said Chief Ken Pimlott, director of CAL FIRE. "Under this agreement we will coop-

eratively explore the use and future transfer of advanced fire sensing technology. This in turn, will benefit the public we serve by helping CAL FIRE increase situational awareness and response efficiency."

NASA has developed an innovative visible, infrared and thermal sensor called the NASA Autonomous Modular Scanner (AMS) at Ames. The scanner has operated on both NASA's Predator B Unmanned Aerial Vehicle (UAV), named Ikhana, and a manned B-200 King Air operated by NASA's Dryden Flight Research Center at Edwards, Calif. The scanner provides real-time wildfire imaging data over large-scale disaster events in the western United States and particularly in California. The innovations include performing all processing autonomously aboard the aircraft, and relaying the information through a satellite communications system to

disaster managers located anywhere in the world.

The system performed flawlessly during several major wildfire events in southern California in 2007 and during the lightning fires in Northern California in 2008. Those missions were flown aboard the NASA Ikhana UAV. More recently, the team has focused on integration and operation of the sensor aboard the manned B-200 King Air aircraft.

"The B-200 has more rapid response capability than the unmanned aerial vehicles. The exciting element is that we have the ability to use different platforms as the mission requirements change," Ambrosia said.

For more information on the Autonomous Modular Scanner and the Western States Fire Missions, visit: <http://www.nasa.gov/centers/dryden/research/wsfm.html>

NASA-funded research discovers life built with toxic chemical

BY CATHY WESELBY

NASA-funded astrobiology research has changed the fundamental knowledge about what comprises all known life on Earth.

Researchers conducting tests in the harsh environment of Mono Lake in California have discovered the first known microorganism on Earth able to thrive and reproduce using the toxic chemical arsenic. The microorganism substitutes arsenic for phosphorus in its cell components.

"The definition of life has just expanded," said Ed Weiler, NASA's associate administrator for the Science

considered an essential element for all living cells.

Phosphorus is a central component of the energy-carrying molecule in all cells (adenosine triphosphate) and also the phospholipids that form all cell membranes. Arsenic, which is chemically similar to phosphorus, is poisonous for most life on Earth. Arsenic disrupts metabolic pathways because chemically it behaves similarly to phosphate.

"We know that some microbes can breathe arsenic, but what we've found is a microbe doing something new -- building parts of itself out of arsenic," said Felisa Wolfe-Simon, a NASA

was being used to produce the building blocks of new GFAJ-1 cells.

The key issue the researchers investigated was when the microbe was grown on arsenic did the arsenic actually become incorporated into the organisms' vital biochemical machinery, such as DNA, proteins and the cell membranes. A variety of sophisticated laboratory techniques was used to determine where the arsenic was incorporated.

The team chose to explore Mono Lake because of its unusual chemistry, especially its high salinity, high alkalinity, and high levels of arsenic. This chemistry is in part a result of Mono Lake's isolation from its sources of fresh water for 50 years.

The results of this study will inform ongoing research in many areas, including the study of Earth's evolution, organic chemistry, biogeochemical cycles, disease mitigation and Earth system research. These findings also will open up new frontiers in microbiology and other areas of research.

"The idea of alternative biochemistries for life is common in science fiction," said Carl Pilcher, director of the NASA Astrobiology Institute at Ames. "Until now, a life form using arsenic as a building block was only theoretical, but now we know such life exists in Mono Lake."

The research team included scientists from the U.S. Geological Survey, Arizona State University in Tempe, Ariz., Lawrence Livermore National Laboratory in Livermore, Calif., Duquesne University in Pittsburgh, Penn., and the Stanford Synchrotron Radiation Lightsource in Menlo Park, Calif.

NASA's Astrobiology Program in Washington contributed funding for the research through its Exobiology and Evolutionary Biology program and the NASA Astrobiology Institute. NASA's Astrobiology Program supports research into the origin, evolution, distribution, and future of life on Earth.

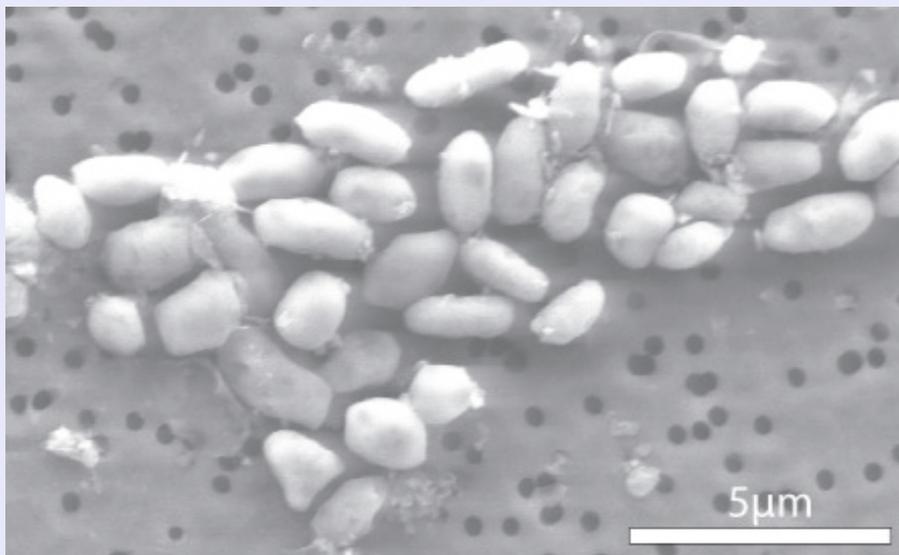


Image of GFAJ-1 grown on arsenic. Image credit: Jodi Switzer Blum

Mission Directorate at the agency's Headquarters in Washington. "As we pursue our efforts to seek signs of life in the solar system, we have to think more broadly, more diversely and consider life as we do not know it."

This finding of an alternative biochemistry makeup will alter biology textbooks and expand the scope of the search for life beyond Earth. The research was published in a recent edition of *Science Express*.

Carbon, hydrogen, nitrogen, oxygen, phosphorus and sulfur are the six basic building blocks of all known forms of life on Earth. Phosphorus is part of the chemical backbone of DNA and RNA, the structures that carry genetic instructions for life, and is

Astrobiology research fellow in residence at the U.S. Geological Survey in Menlo Park, Calif., and the research team's lead scientist. "If something here on Earth can do something so unexpected, what else can life do that we haven't seen yet?"

The newly discovered microbe, strain GFAJ-1, is a member of a common group of bacteria, the Gammaproteobacteria. In the laboratory, the researchers successfully grew microbes from the lake on a diet that was very lean on phosphorus, but included generous helpings of arsenic. When researchers removed the phosphorus and replaced it with arsenic the microbes continued to grow. Subsequent analyses indicated that the arsenic

Letters to the Editor

Dec. 10, 2010

Editor, Astrogram

I was glad to receive the Sept. issue of the Astrogram. I was employed at NASA from 1969 to 1984 in the Chemical Research Projects Office. I only recognize a couple of names in the issue. Of course "Sy" Syvertson was director for a while then, and I do remember Jack Boyd.

The front-page article in the Astrogram, "NASA aims to improve aviation safety" strikes a familiar chord. It was the mission of our group then to also improve aviation safety by increasing the fire resistance of aircrafts. Our group leader was John Parker. It was our premise that more airplane crashes would be survivable if there were not a subsequent fire. We did a lot of good work. We were instrumental in replacing combustible thermo-plastic interior panels that would melt and drip burning material onto the highly combustible seats, and thus propagate a fire throughout the plane, with more fire-resistant thermosetting plastics. Although we tried to develop fire-resistant foam for the seats, we didn't succeed in getting a comfortable material, but we greatly improved the fire-resistance by encasing the foam with non-combustible Nomex or carbon fiber fabric.

We also developed intumescent coatings, fire- and laser-resistant windows. And some novel polymers that would not burn, even in pure oxygen. Although many papers were written and patents issued, many of our developments never got commercialized, remaining to be rediscovered when the need for these things arises.

It is quite gratifying that there have been many recent incidents of plane crashes in which there were quite a few survivors. And the Xmas, 2009 bombing attempt by the so-called Underwear Bomber resulted in only a localized fire that did not spread throughout the plane and with no loss of life. Twenty-five years ago, it would have been a different story. The seats would have caught fire, then the panels, and then propagated throughout the entire plane, with all passengers killed. Our work at NASA probably had a big influence in this aspect of Aviation Safety. At least, I hope so.

George M. Fohlen, Ph.D.

In memorium...

James H. Stevenson, a research psychologist in the Human Systems Integration Division, passed away on Dec. 15, 2010. Stevenson had extensive training and experience in mathematics, psychology and statistics.

From 1964-1968, Stevenson attended Pomona College in southern California for his bachelor's degrees in psychology and mathematics. During 1968-1975, Stevenson studied at Stanford University where he obtained a Ph.D. experimental psychology followed by post-doctoral research in biostatistics and statistical genetics.

In 1975, he joined the Man-Machine Integration Division (now called the Human Systems Integration Division) at NASA Ames. In the ensuing years, he worked on a number of projects, including aviation safety, auditory displays, artificial intelligence and neural networks.

With 35 years of experience at Ames, Stevenson was a key part of our NASA family, and he will be missed.

The Astrogram returns April 2011

The Astrogram staff hopes you all enjoy this issue of the current newsletter in its quarterly publication format. Our next issue will be published in April 2011. If you want to submit a story and/or photo for consideration, please email them to Astrid Olson at A.Olson@nasa.gov by April 15, 2010.

Helping students finish high school and start college

BY MICHAEL BLOEM

Editor's Note:

Michael Bloem researches air traffic management in the Aviation Systems Division at Ames and has been volunteering at BUILD, an organization that helps disengaged, low-income students finish high school and go to college," since 2007. He started tutoring a few years ago at the East Palo Alto site of BUILD.

In the spring of 2008, I was asked by BUILD to help a student named Rickey who had been suspended for possessing drugs at school. Rickey was already dangerously close to failing physics and pre-calculus, and missing school for a suspension wasn't going to help. My job was to help him pass these classes. By that time I had been doing academic mentoring at BUILD for almost a year, but this was a new situation that presented challenges I hadn't yet encountered in my weekly mentoring at BUILD.

Before I met Rickey, I had a certain notion of what an African-American teenager from East Palo Alto who was suspended for drug possession at school would be like. Rickey did not fit this notion. Many students I work with at BUILD are mainly interested in finishing their assignments; the most important part of many mentoring sessions involves persuading students that learning itself is valuable. This was not the case with Rickey, who possesses a refreshing intellectual curiosity. Rickey has a sharp analytical mind and learns quickly. Even when I was too self-absorbed to think of asking how Rickey was doing, Rickey would start our meetings with a genuine "How was your day, Michael?" Interacting with Rickey revealed some of my biases and helped me overcome them.

After a number of tutoring sessions during and after Rickey's suspension, Rickey was able to pass his pre-calculus class. During his senior year, I found myself with Rickey at BUILD more and more often, and eventually I was picking up Rickey for weekend study sessions. Rickey's dysfunctional home life made studying at home nearly impossible, and Rickey's suspension wasn't the last

mistake he made. But in his senior year, Rickey passed AP calculus and physics (the second time around). He went to a private college in the Midwest in 2009. From time to time I still get to see my friend Rickey, and I consider myself blessed to have had the chance to work with him.

Not every academic mentoring relationship at BUILD is as challenging and rewarding as this one. But that isn't to say that every academic mentoring relationship at BUILD isn't as important. BUILD helps students

go to college instead of dropping out of high school, and every student who does represents a changed life and a tremendous positive impact on a community. Academic mentoring is essential to helping BUILD achieve this goal.

"BUILD still needs tutors for this school year, especially in math and science. For more information about becoming a tutor at BUILD, contact Alexis Bayley, BUILD Academic Program Manager, at abayley@build.org or call her at (650) 543-4775."



Top photo: Class of 2012 BUILD students. Bottom photo: Junior student Roman Magallon; Tutor David Hattaway and junior student Benjamin Jimenez. BUILD is an organization that helps disengaged, low-income students finish high school and go on to college.

Ames Ongoing Monthly Events Calendar

African American Advisory Group (AAAG) Mtg., every fourth Wednesday of each month, 12 - 1 p.m., Bldg. N255 Rm 101C. POC: Chair - Jim Busby, ext. 4-2792.

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

Ames Ballroom Dance Club, Classes on Tuesdays. Beginning classes meet at 5:15 p.m. Higher-level class meets at 5:50 p.m. Held in Bldg. 944, the Rec. Center. POC: Helen Hwang at helen.hwang@nasa.gov, ext. 4-1368.

Ames Bicycling Club, every third Wednesday of each month, 12 noon - 1 p.m., Bldg. N-245 Auditorium. For information on the club go to the website <https://ames.clubexpress.com>. POC: Julie Nottage at jnottage@mail.arc.nasa.gov, ext. 4-3711.

Ames Bowling League, Homestead Lanes Thursdays at 6:20 p.m. Need substitute bowlers. Sign up questions: Steve Howard at ext. 4-4884.

Ames Child Care Center Board of Directors Mtg., every other Monday, 1 - 2:30 p.m., Bldg. N-262/Rm 180. POC: Sally Miller, ext. 4-5411.

Ames Contractor Council Mtg., first Weds. of ea. month, 11 a.m., Bldg. N-200, Committee Room. POC: Elisa Taube (408) 541-2838.

Environmental Forum, first Thursday every other month, 9 a.m. - 10 a.m., T20-G conference Rm. 129. URL: <http://q/qe/events/EHS-series/> POC: Stacy St. Louis, ext. 4-6810.

Ames Federal Employees Union (AFEU) Mtg., third Wednesday ea. month, noon. Bldg. N-247, Rm. 109.. Guests welcome. Info at: <http://www.afeu.org>. POC: Paul K. Davis, ext. 4-5916.

The Hispanic Advisory Committee for Excellence (HACE) Mtg., first Thursday of each month, 11:45 a.m. - 12:45 p.m., Bldg. N-255, Rm. 101C. POC: Eric Kristich, ext. 4-5137 and Mark Leon, ext. 4-6498.

Jetstream Toastmasters, Mondays, 12 p.m. - 1 p.m., Bldg. N-269/Rm.179. POC: Tim Steiger, ext. 4-0195, tim.steiger@nasa.gov. Web: <http://jetstream.freetoasthost.com>

Ames Mac Support Group Mtg., third Tuesday of each month, 11:30 a.m. to 1 p.m., Bldg. N-262, Rm 180. POC: Tony ext. 4-0340.

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

Moffett Aikido Club, Monday and Wednesday evenings, 6:30 p.m., Bldg. 944, across from former McDonalds. Aikido is a non-competitive, defensive martial art known as the "Way of Harmony." POC: Diane Pereda (650) 575-9070 or Robert Dean (650) 787-1007, email: mfaikido@aol.com

Native American Advisory Committee Mtg., fourth Tuesday each month, 12 noon - 1 p.m., Bldg. 19, Rm 1096. POC: Mike Liu, ext. 4-1132.

Ames Nimble Knitters Club, every Tuesday at 11:30 a.m., Bldg. N210/Rm 141. POC: Rosalyn Jung, knitfan2@yahoo.com or Diane Alexander at ext. 4-3140. URL: <http://kmit.arc.nasa.gov>

Ames Green Team (formerly the Green Ames Working Group) meetings are held the first Thursday of each month in N237, Room 101, from 1:30-2:30 p.m. For more information, contact Roger Ashbaugh, Ames Environmental Management Division, ext. 4-5602. <http://environmentalmanagement.arc.nasa.gov/reports/eo-13514.html>

Ames Sailing Club Mtg., second Thursday of each month (March through November), from 12 p.m. - 1 p.m., Bldg. N-260, Rm. 113. URL: <http://sail.arc.nasa.gov/>. POC: Clif Horne, ext. 4-4571.

Ames Safety Committee, third Thursday of each month, 10 a.m. - 11 a.m., Bldg. N-237, Rm. 201. POC: John Livacich, jlivacich@mail.arc.nasa.gov, ext. 4-3243 or Terry Reichert, treichert@mail.arc.nasa.gov, ext.-4-0375.

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 Gift Shop N-235 in the cafeteria , 8 a.m. to 2 p.m., ext. 4-6873

Don't forget to purchase your baby shower, birthday, holiday gifts at Ames' two gift shops!

Visitor Center Gift Shop N-943 M-F, 10 a.m. to 4 p.m., ext. 4-5412

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

Tickets, etc... N-943 outside the main gate, 10 a.m. to 3:30 p.m., ext. 4-5412 and Beyond Galileo, 8 a.m. to 1:30 p.m. ext. 4-6873

Mega Bites Cafeteria N-235, 6 a.m. to 2 p.m., ext. 4-5969/Catering ext. 4-2161

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

Moffett Field Golf Club with 'Tee minus 1' Grill and Sports Bar. Call (650) 603-8026.

RV Lots Available Call to reserve a space at (650) 603-7100/01.

Civilian/Contractors, \$50/mo; military \$25/mo

NASA Lodge (N-19) 603-7100

Where to stay when you're too tired to drive home? What about the lodge?! Two types of rooms: Bldg. 19 (43 rooms), rate: \$55/night (\$5 ea add'l adult); Bldg. 583 (150 rooms), rate: \$45/night (\$5 ea. add'l adult)

Ames Swim Center (N-109) 603-8025

The pool is heated year round! The pool is currently available for lap swim, pool parties and special events. POC -Chana Langley, Pool Manager (650) 603-8025. Memberships: single memberships: \$40/yr. Family memberships: \$60/yr. After purchasing a membership, there is an entrance fee: daily entrance fee - \$3/day or lap pass fee - \$40 for 20 uses. Platinum membership - \$360/yr. (no daily fee). Special events: include military training, swim team events, kayak role practice, etc. The cost for special events is \$50/hr.

Ames emergency announcements

To hear the centerwide status recording, call (650) 604-9999 for information announcements and emergency instructions for Ames employees. You can also listen to 1700 KHz AM radio for the same information.

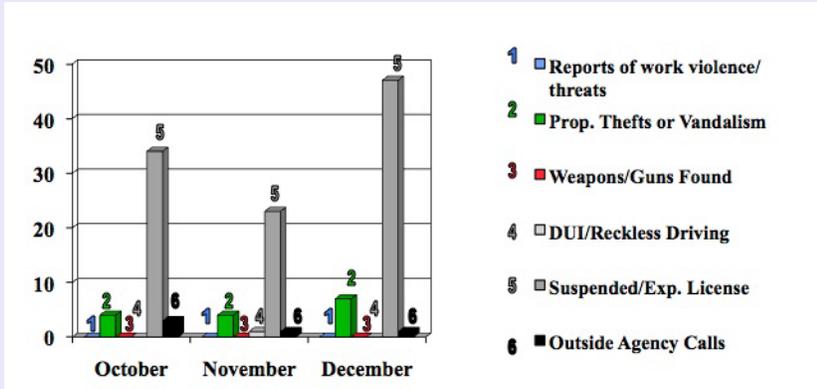
Ames Cat Network

The Ames Cat Network needs help finding homes for cats trapped at Moffett. They range from feral to abandoned/lost pets. Tested, altered and inoculated. Call Iris at ext. 4-5824 if you or someone you know are interested in fostering or adopting a cat.

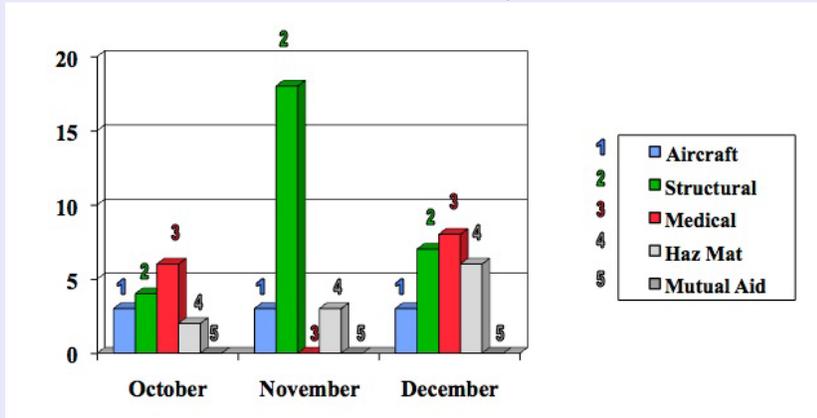
Protective Services monthly activity

A statistical summary of activities of the Protective Services Division's Security/Law Enforcement and Fire Protection Services units for the month of December 2010 is shown below.

Security/Law Enforcement Activity



Fire Protection Activity



NASA Ames to host Tweetup

BY JESSICA CULLER

NASA will give 100 of its Twitter followers an insider look at its planet-hunting Kepler spacecraft and Ames Research Center on Feb. 11.

For the first time, NASA's Twitter followers are being invited to Ames to learn about planetary discoveries from Kepler and the science flights of NASA's Stratospheric Observatory for Infrared Astronomy (SOFIA) aircraft.

The Tweeps also will get behind-the-scenes access to NASA Ames. Attendees will tour the center and speak with NASA officials, managers and scientists. The Tweetup will include a "meet and greet" session to allow participants to mingle with fellow Tweeps and the staff behind the tweets on @NASA and @NASA_Ames.

"This Tweetup will give participants and those who follow along online another look at the diverse ways NASA is pioneering the future in space exploration, scientific discovery and aeronautics research," said Stephanie Schierholz, social media manager at NASA Headquarters in Washington.

For more information about the Tweetup and to sign up, visit: <http://www.nasa.gov/tweetup>

National Aeronautics and Space Administration

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