

September 2013 - A Quarterly Publication

Ames Science Night featuring LADEE launch draws thousands



More than 7,000 people attended Ames Science Night on Sept. 6 to view the live NASA TV broadcast of the Lunar Atmosphere and Dust Environment Explorer (LADEE) spacecraft launch. Ames Research Center designed, developed, built and tested the spacecraft and will manage the 100-day science mission. For additional photos, see <http://www.nasa.gov/content/photos-from-ladee-events-and-ames-science-night/#> NASA photo by Dominic Hart

BY RACHEL HOOVER

NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE, pronounced like "laddie") is a robotic mission that will orbit the moon to gather detailed information about the lunar atmosphere, conditions near the surface and environmental influences on lunar dust. A thorough understanding of these characteristics will address long-standing unknowns, and help scientists understand other planetary bodies as well. The LADEE spacecraft launched Sept. 6, 2013 on a U.S. Air Force Minotaur V rocket from NASA's Wallops Flight Facility, Va.

The LADEE mission is divided into mission phases: Launch, Ascent, Activation and Checkout, Phasing Orbits, Lunar Orbit Insertion, Commissioning, Science, and Decommissioning.

Once launched, LADEE entered into a series of phasing orbits, allowing the spacecraft to arrive at the moon at the proper time and phase. This approach accommodates any

dispersion in the Minotaur V launch injection.

LADEE's arrival at the moon depended on the launch date. The spacecraft will approach the moon from its leading edge, travel behind the moon out of sight of Earth, and then re-emerge and execute a three-minute Lunar Orbit Insertion maneuver. This will place LADEE in an elliptical retrograde equatorial orbit with an orbital period of approximately 24 hours.

A series of maneuvers is then performed to reduce the orbit to become nearly circular with a 156-mile (250-kilometer) altitude.

The 100-day Science Phase is performed at an orbit that will vary between 20–60 kilometers due to the moon's "lumpy" gravity field. During the Science Phase, the moon will rotate more than three times underneath the LADEE orbit. Following the Science Phase, a decommissioning period is planned, during which the altitude will be managed down to lower altitudes, after which the spacecraft

will impact the lunar surface.

LADEE is the first spacecraft designed, developed, built, integrated and tested at NASA Ames.

LADEE has three science instruments and one technology demonstration onboard:

(1) The Ultraviolet and Visible Light Spectrometer will determine the composition of the lunar atmosphere by analyzing light signatures of materials it finds.

(2) The Neutral Mass Spectrometer will measure variations in the lunar atmosphere over multiple lunar orbits with the moon in different space environments.

(3) The Lunar Dust Experiment will collect and analyze samples of any lunar dust particles in the tenuous atmosphere. These measurements will help scientists address a longstanding mystery: was lunar dust, electrically charged by solar ultraviolet light, responsible for the presunrise horizon glow that the Apollo astronauts saw?

continued on page 6

NASA's LADEE Mission: testing a multi-use spacecraft design

BY RUTH DASSO MARLAIRE

On Sept. 6, NASA launched a small satellite mission, called the Lunar Atmosphere and Dust Environment Explorer (LADEE), which will orbit the moon to gather detailed information about its atmosphere and the role of dust in the lunar sky.

design to the test. This same common bus can be used on future missions to explore other destinations, including voyages to orbit and land on the moon, low-Earth orbit, and near-Earth objects."

The space agency has adopted a "more with less" approach to robotic missions. It also is about using NASA's

ways to launch often and inexpensively," said David Korsmeyer, director of engineering at NASA Ames. "We can use off-the-shelf components because customized components are expensive to continually develop and improve. If these systems work successfully, NASA will be looking for other commercial technologies to use for space exploration."

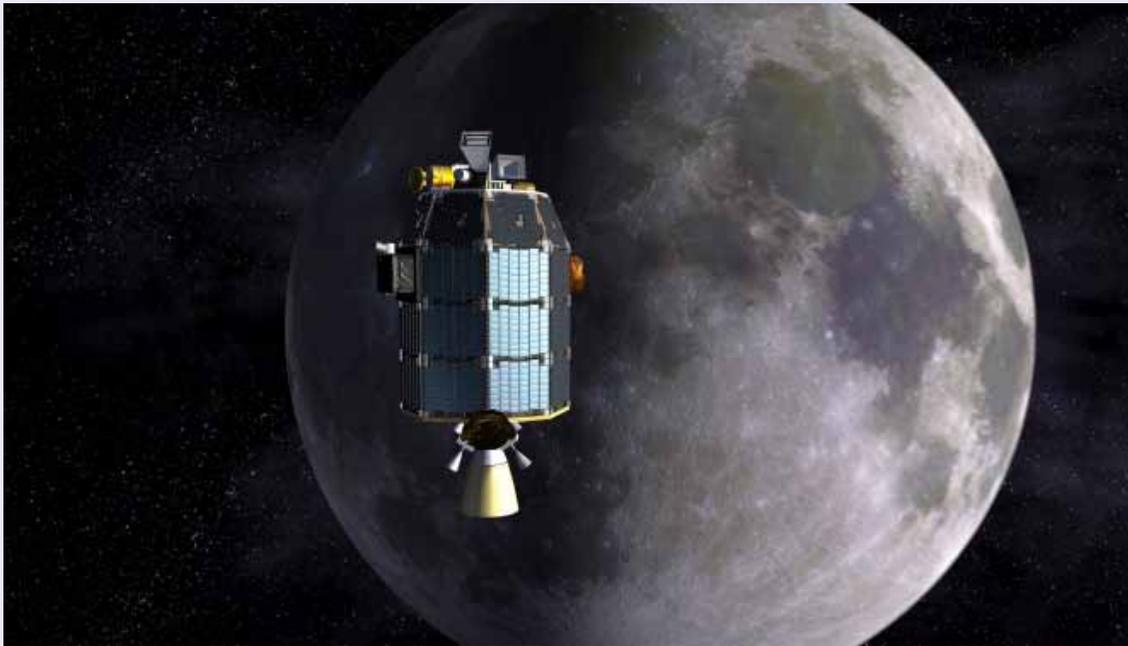
Instead of building increasingly large and complex exploratory missions, these low-cost accelerated missions could open the door for creativity, clever problem solving, and inspired missions with simple goals. Mission planners expect the next decade could see amazing developments as NASA continues to fund missions using this innovative concept.

"Simplicity was not a necessary aspect of this mission, but is clearly a driver for successful missions," said Butler Hine, LADEE project manager at Ames.

"The important thing is to maximize the success per dollar."

NASA's Science Mission Directorate in Washington funds the LADEE mission. In addition to designing the spacecraft, Ames manages the overall mission, operates the spacecraft, and hosts the project scientist. Goddard manages the science instruments and technology demonstration payload, the science operations center and provides overall mission support. Wallops is responsible for launch vehicle integration, launch services and operations. NASA's Marshall Space Flight Center in Huntsville, Ala., manages LADEE within the Lunar Quest Program Office.

For more information about the LADEE mission, visit: <http://www.nasa.gov/ladee>



Using a Modular Common Spacecraft Bus architecture, developed by Ames, LADEE will demonstrate how to build a first class spacecraft at reduced cost. The LADEE spacecraft makes use of general purpose spacecraft modules that allow for a plug-and-play approach to manufacturing and assembly. This approach is projected to give NASA more cost-effective missions in the future. Artist concept courtesy of NASA

LADEE is the first spacecraft designed, developed, built, integrated and tested at NASA Ames. Using a Modular Common Spacecraft Bus architecture, also developed by Ames, LADEE will demonstrate how to build a first class spacecraft at reduced cost. The LADEE spacecraft makes use of general purpose spacecraft modules that allow for a plug-and-play approach to manufacturing and assembly. This approach along with commercial off-the-shelf products allows mission designers to develop, assemble and test multiple spacecraft modules at the same time – essentially giving them the versatility to get the biggest bang for NASA's buck.

"LADEE's common bus is an innovative concept that brings NASA a step closer to multi-use designs and assembly line production, while moving away from custom design," said Ames Director S. Pete Worden. "This mission will put the common bus

small satellite missions to test cutting-edge space technologies for rapid development. These technology demonstrations allow NASA the opportunities to test in space emerging science and engineering technologies, and economical commercial off-the-shelf technologies on a smaller scale. These demonstrations also help researchers better understand how hardware will survive the harsh radiation, temperature and vacuum conditions encountered in space. All while being faster, more efficient and less expensive than traditional missions.

Findings could reap untold benefits for science and industry here on Earth. Rapid technology developments will allow future NASA missions to pursue bolder and more sophisticated science, enable safe and rewarding human missions beyond low-Earth orbit and enable entirely new approaches to U.S. space operations.

"NASA is looking for affordable

NASA ends attempts to fully recover Kepler spacecraft, -- potential new missions considered

BY MICHELE JOHNSON

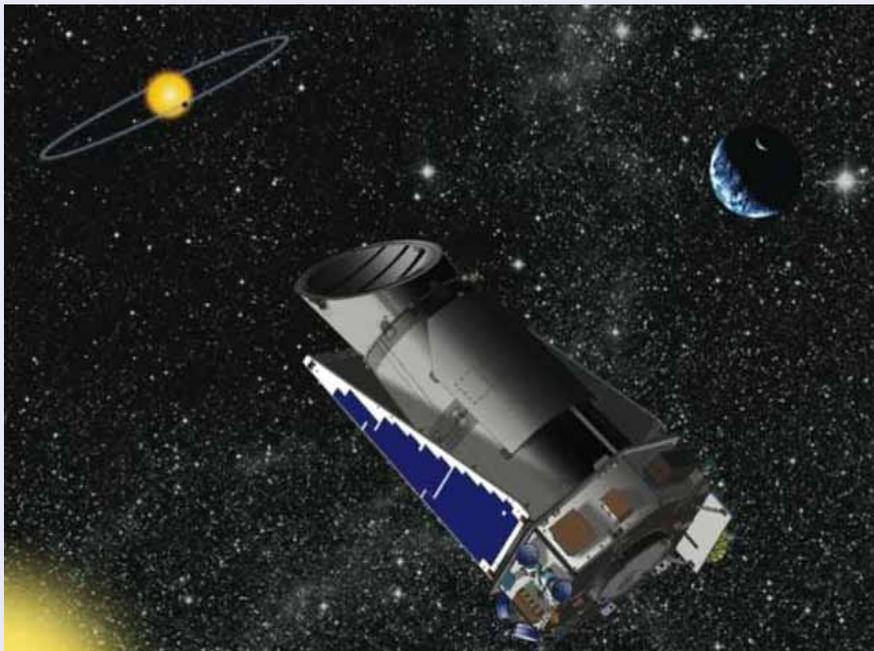
Following months of analysis and testing, the Kepler Space Telescope team is ending its attempts to restore the spacecraft to full working order, and now is considering what new science research it can carry out in its current condition.

Two of Kepler's four gyroscope-like reaction wheels, which are used to precisely point the spacecraft, have failed. The first was lost in July 2012, and the second in May. Engineers' efforts to restore at least one of the wheels have been unsuccessful.

Kepler completed its prime mission in November 2012 and began its four-year extended mission at that time. However, the spacecraft needs three functioning wheels to continue its search for Earth-sized exoplanets, which are planets outside our solar system, orbiting stars like our sun in what's known as the habitable zone -- the range of distances from a star where the surface temperature of a planet might be suitable for liquid water.

As scientists analyze previously collected data, the Kepler team also is looking into whether the space telescope can conduct a different type of science program, potentially including an exoplanet search, using the remaining two good reaction wheels and thrusters.

"Kepler has made extraordinary discoveries in finding exoplanets including several super-Earths in the habitable zone," said John Grunsfeld, associate administrator for NASA's Science Mission Directorate in Wash-



Artist concept of Kepler spacecraft, courtesy NASA

ington. "Knowing that Kepler has successfully collected all the data from its prime mission, I am confident that more amazing discoveries are on the horizon."

Informed by contributions from the broader science community in response to the call for scientific white papers announced Aug. 2, the Kepler project team will perform a study to identify possible science opportunities for a two-wheel Kepler mission.

Depending on the outcome of these studies, which are expected to be completed later this year, NASA

will assess the scientific priority of a two-wheel Kepler mission. Such an assessment may include prioritization relative to other NASA astrophysics missions competing for operational funding at the NASA Senior Review board early next year.

From the data collected in the first half of its mission, Kepler has confirmed 135 exoplanets and identified over 3,500 candidates. The team continues to analyze all four years of collected data, expecting hundreds, if not thousands, of new discoveries including the long-awaited Earth-size planets in the habitable zone of sun-like stars. Though the spacecraft will no longer operate with its unparalleled precision pointing, scientists expect Kepler's most interesting discoveries are still to come.

Meanwhile, preparations are underway for hosting the second Kepler Science Conference Nov. 4-8, at Ames. This will be an opportunity to share not only the investigations of the Kepler project team, but also those of the wider science community using publicly accessible data from Kepler. Registration is now open.

Ames is responsible for the Kepler mission concept, ground system development, mission operations, and science data analysis. For more information about NASA's Kepler spacecraft, visit: <http://www.nasa.gov/kepler>

Center director discusses search for life



In July, Ames Center Director S. Pete Worden presented "The Search for Life in the Universe and Our Future" in the Syvertson Auditorium as part of the 2013 Director's Colloquium Summer Series. The pursuit for evidence of life in the universe is one of humanity's most extraordinary endeavors. Probing where we come from, if we are alone, as well as determining where we are going next, is of paramount importance to space exploration. NASA Ames is at the forefront of this endeavor. In his presentation, Worden discussed how this endeavor is being pursued. NASA photo by Dominic Hart

NASA's next "Top Model," the fruit fly

BY GIANINE FIGLIOZZI

The common fruit fly, *Drosophila melanogaster*, is a biomedical research model that NASA finds attractive for studying biological response to spaceflight. Model organisms such as fruit flies are easier to study than humans. Although *Drosophila* are small and relatively simple creatures, they have the power to reveal the genetic and molecular basis for health and disease in many species of animals—including humans—because we all share the basic machinery of life. NASA is studying fruit flies to understand the molecular, genetic, cellular and physiological responses of whole organisms to spaceflight.

For a consensus opinion on which scientific questions are highest-priority and what research is needed to answer them, NASA engages the National Research Council in Washington, D.C. New hardware and facilities for the study of *Drosophila* aboard the International Space Station are part of NASA's response to the National Research Council's 2011 call for "a deeper understanding of the mechanistic role of gravity in the regulation of biological systems" and specifically for multi-generational studies of fruit flies in space.

The Fruit Fly Lab is a new multi-user facility for spaceflight *Drosophila* research that will be installed aboard the International Space Station in 2014. This facility builds upon NASA's prior experience with spaceflight *Drosophila* research. NASA Ames is developing new hardware, based upon the prior generation system used aboard the space shuttle, which will ensure safe transport of flies aboard SpaceX Dragon vehicles and support longer duration experiments aboard the space station.

For the first time, experiments in space will involve multiple generations of fruit flies under variable gravity conditions of 1-g (Earth gravity), fractional-g (such as moon and Mars gravity), and micro-gravity (weightlessness). System capabilities include environmental and behavioral monitoring.

In a prior study funded by NASA's Space Biology Program, entitled Fungal Pathogenesis, Tumorigenesis, and Effects of Host Immunity in Space



Sharmila Bhattachary, a scientist in the Space Biosciences Division at Ames, uses the *Drosophila* model to tease out the effects of spaceflight on the simpler innate immune system of the fruit fly.

(FIT), fruit flies were housed and bred aboard space shuttle Discovery for nearly 13 days to determine the impact of spaceflight on immune function. The results show that spaceflight alters the innate immune responses of *Drosophila* in multiple ways that resemble the immune suppression observed in astronauts.

"Since the human immune system is complex, we used the *Drosophila* model to tease out the effects of spaceflight on the simpler innate immune system of the fruit fly, focusing on molecular pathways that perform similar functions in the human immune system," said Sharmila Bhattachary, a Ph.D., principal investigator for the FIT study and scientist in the Space Biosciences Division at Ames.

Three fruit fly missions, leading up to the validation flight of the Fruit Fly Lab, are planned for 2014: a cardiovascular study led by investigators at Ames, Stanford University, Palo Alto, Calif. and the Sanford Burnham Medical Research Institute, Orlando, Fla., is planned to launch on SpaceX-3; a student-run study of neurobehavioral changes that occur during spaceflight will follow on SpaceX-4; the maiden voyage of the Fruit Fly Lab will launch aboard SpaceX-5. These upcoming missions benefit from prior experience gained from studies conducted aboard the space shuttle.

Women at NASA manage novel hurricane mission



HS3 project manager Marilyn Vasques and deputy project manager Bernadette Luna help develop daily mission plans that are based on satellite data and local weather predictions, and then are used to develop flight paths, and each take-off and landing. To read about their roles as project managers, see: <http://women.nasa.gov/outreach-programs/> Photo by Marilyn Vasques

NASA supercomputer simulates future U.S. climate conditions

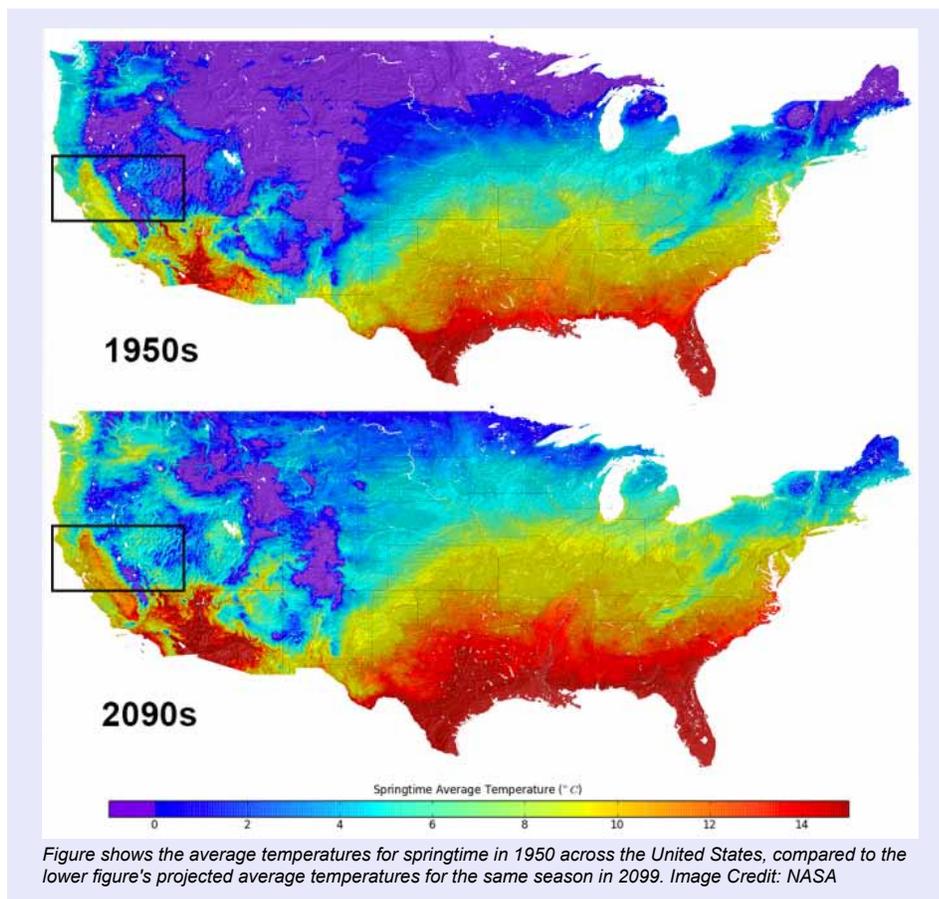
Global models of the climate system are now the foundation for many important climate studies, but they typically show climate changes at very large geographic scales on the order of 100 to 250 kilometers. Some data sets have scaled that down to about 10 kilometers, but even these make it difficult to analyze climate change impacts on a local or regional scale.

Using previously published large-scale climate model projections, a team of scientists from NASA, the Climate Analytics Group, Palo Alto, a non-profit that provides climate data services, and California State University, Monterey Bay, has released monthly climate projections for the conterminous United States at a scale of one half mile (800 meters), or approximately the size of a neighborhood. To generate these high-resolution climate projections, researchers used an innovative scientific collaboration platform called the NASA Earth Exchange (NEX), at NASA Ames.

These climate projections provide a view of future U.S. temperature and precipitation patterns based on four different greenhouse gas emissions scenarios, spanning the period from 1950 to 2099. The new downscaled climate projections were statistically derived from the results of the latest climate scenarios produced by an ensemble of global climate models for the Inter-Governmental Panel on Climate Change 5th Assessment Report (IPCC AR5) and historical surface observations.

"The NEX-DCP30 dataset provides a higher resolution that will be of great reference to the decision-making of natural resource managers, urban planners and the climate change science community," said Ramakrishna Nemani, senior Earth science researcher at Ames, and a co-author of the study. Details and availability of the new dataset were published in *Eos*, Transactions American Geophysical Union on Sept. 10.

These high-resolution climate scenarios, derived from the best physical models of the climate system available, provide a projection of future climate conditions given certain greenhouse gas emissions scenarios, and account for the effects of local topography on temperature and precipitation patterns. They also may make it easier for resource managers to quantify anticipated climate change impacts



on a wide range of conditions and resources important to local communities, such as water supplies and winter snow packs, public health and the spread of insect-borne diseases, flood risk and potential impacts to critical urban infrastructure, wildfire frequency and severity, agricultural production, and wildlife and biodiversity.

These scenarios can help climate scientists, hydrologists, land and natural resource managers, city planners, engineers and others understand the effects of future climate conditions.

Researchers anticipate these new images will serve as an important resource for regional analyses of climate change that are being conducted by scientists at a variety of institutions, including the U.S. Dept. of Interior Climate Science Centers and the National Park Service.

Since information is available at the scale of individual neighborhoods, it also may be of interest to the general public and others seeking to understand future climate conditions for their community.

Production of this dataset required hundreds of thousands of supercomputing hours and very large volumes of data. Previously, it would have taken more than a year to complete. Using the supercomputing resources provided by NEX and the NASA Advanced Supercomputing facility at Ames, the team of scientists was able to produce the downscaled, high resolution climate dataset for the U.S. within months of release of the final global climate scenarios prepared for the next IPCC assessment report.

Future work will expand on current efforts to make the dataset easily accessible to all interested users.

The dataset is currently available via the NASA Center for Climate Simulation at https://portal.nccs.nasa.gov/portal_home/published/NEX.html

Station astronauts remotely control planetary rover from space

By RACHEL HOOVER

Just as remotely-operated vehicles help humans explore the depths of the ocean from above, NASA has begun

and director of the Intelligent Robotics Group at NASA Ames, who designed and manages the tests. "Specifically, this test was the first fully-interactive

was developed by NASA's Human-Robotic Systems project and is a set of software data structures and routines that simplify the process of communicating information between different robots and their command and control systems. RAPID has been used with a wide variety of terrestrial systems including rovers, walking robots, free-flying robots and robotic cranes.

These tests also marked the first use of NASA's Ensemble-based software -- jointly developed at Ames and NASA's Jet Propulsion Laboratory in Pasadena, Calif. -- in space for telerobotics. Ensemble is an open architecture for the development, integration and deployment of mission operations software.

Fundamentally, it is an adaptation of the Eclipse Rich Client Platform (RCP), a widespread, stable and supported framework for component-based application development. Since 2004, the Ensemble project has supported the development of mission operations software for NASA's Science and Human Exploration and Operations mission directorates.

"Whereas it is common practice in undersea exploration to use a joystick and have direct control of remote submarines, the K10 robots are more intelligent," said Fong. "Astronauts interact with the robots at a higher level, telling them where to go, and then the robot itself independently and intelligently figures out how to safely get there."

LADEE launch

continued from front page

The technology demonstration is called the Lunar Laser Communications Demonstration. Currently, communications with spacecraft beyond close Earth orbits require spacecraft to have small, low-mass, low-power radio transmitters and giant satellite dishes on Earth to receive their messages. However, the LADEE spacecraft will demonstrate the use of lasers instead of radio waves to achieve broadband speeds to communicate with Earth.

For more information about LADEE, see: <http://www.nasa.gov/la dee>



K10 Black planetary rover navigates the boulder field in the Roverscape during a Surface Telerobotics Operational Readiness Test at NASA Ames. NASA photo by Dominic Hart

studying how a similar approach may one day help astronauts explore other worlds.

During the summer, NASA tested the Surface Telerobotics exploration concept, in which an astronaut in an orbiting spacecraft remotely operates a robot on a planetary surface. In the future, astronauts orbiting other planetary bodies, such as Mars, asteroids or the moon, could use this approach to perform work on the surface using robotic avatars.

On June 17, Expedition 36 Flight Engineer Chris Cassidy of NASA remotely operated the K10 planetary rover in the Roverscape -- an outdoor robotic test area the size of two football fields located at NASA Ames -- hundreds of miles below on Earth's surface from his post aboard the International Space Station (ISS). For more than three hours, Cassidy used the robot to perform a survey of the Roverscape's rocky, lunar-like terrain.

"The initial test was notable for achieving a number of firsts for NASA and the field of human-robotic exploration," said Terry Fong, Human Exploration Telerobotics project manager

remote operation of a planetary rover by an astronaut in space."

Five weeks later, on July 26, fellow Expedition 36 Flight Engineer Luca Parmitano (European Space Agency) picked up right where Cassidy left off.

Parmitano used K10 to deploy several rolls of Kapton plastic film. The Kapton rolls simulated a film-based radio telescope array, which one day might be installed on the farside of the moon to make low-frequency measurements of the early solar system.

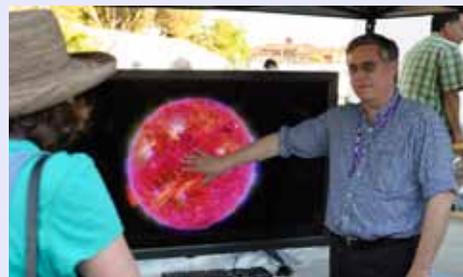
During the final test session on August 20, Astronaut Karen Nyberg remotely operated K10 to perform detailed visual inspection of the simulated telescope.

The primary objective was to obtain high-resolution camera views to document the deployment. A secondary objective was to search for possible flaws, such as folds and tears, in the film.

These tests represent the first time NASA's open-source Robot Application Programming Interface Delegate (RAPID) robot data messaging system was used to control a robot from space. RAPID originally

NASA Ames hosts IRIS solar mission launch events

On June 26, NASA Ames hosted a live NASA TV broadcast Interface Region Imaging Spectrograph (IRIS) mission launch in the Visitor Center, followed by commentary from Ames keynote speakers. IRIS is a NASA Small Explorer Mission to observe how solar material moves, gathers energy and heats up as it travels through a little-understood region in the sun's lower atmosphere. This interface region between the sun's photosphere and corona powers its dynamic million-degree atmosphere and drives the solar wind. NASA photos by Dominic Hart



NASA Aviation Safety analyst flies with Blue Angels

By JESSICA CULLER

Abegael “Abby” Jakey has aviation in her blood, taking her first flight at six months old in a Globe Swift. She hasn’t veered too far away from the industry since.

A pilot since she was 17, daughter and sister to commercial airline mechanics, recreational pilots, former Navy enlisted men, and a wife to a commercial airline pilot, 32 year-old Jakey worked through college as a certified flight instructor teaching others to fly safely.

She has had the unique opportunity to grow up flying antique airplanes, which drove her to her first flying job outside instructing, flying freight in a Beech 18 that led to a job as a regional airline pilot.

Now a contractor with Booz Allen Hamilton, Inc. working for NASA’s Aviation Safety Reporting System (ASRS), Jakey recently took her passion for flight to a higher level as she rode with the U.S. Navy Flight Demonstration Squadron, the Blue Angels.

In her position with the ASRS, Jakey coordinates outreach about the program to pilots, air traffic controllers, maintenance technicians, flight attendants, dispatchers and other aviation personnel. The program collects, analyzes and responds to confidential and voluntarily submitted safety incident or situation reports from those who are frontline personnel working in the National Airspace System. The reports are combined into a set of data that researchers and others can examine as a whole or individually, to reveal potential patterns of unsafe practices or conditions that might otherwise go unreported. Under a memorandum of agreement with the Federal Aviation Administration (FAA), NASA manages the ASRS at NASA Ames.

Because of her dedication to flight and the benefit of adding this experience to her understanding of the full scope of aviation, Jakey was invited earlier this year to ride along with the Blue Angels. The mission of the Blue Angels is to enhance Navy recruiting, and to represent Navy and Marine Corps aviation to the U.S. and its armed forces to America and other countries as international ambassadors of good will. Jakey was selected

to fly based on her ability to influence attitudes and opinions in her community.

On March 13, 2013, Jakey went to El Centro, Calif., to fly in an F/A-18 Hornet with Navy pilot Lt. Ryan Chamberlain. The following is Jakey’s account of her experience, in her own words.



Abegael Jakey, outreach coordinator for NASA’s Aviation Safety Reporting System, suits up for her special recognition flight with the Navy’s Blue Angels. Photo by Kevin Jakey

I woke up on the morning of March 13, 2013 fully expecting some unforeseen dark force to ruin the chance of a lifetime that was just around the corner. What was scheduled to happen in less than nine hours was almost too good to be true. Without my morning coffee and five minutes ahead of our scheduled 5:30 a.m. departure, I got into our rental car with my husband Kevin, our four year-old daughter Madison and Don Purdy, a colleague and former Naval aviator. We were bound for the Naval Air Facility El Centro, Calif., from San Diego. Being susceptible to car sickness, I drove. I was nervous. I was anxious, yet eager, and I was enthusiastically looking forward to my upcoming flight with the U.S. Navy Blue Angels.

At 1:15 p.m., MC1 (mass communications specialist) Terry Siren asked me to suit up. I nervously put on the provided flight suit and walked out to the van that would transport us to the glistening F/A-18 Hornet, Blue Angel #7. It was 92 degrees on the ramp when the crew chief, AME2 (aviation structural mechanic) Jared Mann wasted no time buckling me in. Shortly

thereafter, Lt. Ryan Chamberlain approached, strapped in and without much delay we were ready to go. Fired up, I waved my daughter and husband an “Aloha” and away we went.

On taxi-out, Lt. Chamberlain and I started some casual conversation. I explained my flight experience and he gave a brief account of his. We both were turbo-prop pilots in a former life and the welcome rapport of the conversation instantly put me at ease for the high-G maneuvers I was about to experience. Chamberlain asked me to make the call to the tower for takeoff. I was a bit surprised at the suggestion, but didn’t hesitate; a plane is a plane... right? But, when you say high performance takeoff for an F-18, it’s a little different than what I’m accustomed to. As we took the runway, I grabbed a deep breath and wore a million dollar grin as we started our takeoff roll. At 280 knots, we pulled up to 90 degrees and at that point I knew what six G’s felt like; an amazing experience. For the next 50 minutes, I felt like a kid in a candy store, a flyer at the pinnacle of aviation.

Here I was, actually experiencing it; the flight and opportunity of a lifetime. Diamond rolls, squirrel cages, Cuban eights, sustained inverted flight (not once, but twice), from slow flight to just over 600 knots in 30 seconds, practice target runs — 50 minutes of exhilarating, envelope-pushing fun. Returning for the overhead break back at the field, Chamberlain briefed me on the overhead break. This time, at 7.8 G’s, he “got me.” I briefly passed out. We shared a smart comment and laugh on arrival to a textbook landing.

The whole time in El Centro, I was in awe of the professional demeanor and manner of the Blue Angels. The entire team was made up of exceptional professionals representing the highest traditions of the men and women of our US Navy and Marine Corps. It was an absolute honor to be invited and welcomed into their operation for a day.

The next day, I woke up and was still glowing like I had just won the lottery... to an aviator it might as well have been a billion bucks. I was honored, and always will be, for having this experience.

50th anniversary of the March on Washington-Let Freedom Ring

BY ROSE KING

Fifty years ago, Aug. 28, 1963, “The largest single protest demonstration in United States history occurred at the Lincoln Memorial in Washington, D.C., where 250,000 blacks and whites gathered to lobby for passage of sweeping civil rights measures by Congress.



In celebration of this historical date in history, Rose King, chair of the Ames African American Advisory Group (AAAG), set up a display in Mega Bites, Ames Cafeteria.

AAAG members along with some of the lunch time crowd gathered to help honor the significance of that day with a reading. And as the clock struck noon the ringing of bells could be heard along with the rest of the nation as we paused to “Let Freedom Ring.” Photos by Rose King

Cultural exhibits and annual BBQ connect workforce



The Office of Diversity and Equal Opportunity (ODEO) invited Ames employees to participate in the Third Annual Diversity and Inclusion Day on Aug. 7. The event’s theme was centered on the diverse cultures of our Center’s workforce. The “Cultural Passport” event ran from 11 a.m.-2 p.m. Cultural exhibits represent a region, U.S. state or country. Exhibit items included artifacts, cultural wear, art, costumes and photos. The Ames Exchange held its annual free barbeque picnic in conjunction with the event. NASA photos by Eric James

SOFIA completes first Southern deployment, 2013 teacher program

BY NICK VERONICO

NASA Ames is home to the Stratospheric Observatory for Infrared Astronomy (SOFIA) Science Center. SOFIA is a heavily modified Boeing 747SP jetliner fitted with a 2.5-meter effective diameter telescope that collects data in the infrared wavelengths. SOFIA scientists based at Ames prepare flight plans that enable the observatory to maximize observing time for every flight, and reduce the data collected during each 10-hour mission.

In July and August, SOFIA deployed to Christchurch, New Zealand, to study celestial objects including the disk of gas and dust orbiting the black hole at the center of our Milky Way galaxy, and two dwarf galaxies, the Large and Small Magellanic Clouds, which accompany the Milky Way. While in New Zealand, SOFIA flew three missions per week for three weeks.

In September, SOFIA's Airborne Astronomy Ambassadors program came to a successful conclusion for 2013 having flown 26 educators from across the United States. "The unique design of SOFIA gives educators hands-on experience with world-class astronomical research," said John Gagosian, SOFIA program executive at NASA Headquarters in Washington. "Working with astronomers, educators participate in a research project from beginning to end and integrate that unique perspective with class-



Stratospheric Observatory for Infrared Astronomy (SOFIA) arrived at Christchurch, New Zealand, on July 13, 2013 for three weeks of observing the southern skies. Researchers at the SOFIA Science Center, located at NASA Ames, coordinated the celestial objects to be studied with the aircraft's flight plan to maximize observing time. SOFIA returned to the United States on Aug. 2, 2013. Photo by Carla Thomas

room lessons and public outreach programs."

To date, SOFIA's Airborne Astronomy Ambassadors program has flown more than 30 educators from 17 states. "We know teachers who participate in science research programs return inspired, and their students' engagement with technical subjects are measurably increased for many years afterward," said Dana Backman, manager of SOFIA's education and outreach programs. "Airborne As-

tronomy Ambassadors is an outstanding opportunity for NASA to reach out to both new and veteran teachers of science, technology, engineering and math to bring the excitement of real science research into the classroom and the community at large."

Follow SOFIA on Twitter (@SOFIATElescope), Facebook, Google+ and the mission's YouTube channel at: <http://www.youtube.com/user/SOFIAObservatory>

Phil Fluegemann receives prestigious CFC award

BY ASTRID ALBAUGH

Recently, Philip Fluegemann, Executive Officer for the Deputy Center Director, Code D, was awarded the National Heroes Award by the U.S. Office of Personnel Management and the Combined Federal Campaign (CFC) Awards Committee for, as stated on the award, "demonstrating exceptional performance during the 2012 Combined Federal Campaign. Your commitment to helping others is an example to us all." The campaign runs each year from September through December.

Fluegemann was surprised to receive the award at the recent standing Ames Executive Committee meeting, stating, "I am humbled by the honor (recognizing that only five to 10 individuals a year within the federal civil service receive this national recognition). While my name is

on the award, I assure you this award belongs to the very generous NASA Ames community that selflessly gives of time, talent and dollars each and every year; making a difference for those in need."

NASA Ames was instrumental in contributing to the success of the 2012 Norcal CFC Campaign exceeding its goal for 2012 of \$268,000, with a total collection of \$270,441.

The mission of the Combined Federal Campaign is to promote and support philanthropy through a program that is employee focused, cost-efficient and effective in provided all federal employees the opportunity to improve the quality of life for all. For additional information about the CFC, visit: <http://www.opm.gov/combined-federal-campaign/> Photo by Astrid Albaugh



Patriot Award presented to Phil Snyder of Protective Services

In August, Protective Services Division Chief Phil Snyder, second from right, was presented with the Employer Support of the Guard and Reserve (ESGR) "Patriot Award" by Jane Chen (far left) and Tom Clausen (second from left). This award recognizes supervisors and bosses nominated by a guardsman or reservist employee for support provided directly to the nominator.

Michael Disanto, NASA Special Agent, Protective Services, far right, nominated Snyder in support of Disanto's 14-month deployment with the National Guard. Snyder also was presented with a Statement of Support for the Guard and Reserve certificate to recognize Moffett Field. Photo by Ken Silverman



The giants on whose shoulders we stood



"Reflections on Over 70 Years of NACA/NASA at Ames Research Center: The Giants on Whose Shoulders We Stood" was presented by Jack Boyd, who currently serves as senior advisor to the center director, the History Office and the center Ombudsman, in July as part of the 2013 Director's Colloquium Summer Series. Jack originally traveled on a trans-continental train from Virginia to the San Francisco Bay Area to work at the National Advisory Committee for Aeronautics (NACA) at Moffett Field in 1947. NASA Ames is a leading research center that revolutionized the fields of aeronautics, space exploration, science, engineering and information technology, for both space and terrestrial applications; Ames changes the way we see and interact with the world. No one is more qualified to discuss the history of Ames than Jack.

Why explore? Much will be written as NASA reaches its 50th Anniversary this October. Jack Boyd provided his personal view of the 66 years he has been with NACA and NASA by reflecting on the enormously talented individuals at Ames who helped develop the technology that made space exploration possible. NASA photo by Eric James

Rozier receives distinguished AIAA award

Kristin Rozier (left), a research computer scientist in the Intelligent Systems Division (Code T1), is presented with the Distinguished Service Award from the Intelligent Systems Technical Committee (ISTC) of the American Institute of Aeronautics and Astronautics (AIAA) for "Significant Contributions to the Activities of the ISTC and AIAA 2008-2013."

Rozier founded the AIAA Intelligent Systems Science Fair Award, which has launched the research careers of several students who were otherwise not recognized by the Synopsis Santa Clara Valley Science and Engineering Fair (SCVSEFA). Based upon several years of judging, including at SCVSEFA as a regular category judge, Rozier realized there was a need to recognize outstanding interdisciplinary projects.

She founded the AIAA Intelligent Systems Award, which recognizes the projects that best embody intelligent systems, with applicability to the aerospace domain. The AIAA IS award is now an annual award and has been awarded during the past three years at the SCVSEFA. Ann Patterson-Hine, Code T1, presented Rozier with the award. Photo by Greg W. Orzech, Stinger Ghaffarian Technologies Inc.



Cryogenic Society of America recognizes Lou Salerno



Lou Salerno was selected by the Cryogenic Society of America as the 2013 recipient of the Robert W. Vance Award.

Lou Salerno, former chief of the Instrument Technology Branch at Ames, (he retired from Ames in September 2012) was selected by the Cryogenic Society of America (CSA) as the 2013 recipient of the Robert W. Vance award. The award was established to honor persons for their dedication and long-term commitment to the advancement of CSA and is the first award ever given by the society.

Laurie Huget, executive director of the society, wrote of Salerno, “A long-term contributor to the Cryogenic Society of America, Lou Salerno is a lifetime member, a former president of the society, a founder of the Northern California chapter, a major donor to the Award for Excellence in Cryogen-

ics Research, the chair of the 1999 Space Cryogenic Workshop and instigated the merger of the Space Cryogenic Workshop into the Society. In the spirit of Robert W. Vance, Salerno’s years of dedicated service have significantly benefited the CSA in many ways.”

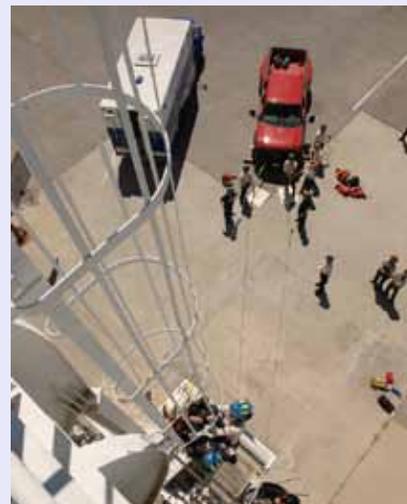
The award was presented in June at the Cryogenic Engineering Conference in Anchorage, Alaska. Although he was not present to receive the award, Salerno said in a letter to the society that he was both honored and humbled and also somewhat embarrassed to receive an award for doing something enjoyable.

Ames’ DART team practices to prepare for potential disasters

BY JESSICA CULLER

In June, the Ames Disaster Assistance and Rescue Team (DART) conducted a rope rescue operation training exercise at the 12-foot Pressurized Wind Tunnel, Building N206. The exercise scenario involved a training mannequin, representing an employee in fall-protection gear, that had fallen from the top of the wind tunnel.

During the exercise, the DART members assembled at their operations facility, Building N267, deployed with their equipment to the exercise location, then conducted a technical rope rescue operation involving victim stabilization and extrication.



This type of training exercise is essential in helping the members of DART maintain technical skills and prepare to respond to center emergencies.

For more information about DART, contact Cindy Simon at Cynthia.A.Simon-1@nasa.gov, or call ext. 4-3962 or contact Erik Rockwell at Erik.S.Rockwell@nasa.gov, ext. 4-2371. NASA photos by Dominic Hart

Ames Associate, scientist Murray Tobak dies

Murray Tobak, died Aug. 31, 2013, at age 88, after a short illness. Murray joined the staff of the NACA Ames Aeronautical Laboratory in 1948, after completing his undergraduate engineering training at the University of California, Berkeley.

He retired 56 years later as a senior scientist from Ames after a long, distinguished and productive career. In his retirement, he continued to work as an Ames Associate and as an associate editor of the AIAA Journal of Aircraft, coming to Ames twice a week until shortly before his death.

Murray made significant contributions in the fields of unsteady aerodynamics, in developing techniques for modeling the nonlinear, nonsteady, flow about maneuvering aircraft, in predicting the behavior of tumbling

bodies entering the earth's atmosphere from space.

Within basic aerodynamics, Murray developed theories explaining the origin of the crosshatching observed on ablating slender bodies in hypersonic flow.

He also developed theories of flow topology, linking the surface-flow variations with the behavior of the off-surface flow features.

Murray also made significant contributions towards explaining the origin of the steady asymmetric vortex flows observed on slender bodies of revolution at large angles of attack.

He eschewed becoming a manager, but he was a friend, colleague and mentor to countless co-workers over the years. Murray led by example, and he will be missed.



Murray Tobak

Billingham captained NASA's SETI with style and efficiency

John Billingham, who transformed SETI (Search for Extraterrestrial Intelligence) from an occasional experiment into a systematic program, unexpectedly passed away on Aug. 4, 2013. He was 83 years old.

Billingham studied medicine at Oxford University in his native England, an unconventional background for someone so intimately connected with the search for extraterrestrial intelligence. But he quickly combined his formal training with an enthusiasm for the burgeoning space program of the 1960s, and went to work for the Royal Air Force and eventually NASA to help design protective astronaut suits and other spaceflight technology.

In 1965, he became chief of the Biotechnology Division at NASA Ames, where he was exposed to a novel research area called exobiology, the possible existence of extraterrestrial life and how it might be discovered. One approach Billingham found especially intriguing was to scan the sky for signals from societies at great distances, a scheme eventually known as SETI (Search for Extraterrestrial Intelligence). This idea had been pioneered by radio astronomer Frank Drake several years earlier.

Captivated by the prospect of detecting sentient beings elsewhere in the cosmos, Billingham joined with Barney Oliver, then director of research and development at the Hewlett Packard corporation, to organize a joint summer design study of

the technology and science of SETI. Two dozen academics spent three months considering what sort of equipment was needed to make a serious, systematic search for signals and where they should point the anten-



John Billingham

nas. Their conclusions, published as "Project Cyclops," became the bible of SETI research for decades to come and are still important today.

Inspired by the practicality of implementing a serious search, Billingham went on to start the NASA SETI program, and headed that effort from its inception in the 1970s until its cancellation by Congress in 1993. It

was during this period of rapid technical development and increased awareness of SETI by academia and the public that the SETI Institute was founded. Although Billingham retired from NASA soon after its SETI efforts were halted, he kept in close touch with the discipline he helped incubate by becoming a member of the SETI Institute's Board of Trustees. At the time of his retirement from NASA, he was chief of the Life Sciences Division at Ames. In 2009, he was inducted into the Ames Research Center Hall of Fame as the acknowledged "Father of SETI" at NASA.

In addition to these foundational efforts, JB (as he was known to colleagues) promoted international conferences devoted to this research, published 85 articles on the subject and instigated the formation of a SETI special interest committee within the International Academy of Astronautics. He also was very much concerned with the public reaction to a SETI detection, helping to formulate procedures that would guide the research community in the event of a detected signal.

With his trademark humor and polished British accent, Billingham captained the ship of NASA's SETI program with style and efficiency. His passing is a major loss to those who knew him, and to the discipline to which he contributed so much.

continued on back page

Steve Green, innovative aero inventor/leader, passes

It is with great sadness that to share the news of the untimely passing of Steve Green of the Aviation



Steve Green

Systems Division (Code AF). Steve passed on the morning of Aug. 31, 2013. He was 51.

Steve was a member of the NASA Ames family for 28 years, beginning in 1985. He was recruited to join a small project in aircraft trajectory prediction and soon became a seminal figure in developing NASA's reputation as the world's preeminent air traffic management research organization.

He was one of the four inventors of the Center/TRACON Automation

System (CTAS), the transformative automation system that ushered in the era of "time-based" air traffic management. Your flights burn less fuel and incur less delay thanks in part to his work. Steve is credited for developing and validating the En-route Descent Advisor automation tool that will begin national deployment in 2014. He pioneered the integration of airborne flight management systems with ground-based automation for air traffic management, and he chaired a half dozen national and international technical committees on Air Traffic Management research and technologies.

Steve was named the Engineer of the Year in 1999 by the AIAA San Francisco Section. He received the NASA Exceptional Engineering Achievement Medal, the NASA "Turning Goals into Reality" Award, and was the recipient of numerous NASA and Ames "team" awards, reflecting his leadership and collaborative nature as he was at the forefront of air traffic technology development for his entire career. Steve contributed more than 50 technical publications including contributions to two books, and he holds two patents on advanced air traffic technologies with a third pending. He was an Associate Fellow of the AIAA.

He is survived by his mother, two sisters, one brother, his former wife,

and his beloved twins, seven-year-old Marcus and Savannah.

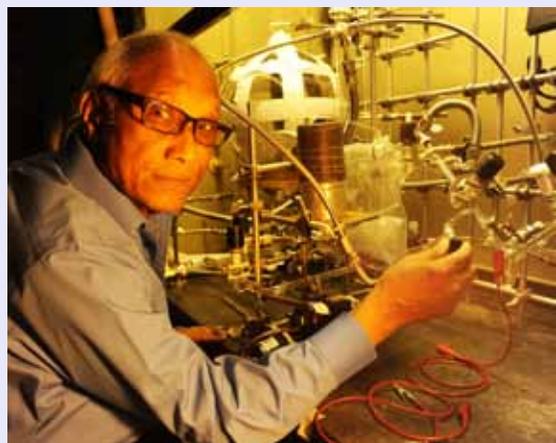
In memory of Steve, his coworkers at Ames have established two ways for friends and colleagues to contribute to his memory:

1) The "Steven M. Green Memorial Fund for benefit of Marcus and Savannah Green" is an education fund for his two children. Checks can be made out to the "Steven M. Green Memorial Fund" may be deposited at any Wells Fargo branch or sent to the Code AF Division Office, MS 210-4.

2) A "digital scrapbook" is being produced, a compilation of memories, anecdotes and personal reflections about his life by friends and colleagues at Ames. Contributions in the form of a document (e.g., .txt, .doc, .pdf), image file, video clip, audio clip, etc., are welcome. Although his kids may be a little young to appreciate our sentiments now, we hope and expect that this "digital scrapbook" will become a meaningful gift to them as they grow older, to help them know their father as we did and to understand how much of an impact Steve had in everyone's lives professionally and personally. Questions and/or contributions for the digital scrapbook may be sent to Gilbert Wu at gilbert.wu@nasa.gov or mailed to MailStop 210-8.

SETI research scientist Bishun Khare will be missed

Bishun Khare, who studied the manner in which planets and moons naturally build up organic molecules



Bishun Khare

in their atmospheres, died quietly on Aug. 20, 2013 at the age of 80.

A research scientist at the SETI Institute who had worked at NASA Ames, Bishun also was an adjunct professor of physics at San Jose State University. In the course of his career, he investigated the formation of compounds that make up the thick haze shrouding Saturn's moon Titan, as well as the methane and other organic compounds in the geysers that erupt from its sister moon, Enceladus. Many of these compounds were brought into being via photochemical reactions, in which energy from sunlight interacts with the natal gases of a planet or moon.

These processes are of as much interest to the biologist as to the chemist, for they could be important precursors to life. Bishun's interest in biology-

relevant chemistry dates to his work with astronomer Carl Sagan in the early 1970s. The two of them followed up an experiment performed at the University of Chicago two decades earlier, in which water and atmospheric gases were "cooked" by artificial lightning into amino acids - a result that seemed to show a natural pathway for the emergence of life on Earth. Khare and Sagan refined the Chicago experiment by using an updated mix of atmospheric gases - a better analog for the air that is thought to have blanketed the young Earth. Their effort confirmed that amino acids could be easily formed in the primitive terrestrial atmosphere of four billion years ago.

Bishun's work in understanding the principal molecular component of Titan's haze - tholin - adopted a similar approach. Sparks and ultraviolet light provided the energy to create tholin in a laboratory mix of gases designed to be an analog of the Titan atmo-

continued on back page

Ames Ongoing Monthly Events Calendar

African American Advisory Group (AAAG) Mtg., last Tuesday of each month, 12 - 1 p.m., Bldg. N255 Rm 101C. POC: Rose King, ext. 4-3442.

Moffett Aikido Club, Monday and Wednesday evenings, 6:30 p.m., Bldg. 944. 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

Ames Amateur Radio Club, third Thurs., of each month, 12 noon, N-T28 (across from N-255). POC: George Tucker, at ext. 4-2200.

Ames Bluegrass Club, every Tuesday from 11:30 a.m. to 1 p.m. in Bldg. 944. Players of all instruments and all levels are welcome, but we are particularly interested in experienced players willing to help improve the group's musical skills. POC: Bob Haberle at ext: 4-5494 or email: robert.m.haberle@nasa.gov

Ames Bocce Ball Club, Ames' newest Exchange-sponsored club is seeking members. POC: Mike Lindsay email: michael.c.lindsay@nasa.gov

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

Ames Contractor Council Mtg., first Weds. of each month, 11 a.m., Bldg. N-200, Committee Room. POC: Herb Finger at ext. 4-6598.

Ames Federal Employees Union (AFEU) Mtg., third Wednesday of each month, noon. Bldg. N-204, Rm. 101. Guests welcome. Check for occasional schedule changes at: <http://www.afeu.org>. POC: Paul K. Davis, ext. 4-5916.

Ames Golf Club, Members have the opportunity to play approximately 13 tournaments per year at a variety of 18-hole golf courses in the Bay and Monterey Area. POC: Barry Sullivan: Barry.T.Sullivan@nasa.gov.

Ames Green Team (formerly the Green Ames Working Group) meetings are held the first Tuesday of each month in N237, Room 101, from 10-11 a.m. For information, call Roger Ashbaugh, Ames Environmental Management Division, ext. 4-5660. <http://environmentalmanagement.arc.nasa.gov/reports/eo-13514.html>

The Hispanic Advisory Committee for Excellence (HACE) Mtg., first Thursday of each month, 11:30 a.m. - 12:30 p.m., Bldg. N-255, Rm. 101C. POC: Jeanette Zamora, jeanette.zamora-ortega-1@nasa.gov.

Ames Jazz Band Club, Bldg. 944, 5:30 p.m. - 7 p.m., POC: Ralph Bach, email: ralph.e.bach@nasa.gov

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 Nimble Knitters Club, every Tuesday at 11:30 a.m., Bldg. N210/Rm 141. POC: Rosalyn Jung, knifan2@yahoo.com or Diane Alexander at ext. 4-3140. URL: <http://knit.arc.nasa.gov>

Ames Roller Hockey Club, meets daily from noon to 1 p.m. at rink on north end of the 80-foot-by-120-foot wind tunnel. Players should have experience skating and must wear protective equipment.

Ames Safety Committee, third Thursday of each month, 10 a.m. - 11 a.m., Bldg. N-237, Rm. 200. POC: John Livacich, jlivacich@mail.arc.nasa.gov, ext. 4-3243.

Women's Influence Network (WIN), first Wednesday of each month, Bldg. 241 room 237, 11:30 - 12:30 p.m., POC: Elena Serna, elena.serna@nasa.gov

Orphanage Without Borders Mtg., Mondays, Buiding 211, Room 205, 11:30 a.m.-12:30 p.m. The mission of Orphanage Without Borders (OWB) is to improve the lives of children living in orphanages and abandoned children. Our goal is to create a network of organizations that work together to provide children worldwide with the acceptable standards of life such as education, health, hygiene, discipline, affection, responsibility, hope of future, shelter, nutrition, clean water, joy and safety. We aim to apply these standards universally, meaning that they will be independent of the nationality, religion, culture, race, political opinion or social class of the children or orphanage location. For additional information contact Miguel at mvcharcos@orphanagewithoutborders.org or mcharcos@sofia.usra.edu.

Physical Inventory Underway

Ames' annual 100 percent wall-to-wall physical inventory for NASA tagged, bar-coded property is proceeding as scheduled. As a reminder, all controlled equipment documented on a NASA Form 892 "Employee Property Pass/Loan Agreement and Removal Permit" must have their NF 892 up to date. Employees are encouraged to bring in that property for scanning. Property passes are assigned to those people authorized to carry government equipment on and off Ames Research Center. If you have questions, contact Nelson Japlit at ext. 4-3428.

Exchange Information

Information about products, services and opportunities provided to the employee and contractor community by the Ames Exchange Council. Visit our 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

Visitor Center Gift Shop (Exploration Center), Tues-Fri, 10 a.m. to 4 p.m., Sat. - Sun, 12 - 4 p.m., ext. 4-5412

Remember to purchase your baby shower, birthday and holiday gifts at Ames' two gift shops!

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

Barcelona Café Bldg. 3, 6:30 a.m. to 2 p.m., ext. 4-4948/Catering ext. 4-4948

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

Moffett Field Golf Club with 'Tee minus One' Grill and Sports Bar. Catering available. Call (650) 603-8026. Extended Happy Hour Thursdays, \$5 and \$6 pitchers of beer starting at 4 p.m. to 8:30 p.m.

RV Lots available. Call to reserve a space at (650) 254-1808.

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

NASA Lodge (N-19) (650) 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: \$65/night (\$5 ea add'l adult); Bldg. 583 A&B (150 rooms), rate: \$55/night (\$5 ea. add'l adult); B547 rate \$60/night (for large groups)

Ames Swim Center (N-109) (650) 603-8025

The swimming pool is now open. Hours of operation are as follows:
Lap swim only:
MWF 10 a.m. - 1 p.m.
MWF 3 p.m. - 6 p.m.
TTH 10 a.m. - 1 p.m.
TTH 4 p.m. - 7 p.m. The pool is heated year round. The pool normally is available for lap swim, pool parties and special events. POC: Ryan Storms, Pool Manager (650) 603-8025. Memberships: single memberships: \$60/yr. Family memberships: \$80/yr. After purchasing a membership, there is an entrance fee: daily entrance fee - \$3/day or lap pass fee - \$50 for 20 uses. Platinum membership - \$380/yr. (no daily fee). Special events: include military training, swim team events, kayak role practice, etc. The cost for special events is \$75/hr, or \$50/hr for military.

Exchange Basketball Gym is now open, Bldg. 2 (650) 603-9717

Hours of operation:
M-F 11 a.m. - 1:30 p.m.
M-F 4 p.m. - 7 p.m.

Chase Park reservations, call ext. 4-4948
NACA Park reservations, call ext. 4-4948

Ames Cat Network

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

Ames emergency announcements

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

Billingham captained SETI

continued from page 13

His wife, Margaret Billingham, died in 2009 after a distinguished career as professor of Pathology and Cardiothoracic Surgery at Stanford, but John is survived by his two sons Robert (a silver medal Olympic sailor and CEO of AmericaOne Foundation) and Graham (a physician specializing in emergency medicine and risk management).

There was a private memorial event held for him. The family has requested that donations be sent to the SETI Institute, 189 Bernardo Ave, Suite 100, Mountain View, CA 94043

Khare, SETI scientist

continued from page 14

sphere. Bishun then measured the spectral "fingerprint" of this material over a very broad range of wavelengths, from microwave to X-ray. This widely cited work has been of tremendous significance for studying other solar system bodies at a distance.

Bishun also took an interest in the properties of carbon nanotubes, a hi-tech material that he envisioned will find increased use in space exploration. He had several patents in this area.

Born in Varanasi (also known as Banares), India, Bishun earned degrees in physics, chemistry and mathematics from Banaras Hindu University. His doctorate in physics was from Syracuse University, and he did postdoctoral research at both the State University of New York (Stony Brook) and at the University of Toronto.

From the 1960s to the 1990s, he worked at Cornell University, and published approximately 100 papers with Carl Sagan. In 1996, he moved to NASA Ames as a Senior National Research Fellow, and in 1998 joined the SETI Institute.

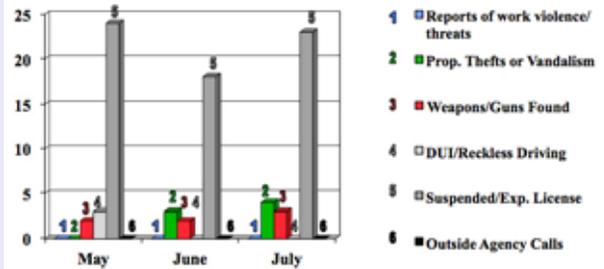
Bishun was enthusiastic and passionate about his work, but was also universally lauded for his gentle manner and extraordinary kindness. He leaves behind a remarkable legacy of exceptional competency and singular decency.

Protective Services monthly activity

A statistical summary of activities of the Protective Service Division's Security/Law Enforcement and Fire Protection Services units for the three-month period ending July 2013 is shown below.

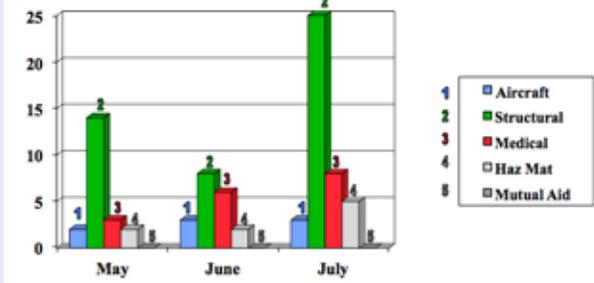
Security/Law Enforcement Activity

**Protective Services Office – Activities
Security/Law Enforcement Monthly Activity Report**



Fire Protection Activity

**Protective Services Office – Activities
Fire Protection Services**



National Aeronautics and Space Administration

Ames Research Center
Moffett Field, CA 94035-1000



FIRST-CLASS
U.S. POSTAGE
PAID
PERMIT NO. 85
MOUNTAIN VIEW, CA

Astrogram NP-2013-09-02-ARC

The Ames Astrogram is an official publication of Ames Research Center, National Aeronautics and Space Administration.

Managing Editor.....Ruth Marlaire
Editor, Layout and Design.....Astrid Albaugh
You can reach the Astrogram Office at: astrogram@mail.arc.nasa.gov or by phone at (650) 604-3347. Astrogram Web site: <http://www.nasa.gov/ames/astrogram>.

PLEASE RECYCLE
Printed on recycled and recyclable paper with vegetable-based ink.