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Challenges ahead

Despite sequester and tight budget, director shares cautiously positive outlook

By Mark Whalen

Despite ongoing uncertainty about NASA's budget, JPL Director Charles Elachi told employees April 22 he is cautiously optimistic that the Laboratory can look forward to numerous challenging opportunities to build on its successful mission portfolio through the end of the decade.

At his annual all-hands meeting in the 321 auditorium, Elachi showed the audience news clips and video of JPL's recent successes, highlighted by the Curiosity rover's landing on Mars in August.

NASA released its fiscal year 2014 budget request in April. Elachi said the projected budget includes a combination of "good news and challenging news" for JPL.

"Considering the fiscal environment we are in, I think the administration provided NASA with strong support," Elachi said. "It's a confirmation of the administration's support for science, technology and exploration."

Although all federal agencies, including NASA, are facing across-the-board cuts of about 8 percent due to sequestration, Elachi said he hopes to minimize the impact on the Laboratory this year. "I think there is no personnel impact," the director said. "We have to tighten our belts, we might defer some procurements, and there will be a small impact on our burden rates."

Elachi did caution that there is uncertainty about how budget plans will develop in the months ahead. NASA must submit to Congress an operating plan for how the agency will implement sequestration cuts, which Congress must then approve before a final budget is decided.

In solar system exploration, JPL will have opportunities to compete for missions via announcements of opportunity in NASA's Discovery Program, most likely in 2015, and New Frontiers, planned for 2016.

Although not included in the president's budget, Congress inserted $75 million for FY 2013 for a JPL definition study for the Europa Clipper, a mission that would investigate whether Jupiter's icy moon could harbor conditions suitable for life.

"There is strong support in the science community, but with the tight budget it wasn't included in the president's request," Elachi said. If the Europa mission proceeds, he added, "I would say that planetary would be in very good shape for the rest of the decade."

JPL's Earth science program is in "excellent shape," he said, noting that the Obama administration has been very supportive of Earth studies and exploration. JPL's seven Earth science mission launches through the decade are included in the budget request.

JPL's Mars program is stable as well. Both InSight, to launch in 2016, and the Mars rover mission for 2020, are in the budget. A science team appointed by NASA will be defining the scientific objectives and payload for the 2020 mission, followed by announcements of opportunity for instruments and research, for which JPL will compete.

Astrophysics is a challenge, Elachi said, but he noted that NASA has approved JPL's participation in Euclid, a European mission looking at dark energy and dark matter currently scheduled to launch in 2020. JPL will provide 16 advanced infrared detectors and four spare detectors for one of the mission's two instruments. JPL will also contribute to science planning and data analysis.

JPL also is supporting NASA's Goddard Space Flight Center on a study for another spaceborne observatory, the Wide-Field Infrared Survey Telescope, which will study exoplanets, dark energy and galaxy evolution.

In the technology arena, JPL is in "very good" shape, Elachi said, with two major projects under development despite sequestration. One, the Low-Density Supersonic Decelerator, is a 2014-2015 demonstration mission for three new entry, descent and landing technologies. The other, the Deep Space Atomic Clock, is designed to provide unprecedented stability needed for the next generation of deep-space navigation and radio science, and will fly in 2015.

The White House announced a change in the federal government's education efforts. Funding for educational programs is slated to be moved from individual agencies to the Department of Education, the National Science Foundation or the Smithsonian Institution.

"It's a different way of doing it, and it's going to create some uncertainty over the next few months," Elachi said. He noted that JPL will have the opportunity to compete for work in these areas, and could

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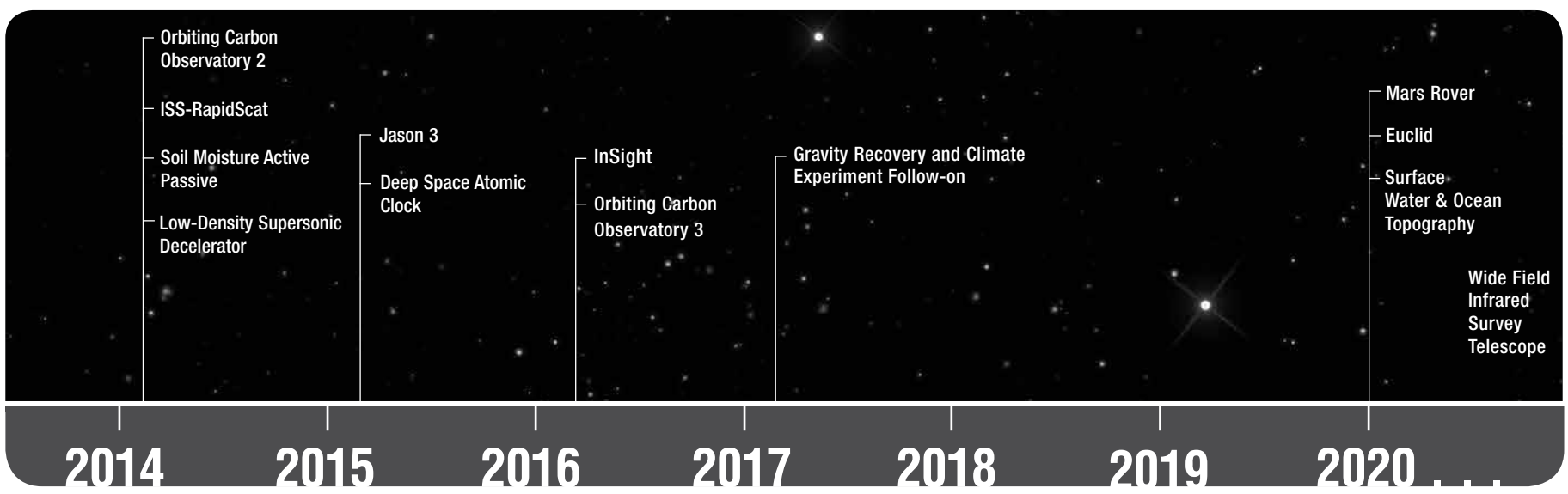


Among Time's Top 100 Most Influential

Three JPLers have been named among the 100 most influential people in the world, according to Time magazine.

Don Yeomans, manager of NASA's Near-Earth Objects Program Office; Pete Theisinger, former project manager for the Mars Exploration Rovers and Mars Science Laboratory; and Richard Cook, deputy solar system director and former Mars rover project manager, were chosen for Time's annual list in April.

The trio were named in the list's pioneers category. Former JPL Director Ed Stone profiled Theisinger and Cook for the Time article; former astronaut Rusty Schweickart profiled Yeomans.

Since 2004, Theisinger and Cook have alternated managing JPL's Mars Science Laboratory, which landed the car-sized Curiosity rover on Mars last summer. Both also previously managed JPL's Mars Exploration Rovers project with its twin rovers, Spirit and Opportunity.

Theisinger joined JPL in 1967. In addition to his Mars mission experience, he also contributed to Mariner 5, Voyager and Galileo. He is now a special assistant to the JPL director, focusing on reimbursable activities.


DON YEOMANS


PETE THEISINGER


RCHARD COOK

Cook joined JPL in 1989, working first on the Magellan mission to Venus. He was mission manager for Mars Pathfinder, which delivered the first rover, Sojourner, to the surface in 1997.

Yeomans, who has worked at JPL since 1976, also supervises JPL's Solar System Dynamics Group. He was a science team member for the Deep Impact/Epoxi mission, U.S. project scientist for the Japanese-led Hayabusa sample-return mission and team chief for the Near-Earth Asteroid Rendezvous mission that orbited then landed on the asteroid Eros in 2001.

For more information, visit *http://time100.time.com.*

Lew Allen Award winners named

Four JPL employees were recently named winners of the 2012 Lew Allen Award for Excellence.

Ian Clark of Division 31, who joined JPL in 2009, was honored for exceptional leadership and achievement in the development of advanced entry, descent and landing technologies.

Christian Frankenberg of Division 32 (2005) was selected for quantifying global plant photosynthesis from satellite chlorophyll fluorescence observations, enabling uniquely valuable unprecedented insights into the terrestrial carbon cycle.

Baris Erkmen, Division 33 (2008), was cited for outstanding leadership and technical accomplishments in optical communications and imaging research, especially the establishment of computational ghost imaging as a significant new area of research at JPL.

Marina Brozovic, Division 34 (2002), was recognized for her exceptional leadership and research roles in both satellite ephemeris development and near-Earth object radar research.


Steve Benskin / JPL Photo Lab

From left: JPL Director Charles Elachi, Christian Frankenberg, Marina Brozovic, Baris Erkmen, JPL Chief Scientist Daniel McCleese. Not pictured is honoree Ian Clark.

The Lew Allen Award is bestowed annually to recognize and encourage significant individual accomplishments or leadership in scientific research or technological innovation by JPL employees during the early years of their professional careers. The honor consists of a wall plaque and an award of $25,000 from the JPL Research and Technology Development Fund to be used at JPL to enhance the professional efforts of the awardee.

Challenges *Continued from page 1*

be successful in winning projects. "We always fare very well when we compete," he added. "You guys are very imaginative and entrepreneurial. So it's going to be a challenge, but I think we could end up in a better position."

Elachi said that public outreach is also affected by federal sequestration, and NASA is cutting back on programs during the current year. He noted the postponement of JPL's Open House planned for June; the event might be rescheduled for the fall or in 2014.

Looking ahead to NASA's budget request for the fiscal year 2014 that starts in October, Elachi noted it includes funding to develop a mission to find, capture, characterize and move a small near-Earth asteroid into lunar orbit, which would later be visited by astronauts. [Please see article on page 3.]

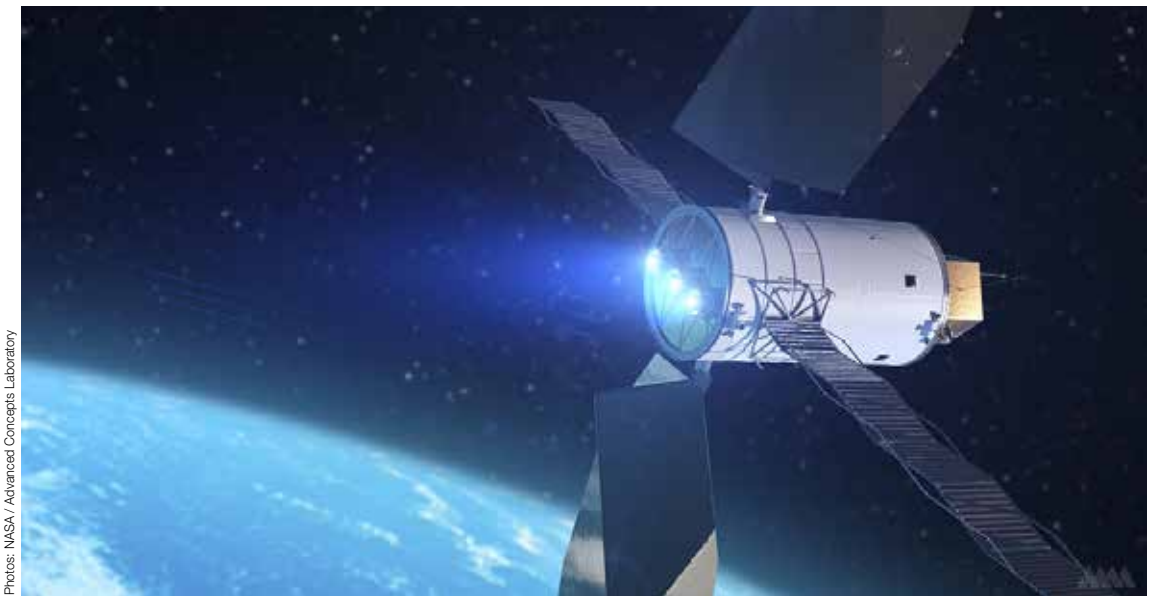
Elachi called the asteroid retrieval concept "a very exciting, out-of-the-box, bold mission." NASA centers' participation in the mission is to be determined.

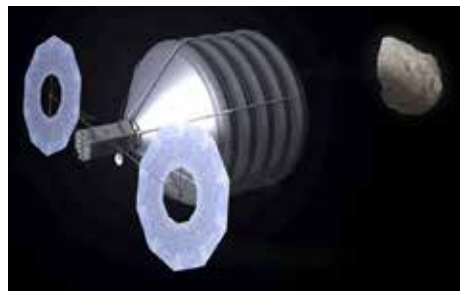
The Lab director said that while many uncertainties remain for the months and years ahead, JPLers can take pride in their record of success.

"Nothing speaks like accomplishments," he said. "You should take particular pride that in the last decade we launched 22 missions, all successful. Curiosity's landing on Mars, with millions watching, inspired a lot of people.

"I see the next decade being as exciting as the last decade."

More information on the FY 14 budget request is available at *http://www.whitehouse.gov/omb/overview.*





Photos: NASA / Advanced Concepts Laboratory

Far left, artist's concept of a solar electric propulsion system that would be used to find, rendezvous with, capture and relocate an asteroid.

Above, spacecraft on approach to its target asteroid.

Below, spacecraft as it captures the asteroid.

ASTEROID RETRIEVAL MISSION

Advances in solar-electric propulsion help enable concept

Picture a robotic spacecraft spiraling outward from Earth to meet up with a small asteroid the size of a school bus. Throwing a bag around the 500-ton space rock, the ion-propulsion-powered probe then rides along with the asteroid and along the way nudges it into a stable orbit around Earth's moon, where astronauts can visit and study it in missions of the future.

Outlandish? Perhaps, but it's also an idea that is finding widespread traction. Thanks to advancements in ion propulsion technology, such a mission is becoming possible for the first time in history. Developed over the past four years by JPL researchers and outside colleagues, the idea is now a key component of NASA's fiscal year 2014 budget proposal that might lead to a major venture involving the agency's science, technology and human spaceflight directorates.

NASA has yet to assign responsibilities for the initiative, known as the Asteroid Retrieval and Utilization Mission, but JPL is hopeful that the Lab will have a significant role because of its history in originating and developing the idea and, more importantly, its expertise in many of the technologies involved.

The idea for a feasible asteroid retrieval mission began in 2010, when JPL technologist John Brophy, with encouragement from Leon Alkalai, proposed it under a study financed by NASA's Innovation Fund. Brophy, who had a key role in developing the ion propulsion for JPL's Deep Space 1 and Dawn missions, saw intriguing possibilities for using advanced versions of this new propulsion technology for retrieving an asteroid. Brophy, Bob Gershman, Damon Landau, Don Yeomans, Chris Porter and James Polk from JPL, along with colleagues at Arizona State University and NASA's Johnson Space Center, worked out the preliminary details.

Martin Lo of JPL and Louis Friedman of the Planetary Society independently suggested the idea of a robotic asteroid retrieval mission to the Caltech-JPL Keck Institute for Space Science. Building on the results from the earlier study, Brophy joined forces with Friedman and Caltech engineering professor Fred Culick to submit a proposal to the Keck institute to work out more details on how such a mission could be done. The team, which included more than 30 other specialists from a variety of institutions, looked at many issues such as how to strike a balance between targeting asteroids big enough to find but small enough to move. That team put together its final report in April 2012.

That led to interest at NASA—generated, in part, by several members of the Keck study team including former shuttle astronaut Tom Jones. The agency put the idea on a fast track, asking JPL to conduct a feasibility study that reported out in April. Additional studies are planned through the summer. The space agency has also included $105 million in its fiscal year 2014 budget request to enable ongoing work.

The study is being led by JPL Chief Engineer Brian Muirhead with major participation from NASA's Glenn Research Center.

As currently envisioned, telescopes from NASA's Near-Earth Object Observation Program in Hawaii and Arizona would scan the skies for a suitable target asteroid about 7 meters (23 feet) in diameter, weighing between 250,000 and 1 million kilograms (275 to 1,100 U.S. tons). Radar telescopes at the Deep Space Network's Goldstone complex and at the Arecibo Observatory in Puerto Rico would then be enlisted in the critical characterization of newly discovered asteroids to determine if they are attractive candidates for retrieval.

Once a target asteroid is selected, the spacecraft could launch in 2017 or 2018. The robotic craft would use a 40-kilowatt ion propulsion system to turn energy from solar panels into thrust to match orbit and rendezvous with the target.

After coming alongside the asteroid, the spacecraft would inflate a funnel-shaped bag that would extend to capture the asteroid. Multiple drawstrings would then cinch the bag closed. The capture bag concept was originally conceived by Porter, from JPL's Structures & Configuration Group, and subsequently refined by Brian Wilcox at JPL.

With the asteroid de-spun and pulled into a resting place against the spacecraft, the craft would then activate its ion propulsion engines to push the rock gently into a flight path allowing a gravity assist from Earth's moon to capture it into orbit around the moon. The asteroid return could be completed by the first half of the next decade, providing it as a destination for astronaut missions of the 2020s.

The asteroids to be targeted for retrieval are too small to be a hazard to Earth, and the mission will be designed so there is no chance of the asteroid accidentally being directed toward Earth.

Brophy noted that moving an object as heavy as a small asteroid will require ion engines much more powerful than anything flown on previous missions. "The capability to scale the propulsion system up to this size is just emerging," he said. "That's why a mission like this has become possible now."

Snagging and studying an asteroid would provide information useful for planetary defense activities in the event that a much larger asteroid might someday threaten Earth, said Muirhead. "This is the first time we would actually be able to get below the surface of an asteroid, find out what it's made of, how it's held together," he said. "If you're going to want to divert them or destroy them, you really need to know about the structure." He added that the asteroid could also provide a valuable target for NASA or private industry experiments in resource utilization.

"JPL is uniquely situated for a mission like this," he said, noting the Lab's expertise in mission design, systems engineering, navigation, and building and flying solar-electric propulsion in deep space.

The mission would serve as well as a steppingstone for future flight projects using high-powered solar electric propulsion. The technology, said Muirhead, "is central to all our strategies to exploring deep space, both with humans and robotically."

News Briefs

Vandi Tompkins

Keith Comeaux

Tompkins gets women's leadership honor

Vandi Tompkins of the Robot Operations Group was recently honored by Leadership California, a nonpartisan network of more than 1,300 women leaders dedicated to advancing the leadership role of women in the state.

Tompkins was feted at the organization's Legacy of Leadership Awards event April 29 in Los Angeles. She was presented with the Trailblazer Award, which honors women leaders "who are pioneers in their field and exemplify a spirit of exploration, passion and groundbreaking achievement that leads the way for others."

A senior driver of the Mars Curiosity rover, Tompkins has been at JPL since 2007. She has been a member of the Mars Exploration Rovers integrated sequencing team and Curiosity's integrated motor control testing team. Before joining JPL, she worked at NASA's Ames Research Center in the Mars technology program and in spacecraft autonomy for vehicles and habitats. She earned master's and doctoral degrees in robotics at Carnegie Mellon University in Pittsburgh.

For more information, visit *http://www.leadershipcalifornia.org/i4a/pages/index.cfm?pageid=1.*

Comeaux honored by alma mater

Keith Comeaux, flight director for Curiosity's August 2012 entry, descent and landing on Mars, has been named to Louisiana State University's Hall of Distinction.

Comeaux, with JPL since 2006, graduated from LSU in 1989 with bachelor's degrees in mechanical engineering and physics. He has served as verification lead, test conductor, team chief and mission manager for the Curiosity rover.

Comeaux also earned master's and doctoral degrees in aeronautics and astronautics from Stanford University and also holds an MBA from UCLA.

The Hall of Distinction recognizes alumni who have distinguished themselves and LSU through their careers, personal and civic accomplishments, and volunteer activities. Honorees are selected by a committee of alumni, faculty and staff.

Social media, web earn kudos

NASA's and JPL's efforts in websites and social media this year have garnered a number of awards.

The 2013 Webby Awards, presented by the International Academy of Digital Arts and Sciences in recognition of excellence on the Internet, honored JPL websites in several categories.

Mars Curiosity rover social media won a Webby Award and People's Voice Award for Overall Social Presence. In the Science and Government categories, the NASA Solar System Exploration site won People's Voice awards. Visit http://winners.webbyawards.com/2013.

Also, the Curiosity rover was named "Foursquare Mayor of the Year" at the Shorty Awards, which honor social media. See *http://shortyawards.com.*

The South by Southwest Conference Interactive Awards, honoring original music, independent films and emerging technologies, named Curiosity the winner in its Social Media category. See *http://sxsw.com/interactive/awards/winners.*

Curiosity team takes Smithsonian honors

The Mars Science Laboratory entry, descent and landing team received the 2013 Trophy for Current Achievement from the Smithsonian National Air and Space Museum April 24. **Back row,** from left: Tom Rivellini, Gavin Mendeck, Steve Lee, Miguel San Martin, Tomas Martin-Mur, Adam Steltzner, Ben Thoma, Howard Eisen and Ravi Prakash. **Front row,** from left: Carl Guernsey, Keith Comeaux, Jody Davis, Ann Devereaux, Allen Chen and Fuk Li. For more information, visit *http://www.jpl.nasa.gov/news/news.php?release=2013-148.*

Passings

Bob Brown / JPL Photo Lab

Alan Wood in 1995 photo with memorabilia of his experiences at Iwo Jima.

Alan Wood, 90, who helped facilitate news coverage of many of the Lab's legacy missions, died April 18.

Wood joined JPL in 1950 as a technical artist before moving to the Public Affairs Office. He illustrated reports and helped coordinate news coverage of missions that included Mariner, Viking, Voyager and Galileo, as well as early tests in the development of the space shuttle. He retired in the mid-1990s.

A Navy lieutenant, Wood played a role in World War II's 1945 battle for Iwo Jima. A few days after his ship arrived at the small Japanese island, Wood was approached by a Marine seeking a U.S. flag to raise atop the island's Mount Suribachi. Wood handed the Marine the flag, which ended up being used for the iconic photograph.

Wood was preceded in death by his parents, a brother and his wife. He is survived by his brother, Roger; son Steve; grandchildren Casey, Connor and Cameron; and niece Alison. A memorial service was held April 27 at Sierra Madre Episcopal Church of the Ascension, with burial at Sierra Madre Pioneer Cemetery.

Tom Thornton Jr.

Thomas Thornton Jr., former head of the Institutional Computing and Information Services Office, died April 6.

Thornton joined JPL in 1961 and retired in 1999. His management roles included technical group supervisor for the Flight Path Analysis Group, Division 31 representative for Mariner/Mars '71 and manager of the Information Systems Division. He also managed program offices for Deep Space Network Advanced Systems, DSN Technology, End-to-End Information Systems and Institutional Computing and Information Systems, where he was instrumental in the implementation of Labwide wideband connectivity via fiber optics, a major improvement in communications technology.

Thornton is survived by his wife, Cathy; son Thomas H. Thornton III, daughter Patricia, daughter-in-law Marla and grandchildren Allison, Jennifer, Nathaniel, Jessica and Nicholas. Services were planned for Frankfort, Ky. The family requests that in lieu of flowers or plants that donations be made to the Prostate Cancer Foundation, 1250 Fourth St., Santa Monica 90401 *(www.pcf.org).*

Letters

To my co-workers and friends at JPL and NASA: Thank you for the warm retirement reception and for the beautiful cards and gifts. It has been a privilege to work with you at JPL, with NASA and with contractors on many projects and tasks. I will miss you but will continue to follow JPL's missions into space and efforts on Earth as well. My best to all of you. Mahalo,

Joyce N. Grunwald

Many thanks to our friends, colleagues and co-workers at JPL for the beautiful plant, cards and expressions of condolence in the passing of Barbara's beloved father, William Wright, at the age of 74. He fought cancer valiantly for six years with the honor and courage of a Navy sailor, husband of nearly 50 years, father and grandfather. He took great pride in our many accomplishments here at JPL. No doubt he is smiling down on us as we continue to do what he called "the great work" in space and here on Earth. With our gratitude and heartfelt thanks,

Paul and Barbara Bleiler

I want to thank my friends and colleagues in Section 318 and the MGSS Program Office for the beautiful plant and very thoughtful sympathy cards sent to my family on the loss of my wife, Judy. My daughters and I are blessed to have your prayers and thoughts during this difficult time. Many of you have also sent donations to St. Jude Memorial Foundation (for St. Jude Hospital Cancer Center) in memory of my wife. I greatly appreciate your generosity, kindness and support.

Adans Ko

Retirees

The following employees retired in April: **Gloria Lawler**, 47 years, Section 8031; **Daniel Erickson**, 41 years, Section 5125; **Joyce Grunwald**, 34 years, Section 2112; **Judy Greenberg**, 11 years, Section 605.

Correction

An article in the April 2013 issue on small missions misidentified the principal investigator of the Integrated Solar Array and Reflectarray Antenna mission. The principal investigator is Richard Hodges.

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