Jet Propulsion Laboratory

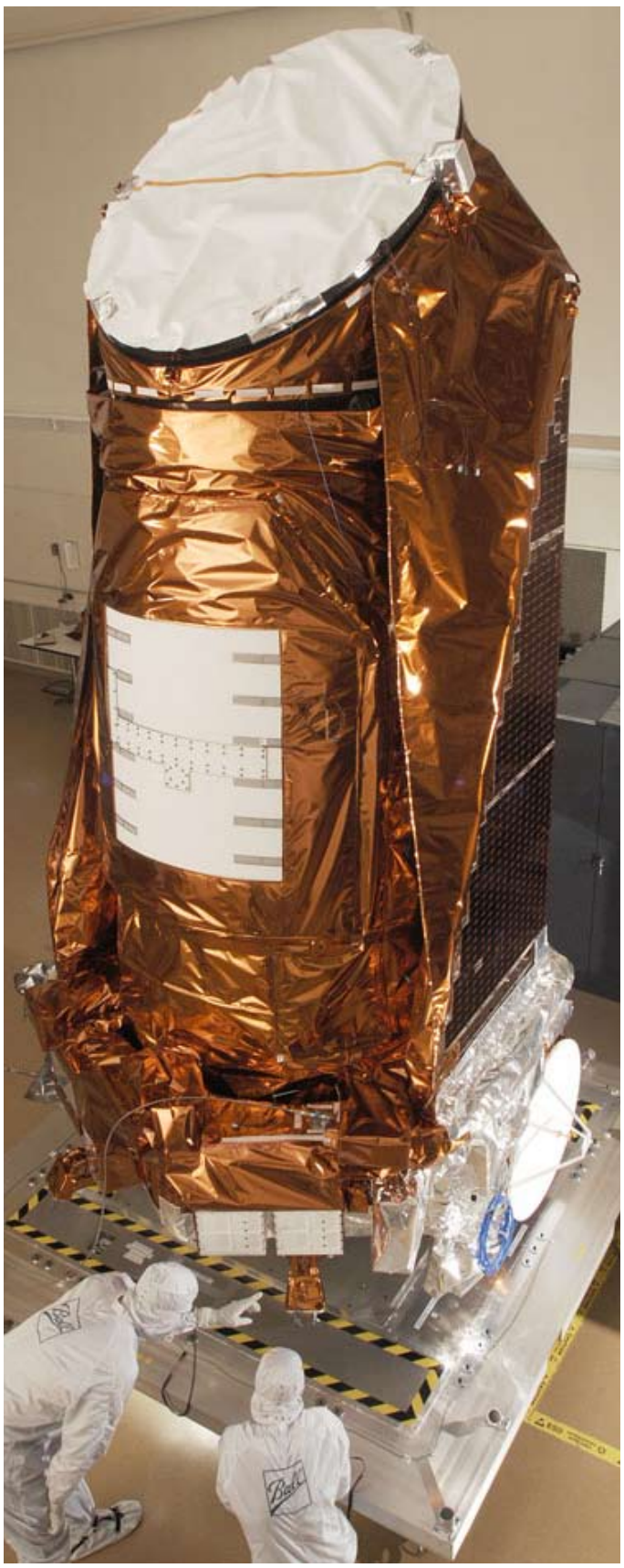
Universe

OCTOBER
2008
VOLUME 38
NUMBER 10

Planet hunter Kepler being readied

Ball Aerospace

Left: Kepler's primary mirror following the application of reflective coating.



NASA's planet-hunting Kepler mission, scheduled to launch next year, has passed an extreme temperature test.

The thermal vacuum test is part of a series of environmental tests the spacecraft will undergo before it launches aboard a Delta II rocket from the Cape Canaveral Air Force Station, Fla., in April 2009.

"Kepler functioned extremely well at the intense temperatures it will encounter in space," said Kepler Project Manager Jim Fanson of JPL.

The test, which was performed at JPL industrial partner Ball Aerospace & Technologies Corp. in Boulder, Colo., simulates the vacuum of space, and the extreme temperatures Kepler will face once launched. The goal is to make sure that the spacecraft and its detectors operate properly in the space-like environment. An electromagnetic compatibility test, to ensure Kepler's electronics are sound, will begin soon.

Other recent milestones include the installation of solar array and reaction wheel assemblies, as well as a flight segment comprehensive performance evaluation, including acoustics, vibration, and pyro-shock tests.

"The results of these tests are now being used to prepare for the science operations that will start after the spacecraft launches and undergoes in-orbit checkout," said Bill Borucki of NASA's Ames Research Center, Moffett Field, Calif., the science principal investigator for the Kepler mission.

Kepler will monitor 100,000 stars, searching for signs of planets—including ones as small as or smaller than Earth. To date, no Earth-sized planet has been discovered.

Kepler will detect planets indirectly, using the "transit" method. A transit occurs each time a planet crosses the line-of-sight between the planet's parent star that it is orbiting and the observer. When this happens, the planet blocks some of the light from its star, resulting in a periodic dimming. This periodic signature is used to detect the planet and to determine its size and its orbit.

Over a four-year period, Kepler will continuously view an amount of sky about equal to the size of a human hand held at arm's length or about equal in area to two "scoops" of the sky made with the Big Dipper constellation. In comparison, the Hubble Space Telescope can view only the amount of sky equal to a grain of sand held at arm's length, and then only for about a half-hour at a time.

Kepler is a NASA Discovery mission. In addition to being the home organization of the science principal investigator, Ames is responsible for the ground system development, mission operations and science data analysis. Kepler mission development is managed by JPL. Ball is responsible for developing the Kepler flight system and supporting mission operations.

For more information, visit *http://kepler.nasa.gov.*

The Kepler spacecraft is shown in a clean room at Ball Aerospace & Technologies Corp.

Meeting challenges at the FRONTLINE

By Mark Whalen

Stressed budgets and too many people vying for limited resources result in keen competition and survival of the fittest. Today, JPL is asked to compete for nearly 50 percent of its business. This means for JPL to have a steady flow of exciting activities to work on, JPLers who work the front end of the business need to excel in this work as much as those who implement the business that is brought in.

"There is a large JPL community that is engaged in innovative concepts development in the form of proposals to our NASA and non-NASA sponsors," said JPL Associate Director for Project Formulation and Strategy Firouz Naderi. "These efforts need coordination and institutional support."

That's where the Strategic Planning and Project Formulation Office (150) comes in. Established about two years ago by Naderi, the organization offers a comprehensive suite of support services to the Lab through the Frontline community, those charged with obtaining new work for JPL.

"Office 150's charter is to professionalize the way JPL acquires new activities," said Brent Sherwood, manager of the office. "The way we do that is by operating as an institutional support organization that partners with program offices and the Engineering and Science Directorate to define, benchmark, coordinate and implement policies and best practices for the planning and acquisition of new business."

A major part of Office 150's charge is to streamline the often-cumbersome proposal process. In response to NASA research announcements, announcements of opportunity and other agency offerings, JPL now writes and submits between 600 and 700 proposals a year.

The Opportunity Development Office (153) assists program offices and proposal writers by providing processes for pulling together winning proposals. The office reviews candidate proposals—making sure they're properly prepared—then will coach proposers on writing, followed by feedback on how to make it better.

"The reason we do this," said Bernie Bienstock, manager of Office 153, "is that the competition is getting smarter and better organized, and they want their piece of the action."

JPL has had considerable success in winning science missions since NASA first started competing them. However, "It's not a given that this trend will continue," noted Ron Salazar, manager of the Proposal Support Office (1531). "But we're trying to carry that success to the future as different people and projects come and go. We're trying to keep the knowledge and experience that will allow us to maintain that success.

"A lot of what we're doing now is making the proposal process more efficient so it's less burdensome on people," Salazar added. "Writing a proposal is a very difficult thing. There's a great deal at stake, and people put a lot of time and energy into it."

A prime example of a big win for the Laboratory came with the 2003 New Frontiers opportunity, to which JPL submitted four proposals. NASA has a two-step selection process: the first step leads to some seed funding and the submission of a step 2 proposal, or concept study report. NASA received seven proposals; of those, two JPL proposals were awarded step 2 study contracts. Once those studies were submitted, NASA ultimately selected the Juno mission to Jupiter.

One source of help for those working on large mission proposals, Salazar said, is the 12 "war rooms" in buildings 301 and 67 to meet, write and review proposals and communicate via videoconferencing with partners and other NASA centers. In addition, a recently created database tracks proposal review lessons learned and provides a simulation of the process that NASA goes through when they evaluate the proposals JPL sends them.

"Then JPL gets a debriefing and we capture all that feedback—both strengths and weaknesses," Salazar added. "We then fold that back into the review process, to continue improving our proposals."

Help in fleshing out mission concepts comes from JPL's Advanced Design Projects Team, better known as Team X, considered by many as the agency gold standard for generating integrated concepts quickly.

"The teams work in a concurrent engineering environment, as opposed to serial engineering—the old way, where you define the problem or task, put together a team, which might meet once, then all go their own way and design their little portion," noted Jim Kaufman, acting manager of the Advanced Concepts Development Office (152). "In concurrent engineering everyone is in the same room, all continually communicating with each other. It's a lot faster and cheaper."

Kaufman noted that, in addition to a recent remodeling of its facilities, Team X has undergone some fairly dramatic changes for the better. "We're trying to expand the accuracy and rigor of models in design, eliminate bugs and introduce configuration management," he said, adding that one of the most important goals was for the line organizations to take responsibility for the design tools used in Team X—meaning technical and cost accountability.

"Prior to the line management having done that, people on Team X would develop models but wouldn't have the blessing of the line organizations; now

Steve Prusha

"We're learning how to build models that represent highly complex missions and systems that will not be deployed for another 10 or 20 years."

Ron Salazar

"Writing a proposal is a very difficult thing. There's a great deal at stake, and people put a lot of time and energy into it."

Carol Lachata / JPL Photolab

they do. In fact, we recently revamped the cost modeling approach Team X uses; that's a major accomplishment."

To keep the creative juices flowing among the science community, for the last two years JPL has offered the Purple Pigeons initiative. "We're looking for the crazy ideas that may not otherwise be funded that have a real high bang for the buck," Kaufman said. Current studies include a Deep Impact–like experiment on Mars, to do active seismometry to understand the interior structure; looking at a fleet of about 100 nano-satellites to measure Earth's magnetic field in detail; the possibility of going to Neptune on solar power alone; looking at reusing the Muses-CN nanorover hardware [a Japanese mission that never flew]; and to detect the seismic signature of meteoroid impacts.

Office 152, led by manager Mark Adler, who is also the chief engineer for 150, helps support the formulation activities with early concept reviews and brainstorming. "For example, does your concept obey the laws of physics and have a reasonable cost?" he asked. "Is it too risky? Not risky enough? Have you considered the alternatives? We try to understand what the scientists want to do, and provide them with the modalities for how to do it. The plan is to have those ideas feed NASA's strategic plans."

He pointed to a success story in Earth science. "We were very active in supporting the recent Earth science survey team that was deciding on next decade's missions and their priority. We helped provide them with innovative concepts. So some of those missions are coming back to us, like the Soil Moisture Active/Passive Mission.

"In order to give advice to NASA, they have to have a rough idea of what's possible and what's not," Adler added. "They need us or other places like us to support them to generate the options."

Steve Prusha, manager of the System Modeling and Analysis Office (155), leads Office 150's efforts in development work supported by direct funds from NASA. The Constellation Program is a principal supporter. The key element of the Constellation task, he said, has been the development of a lunar surface operations model and supporting analytical tools by Steve Wall and Chuck Weisbin.

"We're learning how to build models that represent highly complex missions and systems that will not be deployed for another 10 or 20 years," Prusha said. "The lunar program is in the very early stages of concept development, characterized by large programmatic and technical uncertainty, but also at the point where they have to make key decisions affecting major investments. Our key challenge is building these very complex models into an effective and credible decision-support capability for Constellation—giving them enough information to help make the right decisions, but remaining very agile and transparent.

"Ultimately, what we hope to learn from developing these very high-level, global integrated models can then be applied to missions at Europa, Titan or Mars," he added.

"We're not as involved with the day-to-day proposal generation process," Prusha said. "We're looking downstream to develop new tools that will be deployed with design teams like Team X, such as new modeling and visualization capabilities. We'll end up handing those to our colleagues in the rest of 150, the Engineering and Science Directorate and the mission directorates to utilize in concept and proposal development."

The bottom line is that it is more difficult to win proposals in today's competitive world, noted Jeff Leising, manager of the Project Formulation Support Office (154).

"One of the things we do is to help formulation projects pilot new processes that will increase their efficiency or make their job easier," he said. "In doing this we have found that 'one size does not fit all.'"

One current example is Urey, an instrument project. "Working with the project, we developed an instrument lifecycle that will have broad use across JPL," Leising said. "Previous instrument lifecycles did not distinguish between phases A and B, or identify corresponding activities and deliverables. Urey had critical milestones to meet midway through formulation in order to satisfy NASA and the European ExoMars Project. We helped them sequence these activities, formulate plans for early prototype development, structure reviews, define requirements and document plans.

"We've basically taken a lot of things developed by the Project Support Office over the last six to seven years in order to assist projects and have extended them back into the pre-phase A world in support of proposal teams and pre-projects," he added. This includes developing a pre–phase A life cycle, Frontline website, mission development workshop, examples and templates for planning documents, a concurrent approach for identifying functional requirements and schedule analysis, he noted.

"In addition, we are putting increased emphasis on supporting instrument projects," Leising said. "What we're trying to do, without impacting competitiveness, is to help teams develop technical and programmatic concepts that are more robust than in the past, so that a project is less likely to overrun. Among the things we're looking for are ways to retire risk earlier and develop more scope contingency and margin."

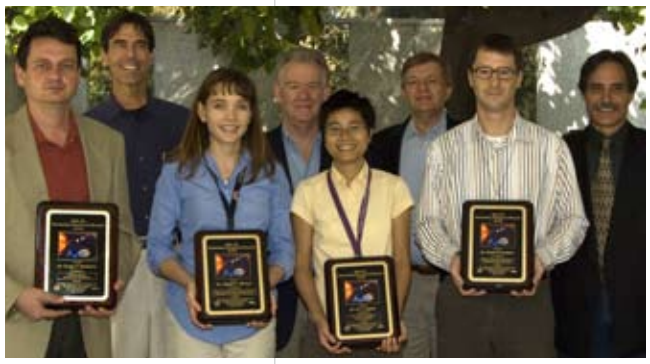
". . . does your concept obey the laws of physics and have a reasonable cost? Is it too risky? Not risky enough? Have you considered the alternatives?"

Mark Adler

Jim Kaufman

"We're looking for the crazy ideas that may not otherwise be funded that have a real high bang for the buck."

News Briefs



Carol Lachata / JPL Photo Lab

Winners of the JPL Outstanding Postdoctoral Research Award, front row, from left: Sergey Pereverzev, Abigail Allwood, An Nguyen, Richard Umstaetter. Back row, from left: Division 32 Manager Harold Yorke, Chief Scientist Dan McCleese, Bill Langer (Research, Engineering and Science deputy director) and Division 38 Manager Thomas Luchik.

Kudos to postdocs

Ceremonies held in late September honored four postdoctoral scholars for their outstanding research efforts at JPL.

The researchers won a competition at the Lab's Postdoctoral Research Day, held Aug. 26. The day showcased the outstanding work of 54 postdoctoral scholars in the fields of Earth science, astrophysics and space science, planetary science and life detection, and advanced technology.

The winners delivered lectures on their work at the Sept. 22 awards ceremony and were presented with commemorative plaques by JPL Chief Scientist Dan McCleese.

The four winners were: An Nguygen (Section 3248) for her work on "Brine rejection and its effect on the Arctic halocline," Abigail Allwood (3226) for her research on "Earth's oldest biosignatures: A record of microbial activity within 3.45 billion-year-old evaporates," Richard Umstaetter (3267) for his work on "Bayesian comparison of approximations of gravitational wave chirp signals" and Sergey Pereverzev (389B) for "An ultra-sensitive hot-electron nanobolometer."

Cost estimation honors to Hihn

Jairus Hihn of the Missions Systems Concept Section has been awarded a lifetime achievement award for systems and software cost estimation by the USC Center for Systems and Software Engineering.

Hihn earned the honor "for seminal contributions to software cost estimation and its applications to economic analysis and quantitative software management."

With JPL since 1988, Hihn has been the manager of the Software Quality Improvement Projects Measurement Estimation and Analysis Element since 2003. In 2004 he was awarded the Parametrician of the Year Award from the International Society of Parametric Analysts, an honor for outstanding contributions to the profession of parametric cost analysis.

He is scheduled to accept the award at a systems and software cost modeling forum Oct. 27 at USC.

More honors for cost estimators

Leigh Rosenberg, a principal engineer in the Mission Systems Concepts Section (312), along with a JPL cost estimating team, received honors at NASA's annual Cost Symposium in August.

Rosenberg received NASA's Cost Estimating Leadership award, given for leadership and inspiration to the space cost community as well as mentoring and strong cost advocacy. His specific work has included noteworthy roles in the development and implementation of the Project Cost Analysis Tool, the NASA Cost Analysis Data Requirement database and the Parametric Mission Cost Model.

The NASA Cost Estimating Team award was presented to the Constellation Lunar Surface Systems Strategic Cost Analysis Team, which included JPLers Sherry Stukes, Robert Shishko and Brian Bairstow.

This award recognizes exceptional performance and accomplishments during the past year. Stukes was cited for software size and cost modeling, while Shishko and Bairstow earned kudos for mission operations cost modeling.

Love returns to JPL

Richard Hasegawa / JPL Photo Lab

Astronaut Stan Love, a former JPL engineer, discussed both the challenges and the majesty of his first space shuttle flight to a von Kármán Auditorium audience on Sept. 2.

Love showed video highlights while describing his memories of the February mission aboard Space Shuttle Atlantis. The STS-122 mission carried the European Space Agency's Columbus Laboratory and other modules to the International Space Station.

Love performed two spacewalks during the 14-day mission to help prepare the laboratory for installation, to add two science payloads to the outside of Columbus, and to carry a failed station gyroscope to the shuttle for return to Earth.

He showed the carefully choreographed spacewalks, where astronauts were painstakingly moved into position by the shuttle's robotic arm. During rare moments he got the opportunity to look down at the home planet. "The view was absolutely incredible."

"At first I didn't sleep well," he said. "But after a few nights I got used to it, and it was amazingly peaceful and restful." He acknowledged, however, that he slept 13 hours his first night back on Earth; still accustomed to the weightlessness, he admitted "it took a huge effort to turn over."

Love, married with kids aged 9 and 12, said his training and the journey to space have been a bit tough on his family.

As for his future, "My wife categorically forbids me from going to Mars," Love said with a smile. "But she didn't say anything about the moon."

Passings

Iris Osiek, 103, retired from the former Section 122, died June 26.

Osiek worked at JPL from 1961 to 1972.

Retiree **Leonard Marsh,** 90, died July 6. He worked at JPL from 1951 to 1978.

Retiree **Gordon Kautz,** 80, died July 20. He worked at JPL from 1955 to 1975.

Henry Stadler, 85, a retired physicist, died July 22.

Stadler joined the Lab in 1982 and retired in 1994. He is survived by his wife, Carol; children Jane, John and Sarah; and six grandchildren. Services were held Aug. 2 in Berkeley, Calif.

Fran Mulvehill, 80, a retired secretary, died Aug. 13.

Mulvehill worked at the Lab for 25 years, retiring in 2002. She is survived by son Kevin and his wife Robin; daughter Maureen and husband Neil Yamaguchi; daughter Phyllis; and grandchildren Nicole, Kelli, Leslie and Brian.

Retiree **Donald Maxeiner,** 89, died Aug. 24.

Maxeiner worked at JPL from 1951 to 1978. A member of the Explorer 1 team, much of his work involved high-speed instrumental photography.

He is survived by his wife, Jean, daughter Lynn, grandchildren Sanantha and Douglas and great grandchildren Haidyn, Brody and Gunnar. Services were held Sept. 13 at San Gabriel Cemetery.

Jerome Wolf, 88, a retired senior administrator in Division 300, died Sept. 9.

Wolf joined JPL in 1960 and retired in 1984. He is survived by children Liz, Trish and Peter; grandchildren Jennifer, Holly, Josh, Nathan and Bayjolie; and brother Mike.

Services were held Sept. 20 at Mountain View Cemetery in Altadena.

Letters

I would like to express my sincere thanks and appreciation to all my friends and co-workers in the AOS Program Office for their support upon the recent passing of my sister. The beautiful flowers, cards and the many expressions of sympathy have been very comforting to me and to my family. Thanks also to JPL for the lovely plant.

Noemi Portugues and family

Thanks to all of you who helped me celebrate my retirement from JPL. I am glad I got to reminisce with many colleagues at my retirement party and I appreciated all the gifts I received, especially the wonderful Apple iPhone! My 30 years at JPL have been such a treasure for a professional career. Best of luck to all of you who are still benefiting from working for such a wonderful institution.

Tom Renfrow

I would like to thank my JPL friends and co-workers for all their love and support in the "going home" of my father, David D. Carter. Also, many thanks to JPL for the beautiful plant.

Shari Carter Mayer

I would like to thank everyone who expressed their condolences on the recent passing of my mother, and also to JPL for the lovely plant that we received.

Brian Wilcox

Thank you for your heartfelt expressions of sympathy upon the recent passing of my mother. Coming as it did three days before our son's wedding, this tragedy reminded us how much we must treasure our blessings. I truly appreciate the friendship of my JPL colleagues.

Jay Braun

Retirees

The following JPL employees retired in October:
Allen Berman, 43 years, Section 9210; **George Dick,** 39 years, Section 3320; **Yolanda Walton,** 39 years, Section 5010; **James Renfrow,** 35 years, Section 1700; **Barbara Mochrie,** 26 years, Section 2200; **Armond Salazar,** 18 years, Section 9200.

READ AND SUBMIT CLASSIFIED ADS AT JPL'S ONLINE NEWS SOURCE
http://dailyplanet

E-MAIL US AT
universe@jpl.nasa.gov

Universe

Editor
Mark Whalen

Design
Audrey Steffan

Production
David Hinkle

Photography
JPL Photo Lab

Universe is published by the Office of Communications and Education of the Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109.