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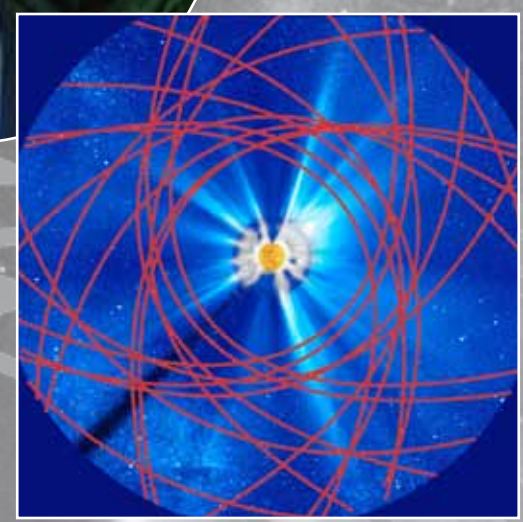
JPL to contribute to new solar mission

Velli is principal investigator on Solar Probe Plus, scheduled to launch by 2018

Marco Velli



Solar Probe Plus orbits overlaid on images of the solar corona.

JPL researcher Marco Velli has been named one of the principal investigators for NASA's Solar Probe Plus mission, which is scheduled for launch by 2018.

The Solar Probe Plus spacecraft will plunge directly into the sun's atmosphere about 4 million miles above its surface and will explore a region no other spacecraft ever has encountered. The mission is being developed by the Applied Physics Lab at Johns Hopkins University.

Velli, who works in JPL's Space and Astrophysical Plasmas Group, will head one of five science investigations that will unlock the sun's biggest mysteries.

In leading "Heliospheric Origins with Solar Probe Plus," Velli is the mission's observatory scientist and will serve as a senior scientist on the science working group. He will provide an independent assessment of scientific performance and act as a community advocate for the mission.

The sun's outer atmosphere, the solar corona, is a high-temperature plasma, made up of completely ionized hydrogen and helium at temperatures upward of 2 million degrees C, sitting above the photosphere, the sun's outer visible layer that has a temperature of 6000°C (11,000°F). The hot corona gives rise to the solar wind, which expands outwards to produce the heliosphere, the plasma bubble in which Earth and the other planets are embedded. The aim of Solar Probe Plus is to understand coronal heating and solar wind acceleration, and to unveil the mechanisms of coronal mass ejections and energetic particle acceleration in the inner heliosphere.

"The success of the Solar Probe Plus science program rests on the collaborative and synergistic working of all the principal investigators," Velli said. "My role as observatory scientist is to facilitate collaboration and integration of the different experiments to collectively execute the measurements required by the scientific objectives. This means verifying that resources (e.g., mass, telemetry) are optimally allocated among the investigations and ensuring that baseline/threshold science definitions are compatible across the experiments. It also involves coordinating and planning scientific observations, including campaigns in support of Solar Probe Plus perihelion passes to maximize the scientific return of the mission."

Solar Probe Plus measurements and data collection will occur in an extremely challenging environment, Velli said. The perihelion at 9.5 solar radii from the center of the sun requires a nadir-pointing heat shield to protect the spacecraft and instrumentation; the largely unknown dust environment in the inner heliosphere provides challenges for instrument resilience; and the spacecraft's orbit imposes telemetry rates that place limits on the overall data that can be collected.

Velli noted that the goals of Solar Probe Plus will complement JPL's Ulysses mission, which ended in June 2009. Ulysses was the first mission to explore the heliosphere outside of the ecliptic plane, mapping out the space environment in three dimensions and helping us to understand how the sun's magnetic activity cycle results in the solar wind environment experienced by Earth and the other planets.

"The goal of Solar Probe Plus is to understand how the heliosphere is generated," Velli said. "In other words, it aims to understand how the hot solar corona gives rise to the solar wind as well as the connection between the wind observed in situ and its solar origins."

When the Solar Probe Plus spacecraft, about the size of a small car, approaches the sun, it will be at 8.5 solar radii from the sun's surface. Ulysses, on the other hand, had a closest approach that was outside Earth orbit, at about 1.3 solar radii.

Besides Velli, JPL is involved in the mission through co-investigators in two of the instruments that have been selected: the Wide-field Imager for Solar Probe from the Naval Research Laboratory (Paulett Liewer and Eric DeJong) and the Integrated Science Investigation of the Sun from the Southwest Research Institute in San Antonio. One of the two

Continued on page 2

Top: Artist's concept of the Solar Probe Plus spacecraft, fully deployed in cruise configuration, flying past Venus during one of the seven gravity assists that sends it closer to the sun.

Bottom: Just separated from its launch vehicle and booster rocket, Solar Probe Plus leaves Earth, bound for the inner solar system and an unprecedented study of the sun.

Air fleet serves Earth science missions

From left: Mike Krinov, crew chief, NASA Glenn Research Center; James Black, JPL Logistics and Materiel Services Section; James Demers, research pilot, Glenn Research Center; Michael Mahoney, JPL Atmospheric Observations Group; Pam Brown, JPL Environmental, Health and Safety Program Office.

JPL researchers recently had the opportunity to inspect one of the state-of-the-art flight-based research platforms to which they have access through NASA's Airborne Science Program.

On July 29, dozens of JPLers checked out the newest addition to the airborne research platform fleet, the S–3B Viking, when it arrived at Burbank Airport for a brief visit. Acquired by NASA from the U.S. Navy, the S–3B will facilitate NASA research into areas such as in-flight icing, aircraft communication, next-generation airspace and many other Earth science–related areas.

The Airborne Science Program provides aircraft systems that further science and advance the use of satellite data toward the following objectives:

- Conduct in-situ atmospheric measurements with varying vertical and horizontal resolutions;
- Collect high-resolution imagery for focused process studies and subpixel resolution for spaceborne calibration;
- Implement "sensor web" observational strategies for conducting Earth science missions, including intelligent mission management and sensor networking;
- Demonstrate and exploit the capabilities of uninhabited and autonomous aircraft for science investigations;
- Test new sensor technologies in space-like environments;
- Calibrate and validate space-based measurements and retrieval algorithms.

To meet these observing objectives, the program provides access to a suite of sustained, ongoing platforms and sensors on which investigators can rely from year to year. The program also looks for new or evolving technologies to demonstrate their applicability to Earth science.

The airborne research platform fleet includes about three dozen aircraft; see *http://airbornescience.nasa.gov/platforms/platforms.html*. The new S–3B—equipped with an Inmarsat swift-broadband satellite terminal that provides crew and researchers with global voice and high-speed data coverage—is housed at Glenn Research Center along with two other S–3B aircraft. NASA acquired the plane through a government reutilization program for excess assets, which enables such interagency transfers.

JPLers interested in using a flight-based platform—including the S–3B Viking—for their research activities should refer to the procedure "Utilization of Charter Flights for Research and Development, Testing, and Experiments" (JPL Rules! DocID 60993) and contact James Black of the Logistics and Materiel Services Section at ext. 4-1961 or via e-mail.

Others at JPL integral to the process are Kevin Robinson of the Acquisition Division (4-8254) as well as Pamela Brown (4-8081) and Kirk Barrow (4-6345) of the Environmental Health and Safety Program Office.

For more information about the flight-based research platforms available from NASA, see *http://airbornescience.nasa.gov/platforms/platforms.html.*

SOLAR PROBE PLUS *Continued from page 1*

ISIS instruments for measuring the high-energy particles accelerated by solar flares and shocks will be provided by a JPL-led team (Mark Wiedenbeck) that includes co-investigators from the Goddard Space Flight Center as well as Caltech co-investigators Richard Mewaldt and Alan Cummings. In addition, former JPL Director Ed Stone is participating as a "senior science mentor." Velli added that much of the work will be done with the high-end 3-D visualization techniques developed at JPL.

"Solar Probe Plus will carry out the first direct exploration of the outer atmosphere of a star, inside the region where the flow is still largely controlled by the magnetic field," Velli noted. "Though we have many ideas of how the solar corona is heated and the solar wind is accelerated, I expect we will make unanticipated discoveries about the processes that convert this energy into coronal heating and solar wind flow. In addition, we will learn about the dust and particle environment of the inner solar system.

"We will learn how particles are accelerated up to very high energies in the solar corona. The probe will also teach us how the magnetic field in the solar corona becomes unstable, generating coronal mass ejections and the solar flares that influence space weather here on Earth. All of these processes occur elsewhere in the universe, where plasmas and magnetic fields interact over energy scales much greater than on the sun. In this sense, we will be making the first-ever measurements in situ of fundamental astrophysical processes such as magnetic reconnection, cosmic ray acceleration and shock waves."

The best possible outcome for the mission would be to successfully carry out the first measurements in the solar corona, Velli added. "If it can survive longer than the first three passes so close to the sun, it will be able to monitor the changes as the 11-year solar activity progresses. This is what Ulysses did, making extraordinary discoveries on how the heliosphere evolves from solar minimum to maximum and minimum again."

Velli's work at JPL has mostly been on theoretical studies of the plasma astrophysics of the sun and solar wind. He has been involved in the science definition teams for both Solar Probe and a companion joint NASA/European Space Agency mission, Solar Orbiter, which will carry large telescopes and plasma and energetic particle measuring instruments inside the orbit of Mercury.

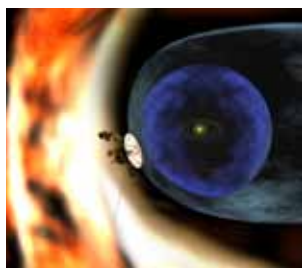
"Understanding the solar wind is of fundamental significance to all of astrophysics since it is the archetype for all stellar winds and related astrophysical flows," Velli said. "For me working on Solar Probe Plus has been a major goal, and it is the first flight project I will be working on directly with such intensity."

Solar Probe Plus is part of NASA's Living With a Star Program. NASA invited researchers in 2009 to submit science proposals, and 13 were selected for review by a panel of NASA and outside scientists. The total dollar amount for the five selected investigations is approximately $180 million for preliminary analysis, design development and tests.

For more information on the mission, visit *http://solarprobe.gsfc.nasa.gov.*

Voyager redux

Carol Lachata / JPL Photo Lab



Suzanne Dodd, who began with the mission in the mid-'80s, returns as manager

By Mark Whalen

Among the plethora of longtime scientists and engineers with 30-plus years at JPL, it might be tough to find a veteran still onboard who hasn't worked on the Laboratory's historic Voyager mission to the outer planets, the twin spacecraft now on their way out of the solar system.

One young engineer who made her initial mark on the mission fresh out of Caltech in 1984 has now come full circle, as she has returned to Voyager as its new project manager.

Suzanne Dodd, also currently the Spitzer Space Telescope project manager, has run into a number of veterans from the early Voyager days since her recent appointment.

"Someone just told me they worked on Voyager's software code in 1975," Dodd said. "Another person asked, 'Do you remember me when we worked on the Neptune encounter?' It's taken some time to put names with faces, but it's been really fun getting reacquainted with JPLers who have worked on the Voyager project over the years."

It was on Voyager's sequencing team for its encounters with Uranus and Neptune that Dodd got her JPL career started with a bang. "No mission had ever gone there before, so we didn't know what those planets would look like up close," she said. "I'm looking over Carl Sagan's shoulder as he's looking at the images, and I'm thinking, 'Wow, I was involved in the design of that, getting that observation.'"

There was more gratification a couple of years later, Dodd said, when those initial images she and Sagan spied were published in her two daughters' science textbooks. "That was a big thrill," she said. "There's really a great connection between what students read in the textbooks and what's done at JPL with our missions."

Dodd continued her initial stint with Voyager through 1989, when she joined the mission planning team for the ill-fated Mars Observer. Cassini was next, where starting in 1993 she served as uplink team chief, overseeing the sequencing and mission-planning efforts through launch and the first Venus flyby. She then spent 11 years at Caltech's Spitzer Science Center and Infrared Processing and Analysis Center, including time as manager for both organizations. This past June she returned to JPL as the Spitzer project manager. "I'm so proud of the performance of the telescope," she said, particularly citing the achievement of direct detection of exoplanets. "It's worked superbly, from the instruments to the engineering. The science return has been voluminous and very exciting."

Today, Dodd is intent on raising Voyager's profile. "If I have one goal as the project manager, it's to make more people aware of Voyager—both inside the space world and in the general public—and not let it get lost among the many dozens of extended missions that are going on," she said. "Voyager is unique, in its location, its environment and its longevity. It's important to realize that we're not just flying it for historical sake or just because it can still operate; we're flying it for the new data it's taking, and it's still doing exceptional science. It's not hanging on just to hang on."

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Today, a trim staff of about a dozen full-timers operates the twin Voyager spacecraft, including five from Dodd's early Voyager days. That's a far cry from the glory days of the mission's grand tour through the solar system, with hundreds of staffers onboard. But Dodd maintains that Voyager has much more to do and much to offer current and future JPLers.

"From a science perspective, it shouldn't be considered an old man's mission," Dodd said of the pair launched in 1977. "It's got new, exciting science every day. No spacecraft have ever ventured as far away from Earth as the Voyager spacecraft, and no spacecraft will for at least another 50 years. There's a lot that can be done with the data by scientists interested in modeling heliospheric phenomena and interstellar phenomena."

Voyager is operating in a realm only defined by models, she explained. "We have theoretical models on the heliopause and heliosheath and how the boundary with interstellar space works, and we're providing key in-situ data points to fit those models."

The mission launched 33 years ago that has provided volumes of memorable, iconic science return has also proven to be an outstanding value. Dodd noted that as with all missions, Voyager goes through a NASA senior review every two years; the most recent rated Voyager fourth out of 12 missions in science value per dollar. Voyager today operates for less than $5 million annually, including science investigator funding.

Dodd said within four to six years the Voyagers will cross the bow shock into interstellar space and be surrounded for the first time by matter from other stars—and the further unknown.

"We'd like to operate Voyager out past 2020," she said. "We have enough reserves to go to at least 2020, and perhaps beyond."

News Briefs

Otfrid Liepack

Liepack earns IAA honor

Otfrid Liepack, supervisor of the Project System Integration, Test and Deployment Group (315E), has been elected a member of the Social Sciences Section of the International Academy of Astronautics. His activities in the field of space history are being recognized with this election.

Liepack joined JPL in June 1995. He worked previously on several JPL missions, such as Galileo, Cassini and Phoenix, either operating instruments or performing verification and validation activities. In recent years he worked with Johnson Space Center, providing systems engineering support for the development of the Constellation Program's operations architecture. He started his current position in August 2010.

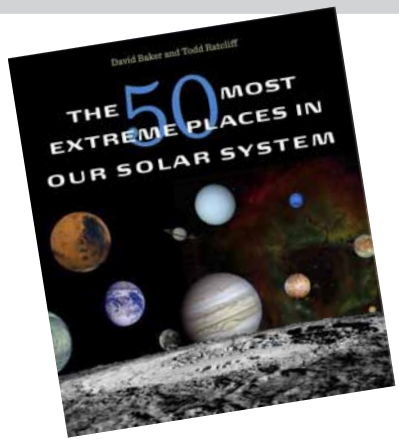
Liepack holds a master's degree from the Technical University Berlin, Germany, and a doctorate from Germany's Technical University Chemnitz that covered the development of a cost model to reduce operations costs of planetary missions.

The International Academy of Astronautics was founded in 1960 and was led by former JPL Director Theodore von Kármán. The organization brings together the world's foremost experts in the disciplines of astronautics on a regular basis to recognize the accomplishments of their peers, to explore and discuss cutting-edge issues in space research and technology, and to provide direction and guidance in the non-military uses of space and the ongoing exploration of the solar system. Liepack currently serves as regional secretary of the academy in the United States.

New book looks at solar system extremes

JPL planetary geophysicist Todd Ratcliff is the co-author of a new book, "The 50 Most Extreme Places in Our Solar System."

Using about 280 images, mostly from NASA/JPL missions, the book explores planets' surface and interiors along with phenomena such as extreme climates and wild weather throughout the solar system. Also



considered are rings and magnetism, along with possible life on other worlds. Extreme life on Earth is covered as well.

Ratcliff, from the Geodynamics and Space Geodesy Group, said the volume is intended for those with an interest in planetary science but who do not necessarily have a science background. The book has also been translated into German.

Co-author David Baker is chairman of the Physics Department at Austin College.

The book is available at the JPL Store and online. Facebook, Twitter, and MySpace links are available on the author's website at *http://www.extremesolarsystem.com* or visit *http://www.hup.harvard.edu/catalog.*

2011 benefits enrollment underway

Benefits enrollment is now underway through Oct. 29. This is your opportunity to update your benefits selections, enroll in a health care and/or dependent day care spending account, and add dependents to your coverage for next year. Also, just as last year during annual enrollment, Caltech is requiring all employees to verify their dependent information for medical and dental.

The Benefits Office notes that as health care costs continue to escalate, it is more important than ever that their records include only dependents who are eligible for benefits.

Even if you have already provided dependent certification and/or documentation (last year or this year), you must certify that your dependents continue to meet Caltech's eligibility requirements. If any of your dependents are no longer eligible, simply remove them from your coverage.

For more information, call ext. 4-3760.

Passings

Kenneth Mussen

Retiree **Kenneth Mussen,** 90, died June 13.

Mussen worked at JPL from 1945 to 1990. He was involved in solar thermal testing for missions that included Corporal, Ranger, Mariner, Sargent, Viking and Voyager.

Mussen is survived by his wife, Carol, son Dennis and daughter Deborah Myers.

Al Beers, 79, retired former supervisor of the Space Flight Operations Section, died Sept. 10.

Beers joined JPL in 1964 and retired in 2000. He was mission operations support manager for JPL's Active Magnetospheric Particle Tracer Experiment, which offered a better understanding of certain mechanisms and physical properties of the Earth's magnetosphere. Among his honors was a NASA Group Achievement Award presented in connection with the Helios Project, a combined NASA/West Germany solar probe.

Beers is survived by his wife, Julie, and children Roxanne, Alex and Ross. In lieu of flowers, his family requests consideration of donations to the Pulmonary Fibrosis Foundation, 811 W. Evergreen Ave., Suite 303, Chicago, IL 60642, *info@pulmonaryfibrosis.org.*

Wendy Casiano

Mission Operations Engineer **Wendy Casiano,** 32, died Sept. 2.

Casiano had worked at JPL for 13 years. She is survived by her husband, Orlando, a group supervisor for Section 383; children Adrian, Iliana and Jacob; her mother and father, Leo and Raquel Barboza; and sisters Colleen and Leslie Barboza.

Services were held Sept. 8 at Forest Lawn, Hollywood Hills. In lieu of flowers, the family requests donations to funeral costs at *http://pixelmepink.com/wendy.*

Former Viking Deputy Mission Director **Robert Crabtree,** 83, died Sept. 21.

Crabtree worked at JPL for 32 years, beginning in 1960. He served as test and operations manager for the Ranger mission, which sent back the first high-resolution photographs of the moon's surface. From 1965 to 1968, he was manager of systems test and launch operations for the Surveyor project, which achieved the first soft landing of a spacecraft on the moon. From 1968 to 1977 he served on the Mercury and Viking projects, most notably as deputy mission director for Viking, which successfully landed the first two spacecraft on Mars. In the early 1980s, Crabtree contributed to a number of projects for the U.S. Army, and then from 1987 to 1992 he was manager for JPL's Assessment and Technology Programs.

Crabtree is survived by his son and daughter-in-law Tom and Robyn Crabtree, grandchildren James and Jillian and his sister, Ardelle Legel.

A memorial gathering will be held Friday, Oct. 1 at 11 a.m. at Joselito's Restaurant, 2345 Honolulu Ave., Montrose.

Robert Crabtree

Letters

Joseph Skipper's family and I would like to say "thank you" for all the kind and thoughtful e-mails and cards. Skipper would have been totally surprised at how many of you cared. His survivors know and are deeply touched. I am still enjoying the tropical plant mix JPL Hospitality sent. Thank you for this warm and lovely gesture.

Beverly Corbett

Tiffany and I would like to thank our friends and co-workers for their thoughts and prayers after the passing of my father. We truly appreciate the support, flowers, cards and attendance at the service. We also want to thank JPL for the beautiful orchid.

Tim and Tiffany Daleo

I would like to thank my JPL friends and colleagues for the kind words regarding the passing of my mother. Thank you also for the beautiful plant; your thoughtfulness was sincerely appreciated.

Bob Sadler

Retirees

The following JPL employees retired in September:

Katherine Moyd, 38 years, Section 315H; **Ingrid Hsu,** 33 years, Section 388; **Sharon Maupin**, 26 years, Section 7050; **Robyn Diegan,** 20 years, Section 2114; **Jon Depew,** 13 years, Section 3543.

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