

Actions seek to keep Lab ready for future

By Mark Whalen

As NASA works to redefine its mission in the coming years—particularly while facing the prospect of tight budgets—JPL is working to position itself to meet the challenges of the coming decade as well as the opportunities that will develop as NASA evolves.

“When times are challenging, the best organizations rise to the top because they can offer capabilities to meet the challenges better than most,” said Firouz Naderi, JPL associate director for project formulation and strategy. “We think JPL is positioned—probably better than most—to respond to the challenges that stem from the limited resources available to NASA.”



Firouz Naderi

The Laboratory’s Executive Council recently met at its annual offsite retreat to focus on specific actions to undertake that will ensure JPL continues to conceive, design, build and manage

missions as few other organizations can offer.

There were three broad themes to the retreat:

• **What is JPL’s business outlook, and how does the Lab capture these opportunities?**

“Because of constrained budget in the next decade there are not many opportunities for multi-billion-dollar flagship missions and only a few that exceed \$1 billion,” said Naderi. “However, there will be many missions that will be selected through competition. These will be smaller missions such as Explorers and Ventures (\$150 million–\$200 million), medium-size missions as offered through Discovery competition (\$500 million) and large missions offered through the New Frontiers (\$1 billion). We need to offer innovative concepts that do exciting science cost effectively to capture some of these missions.”

• **Given the constraints in the NASA budget, how does the Laboratory operate even more efficiently to be able to do the same or more for less?** “The funds needed to operate the Laboratory are generated through the

burden budget, which is approximately 25 percent of the JPL business base. A lower business base puts pressures on the burden budget so we are looking for organizational and process efficiencies that allow JPL to operate as effectively or more—but for less money,” Naderi said.

• **JPL employees.** “We want to make sure to continue to hire the best and create opportunities for them, shape the environment around them so they can excel,” Naderi said, adding that a critical goal is to maintain “a skilled, sharp workforce through hands-on assignments.”

For the latter, an array of mentoring and training programs is under development. Also under review will be methods to seek more frequent employee feedback, including more targeted surveys.

Naderi noted the three classes of missions coming up.

Large missions, which are funded at about \$1 billion or more. For JPL, these include Mars ’18, a collaboration with the European Space Agency; DesDynI, an Earth-observing mission that has been

deferred but later may be restored to full funding; and a potential opportunity for an Advanced Mirror Development follow-on, according to Naderi. Also in this class are the competitively selected New Frontiers missions that are now capped at \$1 billion, not including the launch vehicle. Potentially there will be three New Frontiers opportunities in the next decade, Naderi said. One of these missions, New Frontiers 3, is being decided now.

Medium class: Discovery-class missions of up to \$500 million, with potentially four opportunities within the next decade. Also in this class is the assigned mission Surface Water and Ocean Topography (SWOT) mission.

Small class: Venture (Earth science) and Explorer (astrophysics/heliophysics) will offer flight opportunities every year with missions in the \$150 million range. In the smaller class there will also be various technology flight demonstration opportunities.

“There are great opportunities offered between New Frontiers, Discovery, Venture and Explorer and tech demos,”

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The proposed Surface Water and Ocean Topography mission would be the first global survey of Earth’s surface water.

Science investment critical to nation’s future, says White House adviser Holdren

Despite the tough economy, it’s critical that the nation boost its investment in science and technology, according to John Holdren, who heads the White House Office of Science and Technology Policy and addressed a Caltech audience April 19.

President Obama believes that in many ways science is more essential than ever before for the nation, Holdren said. The president “understands with crystal clarity how important [science is] to the future of the country, and indeed, to the future of the world.”

Holdren noted that the near-term domestic challenges in which science can have a major effect include economic recovery and growth, health care, energy and climate, national and homeland security, and resources and the environment. Globally, many of the same issues

may be more daunting, he said.

“These are challenges that are interdisciplinary and interconnected, and can’t be solved, or even understood, without insight from the natural sciences, engineering, social sciences and humanities,” Holdren said. “Science and technology are not just germane to this success; they are central.”

Holdren stressed the importance of investing in and supporting all levels of education, particularly in science, technology, engineering and math. Obama has shown a fondness for those who have excelled in both teaching and learning.

“Many of the events we propose involve kids, winners of national competitions for STEM and robotics, as well as adults who are winners of major prizes such as the



John Holdren, who heads the White House Office of Science and Technology, addresses a Caltech audience April 19.

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Dutch Stegier, JPL Photo Lab



NEW FACILITY SHOWCASES HIGH-TECH ADVANCES IN EARTH STUDIES

A new facility dedicated to showcasing close-up and 3-D views of our home planet and JPL's Earth science missions has been dedicated just in time for May's open house.

As part of Earth Day commemorations, JPL's new Earth Science Center on the first floor of Building 264 was dedicated in late April.

"The main purpose of the center is to reach and inspire young people," noted Michael Greene, manager of JPL's Public Engagement Formulation & Strategic Alliances Section. "It's a great opportunity to demonstrate science, technology, engineering and math to students who come to the Lab."

Greene noted it was important to be able to open to the facility on the Lab's "Main Street," an easy walk from the main gate, since after the May 14-15 open house the new center will be a major feature of the daily tours provided by the Public Services Office. The Lab averages about 100 visitors each day.

Upon entering, visitors will note two touchscreens located on opposite walls of the facility that control real-time views of "Eyes on the Earth," an interactive 3-D visualization—created by JPL's Kevin Hussey and his visualization group—that allows users to view the location of all of JPL's Earth-orbiting satellites and extract information about each mission.

In the center of the entry room is a four-foot-diameter Earth data globe, also provided by Hussey's team, that currently displays pre-programmed visualizations but will soon be reworked to coordinate with the Eyes on the Earth screens.

The majesty of our home planet comes to life in "Earth: Your Future, Our Mission," the first film showing in the center's 3-D theater. Produced and written by Greene and hosted by Amber Jenkins of the Earth Public Engagement Group, the film explains JPL's contributions to Earth/ocean studies and impact of climate change on society. The theater, seating

about 40 people, can also accommodate two-dimensional films.

A separate room within the facility, the Earth Science Applications Center, has multipurpose functionality for meetings, science applications and virtual conferences. This area includes three 60-inch high-definition LED displays, a 1400 x 1050 projector and screen, high-definition videoconference system, and a user-friendly touch-panel control system.

Securing the Building 264 space was a big challenge, noted Brett Ramaker, programmatic business administration manager for the Earth Science and Technology Directorate. "With all of our launches coming up this year, operations space in this building was at a premium," he said. While the new facility takes the place of the former Voyager/Ulysses project office, the Earth science mission operations team was moved to the building's 3rd floor. The Ulysses project ended last year and Voyager is now managed from the Woodbury complex.

The intricate switching and programming for the facility posed many software and technical challenges that were met by Stephen Sawyer and the Network Engineering Group along with Hussey and his visualization team. The entry and conference rooms share the same digital switching technology and similar control systems, but are completely independent of each other, noted Sawyer.

Charlie White of the Web Design & Knowledge Management Group helped design the physical space using Second Life, a virtual online world created from 3-D modeling. "This room was a collaborative team effort," he said. "It allowed all the stakeholders to visualize it and make real-time changes that saved weeks. Dan Goods was instrumental in the artistic design, while we balanced requirements from Facilities. When we presented to Charles Elachi, it was the first time we did a presentation in Second Life that was not 'about' Second Life. It was simply a tool to convey a message that was visually understandable." ■

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Naderi said. "Next decade we are looking at a pool of potentially \$6 billion to \$8 billion of missions that would be offered competitively. In aggregate, that equals two or three traditional flagship missions.

"So JPL needs to gear itself to hopefully win its share by putting forward—in response to announcements of opportunity—exciting missions that offer high science per dollar value."

While JPL has fared well in the past in a competitive environment, other organizations are becoming increasingly active in the same fields JPL works in, Naderi noted. "As the sources of funds become

less available and the competition more vigorous, one has to do even more."

Among JPL's strongest attributes is a workforce that keeps its skills in implementing missions sharp through hands-on, in-house work. Without a predictable cadence of flagship missions in the near future, Naderi noted that the challenge of maintaining the in-house work "might mean we have to be thinking about a mixed mode of implementation—rather than a strict systems contract—of missions like Discovery and New Frontier, where we do the type of work that keeps our workforce's skills sharp, and at the same time buy from industry what they do best," he said.

As for the Ventures and Explorers, while it's unlikely that JPL would get into

manufacturing small spacecraft buses, for which viable industrial providers exist, "we are definitely going to be active in small missions using small craft," Naderi added. "JPL needs to approach these missions appropriately consistent with the smaller price tags and a tolerance for relatively higher risk."

JPL will also pursue opportunities in nontraditional areas, meaning outside of the agency's Science Mission Directorate. JPL will seek assignments where the Lab's expertise can be applied to human spaceflight, "particularly if there are robotic precursor missions to destinations ahead of human spaceflight," Naderi noted, adding that JPL will seek to partner with other NASA centers where appropriate. "We will also pursue non-NASA

business that by nature is either scientifically or technologically syncretistic with what we do for NASA and that have societal and national-interest benefits.

"All in all, the EC retreat resulted in 16 high-level action items spanning the three focused areas around which the retreat was structured," Naderi added. "Each of the actions is assigned to an EC/deputy EC member who will draw on the vast resources of the Laboratory to develop a response."

"Good organizations can differentiate themselves from the crowd when times get challenging, because they have more to offer," Naderi said. "We have the capability to be able to excel in this environment." ■

Farr dives deep for thrills, discovery

By Peter Basch

There are a few places on this planet ... where I have been and nobody else will be. I've been to places where literally it takes two days to get to the light again.

— Bill Farr

It's sometime in the 1990s, and Bill Farr is 60 feet underwater far back in a cave in Florida. The water is silty; visibility is six inches. Having gone as deep as his air supply permits, he turns around to exit the cave and return to the surface. Farr wriggles through a 10-inch gap between limestone walls, what cavers call a "squeeze," dragging along full scuba gear. Halfway through, he gets stuck. He exhales, tries to inhale, and can't—there's no air. Something is wrong with his gear.

Farr quickly concludes that his regulator must be broken. He switches to a spare, turns it on, and air rushes through. Blinded by silt, he disassembles the broken regulator by touch. As he's counting the parts, he thinks, "I don't remember it coming apart in this many pieces."

The stuff of nightmares? To most the scenario would be harrowing, but to JPL optical communications researcher Bill Farr it's one more logbook entry in a lifetime of extreme diving in underwater caves. Since 2001, Farr has been a member of the technical staff in Division 33 working on single-photon detectors, a communication technology that could vastly increase data return from missions at Mars and beyond. After hours, he has traveled extensively in search of new caves to explore with mask, fins and tanks.

Farr's dual interests in electronics and cave exploration go back to his teenage years in the early 1970s. As an eighth grader in Houston, Farr recalls, he taught himself electronics by going through the assembly manuals for an RCA Spectra 70 computer on which his school shared time. During his senior year in high school, Farr worked at the Marine Biomedical Institute in Galveston, doing chemistry research and mass spectrometry. He overheard people talking about speleology; he had read about this—the scientific study of caves. Weeks later, he was exploring his first caves.

The next fall, Farr came to Caltech. He paid his tuition by doing computer consulting on weekends. Weekend jobs are not unusual for undergraduates, but Farr's was 2,600 miles away, in New Orleans. He'd fly out after class to work for the Gulf South Research Institute on expert software. Taking outputs from a mass spectrometer, the new software analyzed water samples for pollutants, accomplishing in minutes what used to take days. Perhaps unsurprisingly, given his commute, Farr never graduated from Caltech. As he puts it, "I never learned well in courses. I was always self-taught."

Farr's wife, Carol Vesely, is also a renowned cave explorer, though not a scuba diver. They met in 1985 at a cavers' club in Pasadena. Two years later, they discovered the deepest cave in the Americas, Cueva Chevé in Oaxaca, Mexico. While exploring the upper

reaches of Chevé cave, the cavers crawled through a 10-inch squeeze, and emerged into a chamber furnished with onyx pots full of jade beads and dried blood, and a tablet portraying a Mayan battle from 700 A.D. The tablet is now at the Oaxaca Museum.

Over the years, Farr has made more than 130 dives in caves in the United States and Mexico. Many have been at Lilburn Cave in Sequoia National Park; with more than 17 miles of passage, it is California's longest known cave system. In some cases, he may travel in subterranean waters for a half mile or more, removing scuba gear to squeeze through tight passages, before surfacing far from his entry point. Cavers carry reels of line that they unwind as they go, leaving a trail that can show them the way out if conditions get hairy. Often diving to extreme depths, they must breathe special mixed gases. Without them, inhaling the nitrogen in regular air at high pressures can create a narcotic-like effect in the brain, clouding judgment. Too much oxygen in the mix can cause convulsions at depth.

Farr is known for pushing the limits. He dives at high altitudes, in extremely cold water, through tight passages. According to Vesely, "I couldn't take a regulator apart and put it back together on the surface, and he's done it underwater. But I don't think it necessarily makes you invincible. You have to realize that even if you are very competent you have to know when to turn around."

Farr's 16-year-old son, Brian, has joined his parents in exploring caves since he was four months old, but Bill and Carol won't let him dive until he's fully grown. And he can't cave-dive, according to Farr, "until he's 30, and knows that he's mortal."

Farr, now 53, says his family has been discouraging him from risk-taking, though he believes he can dive well into his 60s. He confessed that he has not been diving the Lilburn Cave in Northern California recently because it is plugged up with sand. When that cave opens up again, Farr predicts, "there'll be trouble at home."

Farr finds cave diving "incredibly relaxing. You don't worry about work, you don't worry about taxes, not quite like sleep, but that restful. It's not a rush, it's pure calmness."

Farr shares every explorer's ambition to be first: "There are a few places on this planet, places on the Earth where I have been and nobody else will be. I've been to places where literally it takes two days to get to the light again."

At home in both the sky and the depths, Bill Farr relishes the dark, whether diving down into the lightless bowels of caves, or looking out into the blackness of space, grabbing one photon at a time. ■

Bill Farr at the "Upstream Rise" in Lilburn Cave in Sequoia National Park, circa 1995. The marble cave is one of California's longest caves at almost 17 miles.

Have a co-worker with an intriguing avocation? Send story ideas to universe@jpl.nasa.gov.



News Briefs



Sembiam Rengarajan

Rengarajan named to lecture post for engineering society

Sembiam Rengarajan, a part-time employee in the Antenna Research and Formulation Group and a professor of electrical and computer engineering at Cal State Northridge, has been appointed a Distinguished Lecturer by the Antennas and Propagation Society of the Institute of Electrical and Electronics Engineers.

Rengarajan is one of nine such distinguished lecturers appointed worldwide for the triennium 2011–13. He has published more than 200 journal articles and conference papers on antennas and electromagnetics. A Fellow of the Institute of Electrical and Electronics Engineers and of the Electromagnetics Academy, he has served as an associate editor of IEEE Transactions on Antennas and Propagation and is the current vice chair of the Commission on Waves and Fields of the United States National Committee of the International Union of Radio Science and will serve as chair of the commission from 2012–14.

Rengarajan has received more than a dozen awards from NASA for his innovative research and technical contributions to Deep Space Network ground systems antennas and to JPL's Spacecraft Antenna Research Group. Please see <http://ieeeps.org/distlectureres.html> for more information.

Asplund earns honors for newsletter, video

Shari Asplund, the Discovery Program education and public outreach manager at JPL, has won a 2010-2011 Society for Technical Communication Spotlight Award of Excellence for the



Shari Asplund

"Discovery and New Frontiers News," the newsletter she writes and edits featuring NASA's Discovery and New Frontiers programs and missions.

At their banquet in March, the awards committee announced they forwarded four of the top winners, including the newsletter, to the international competition for further adjudication; awards will be announced in May.

The Discovery and New Frontiers News archive can be found at <http://discovery.nasa.gov/newsletter/newsletter.cfm>.

Asplund also won honors for her collaboration on "Space School Musical," a "hip-hopera" that uses song and dance to introduce students to the planets, moons, asteroids and more.

The Discovery Program video was selected to receive a 2011 Telly Award in the children's audience category. The Telly Awards honor the finest video and film productions, with more than 13,000 entries in numerous categories. The space musical teaches solar system science with 30 minutes of fun, non-stop action, and is designed to be performed by schools and afterschool programs.

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Nobel Prize, National Medal of Science, and presidential award for math and science teaching," Holdren said. "The president often tells me afterward, 'I wish I could see more science and math students, and more scientists and engineers, and fewer sports teams.' He loves getting kids excited, loves rewarding kids who have done well in science, math and engineering, and he puts his heart and soul into it."

Holdren said Obama in February proposed a research and development budget for FY 2012 that was "quite aggressive," including a 19 percent boost for the Department of Health Services, 16 percent for the National Oceanic and Atmospheric Administration, 13 percent for the National Science Foundation and 11 percent for basic and applied research. Overall, the request totals \$147.9 billion, up \$800 million from FY 2010.

"We don't expect to get all of this, but we're going to fight for

as much as we can get, because the president believes and understands that even in the most difficult financial times these investments in science, technology, innovation and STEM education are investments that are crucial for the country's future."

A key challenge ahead for the federal government, Holdren said, will be to sustain support for science and technology under current budget cuts. In particular for NASA, he cited that advanced technology for space propulsion and other aspects of space-exploration missions, "something we want to really boost in NASA, has been slashed in the current appropriations act, and we're going to have to fight to get it back in the 2012 budget."

For those who work in the sciences, Holdren noted, it's critical to get key messages across to the public about why science and engineering matter—for the economy, the environment and security—and how science works. ■



Space Images version 2 app now available

Fifteen months and more than 500,000 downloads ago, JPL released its first-ever mobile application, an extensive collection of some of the Lab's most stunning space images. Now adding new devices including iPad and Android to its arsenal, JPL's Space Images App is back with a souped-up version 2.

The Office of Communications and Education partnered with Section 388's Photojournal team and the Office of the Chief Information Officer to develop and test the app, incorporating new features suggested by users of last year's version 1. Along with videos, photo sharing through Twitter, Facebook and e-mail, and an Editor's Pick category, Space Images V2 features higher-resolution images, letting users zoom in and explore photos in greater detail, and improved functionality.

"Since V1 launched, mobile technology has changed significantly, and we wanted to ensure that we were taking full advantage of the native functionality," said Jon Nelson, JPL's manager of online publishing.

In part, that meant creating an immersive experience online as well as on mobile devices. Coupled with its rollout of Space Images V2, Nelson's team launched a Space Images website at <http://www.jpl.nasa.gov/spaceimages>, which pulls in ratings from the app and gives users the opportunity to build their own photo albums and desktop wallpaper. Nelson said it's a stunning showcase of what has been called the "crown jewels" of JPL's efforts to share the wonder of space with the public.

With the iPad and Android versions already totaling more than 7,500 downloads, Nelson and his team are looking forward to a bright future for Space Images V2 and mobile initiatives to come.

See a demonstration of Space Images as part of the "Visualizing Space" exhibit at the 2011 JPL open house.

Passings



Brian McGlinchey

Brian (Mac) McGlinchey, 74, retired manager of JPL's Mechanical Systems Engineering and Research Division, died March 29.

McGlinchey joined JPL in 1963. In 1988 he was named deputy manager of the Electronics and Control Division and five years later began as manager of Division 350, in which he served until his retirement in 1999.

McGlinchey received NASA's Exceptional Service Medal in 1992.

He is survived by his wife, Marilyn; son Kevin and his fiancée Debra; son Craig (and wife Stina); and grandchildren Kayla, Michael, Megan and Shannon.

Services were held April 2 at Forest Lawn in Glendale. McGlinchey's family requests consideration of donations in his memory to research on Parkinson's disease; visit parkinsons.org.

Letters

I would like to thank all of our friends at JPL for their condolences at the loss of Colin's mother. The plant that JPL sent was beautiful and very much appreciated. It is nice to be working with such thoughtful people!

Debby and Colin Mahoney

Retirees

The following JPL employees retired in April: **Rolf Hastrup**, 52 years, Section 313B; **William Whitney**, 47 years, Section 1852; **Stephen Synnott**, 36 years, Section 3430; **Barbara Amago**, 33 years, Section 2731; **Yolanda Castillo**, 33 years, Section 3810; **Carolina Flores-Helizon**, 29 years, Section 382G; **Michael Chilicki**, 28 years, Section 3818; **Richard Hann**, 17 years, Section 1110; **Farrokh Shoar**, 12 years, Section 172H.

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