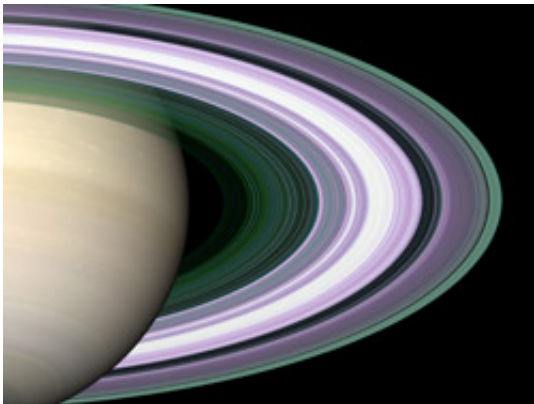


Space agency's 2020 vision shortsighted, say Berkeley astronomers

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An unmanned mission to Saturn recently found evidence of liquid water on one of its moons — proof, says Berkeley planet-hunter Geoffrey Marcy, of the worth of the kinds of low-cost, high-yield research now threatened by NASA budget cuts. (Image courtesy NASA/JPL/Space Science Institute)

"Returning to the moon is an important step for our space program," declared President Bush in January 2005, announcing his intention to "give NASA a new focus and vision for exploration" by putting Americans back on the moon by 2020, followed by the first manned mission to Mars. Months later, NASA's incoming administrator, Michael Griffin, vowed that despite the staggering cost of this bold vision — conservatively estimated at over \$100 billion — not "one thin dime" would come out of his agency's budget for unmanned space science.

Mathematics, however, being no less exacting than astrophysics, either the vow or the vision would ultimately have to be scrubbed. And in February — when the space agency proposed massive budget cuts in smaller missions as a down payment on Mars — it became painfully clear that the next "giant step for man" could mean a giant leap backward for the relatively low-cost, high-yield astronomy research conducted by and at the nation's universities, including Berkeley's own Space Sciences Laboratory (SSL).

"Cuts for NASA are so huge over the next few years that they're scrambling to find money," says physics professor Robert Lin, SSL's director. "We're not the only ones who are going to have some problems. But for universities, it's the smaller missions that are really important."

Most worrisome for scientists at the Grizzly Peak lab are the deep slashes to the Explorer program, which physicist Janet Luhmann, an SSL senior fellow, calls "the bread and butter of university space labs." In addition to funding some of the lab's most high-impact projects — including the Ramaty High Energy Solar Spectroscopic Imager, or RHESSI, which was launched into Earth's orbit in February 2002 to explore the physics of particle acceleration and energy release in solar flares — the Explorer missions often give students their first taste of big-time rocket science.

"We're training the next generation of astrophysicists and space scientists," explains Lin. From 30 to 40 grad students and as many as 100 undergrads come through the lab each year, gaining experience in what Lin calls "highly technical, hands-on research" and often moving on to large missions as scientists, engineers, and project managers. Somewhat serendipitously, the time required for many Explorer projects from development to launch approximates that for a Ph.D. program.

"Especially now, when NASA has gone to an exploration program that's

going to last for 30 years or more, it's really important to get the right people with the right training," he says. "Yet they're cutting back on the very projects that could help to train them. So there's a bit of a contradiction here."

The agency's spending cuts — projected at \$3 billion over the next five years, pending congressional approval — are "largely directed at universities," notes the lab's associate director, assistant professor Steven Boggs. But he also considers the budget proposal "a very major blow to the future of NASA" and adds, "You have to wonder if NASA is going to continue to be in the science business."

In addition to the planned moon and Mars missions, Griffin has said the cuts are needed to pay for shuttle flights — at a cost of \$1 billion per launch — which in turn are needed to complete the International Space Station. No shuttles have been launched since the Columbia disintegrated while returning to Earth in February 2003, killing all seven astronauts aboard.

Of the 10 unmanned Explorer projects launched over the past decade, eight have been led by university teams, including two at SSL: RHESSI and FAST, for Fast Auroral SnapshoT, a satellite that is sending back new data about Earth's aurora. A third set of five Explorer space probes, called THEMIS — for Time History of Events and Macroscale Interactions during Substorms — are built and undergoing testing, and are slated to be trucked to Florida for launch later this year. All three missions appear safe from the budget knife.

At least two NASA projects with which Berkeley scientists are involved have been less fortunate. NuSTAR, a space-based X-ray telescope proposed by the California Institute of Technology and approved by NASA — and to which the campus's contribution was to be relatively small — has been canceled. Berkeley astronomer Geoffrey Marcy,

however, has played a significant role as an investigator for the Terrestrial Planet Finder, a project designed to search for habitable, Earth-like planets in distant solar systems. The Caltech-led TPF was scheduled for launch between 2012 and 2015, but has now been "deferred indefinitely" by NASA.

Lin, the principal investigator for RHESSI, says the Explorer program has produced "unequaled science per dollar." He's particularly concerned about the agency's scaling back of its competitions for project proposals. The last opportunity for universities to submit proposals came in 2002, and the next one now appears unlikely until 2008.

"The scary effect is, what about in the future?" Lin says. "We're very successful at this. And not having the opportunity to compete in the future, for at least several more years, will be a serious blow to us."

Even some projects expected to launch on schedule, including one for which Luhmann serves as principal investigator, could be jeopardized by NASA's new focus on costly manned missions. Getting a satellite into space, she explains, "doesn't mean our science analysis funds are guaranteed — they're likely to be taxed as much as any new mission program in the next year or two, as budgets are squeezed by the shifting priorities at NASA. ... There's really no safe haven for science. There's never close to enough support to truly mine all the data the missions obtain."

Marcy predicts that small missions "will largely dry up" under the space agency's new agenda, and that "Berkeley will lose soft-money scientists both on campus and at the labs, as well as technical engineers who have worked here for years."

He adds that the cuts will have "a devastating impact" on astronomy research, and particularly on what he calls the "two remarkable quests"

to have emerged in the past decade: "the cause of the accelerating expansion of the universe, and the existence of habitable worlds."

NASA, he believes, "has backed away from the two most philosophically compelling questions to face modern physical science: 'What is the history and destiny of the universe?' and 'Are we alone?'"

For Lin, the question now is how to fend off the "havoc" created by "these sudden, epic changes" in the space agency's budget. His answer — unless Congress decides to restore some funding for the Explorer program and other small-scale projects — is that the Space Sciences Lab will need to be better than ever at competing for a share of a drastically shrinking pie.

"I'm actually a supporter of manned space," he admits. "I think it's something the country should do. But I'm concerned about the balance between science and manned exploration....These [smaller] projects are scientifically tremendous. So I think the problem from our point of view is not so much going with manned exploration, but trying to keep a reasonable balance between the two sides."

Lin wrote in February to Griffin, NASA's administrator, to express his "deep concern" about the proposed budget, and urging him to "support this critical program by restoring delayed and canceled missions, and to enable new opportunities to be announced in a timely way."

"While I understand that NASA is facing difficult budgetary decisions, and priorities must be set," Lin wrote, "it would be a severe blow to the community and damaging to NASA science to allow such a productive, high-leverage, and unique program to be so severely cut."

At a congressional hearing on NASA's budget, several members of the House Science Committee — including its chairman, Rep. Sherwood

Boehlert (R-N.Y.) — voiced their own concerns about the possibility, as Boehlert said, that "NASA has gotten it wrong by trying to preserve flagship missions while cutting smaller missions and research grants."

"I want to do everything in my power to protect NASA science," Boehlert declared.

One Democratic member of the committee, Rep. Sheila Jackson Lee of Texas, took a personal tour of the lab on a recent visit to campus.

The value of smaller, research-based projects was underscored in March, when the unmanned Cassini orbiter sent back stunning evidence of liquid water on Saturn's moon Enceladous — a sign that it might support life.

That mission, and ongoing robotic missions to Mars, "demonstrate the broad value in inexpensive, exploratory missions," explains Marcy. "The characterization of water on Mars, rivers on Titan, and water under the surface of Enceladous brings fabulous scientific implications and engenders widespread public inspiration."

"These orbs are the destinations of the real Star Trek," adds Marcy. "And they can be explored with excellent cameras at the modest cost of \$5 per taxpayer per year."

Source: UC Berkeley, By Barry Bergman

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