

former director of Lawrence Berkeley National Laboratory, is a member of the panel. "Although safety might have been lacking in some areas at SLAC," says Shank, "Dorfan is well known among lab directors for his strong commitment to safety."

The Stanford panel is asked to ensure that appropriate systems and procedures are in place for safe resumption of the SLAC experimental program. The panel is expected to report to Hennessy by 1 March. Final approval for restarting the accelerators and storage rings on the SLAC site, including the Stanford Synchrotron Radiation Laboratory's stand-alone SPEAR ring, must come from DOE. **Bertram Schwarzschild**

Publishing Restrictions Eased, but Not Rescinded

US publishers may conduct normal publishing activities with private citizens in Cuba, Iran, and Sudan, countries under US economic embargo, according to a 15 December 2004 ruling by the Treasury Department's Office of Foreign Assets Control. The ruling overrides prohibitions that had led to self-censorship, fears of fines and jail time, and lawsuits against OFAC by authors and publishers.

In a press release, Stuart Levey, an under secretary for the Treasury's Office of Terrorism and Financial Intelligence, said, "OFAC's previous guidance was interpreted by some as discouraging the publication of dissident speech from within [the] oppressive regimes [of the embargoed countries]. That is the opposite of what we want."

For publishers and lawmakers, the ruling is an improvement, but it's not what they really want: no governmental regulation of publishing. Before this latest ruling, OFAC "had insisted that activities assisting 'works in progress' such as co-authorship and 'artistic or significant enhancement' were prohibited," says Marc Brodsky, executive director of the American Institute of Physics and chairman of the Association of American Publishers professional and scholarly publishing division, a party to a lawsuit filed last year against OFAC (see PHYSICS TODAY, November 2004, page 33). The new ruling "removes for a while the sword hanging over the heads of authors and publishers," says Brodsky. But, he adds, it excludes many governmental entities. "I don't know what the implications are." As an example, he asks how publications from

government organizations similar to National Institutes of Health in the embargoed countries will be handled.

Moreover, says Brodsky, "publishers worry that OFAC might again arbitrarily and capriciously change its regulations, and we think they have no right to even issue regulations on publishing." In response to the new ruling, Representative Howard Berman (D-CA), author of the 1988 amendment that exempts "information" and "informational materials" from government regulation, released a statement saying, "OFAC is still acting like they have the authority to grant permission and that interferes with our fundamental right to freedom of expression."

"The plaintiffs are still considering whether to continue the lawsuit," Brodsky says. Besides the principle of free speech, he adds, "we'd like to recover our [legal] costs. It's been hundreds of thousands of dollars." **Toni Feder**

Countries Race to Launch Moon Missions

When James B. Garvin, NASA's newly appointed chief scientist, first spoke to PHYSICS TODAY last month about President Bush's space vision of returning humans to the Moon, he was caught in afternoon rush-hour traffic around Washington, DC. The Beltway traffic seemed like an apt metaphor for the surge of interest in lunar scientific and human exploration. After the initial rush of US and Soviet lunar programs in the 1960s and early 1970s, exploration was reduced to a few flybys by spacecraft on their way to the outer planets.

That changed in 1994 when a low-cost Defense Department spacecraft called *Clementine* reached lunar orbit and mapped the Moon. The craft measured the Moon's shape and aspects of its mineralogy, and conducted radar observations that appeared to suggest tantalizing deposits of water ice in permanently shadowed polar craters. *Lunar Prospector*, a NASA spacecraft launched four years later, made detailed measurements of the Moon's near-side gravitational field, discovered indications of hydrogen—potentially related to water ice—in the polar regions, and

Japan's lunar probe *Selene* will pick spots for firing *Lunar-A*'s penetrators into the Moon.

found indications of new crustal magnetic signatures.

Now, a new wave of research is beginning with more than seven spacecraft prepped, planned, or arriving in lunar orbit from the US, Japan, Europe, India, and China. "*Clementine* and *Lunar Prospector* were the catalysts for lunar exploration that is long overdue," says lunar researcher Carlé Pieters of Brown University.

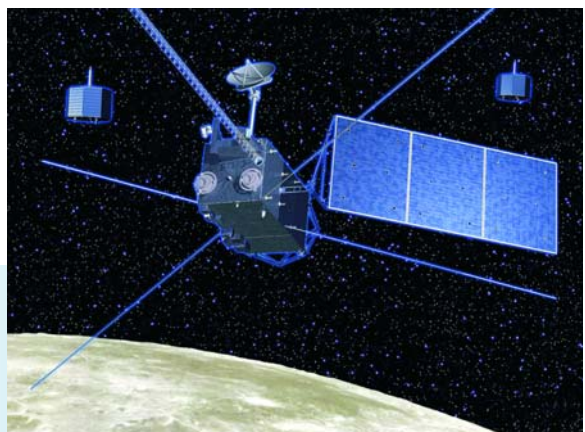
Why the Moon?

The global interest in the Moon can be summarized in three main points. First, "the Moon is the scientific gateway to understanding the formation and evolution of the inner solar system and the early crusts of Earth and Mars," says NASA's Garvin. Second, the Moon serves as a good destination for humans leaving low-Earth orbit to practice techniques that could eventually be used on Mars. Third, the Moon is also "relatively easy to get to for a nation just beginning a robotic exploration program," says Mark Robinson of Northwestern University.

The first of the new spacecraft, Europe's *SMART-1*, arrived in lunar orbit last November. It will be followed by two Japanese spacecraft, *Lunar-A* and *Selene*. In 2007, India will launch *Chandrayaan-1*, which will be closely followed by China's *CHANG'E-1*. In 2008, the US will send the *Lunar Reconnaissance Orbiter* (LRO) to help scout locations for human exploration. If NASA gives the go-ahead this summer, the \$700 million *Moonrise* mission to the South-Pole Aitken (SPA) Basin will launch in the 2009–2010 time frame and return a lunar sample to Earth.

Lunar gold rush

Although the European Space Agency has talked about lunar missions for decades, the launch of *SMART-1* was more associated with the results from *Clementine* than with any long-term lunar program. The ESA craft also acts



as a technology demonstrator for a new highly efficient low-thrust ion engine.

ESA is negotiating with the European Union over a Moon-Mars program. Called Aurora, the program, which will cost C900 million (US \$1.2 billion) over the next five years, will be funded by both organizations. Despite the new funding, European scientists are worried about the amount of influence the EU will have on the scientific program.

Of the two Japanese missions, *Selene* will be launched first in 2006, followed by *Lunar-A* which will hurl penetrators onto the Moon's near and far sides. The resulting seismic shocks and heat flow measurements should help determine the size of the lunar core, and in turn the origin of the Moon, says Hitoshi Mizutani, *Lunar-A* project manager for the Japan Aerospace Exploration Agency (JAXA). Both missions have faced delays due to problems with Japan's launch vehicles. Currently JAXA is reevaluating its lunar strategy and is expected to announce a series of more ambitious future Moon missions soon.

China's *CHANGE-1* orbiter is the first of a three-stage lunar program that was announced two years ago. The 1.4 billion yuan (US\$169 million) spacecraft will survey the topography,

the thickness of the lunar soil, and its mineralogy, and will monitor the space environment, says *CHANGE-1*'s chief payload designer Sun Hxian. The second stage will consist of a lander-rover mission. The third stage involves a sample return probe for launch before 2020. Still later, China hopes to send humans to the Moon.

In the US, the president's speech last year focused NASA's attention on what scientific and exploration-related measurements are needed in the near-term to implement Moon-Mars human explorations. NASA's Moon missions are funded from two different sources: the exploration systems mission directorate and the science mission directorate. "*LRO* is different from the other international lunar missions, as it must fly in an extremely low lunar orbit and is extremely challenging; it's a dual-use mission in that it's aligned for [human] exploration needs. . . . Other missions [such as *Moonrise*] are purely scientific," says Garvin. *LRO* is the first of many lunar missions to be funded by NASA to prepare for human exploration.

Moonrise, whose development and launch is one of several recommendations of the 2002 National Academy of Sciences decadal survey of the solar system, would be funded from the

New Frontiers program in NASA's science directorate. The SPA basin, which dominates the south-central lunar far side, is suspected to be the largest and oldest impact basin in the solar system. The kinetic energy of the impact may have thrown up material from deep within the Moon's interior. "Dating the SPA basin impact would constrain the period of early heavy bombardment in the inner solar system," says Brown University's Pieters.

NASA's long-term strategy for lunar exploration is still under development. Last month, the first steps in setting this strategy came into place when NASA held a small brainstorming workshop at the University of Maryland, College Park. "We really want the whole community involved in this," says Garvin, "which is why, during the summer, we will be hosting a series of workshops for the public, industry, and academia to help build a roadmap for NASA. . . . Science is a key member [of the president's space vision], but also not the only member; exploration needs to be enabled by science and to enable science."

International cooperation?

Many of the instruments on these spacecraft have similar capabilities.

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"Each mission has its own objectives and emphasis," says Pieters. "But there is naturally some overlap, especially in imaging." If scientists can get access to all the lunar mission data sets, then our understanding about the Moon will be stronger, she adds.

Despite having nationalistic lunar goals, nearly all the space agencies are discussing collaboration through organizations such as the International Lunar Exploration Working Group. "There are many bilateral and other negotiations going on," says Garvin. For example, Russia is contributing a neutron detector to *LRO*. In turn, ESA and NASA are working with JAXA, and the US is close to completing discussions about placing up to two instruments on India's *Chandrayaan-1*. Even China is considering international involvement in its lunar program. "I'm guardedly optimistic that by the end of the decade we will be sharing remarkable new data sets about the Moon," adds Garvin.

Paul Guinnessy

Wave Power Wins Siemens Westinghouse Competition

Aaron Goldin, a 17-year-old high-school student from San Diego County, California, has won the individual category of the Siemens Westinghouse Competition in Mathematics, Science, and Technology. Goldin invented a device that generates electricity from ocean waves. "I was playing with a gyroscope when I felt the familiar torque on my wrist... and

eventually I realized I could build a wave-powered generator from it," he says. A prototype, built in his garage, is about 20% efficient in energy conversion, roughly half that of a power station. Goldin hopes that with further refinements, the energy efficiency could be more than doubled.

The main advantage of Goldin's invention over other deep-sea wave-powered generators is that it directly converts the periodic torque of the ocean against the floating device into electrical energy. Other generators require a secondary step. All the moving parts are encased inside a protective

shell away from saltwater, which in turn reduces corrosion and hence the maintenance costs of the device.

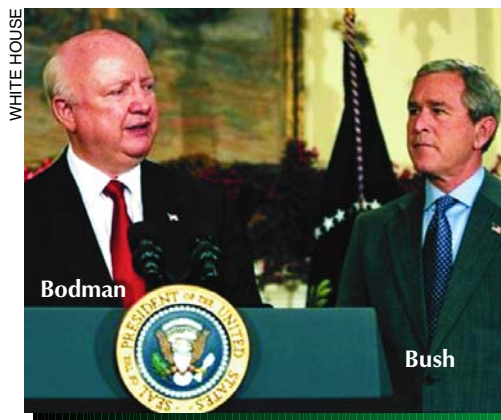
Goldin's award consists of a \$100 000 scholarship to be used toward tuition costs when he starts college later this year. "I hope to continue my studies in physics and engineering," he says, "but at the same time I want to take this opportunity to study some other fields and activities."

Paul Guinnessy

News Notes

Changes at DOE, NASA. The Bush administration's post-election shuffle has included changes in the top jobs at both NASA and the Department of Energy. Spencer Abraham announced his resignation at DOE in mid-November, saying he wanted to spend more time with his wife and three daughters. NASA Administrator Sean O'Keefe resigned in mid-December and is returning to his home state of Louisiana to become the chancellor of Louisiana State University in Baton Rouge.

Samuel Bodman, a Treasury Department official with a background in chemical engineering, was nominated by President Bush to replace Abraham as the secretary of energy. Bodman, 66, is better known in the financial community than the energy industry, but was recommended for the energy job by outgoing Commerce



Secretary Donald L. Evans, a close friend of President Bush.

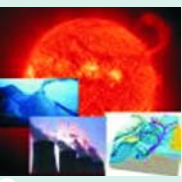
Before moving to the Treasury Department, Bodman was a deputy secretary at the Department of Commerce, where he was responsible for oversight of both the National Oceanic and Atmospheric Administration and NIST. He graduated from MIT in 1965 with an ScD and spent several years at the school as an associate professor of chemical engineering. He left MIT and spent 17 years with Fidelity Investments in Boston, and then became chairman of Cabot Corp, a Boston-based chemical company.

A search is under way for a new administrator at NASA, but it is not clear if anyone will be named before O'Keefe's planned departure date in mid-February.

JLD ■

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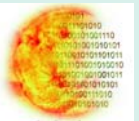
Mitigating the impact of climate change is fraught with unpalatable tradeoffs—all the more reason, believe the five climatologists who founded **RealClimate**, that the public should receive accurate and balanced information about climate science. Launched in December 2004, the RealClimate website provides expert and timely commentary on how climate change is covered in popular media.

<http://nerdling.net/slushpile>



Tania Ritchie studies chemical engineering and physics at the University of Newcastle in Australia. But this austral summer, she is visiting David Base in Antarctica. Her mission is to help retrieve, maintain, and calibrate equipment that monitors Earth's magnetic field. You can follow her progress by reading her entertaining weblog **Slush**.

<http://virtualsolar.org>



The **Virtual Solar Observatory** provides a single portal to more than 50 databases of solar data that are available on the Internet. This site offers several search parameters, including time and spectral region.

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Compiled and edited by Charles Day

Goldin