TOP-RANKED MISSIONS

Large

Solar Probe: A $650 million spacecraft that will come within 4.8 million kilometers of the sun

Medium

1. **Magnetospheric Multiscale:** Four satellites to measure phenomena associated with Earth's magnetosphere
2. **Geospace Network:** Four satellites to observe how Earth is affected by solar storms
3. **Jupiter Polar Mission:** Spacecraft to study Jupiter's magnetic fields

Small

1. **Frequency Agile Solar Radio Telescope:** Wide-band radio telescope for studying solar features
2. **Relocatable Atmospheric Observatory:** Mobile radar designed to study magnetosphere-ionosphere interactions
3. **L1 Monitor:** Solar-wind instrument stationed at the L1 libration point

the Jupiter Polar Mission, that would study the interplay between the sun, Jupiter, and Jupiter's moons.

"The Solar Probe, right now, is canceled, and we're telling them to change course," says panel member James Burch, vice president of the Southwest Research Institute's Instrumentation and Space Research Division in San Antonio, Texas. "The Jupiter Polar Mission is not in the program right now. [The changes] might mean that they have to reshuffle the order of their solar terrestrial probes."

As with a recently released study on planetary exploration (*Science*, 19 July, p. 317), the Lanzerotti panel grouped its ranked recommendations into large ($400 million–plus), medium ($250 million to $400 million), and small (less than $250 million) missions. Some of the experiments, such as the top-ranked Solar Probe, will study the sun directly. Others, such as the second-place Geospace Network, a group of satellites that will monitor Earth's environs, are intended to illuminate how Earth is influenced by the sun. The Solar Probe was the only large mission ranked, whereas nine missions each were included in the small and medium categories.

The panel's plan includes missions for which NASA does not yet have funding. But it will all "fit within the budget we think is going to be available," says Burch, from a current $400 million to $650 million in 2008 and beyond. The panel also concluded that the technical hurdles facing these missions require a new level of cooperation among five government agencies—NASA, the National Science Foundation (NSF), the National Oceanic and Atmospheric Administration, and the departments of Defense and Energy—on basic research as well as operational programs. For example, it recommends that NASA continue research into advanced power, propulsion, and electronics for spacecraft while NSF improves the reliability of ground-based sensors and networks, some of which also operate in extreme environments.

"I think it will help maintain the vitality and health" of the field, says Michael Calabrese, a program manager at Goddard Space Flight Center in Greenbelt, Maryland, who notes that a NASA-sponsored panel is working on a 25-year road map that will supplement the 10-year scope of this report. "That way you get two looks at this," he says. In the meantime, the academy report gives NASA a way to lift missions out of the budgetary frying pan and into the solar fire.

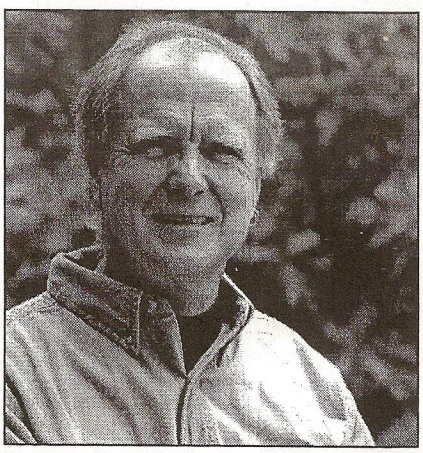
–ANDREW LAWLER AND CHARLES SEIFE

CREDITS: (TOP TO BOTTOM) SOURCE: NATIONAL RESEARCH COUNCIL; STEVE MCCAW/NIEHS

ENVIRONMENTAL SCIENCE

NIEHS Toxicologist Receives a 'Gag Order'

A toxic tiff at the National Institute of Environmental Health Sciences (NIEHS) seems to have escalated into a cause célèbre that has even caught the attention of a member of the House Committee on Government Reform. At the center of the dispute is James Huff, a 23-year veteran of NIEHS's carcinogen testing program and an outspoken critic of the chemical industry. Last month, after clashing with his supervisor, Huff received what he calls a "gag order," a proposed agreement forbidding him from criticizing NIEHS in public. The agreement



Promoted? Amid controversy, NIEHS's James Huff was offered a job in the director's office.

ScienceScope

Patent Protest Academics at the University of Cambridge, U.K., are protesting an administration plan to claim all intellectual property (IP) generated by campus researchers. Critics say the change will stifle innovation and stall the "Cambridge phenomenon": the dramatic growth of university-spawned high-tech companies.

Currently, Cambridge lays claim only to research findings generated using external funds, whereas staff members can independently patent and control IP produced with university grants. But the governing council last week proposed that the university gain control of all campus IP created after January 2003. Any patent profits would be shared among the inventor, the inventor's department, and the university.

The new policy would bring Cambridge into line with most U.K. universities, administrators say. And any connection between the university's hands-off approach to patenting and the commercial success of its spin-offs is "unprovable," they add.

Cambridge computer scientist Ross Anderson disagrees and is drumming up opposition to the plan. Regent House, the university's democratic decision-making body, could vote on the issue as soon as October.

Intramural Introspection National Institutes of Health director Elias Zerhouni is taking a look at NIH's intramural programs to make sure they hew to their official mission. Zerhouni, who's been at NIH 2 months now, told *Science* that the intramural program "plays a very important role" and that he "agrees" that its 10% share of NIH's total $23.5 billion budget is about right. However, he wants to be sure that each institute's intramural portfolio is "second to none" in quality and consists of "programs only the NIH [intramural program] can do."

Michael Gottesman, NIH's intramural research deputy director, has been gathering responses from the directors of NIH's 27 institutes and centers on what "unique things" their intramural programs do. Gottesman says the review is part of "an ongoing process" in which an outside board reviews each institute's intramural component. Zerhouni, he says, simply wants to "be certain" that the program "is used to support high-impact research and training activities which would be difficult to conduct elsewhere."

itself was soon circulating in e-mails, and when outsiders learned about it last week, NIEHS apparently withdrew the order.

Huff, 64, is no stranger to controversy. Beginning in 1979, he helped develop a high-profile program at NIEHS that tests suspected carcinogens on mice and rats by feeding them chemicals over an entire lifetime. Regulators have used such long-term assays to decide which chemicals might cause human cancer—and have come under intense fire for using methods that industry believes exaggerate risk. Huff, the author of more than 300 published scientific papers, has defended the validity of these methods and publicly criticized attempts by NIEHS and industry officials to revise them. Last year Huff publicly blasted a $4 million NIEHS-industry research collaboration on the effects of chemicals on human reproduction and early development.

The draft agreement, which Huff says he received 23 July, came after NIEHS scientific director Lutz Birnbaumer asked Huff to stop other research and prepare a report on a topic Huff isn't interested in. In an e-mail, Birnbaumer said that the disagreement arose because Huff "has refused to review and summarize" an area of cell biology "in a timely manner."

The NIEHS agreement would have required Huff "not to send ... letters, emails or other communications that are critical of NIEHS as an Institute or its scientific work to the media, scientific organizations, scientists, administrative organizations, or other groups or individuals outside NIEHS." It also states that if Huff violates the agreement and can't provide a satisfactory explanation to the NIEHS director, he must retire or resign "voluntarily" within a week, and that he must retire by December 2003 in any case. Francine Little, an NIEHS administrator whose name appears on the memo, declined to comment on it, describing it as a "confidential personnel matter." But she noted that it was part of a negotiation and not "a done deal."

News of the threatened action spread rapidly among toxicologists and public health advocates. Some said they were upset by what they saw as an attempt to silence internal dissent. Lorenzo Tomatis, former director of the respected International Agency for Research on Cancer in Lyon, France, who collaborates with Huff each summer at NIEHS, said the draft agreement "had the tone you would expect to find under a dictatorship." And Christopher Portier, director of NIEHS's environmental toxicology program, said he had not seen the memo firsthand, but "it sounds somewhat extreme."

Congress is getting into the fray as well. Representative Dennis Kucinich (D–OH), in a letter he sent last week to NIEHS director Kenneth Olden and Little, demanded information on Huff's case and NIEHS policies on gag orders. "NIEHS should be determining the incidence of human illness caused by chemical, pollutant, and other environmental causes, not putting a gag order on one [of] its best scientists," Kucinich wrote in an e-mailed statement to *Science*.

Olden, who was away on vacation, could not be reached for comment. But David Brown, an assistant to Olden, said Olden telephoned Huff on 2 August and offered him a new job in the director's office. Brown concludes, "There's no story now." Huff says he's encouraged by the offer but adds: "No commitments have been made. ... I want to see what they put in writing." –DAN FERBER

HIGH-ENERGY PHYSICS

Muon Measurements Muddle a Model

Scientists at Brookhaven National Laboratory in Upton, New York, hope they've made a momentous discovery: They have confirmed a nagging discrepancy between the Standard Model of particle physics and the "magnetic moment" of the muon. Physicists are still debating just how significant the mismatch is, however.

"That's what we're all asking ourselves," says Frank Wilczek, a physicist at the Massachusetts Institute of Technology. It's possible that the discrepancy is a statistical glitch or a problem with the theoretical calculations, or it might be a sign of physics beyond the Standard Model.

The new result, presented last week at a seminar at Brookhaven, is twice as precise as earlier results of the experiment, presented last year (*Science*, 9 February 2001, p. 958; 21 December 2001, p. 2449). In the experiment, known as muon g–2 (pronounced "g minus two"), scientists used a 14-meter-wide superconducting magnet in Brookhaven's Alternating Gradient Synchrotron to induce muons—heavier siblings of the electron—to curve around in a circle. In the process, they measured the muon's propensity to twist in a magnetic field, known as its magnetic moment. They have now measured the value to an uncertainty of 0.7 parts per million. "It's just an awesome experiment," says Wilczek.

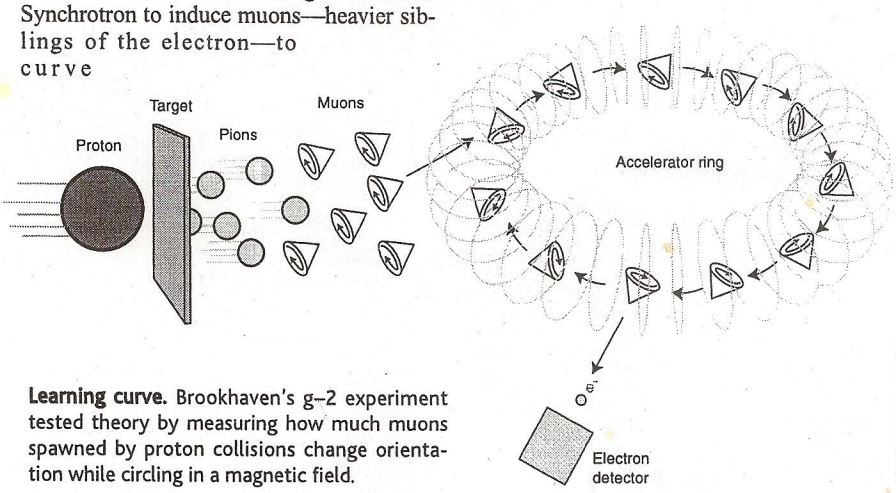
The results give "a very nice, consistent picture" of the magnetic moment, says Boston University's Lee Roberts, a member of the muon collaboration. "But the question for the theoretical community is ... what we should really be comparing it with."

Physicists would like to test the value against the Standard Model, the theoretical framework that explains how particles interact. The model predicts what the muon's magnetic moment should be. Unfortunately, at present it gives two different numbers.

That's because the theory relies on other experiments to fill in data that aren't easily calculated from first principles. Physicists can get the missing information either by studying electron-positron collisions or by watching the decay of tau leptons, other heavy siblings of the electron. The two methods should agree, but they don't.

According to team member James Miller of Boston University, this makes it hard to evaluate just how significant the disagreement between experiment and the Standard Model is. "We're not sure which number to take," he says. Using tau-decay data, the difference is a mere 1.6 standard deviations, which is not considered significant. Using published electron-positron data, the number jumps to 2.6 standard deviations, which is considered interesting but far from conclusive. However, using new, unpublished electron-positron data from the Budker Institute of Nuclear Physics in Novosibirsk, Russia, the significance jumps to 3.7 standard deviations—which, if true, would be a significant result.

"My first statement would be not to be in a hurry" to jump to a conclusion about the mismatch between theory and experi-



Learning curve. Brookhaven's g–2 experiment tested theory by measuring how much muons spawned by proton collisions change orientation while circling in a magnetic field.

ILLUSTRATION: C. SLAYDEN

2 of 2