

injunction, according to Barbara Mishkin, a Washington attorney who represents several scientists accused of misconduct. NIH might ask the solicitor general—who authorizes all federal appeals—to contest the ruling, but Charrow believes the agency is more likely to just give in and begin a formal rule-making process. If so, its current investigations will probably grind to a halt until new rules are properly in place.

If NIH does go through a formal rule-making process, outsiders would have a chance to influence the way the OSI performs its investigations, a prospect that energizes Abbs' attorney, Carl Gulbrandsen. "I hope that universities and organizations which represent scientists get involved in urging OSI to adopt new rules," he says. In particular, Gulbrandsen would like to see OSI give those being investigated the right to question witnesses and review evidence. Mishkin also wants to see more protections built into the investigative process, pointing out that under existing rules, it can take years for a scientist to receive a full hearing.

OSI may resist such changes, however, since Crabbe ruled that although the procedures were improperly promulgated, their content does not raise constitutional problems. Abbs, who is under investigation for allegedly forging three graphs in a 1987 *Neurology* paper, had claimed that the threat to his reputation and future federal funding required OSI to provide him with "due process" protections allowing him to cross-examine witnesses and review the evidence marshaled against him. But Crabbe ruled that damage to reputation alone is not a sufficient reason to invoke due process protection, and pointed out that since the current guidelines entitle Abbs to a full hearing if NIH barred him from receiving federal funds, OSI had already afforded him sufficient due process.

Although NIH may use this element of the decision as justification for avoiding a full-scale reformulation of its procedures, Crabbe also made clear that the agency has plenty of room for improvement. In a court hearing last August, the judge said she was "appalled" by the "discretionary" and "unspecified" nature of the OSI procedures. "I must say I was shocked that an agency of the United States...would permit procedures such as the ones that I saw promulgated. I thought they were the work of amateurs. They didn't seem to have any consideration whatsoever for the very serious subject matter that they were investigating." The lengthy process of taking such considerations into account not only leaves NIH with a major predicament, it also leaves those it has been investigating—some for well over a year—still twisting in the wind.

■ DAVID P. HAMILTON

# Leon Lederman's Quest: Double Science Funding

*A report sent to all AAAS members urges special treatment for science, but Lederman's calculations and tactics draw fire*

LEON M. LEDERMAN, THE NOBEL PRIZE-winning physicist and president-elect of the American Association for the Advancement of Science, has a mission. He aims to convince anybody who will listen—from his fellow scientists, to science policy makers, to members of the public—that "academic science is in very serious trouble." He bases this conclusion on an informal survey of some 250 scientists at 30 research universities and on his personal calculations of how the ratio of research dollars to researchers has declined since 1968—a year he picks as science's Golden Age. To bring a return to those happier days, he believes the federal government will have to double its spending on academic research.

Lederman has made this theme a campaign, kicked off by a personally written report, *Science: The End of the Frontier* (sent with this issue of *Science*), and a meeting, held on 7 January at the National Academy of Sciences, to convey the contents of the report to policy makers in Washington, D.C. That meeting revealed that Leder-

man will have some convincing to do. Critics were quick to question both the way Lederman reached his conclusions and the methods he intends to use to seek more federal spending on research. In a statement commenting on the report, Presidential Science Adviser D. Allan Bromley called Lederman's evidence "anecdotal." While admitting that many individual scientists have experienced difficulty obtaining research funds, Bromley argues that between 1968 and 1988 federal support for academic research rose from \$5 billion to \$8 billion, an increase of 60% in constant dollars. But Lederman says Bromley isn't using the appropriate inflation corrector—inflation in science has risen faster than the rest of the

economy—and the true increase is closer to 20%. Regardless of who is right on the specific budget numbers, science is clearly better off than many other segments of the budget, prompting Frederick M. Bernthal, acting director of the National Science Foundation, to say, "My heart tells me that I'm sympathetic with [Lederman's goals], but my head tells me we've got a lot of convincing to do."

Lederman is not deterred by his critics. At the meeting he acknowledged some of the shortcomings of his informal survey, but insisted the conclusions about the malaise among researchers are an accurate reflection of the true state of affairs. "I would be amazed if a more thorough survey wouldn't have come up with the same results," he said. Lederman did not have to look far to find people who share his conclusions. "I feel more and more uneasy about advising students to enter science," said Daniel Kleppner, professor of physics at the Massachusetts Institute of Tech-



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**Man with a mission. Will Lederman's charisma help sell science?**

nology, who presented a researcher's perspective at the meeting. "My chief contribution to my research is to raise money for it," he told the audience. Alan P. Koretsky, assistant professor of biological sciences at Carnegie Mellon University in Pittsburgh, also described how funding shortages were having a negative effect on his research lab. "I cannot give my students the same freedom I was given," he said. "The most exciting and risky projects have been put in limbo."

Lederman argued that scientists basically have two choices about how to seek remedies to their financial woes. They can either acknowledge that fiscal times are tight and tighten their belts like everyone else or, alternatively, they can argue that support for

science and education holds the key to future economic health, and that tough financial times are precisely when support for science should be the strongest. When society perceives a need, the money is found to meet it, says Lederman. Although it will take an additional \$10 billion to meet his doubling goal, "It isn't a matter of money," he says. "It's a matter of choice."

Frank Press, president of the National Academy of Sciences, agreed that doubling federal support for science will pay back as an investment. But, he added, "No nation can write a blank check for science." Echoing a theme he first sounded 2 years ago (*Science*, 23 December 1988, p. 1626), Press insisted that "scientists must participate in establishing priorities," something Lederman's report does not discuss.

Others emphasized that it is important for researchers not to appear as just another special interest group begging for a bigger share of the federal research pie. Robert L. Stern, secretary of the industrial science section of AAAS, warned that although Lederman's report could be a rallying point, it could also be perceived as self serving by a Congress besieged with pleas for money. He argued that emphasizing the importance of science for the economy will make it easier for politicians to support the report's conclusions. Senator Albert Gore, Jr. (D-TN) took up this theme, saying that Congress' willingness to support an ambitious expansion in federal spending on science will depend on whether the public believes "it will pay off, not only in advancing the frontiers of science, but also in the collateral benefits that have accrued in the past"—specifically products and services that will benefit economic growth.

The decision to send Lederman's report to all 140,000 members of AAAS is an unusual step for the association. When asked if this signalled an intention to increase lobbying efforts on behalf of federal spending for science, AAAS executive officer Richard S. Nicholson denied that the report represented an attempt to lobby, repeating instead a rhetorical question posed in the report: "Is it not the obligation of societies like AAAS to bring the state of science to the attention of policy makers and the public that pays for and ultimately benefits from research?" Although AAAS paid an estimated \$30,000 to publish and distribute the report, it is Lederman's personal statement and has not been formally endorsed by the AAAS board of directors.

For his part, Lederman is not sure what his next step will be. The report will be presented to the AAAS board of directors at its next meeting in February. "I guess I'd better have an action plan ready by then," he says.

■ JOSEPH PALCA

# Skeptics and Visionaries Examine Energy Saving

*Some say new, efficient appliances could save enormous amounts of energy—and solve the greenhouse problem. But will they be used? There's the rub*

BERLIN—NO SUCH THING AS A FREE LUNCH? Try this. Replace one 75 watt incandescent lightbulb in your home or office with a modern 15 watt compact fluorescent tube. You get the same amount of light for 13 times longer, cut your lighting bill by 80% to 90%, and over the lifetime of the tube save enough coal-fired electricity to keep about a ton of carbon dioxide out of the atmosphere. Factor in reduced maintenance costs, and the compact fluorescent tube costs about 0.6 cents less per kilowatt-hour than the incandescent bulb it replaced. "This is no free lunch," says Amory Lovins, director of research at the Rocky Mountain Institute in Snowmass, Colorado, "It's a lunch they pay you to eat."

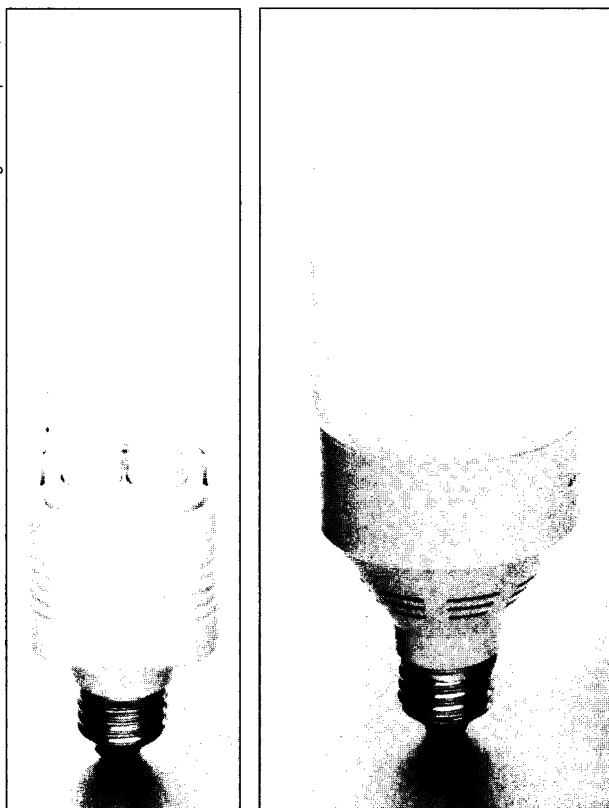
Lovins, high priest of energy efficiency, was spreading the gospel at a Dahlem Conference convened last month to ask how to control the accumulation of atmospheric carbon dioxide, and thus minimize the feared additional greenhouse effect.\* His answer: Look after energy, and CO<sub>2</sub> will look after itself. Lovins makes an even grander claim: He says his institute has identified 50 energy-saving technologies that, if implemented worldwide, would cut global energy use in half.

Lovins has been saying much the same thing for years, and critics have always charged that the costs are far higher, and the savings far lower, than Lovins claimed. John Reilly, an economist with the U.S. Department of Agriculture's Economic Research Service, spoke for some of the other Dahlem participants when he asked bluntly: "If it's so damn good, why isn't anyone using it?" The answer is, they're starting to. The reasons became apparent at

the meeting: technology is improving rapidly, so that some of Lovins' more outlandish claims have become more possible; and econometricians like Reilly have begun to see that they really can start to think seriously about energy-saving technologies.

Reilly represents the classical econometricians' top-down view: They look at past trends in energy use—for example, after the price hikes of the 1970s—and see no evidence that

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people can be convinced to use the most energy-efficient technologies, even when to do so would be in their long-term economic interest. Instead, the econometricians observe, short-term costs play a disproportionate part in consumer decisions.

Lovins, on the other hand, represents the engineer's approach: from the bottom up. He calculates overall savings by measuring each device and assuming the best devices would all be used; if they aren't, that only

\*The Dahlem Workshop on "Limiting the Greenhouse Effect: Options for Controlling Atmospheric CO<sub>2</sub> Accumulation" was held in Berlin from 10 to 14 December 1990. The results will be published by John Wiley & Sons Ltd., Chichester, England.