change in a stable way with disease—itself a first step to identifying molecular markers of disease and potential drug targets.

The time-consuming approach of gel cutting does allow such quantification. But that's typically not the case when the spots are transferred, or blotted, to another membrane, says Parekh. "Some proteins don't blot. Others are lost in the process. So as soon as you blot, you lose the quantity information," he says.

PE is betting that Aebersold's technology will help. In the October 1999 issue of *Nature Biotechnology*, Aebersold and his University of Washington colleagues reported a new approach that uses stable isotopes to quantify numerous proteins in cell extracts with mass spectrometry. The advance is "outstanding," says Hochstrasser, because it allows mass spectrometers to pin down protein levels from large numbers of proteins at once—a difficult proposition with today's technology. At this stage, it is not clear whether the new technique will work with a molecular scanner and a high-speed mass spectrometer. To find out, Aebersold is already working on joint research projects with PE scientists.

Even if it takes a while to get the mass spectrometers up to top speed, Celera can still make considerable progress, says Venter, as the company will be using other proteomics tools as well. A key approach, he says, will be to create antibodies to all proteins. These antibodies can then be used to fish out of a sample both targeted proteins and those they interact with. That, Venter says, will help Celera build up a database of how proteins interact with each other in complex biochemical pathways—information that is likely to be valuable to drug companies aiming to intervene in those pathways at specific points.

Incyte's Whitfield says he is not fazed by Celera's entry into the field. Even if PE and Celera manage to pull all these pieces together and launch a high-speed proteomics effort, other companies will also be developing their own high-speed approaches, he says: "We all understand that faster, cheaper, better is the way to go." With Celera preparing to enter the field, Whitfield adds, "I'm sure there is going to be great competition."

–ROBERT F. SERVICE

TECHNOLOGY CONTROLS

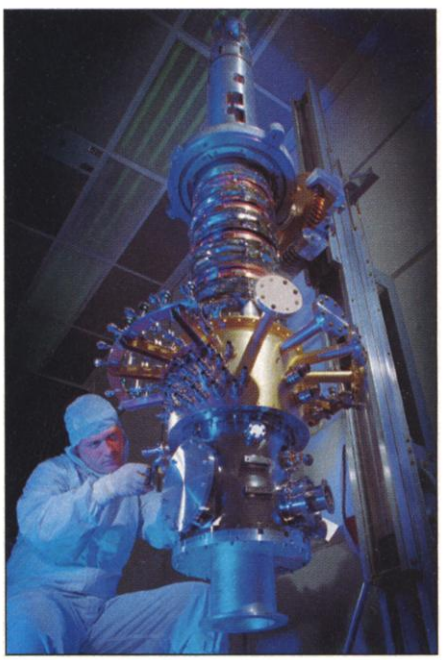
Space Scientists Decry Stricter Export Rules

Congressional moves to tighten technology regulations could restrict collaborations with non-U.S. scientists

When Stanford University needed a proton detector for a NASA-funded satellite that would probe Einstein's theory of relativity, it ordered one from a Hungarian scientist living in Ireland. Last summer the detector was shipped to a Lockheed Martin facility near Denver for testing. But company officials, citing new rules on the export of sensitive satellite technology, said the scientist was not welcome without express permission from the State Department—a notoriously costly and time-consuming process. Stanford scrambled successfully to find another company that would allow the designer to test the instrument, and work continues on the payload (*Science*, 10 March, p. 1726).

This incident and other episodes—including one in which universities were reluctant to bid on a program for fear of breaking the rules—have left researchers worried about the status of international collaborations. Lockheed's hard line stems from rules drawn up last spring by the State Department, at Congress's insistence, that are designed to prevent sensitive technology from falling into the wrong hands. Researchers fret that a strict interpretation of the rules could have dire consequences, including jail if, for example, they discuss spacecraft designs with foreign graduate students without prior approval. "This is a terrible problem," fumes Stanford physicist and engineer Brad Parkinson. "It flies in the face of reason." But officials at State insist that scientists are exaggerating the threat and that the regulations should not affect research in any dramatic way. "It's an overreaction," says William Lowell, chief of State's office of defense trade controls. "I'm sure we can address 95% of these problems."

The dispute is the latest battle in a long-running war between defenders of national security and scientists who work in sensitive areas. In the early 1980s, for example, scientists fought attempts by the Reagan Administration to regulate the flow of research equipment and data overseas through U.S. arms traffic regulations, which control the import and export of technology, such as satellite technology, with military applications. A 1985 executive order marked a truce by declaring that the problem would be handled by classifying sensitive materials as secret rather than by imposing restrictions on exports.



Under wraps. New rules on sensitive technology affect access to payloads such as Gravity Probe B.

CREDIT: R. UNDERWOOD/LOCKHEED MARTIN MISSILES AND SPACE

But in 1998 Congress told the Administration to take a tougher stance on technology exports, citing the alleged transfer of sensitive satellite technology to China in the course of that country's launching of U.S.-built payloads. As part of the annual authorization of defense programs, it ordered the Administration to shift responsibility from the Commerce Department, which had exercised oversight since the early 1990s, to the State Department. Commerce traditionally seeks ways to promote trade and has a license exemption for technology connected with fundamental research, while the State Department has a reputation for taking a more hawkish position on the transfer of technology.

The new rules put spacecraft technology, with the exception of information in the public domain, on the department's roster of technologies deemed militarily sensitive. That includes not just hardware but also any technical data and the act of providing technical data to foreigners on the design, manufacture, use, and repair of an item. "Under existing rules, [even] speech can be deemed subject to licensing," says one official at the National Research Council (NRC).

A small cadre of policy-minded researchers have begun to protest what they see as a grave danger to scientists with overseas collaborators or who purchase equipment from abroad.

"This is chilling the climate" for space research and "putting a burden on a lot of researchers," warns Claude Canizares, a Massachusetts Institute of Technology physicist and chair of the NRC's space studies board. In a 4 February letter to NRC chair Bruce Alberts, he warned of "serious repercussions in the university and industrial communities" that threaten to undermine international cooperation on space projects. Canizares urged Alberts to organize a workshop on the issue, and on 16 March he briefed NASA Administrator Dan Goldin during a meeting of the NASA Advisory Council, which named Canizares chair of a subcommittee to study the issue.

State Department managers maintain that the rules are no stricter than when the department was previously in charge of satellite-related licensing and should not hinder researchers. "We don't regulate fundamental and basic research at universities, and there is no intention by State to bring about a change in scientific research," says Lowell. There are exemptions in the rules for university researchers, he added, giving them more flexibility than industrial scientists and engineers.

NASA's Robert Tucker, who handles the issue for the space agency, notes that foreign scientists who are full-time employees at a U.S. university do not need licenses to be involved in satellite work. But given the continuing congressional interest in the issue—legislators held several hearings last year—and related judicial decisions, nervous university lawyers and companies such as Lockheed Martin are interpreting the rules strictly in cases like the one involving the Stanford payload, called Gravity Probe B. For example, some university teams were reluctant even to respond to a recent NASA request for proposals for scientific payloads in a small satellite program, Canizares says, out of concern that they would need export licenses to discuss technical details of the payload with foreign-born students. "People are so worried about this, there's a cascading of conservatism," Canizares told Goldin. Both Canizares and Parkinson, who chairs the NASA Advisory Council, urged Goldin to convey the community's concerns to Administration officials.

The controversy comes at an awkward time for Goldin, who just 2 months ago announced an initiative to improve and expand NASA's relationship with universities. But NASA officials are loath to risk antagonizing Congress in pressing their case. In February, the agency notified contractors that they are responsible for getting the necessary export licenses for hardware, software, technical data, or technical assistance, as well as for situations in which "the foreign person" has access to data or software.

"I would not like to see hearings [involving] NASA-funded researchers who face criminal prosecution," Goldin told Canizares at the advisory council meeting. But he nevertheless agreed to examine the issue and pledged to work cooperatively with universities.

The controversy doesn't stop with satellites. Other academic groups are fearful that congressional hostility to many types of international exchanges may spread to work in other areas. For example, Department of Energy (DOE) researchers must navigate much stricter rules than in the past when interacting with foreign colleagues and graduate students, part of the fallout from allegations of lax security at nuclear weapons labs. In response, Rachel Claus, counsel for the DOE-funded Stanford Linear Accelerator Center, has urged universities to stand united and to refuse to attend "U.S. citizens only" meetings held by timid hosts. The Washington-based Council on Government Relations and the Association of American Universities have also begun to raise the issue with Administration officials.

But most scientists seem to be talking to themselves. Lowell said last week that he has received no complaints from the scientific community about the rules regarding spacecraft. At the same time, he says the department is only a week or so away from revising those regulations based on vocal concerns from industry. "If scientists want to make changes," he says, "this is the time."

–ANDREW LAWLER

BIOMEDICAL POLITICS

Controversial Cancer Therapy Finds Political Support

Some members of Congress and presidential hopefuls are lobbying the FDA to let a 4-year-old boy receive an unapproved treatment

For nearly 2 decades, Texas physician Stanislaw Burzynski has battled the medical establishment and federal officials over his controversial treatment for cancer. Many patients who have flocked to the Burzynski clinic outside Houston claim to be cured. But the Food and Drug Administration (FDA) maintains that his drugs, dubbed antineoplastons, have not been shown to be either effective or safe and has tried to shut him down. Burzynski prevailed in a key court battle in 1997 and continues to practice. But under FDA rules, he can only use these drugs in experimental trials monitored by the agency, and only on patients who have exhausted conventional therapies. Now Burzynski's powerful allies in Congress and on the presidential campaign trail have launched a major lobbying campaign and media blitz to overturn that rule. It is the latest saga in the long-running battle over who should control access to unorthodox medical treatments.

At the center of the furor is a 4-year-old boy with brain cancer, Thomas Navarro, whose parents want him to have access to Burzynski's unapproved treatment. The child's plight has been broadcast on NBC Nightly News and last week was the focus of a six-page spread in *People* magazine. Representative Dan Burton (R–IN), a longtime Burzynski supporter, has introduced a bill in Congress, named for the boy, that would strip FDA of its power to protect patients from clinical trials where safety is an issue. Some in the medical establishment fear this latest furor could open the floodgates for patients who want access to untested, and possibly dangerous, therapies. Burton's bill, in particular, is

Big guns. Both Rep. Dan Burton *(left)* and Alan Keyes *(right)* are championing the cause of Thomas Navarro (seated).

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