"if any portion of the SDI is vulnerable because of the available technology, then this is probably it." But, along with others, he appealed for "unconstrained brainstorming" to develop innovative ideas.

The panel from which Parnas resigned was established to help guide the software research. "Given the current state of software technology, he may be right," says James Offutt, an SDI assistant director for battle management. "I don't think this area is as mature as weapons and sensors, for example. But we're not concerned with the current technology; we're concerned with where we'll be in 5 or 10 years." He is particularly optimistic about using "a hybrid of artificial intelligence and numerical algorithmic programming" as well as about potential improvements in hardware that might ease the requirements somewhat.

Daniel Cohen, director of the systems division at the USC Information Sciences Institute and codirector of the battle management advisory panel, says that he agrees with many of Parnas's conclusions, but also remains optimistic. "Parnas is absolutely right that it can't be tested; that artificial intelligence probably will not help; that program verification techniques are still in their infancy; and that automatic programming also will not solve this problem. Yet there is a very good chance that this code can be written in less than 5 years. It is, after all, not more complicated than the Apollo moon shot, by much."

But others, such as Herbert Lin, a research fellow at MIT who has written an extensive report on battle management, offer less flattering analogies to suggest that systems which cannot be tested and debugged are likely to fail. "Gemini V missed its landing point by 100 miles because its guidance program implicitly ignored the motion of the earth around the sun," Lin says. A more contemporary example was provided several weeks ago when the space shuttle flubbed a "Star Wars" laser experiment because its computer was given instructions in feet rather than nautical miles.

In his letter, Parnas criticizes the battle management panel because it "contains not one person who has built actual battle management software . . . and no experts on trajectory computations, pattern recognition, or other areas critical to this problem. All of its members stand to profit from continuation of the program." Copies of his letter have been sent to members of the Senate Armed Services Committee and to presidential science adviser George A. Keyworth, II.—**R. Jeffrey Smith**

## U.S. Wants to Keep Eye on Biotech Exports

For the past couple of years, the Departments of Defense and Commerce have hinted that they might place export restrictions on some areas of biotechnology. Now there appears to be some slight movement on the issue.

The Defense Department, worried that the Soviet bloc may be trying to exploit the technology for biological warfare, said recently that it will ask the nation's allies to begin tracking biotechnology exports. At a meeting this fall in Paris of COCOM, the Coordinating Committee for Multilateral Export Controls, the Defense Department will propose that certain exports related to genetic engineering be placed on a watch list and monitored by its members, which include Japan and members of the North Atlantic Treaty Organization, except Iceland and Spain. The department has not yet decided what exports it wants monitored.

This disclosure immediately aroused fears among scientists and administrators in industry and academia that the Defense Department would restrict the flow of research information. But Stephen D. Bryen, deputy assistant secretary of defense, who heads the Pentagon's efforts to regulate strategically important technologies, says that the Defense Department "is not talking about restricting basic research. It's been blown out of proportion that we'll clamp down on information flow. We simply want to conduct monitoring to see where the technology is going," he said. "The premise is that it's possible that the Soviets are engaged in developing biological weapons."

Bernadine Healy, deputy director of the Office of Science and Technology Policy, said after a Cabinet council meeting on 12 July, at which biotechnology was the subject, that "there is no talk about restricting scientific communication." Healy, who is coordinating the development of federal regulation in biotechnology, said, "The issue is whether the watch list will have specific products on it."

Bryen stressed that discussions about what should go on the watch list are still at a very preliminary stage. (Some biological materials and equipment are already restricted under Commerce Department rules.) A list will be drawn up internally and then presented to COCOM. Industry will be consulted at a later date, Bryen said.

Industry representatives, however, may get some input through the Commerce Department. The department is forming a committee of outside experts to advise officials how to modify the existing export restrictions to enhance U.S. trade while balancing national security concerns. The chairman of the committee is Michael G. Hanna, Jr., director of Litton Institute of Applied Biotechnology, but the rest of the committee has not yet been fully constituted. Hanna said, "It is my understanding that we will be participating in the Defense Department's discussion as they develop the watch list."

The Commerce Department "is simply discussing whether export control is needed, but nothing much is going on right now," said Alfred Hellman, who is a technical adviser at Commerce and was formerly a cell biologist at the National Cancer Institute. Hellman noted that the department recently approved funding for two scientists to monitor trade in biotechnology while based in London and Tokyo. "We want to find out what other countries are selling in terms of biotechnology. It would be ludicrous for our companies to be restricted from selling abroad if comparable products by foreign producers are on the market," Hellman said.

Joseph Perpich, vice president of Meloy Laboratories, which develops biotechnology products, says the review of export laws is a legitimate exercise because some of the restrictions are outdated. But "it's essential that Defense and Commerce don't create rules rapidly and get into an adversarial relationship with the industry as they have done with the computer industry."—**Marjorie Sun**

## Creationists Lose Again

Fundamentalist religious groups have lost another legal battle in their attempts to require the teaching of so-called creation science in public schools. On 8 June, a federal appeals court in New Orleans ruled that Louisi-

ana's balanced treatment act, which mandates equal treatment of creation science and evolution in the state's public schools, is unconstitutional.

The appeals court, which upheld a ruling delivered earlier this year by Judge Adrian Duplantier (*Science*, 25 January, p. 395), said the law violates the constitutional guarantee of separation of church and state. "We seek simply to keep the government . . . neutral with respect to any religious controversy," the court said.

Two days after the appeals court decision, Louisiana Attorney General William Guste said he would appeal the ruling to the 16-member fifth circuit court to rehear the case.

A similar law in Arkansas requiring the teaching of creation science in that state's public schools was struck down for the same reason in 1982.

—COLIN NORMAN

## Generic Valiums Clear Another Hurdle at FDA

The Food and Drug Administration (FDA) has rejected arguments by Hoffmann–La Roche Inc. that the agency is using the wrong tests to evaluate generic versions of Valium. The decision removes what could have become a major obstacle to agency approval of generic forms of Valium, whose patent expired in February. Several manufacturers have applications pending before FDA to manufacture generic diazepam, the active ingredient in Valium.

Shortly before Valium went off patent, Roche filed a petition asking FDA to use a new method to measure whether generics are indeed equivalent to Valium (*Science*, 26 April, p. 472). The changes, if adopted, would have been more costly and time-consuming for generic companies. In the petition, Roche contended that the agency should require computerized brain-wave tests in addition to blood sampling as a measure of bioequivalency. It based its claims mainly on a company-sponsored study, which, it said, showed that generic diazepams available in Canada and Turkey did not produce the same central nervous effects as Valium.

Harry Meyer, director of the Center for Drugs and Biologics at FDA, said in a letter to Roche that the company had failed to provide well-documented evidence to support its various claims. Meyer noted that a blood level study, which compared the foreign generics to Valium, was so "seriously flawed" that it "invalidated" the company's argument that the brain-wave tests can distinguish important differences between generics and Valium.

While the agency rejected a majority of Roche's claims, FDA agreed to slight changes in its bioequivalency testing procedures on two counts as a result of the petition. The rate at which diazepams dissolve will be measured at a higher *p*H, and blood samples will be collected at an earlier stage in testing. Company officials say the revisions that FDA did agree to were a significant victory. "FDA should be appreciative of our petition," Bruce Medd, a Roche scientist said.

A generic company bidding for part of the Valium market says that its product meets the revised guidelines anyway. The changes will not hold up approval, says James Leonard, who is now president of Zenith Laboratories Inc., a generic drug company, and was president of Roche Products for 18 years.

Marvin Seife, director of FDA's division of generic drugs, said that the petition has not held up the agency's review of the generic diazepams and says approval may begin within the next month or two.—MARJORIE SUN

## USDA Smooths Way for Biotech Imports

Biotechnology companies will be able to import cell lines and other biological materials more cheaply and swiftly as a result of an agreement struck last month with the U.S. Department of Agriculture (USDA).

The department quarantines incoming biological materials at its Plum Island facility to prevent the introduction of hoof-and-mouth disease and other livestock diseases foreign to the United States. But companies have complained that the process of clearing USDA quarantine rules and testing procedures can take up to 18 months. The department agreed to changes that will shorten the process to 2 months.

Companies, which expect to import substantially more biological material in the next few years, will now be able to finish the necessary paperwork while their material is being tested. USDA previously required the paperwork be completed entirely before testing could start. In addition, companies can set up escrow accounts to fund the tests. USDA used to bill the firm and require payment before testing could proceed.

The testing process will be less expensive as well. USDA agreed to permit the use of in vitro tests in place of several in vivo tests, which cuts the cost for the companies by $6000 to $7000 per test.

The industry also has asked the department to grant exemptions to the rules if the incoming biologics are intended only for human use, but this issue is still under discussion. James Glasser, associate director of the Animal and Plant Health Inspection Service, said that before exemptions would be granted, the agricultural community will have to be "sensitized" to the idea, and criteria defining safeguards would have to be set.

—MARJORIE SUN

## Comings and Goings

**Bernard D. Goldstein**, head of research and development at the Environmental Protection Agency, is resigning effective 2 August to return to the University of Medicine and Dentistry of New Jersey–Rutgers Medical School. Goldstein was recruited 2 years ago by former agency administrator William Ruckelshaus as part of the new crew to set EPA back on course after Anne Burford resigned. Goldstein was recently approached to head the beleaguered Occupational Safety and Health Administration, but declined so that he could return to his family in New Jersey. He will be heading a new graduate program in environmental health. No successor to Goldstein has been named.

**Richard S. Nicholson** has been nominated to be assistant director for mathematics and physical sciences at the National Science Foundation. Nicholson has been staff director of the foundation. His appointment is subject to Senate confirmation, which is expected.—MARJORIE SUN