Subcommittees Vote 'Big Science' Veto

A House appropriations subcommittee voted last week to kill funding for the planned U.S. space station. At the same time, it left intact most other science programs within NASA and the National Science Foundation, and boosted research funding for the EPA.

The subcommittee has jurisdiction over the budgets of all independent federal agencies. Its vote, which shocked NASA officials and aerospace contractors, holds strong symbolic value, reflecting the willingness of Congress to reevaluate its commitment to politically popular "big science" projects.

The full appropriations committee could overturn the decision in the next few weeks. Or House members could reject this appropriations bill and restore space station funds when the bill comes to a vote on the floor. However, several knowledgeable insiders suspect the subcommittee's verdict will stand. Just one day after the vote, Rep. George E. Brown Jr. (D-Calif.), chairman of the House Science, Space and Technology Committee, said the space station "looks like it's defunct."

During the same week, a second appropriations subcommittee voted to sharply reduce spending on another controversial megaproject: the Superconducting Super Collider (SSC).

Many science policy analysts and lawmakers on Capitol Hill read last week's balloting not just as votes against the space station and SSC, but as watershed challenges to the multibillion-dollar "big science" projects that dominate the budgets of major research agencies.

Daniel Sarewitz, a staff member of the House science committee, says the first appropriations subcommittee essentially offered "either to cut out the space station and leave funding for basic science at NASA, EPA and NSF intact, or to fund the space station and cut severely basic science." This tradeoff, "driven solely by fiscal constraints," does not reflect any particular philosophy of science policy or what's best for the research and development community, Sarewitz maintains.

The cost of Space Station Freedom, originally estimated in 1984 at about $8 billion, may approach $40 billion, according to the most recent projections. Congress has so far spent $4 billion on it.

"We simply can no longer afford huge new projects, with huge price tags, while trying to maintain services that the American people expect," says Rep. Bob Traxler (D-Mich.), chairman of the subcommittee that voted to terminate the program.

The space station has suffered considerable criticism recently. In March, for example, the Washington Post and the Springfield, Va.-based Space News, respectively, published leaked evaluations of the program by a National Research Council committee and by the President's Office of Science and Technology Policy. Both articles questioned the space station's scientific value in light of newly proposed cost-cutting changes. "Federally Funded Research," a report released last week by the congressional Office of Technology Assessment (OTA), also concludes that "the space station has little justification on scientific grounds."

However, the OTA report cites a general, tacit expectation that once "the 'go/no-go' decision has been made at the national level," funding to complete a science megaproject will "be honored, no matter how much the cost estimates or timetables for completion change." Last week's votes appear to signal a change in this implied contract — a change portended by recent budget limitations, the OTA report maintains.

"I foresee a message coming out of the appropriations committee that we are not going to be able to fund the big projects — the megaprojects," says Rep. Ron Packard (R-Calif.), a House science committee member. "If we can't provide the research that will stimulate and motivate the private sector to do some of those [megaprojects], they probably won't get done."

The new subcommittee decisions have also reignited debate over how Congress sets its funding priorities. What these votes "bring to light is that we don't have a mechanism in Congress yet for studying [research] priorities," Brown maintains. "We need a system that can set priorities — as, say, between the space station and the SSC, or between the civilian space program and the military space program."

The OTA report reaches a similar conclusion: "There are few mechanisms and no tradition [within the federal funding system] of ranking research topics across fields and subfields of inquiry."

Because the science community "has long declined to engage in priority setting," Congress has been forced to do so, the report contends. Moreover, the report argues that Congress' efforts have fallen short in three ways:

- "Criteria used in selecting areas of research and megaprojects are not made explicit, and appear to vary widely."
- "There is currently no formal or explicit mechanism for evaluating the total research portfolio of the federal government in terms of progress toward national objectives," such as increasing national security, health, economic activity or educational resources.
- The principal filters used as criteria for screening the projects most worthy of funding — scientific merit and mission relevance — have proved too coarse to narrow the field to a manageable list of choices.

Brown, responding to this analysis, announced last week that he had created a task force within the House science committee to focus on the health of research. Expected to meet weekly, the 10-member group aims to develop more useful criteria for helping Congress set research funding priorities, especially across scientific disciplines.

Sarewitz, a member of the new task force, says, "We need to set up some way of comparing programs that might seem scientifically not comparable," such as whether and how much each project contributes to the achievement of already articulated national goals. He adds that the task force might also consider asking federal research agencies to articulate their long-term strategic goals — and then making them "come back to us with the data that show whether or not they're achieving those goals." — *J. Raloff*

Manic depression: Success story dims

Since the discovery more than 30 years ago that lithium salts can take the edge off the sharp mood swings of manic depression, psychiatrists have considered this treatment a major success story. However, a 7½-year follow-up of formerly hospitalized manic depressives shows that about 40 percent of those receiving lithium, sometimes combined with other treatments, continue to experience marked emotional highs and lows, as well as serious problems at work and home.

On the positive side, the study charts consistent improvement and good overall functioning among one in three lithium-treated manic depressives.

Joseph F. Goldberg of Michael Reese Hospital in Chicago presented the new data last week at the annual meeting of the American Psychiatric Association in New Orleans. The results extend his four-year follow-up of the same group of patients, which yielded similar findings (SN: 6/27/87, p.410).

Other recent studies show that within two years of starting lithium treatment, about 40 percent of manic depressives experience a new episode of mania, says William Z. Potter of the National Institute of Mental Health in Bethesda, Md.

"Our standard treatment for manic depression isn't working as we hoped it

would," Potter asserts.

An estimated 2 million to 3 million people in the United States suffer from manic depression, characterized by periods of severe depression alternating with episodes of uncontrolled elation, restlessness, racing thoughts and delusions of grandeur. Periods of normal mood typically occur between manic and depressive episodes.

Goldberg's team evaluated 35 manic depressive patients and 35 depressed patients with no mania, initially treated in two psychiatric hospitals. The researchers assessed each patient 2½, 4½ and 7½ years after discharge to outpatient treatment, which usually included lithium in combination with psychotherapy and psychoactive drugs such as antipsychotics or antidepressants.

At the final follow-up, 12 of 35 manic depressives functioned well and generally lacked the psychiatric symptoms that had led to their hospitalization. Among patients hospitalized for depression only, 19 of 35 achieved that same level of functioning.

Another 19 manic depressives and 13 depressed individuals achieved "intermediate" functioning after 7½ years, with periodic returns of symptoms, difficulties in social situations, and occasional rehospitalizations. The researchers observed poor functioning and no improvement since the initial hospitalization in four of the manic depressives and in three of the depression patients.

A number of factors contributed to the poorest outcomes in the manic depressive group, they say. These include failure to take lithium or follow prescription instructions, occurrence of "mixed states" in which symptoms of mania and depression coexist, and rapid alternations between periods of mania and depression.

Further long-term lithium studies must examine a broader spectrum of manic depressives, with a special focus on those who do not get better, Potter says. Pharmaceutical firms should also direct their efforts toward identifying novel chemical compounds that can quell symptoms of manic depression, he contends.

Further research would also benefit from a redefinition of manic depression, maintains Frederick K. Goodwin, head of the Alcohol, Drug Abuse and Mental Health Administration in Rockville, Md. Goodwin argues that the current diagnostic manual of psychiatric disorders inappropriately separates manic depression from the various forms of depression without mania. People with manic depression and people with recurring severe depression share important qualities, he points out, such as the tendency to show symptoms by young adulthood, recurrence of psychiatric episodes every one to two years, and in many cases a family history that includes manic depression. *– B. Bower*

Needle imaged in animal-tissue haystack

A figure silhouetted in bright sunlight casts a sharp shadow. In a thick fog, the figure and its shadow virtually disappear, smeared out by the way water droplets randomly scatter any light penetrating the fog.

Animal tissue also scatters light, making it difficult to use visible or infrared light as a probe to locate and characterize tumors within the body. However, researchers have now demonstrated that they can capture "shadowgraphs" of objects embedded in tissue by concentrating on the fraction of a light pulse that passes most rapidly through a tissue sample. With further development, this imaging scheme may offer an alternative to X-ray techniques for noninvasive screening of human breasts.

When a beam of light passes through a tissue sample or a milky fluid, a small fraction of the light travels in a nearly straight line. The remainder, scattered by the medium, follows a considerably more tortuous path before finally exiting the sample. Because this scattered light travels farther, it takes longer than the straight-line, or ballistic, light to pass through the material.

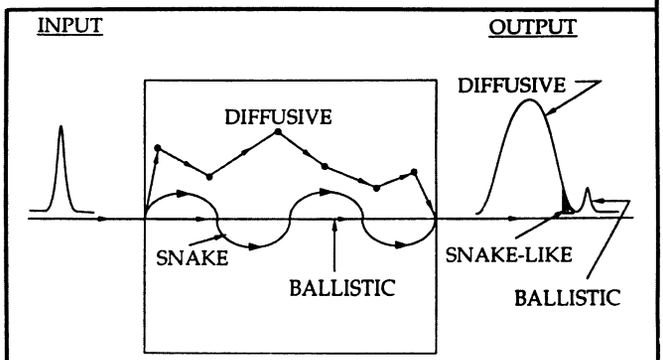
In other words, light traveling predominantly in the forward direction arrives at a detector first. Because only this early light produces a sharp shadowgraph of an embedded object, researchers need a way to isolate it from the rest of the light emerging from a sample.

"We're looking for the shadow," says physicist Robert R. Alfano of the City College of the City University of New York. At last week's Conference on Lasers and Electro-Optics, held in Baltimore, several research teams developing visible-light imaging systems presented their progress reports.

The idea is to synchronize the opening and closing of an electronic or optical "gate" in front of a detector with the entry of a short laser pulse into a sample. To get sufficient contrast and spatial resolution in the resulting image, researchers try to use the shortest possible laser pulses and the fastest, most sensitive gates available.

At the University of Michigan in Ann Arbor, Janis A. Valdmanis, Emmett N. Leith and their colleagues use a holographic technique for capturing 100-femtosecond slices of early light to produce a two-dimensional image. An electronic camera records the resulting holographic interference patterns, which are rapidly processed and averaged by a computer to generate an image on a video screen.

Using this system, the group has obtained clear images of two sewing needles, 0.5 millimeter in diameter, hidden behind 6 millimeters of raw chicken meat. Under continuous laser light and without the gate in operation, the chicken meat completely obscures the needles.



A light-scattering medium lengthens the duration of any light pulse that travels through it. Forward-scattered light travels the shortest distance and comes out first.

Alfano

"We have also demonstrated the capability of imaging . . . objects buried in diffusing [scattering] material several centimeters thick," the Michigan researchers report.

Alfano and his co-workers use an optical gate known as a Kerr shutter to snap images of various patterns viewed through a milky suspension of tiny polystyrene spheres in water. Using 10-picosecond laser pulses, they can pinpoint the location of a spot 200 microns in diameter and resolve a rectangular bar 400 microns wide. The New York group has also imaged such patterns through samples of chicken and human breast tissue about 3.5 millimeters thick.

"Our plan is to increase how deep we can go [into tissue] and to use shorter pulses to see if we can get better resolution," Alfano says.

Although these visible-light imaging techniques show promise, they remain in the research stage. In the May 10 MORBIDITY AND MORTALITY WEEKLY REPORT, the Atlanta-based Centers for Disease Control warns that the efficacy of such "transillumination" techniques for detecting early stages of breast cancer has not yet been demonstrated, and cautions that any transillumination devices now being marketed do not provide meaningful clinical information. *– I. Peterson*