

ences the way research is funded, Rudman said that he will conduct an investigation of the way research support is parceled out. It may be no idle threat, for Rudman is a member of the appropriations subcommittee that handles NIH's budget.

—Colin Norman

A Reprieve for Planetary Science

NASA's planetary exploration program may not be grounded after all. The White House's Office of Management and Budget, which recently told the space agency to drop the program (*Science*, 18 December, p. 1322), has given NASA verbal permission to include funds for the Galileo orbiter/probe mission to Jupiter in its fiscal year 1983 budget proposal.

The OMB's change of heart came after NASA officials lobbied intensively on behalf of the planetary program. Planetary scientists had warned that cancellation of Galileo, the only American deep space mission currently under development, would mean the dispersal of engineering and science teams and perhaps the closing of NASA's Jet Propulsion Laboratory, which manages most of the planetary missions.

There appears to be little likelihood, however, that NASA will be able to fly the Venus Orbiting Imaging Radar, which had been scheduled for a new start in 1984. Because of the imminent peril to Galileo, the agency was unwilling to fight for VOIR at this time.

Prospects for Galileo are still clouded by questions about how the spacecraft will get to Jupiter. The space shuttle will only be able to carry the spacecraft into low earth orbit. An upper stage of some kind will be needed to launch it into a trajectory toward Jupiter.

According to current plans, that upper stage will be General Dynamics' liquid-fueled Centaur rocket, modified slightly to fit into the shuttle bay. At this writing, however, the OMB plans to cancel NASA's Centaur program. If so, it would come as a disappointment to the Air Force, which finds the Centaur upper stage so worthwhile for its own purposes that it is willing to help NASA pay for the program.

If the Centaur is canceled, Galileo will have to be launched with the already developed Inertial Upper Stage, a solid-fuel device with considerably less thrust. This in turn implies a lower launch velocity and a longer transit time. Assuming a launch date of 1985, the spacecraft's arrival at Jupiter would thus be delayed from 1987 until 1989. According to one NASA estimate, the extra cost of ground operations during that delay would amount to some \$300 million (on top of Galileo's present cost of about \$700 million). The cost of modifying the Centaur and adapting the shuttle to carry it is estimated at about \$450 million; NASA officials point out, however, that the Centaur would then be available for any number of military, commercial, and scientific missions.—M. Mitchell Waldrop

Keyworth Says Cuts May Be Good for Science

A period of stringency in federal support for science and technology is not only inevitable but it may actually be beneficial, George A. Keyworth, President Reagan's science adviser, told the House Committee on Science and Technology on 10 December. "My own experience leads me to believe that the best overall quality of research may not occur in times of accelerating support but in times of moderate restraint," he told the committee.

Keyworth's message was hard to miss, it was stated so bluntly and repeated so often in his testimony. With the exception of defense R & D, science budgets are in for a tough time. But if cuts are applied selectively, with the axe falling on areas that "have passed the days of their most important and exciting work," the quality of American research can be maintained. Indeed, said Keyworth, "just as the occasional pruning of a tree can promote, rather than retard, its health," so the pruning of research budgets can benefit science. He did not propose any candidates for the shears, however, nor did he suggest how to identify areas of research that have passed their prime.

It is not the first time that Keyworth has sounded this theme, but it is given

added urgency by the fact that the fiscal year (FY) 1983 budget is now being finalized. With record deficits being forecast, even by some of Reagan's own advisers, the Administration is looking for deep cuts in many domestic programs. Research and development has already been pruned in FY 1982—though not as severely as many other areas of the federal budget—and it will clearly be cut back again next year.

"To those who may still hope for constantly growing budgets across the board, let me say this—that time has passed and we need the scientific community's best and most thoughtful judgment and advice to maintain the health of our science and technology base," Keyworth said. "To those who object to such undertakings . . . I must say that if scientists do not make such choices, others will, but with less acuity."

As for science and engineering education, Keyworth acknowledged that there is a serious shortage of qualified people in some fields and that the universities are facing difficulties in recruiting and retaining faculty members in some disciplines. But this situation, he said "is primarily one of the marketplace working as it should, and does not require a massive Federal response." Part of the solution, he argued, will come from increased support for higher education from the private sector. "This is a problem that can and must be worked out by those who supply scientific and engineering manpower and those who utilize it," he said.

The quality of facilities and instruments in universities is another area that Keyworth acknowledged presents serious problems. According to one estimate, \$1 billion may be required to upgrade facilities to a reasonable level. But again, Keyworth made it clear that the federal government should not be regarded as the source of such funds. "I believe that the communities themselves, working with their supporting agencies, must decide which of their needs are most important and how best those needs can be met," he said. For example, a university may have to decide whether its need for new equipment is important enough to justify an offsetting reduction in some other category of support, he warned.

—Colin Norman