from the genome office, says he is committed to pursuing a 1-centimorgan map. "Remember, a 1-centimorgan map is what got us the cystic fibrosis gene," he says, referring to the detailed map of part of chromosome 7 that he and others prepared. But for now, he is concentrating on just three chromosomes, 17, 16, and 5, which house disease genes he is also looking for.

"Such a major goal should not be dependent on one person," argues Botstein, and White agrees. "One person can get the job done, given enough time. But you can't do it in 5 years."

Meanwhile, Donis-Keller puts the onus for the missing genetic map squarely on NIH, as do others. "I am not sure anyone wants a genetic map, despite what they say. My first love is the genetic linkage map, to create a high-quality biological tool," says Donis-Keller, who recently moved from Collaborative to Washington University. "But in this atmosphere of tight money, I have had trouble obtaining funds, and others have too."

This is just not the kind of work that excites most peer reviewers, notes Donis-Keller, who says that the study section complained that her application was not innovative. "I never said it was innovative. But it is important and doable."

"There were grants that didn't get funded, but that is true of any area," replies Jordan. "We haven't made a policy of not funding genetic mapping."

Nonetheless, the center is now rethinking its strategy. The advisory committee has set up a new working group to look at, among other things, how to obtain a fine-resolution genetic map. Should the genome center actively solicit proposals, or is it time to switch to contracts? People are also coming up with ideas on how to staff such an endeavor, says Jordan. "One idea would be to recruit people for a limited time to work on the map, then let them exploit the data. Until it is all done by machine, it will be a problem, because postdocs need publications."

Meanwhile, the advisory committee has already heeded Olson's advice and scaled back the goal for the map. Although the ultimate goal is still a 1-centimorgan map, for the next 5 years they are aiming for a map in which the average distance between markers is 2 centimorgans, with no gap greater than 5 centimorgans—still a very ambitious goal, says Olson, and one that will require a major push.

As Botstein pointed out, genetic mapping is trivial compared to sequencing the entire 3 billion bases in the human genome. "If we are stuck on the logistics of this little task, then I'm worried about the rest."

■ LESLIE ROBERTS

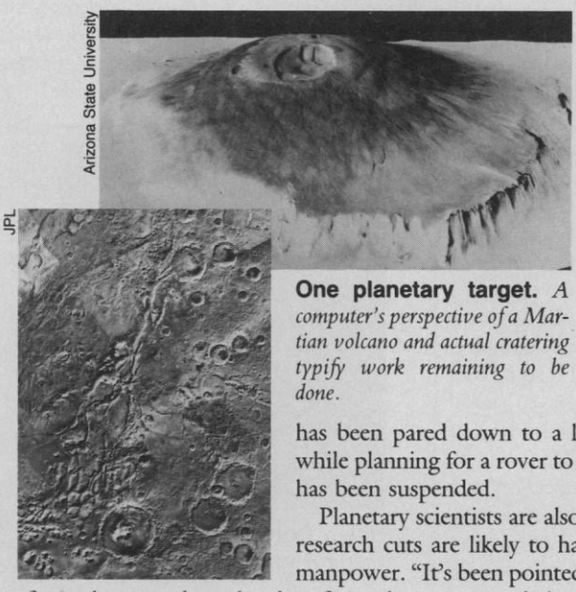
Planetary Science Funds Cut

Just when launches of scientific missions to the planets are gearing back up after a 12-year hiatus, planetary scientists are reeling under another budget cut—this time in the funding that they need to help figure out what all their new observations mean. "We've had a rather severe hit," says William Quaide, chief of the planetary science branch of NASA's solar system exploration division. "It's harder still because we had a big cut of $10 million last year."

NASA officials have had to chop $12 million from the current fiscal year budget for planetary science that Congress approved just last October. This is a modest sum compared to what it takes to run a planetary mission. For example, the Galileo spacecraft, which recently began its long-delayed, 6-year trip to Jupiter, will consume $1.3 billion before its mission is completed. But spacecraft funding can be pared back only so far without jeopardizing the whole project. Budgets for planetary spacecraft flights in the 1990s are "barely able to ensure successful operation," Quaide says.

So this year's $12-million worth of cuts are concentrated in the $79-million budget for research and analysis, thus reducing to just $67 million the money available for analyzing the data collected by previous planetary missions. Even funding for analysis of data yet to be acquired by the Magellan spacecraft, which is due to arrive at Venus this August, is being cut back.

Other projects will have to be postponed or scrapped entirely. "I can only spread the pain so much [across the board]," says Quaide, "before terminating whole programs."



One planetary target. *A computer's perspective of a Martian volcano and actual cratering typify work remaining to be done.*

New programs for studying the origins of the solar system and upgrading laboratory instrumentation have been put off to next year. Funding for U.S. investigators working on the data returned by the ill-fated Soviet Phobos mission to Mars has been ended early. In addition, advanced planning for future planetary missions has been pared down to a lunar orbiter mission only, while planning for a rover to explore the surface of Mars has been suspended.

Planetary scientists are also dismayed by the effect the research cuts are likely to have on the training of new manpower. "It's been pointed out that there's a shortage of people to analyze the data from the programs being planned by NASA," says planetary meteorologist Andrew Ingersoll of the California Institute of Technology, who is the current chairman of the Division of Planetary Science of the American Astronomical Society. "Where do these people come from if not from among those analyzing the data already in hand?"

This year's decline results from an odd assortment of budgetary pressures. About a third can be attributed to the budget reductions mandated by the Gramm-Rudman Act and by the levy on all federal programs to pay for the war on drugs. Another third can be blamed on better relations with the Soviets. As part of a 1994 Soviet mission to Mars, a low-flying balloon will return closeup views of the surface through a $4.4-million radio relay system added to the Mars Observer, the first U.S. mission to the red planet in 17 years. Because the Mars Observer's budget could not handle the cost of the relay, NASA officials took it out of scientific research. They took a couple million dollars more to pay for cost overruns on other flight programs.

U.S. planetary scientists have a lot on their plate for the 1990s. In addition to Magellan, Galileo, and the Mars Observer, work is getting started on a dual mission to a comet and Saturn. But how, the researchers ask, will they be able to digest all the data these missions bring back?

■ RICHARD A. KERR