Europe Ponders Space Constraints

Following budget cuts and the loss of a major mission, Europe's space scientists are trying to pick up the pieces of their once-proud mission program

PARIS—When European space scientists gathered in Geneva last week, they knew they were in for a rough time: They had the unenviable task of trying to fit too many top-rated projects into the European Space Agency's (ESA's) shrinking budget. Worse, they did not even know if there would be enough money to fund missions that had already been approved. "It was one of those meetings where the whole program gets shaken up. They tend to be rather traumatic," says astronomer Michael Rowan-Robinson of London's Imperial College.

The gathering—a meeting of ESA's top-level Space Science Advisory Committee (SSAC) and a set of working groups drawn from several space-science disciplines—had to settle for an uncomfortable level of uncertainty in ESA's medium- and long-term plans. The committee made one painful decision: to recommend that a mission to the planet Mercury, slated for launch in the first decade of next century, be delayed indefinitely. But even that loss will not free up enough money to fly all the other missions space scientists had planned by 2010.

Some major projects could still be in jeopardy, the timing of all but the next four missions on ESA's schedule is up in the air, and plans to join NASA on a variety of projects are uncertain. In the end, all that SSAC members could do was resolve to wait until their next meeting at the end of April, when some of the funding unknowns will be clearer. They also decided to set up small working groups to study individual problems, such as possible collaboration with NASA on the Next Generation Space Telescope (NGST), or a new Mars program.

At the root of SSAC's problems are two fiscal body blows that ESA has taken in the past 18 months. In October 1995, the agency's governing council, after an acrimonious debate, ordered the space-science budget to be cut by 3% a year over 3 years. Then, last June, Europe's new Ariane 5 rocket was destroyed seconds after it blasted off on its maiden voyage, carrying the entire Cluster mission—a quartet of spacecraft that were to study Earth's magnetosphere. ESA decided last fall to refly the mission, but it is still not clear where most of the money for new instruments is going to come from, or what impact the decision to repeat Cluster will have on other missions.

A cluster of problems. While the loss of Cluster represents the loss of "a big chunk of money ... it is not the main problem," says Giacomo Cavallo, ESA's head of science programming and coordination. "The budget perspective that we have is the real problem." The 3% annual cut will amount to a reduction of about $40 million by 1998, Cavallo says. ESA's annual space-science budget after that, based on 1995 figures, will be $393 million—roughly one-fifth what NASA spends on space science and 10% less than ESA had been planning to spend each year. And that is assuming no further cuts are imposed. Funding is due to be reviewed again in 1998, and, according to Cavallo, prospects are bleak: "The level of resources must always be established unanimously [by ESA member states]; if no unanimous agreement is reached, then the decrease continues for 2 more years, going to around 15%."

Member governments are putting the squeeze on ESA because they are having money troubles at home. And cash shortages in national space-science budgets are, in turn, making it hard to build the payloads—the scientific instruments—for ESA missions. This is a general problem for European space-science projects, for ESA provides the spacecraft, while the payloads are funded by agencies in the participating states. But it has become especially acute for the Cluster mission.

No national space program had budgeted for another set of Cluster payloads, and so far neither of the two major participants, Germany and France, has committed funds to rebuild the instruments, says Cavallo. As a result, it is still far from certain that Cluster will rise from the ashes of Ariane 5. Its fate will be decided at next month's meeting of ESA's Science Program Committee (SPC), when member countries will be asked to make firm commitments to provide payload.

It is therefore no surprise that SSAC had a hard time last week making any concrete recommendations for the timetable of ESA's science program, dubbed Horizon 2000. The program, with an extension called Horizon 2000 Plus, maps out around a dozen large "cornerstone" and medium-sized science missions stretching into the second decade of next century. Cavallo says the committee attempted "to prepare a realistic implementation plan extending only to about 2009." For now, the launch dates will remain as planned for Horizon 2000's next four missions: Cassini/Huygens, a mission with NASA to Saturn and its moon Titan; the x-ray observatory XMM; Integral, a gamma-ray observatory; and Rosetta, a cometary mission. Whether Cluster flies or not will have an impact on which mission gets the next slot after that: the Far Infrared and Submillimeter Space Telescope (FIRST), or Planck (formerly COBRAS/SAMBA), a millimeter-wavelength, all-sky mapping mission.

Bringing forward the launch of FIRST is viewed by some as a desirable option, reports Rowan-Robinson, who attended last week's meeting as an observer. "It turns out that it would actually save money," he says, by compressing its expensive development into a shorter period. But a final decision hangs on member countries' willingness to finance the scientific payload. The fourth medium-sized Horizon 2000 mission, which is slated to be a planetary mission, remains largely undefined, and SSAC members hope this will provide some flexibility in ESA's future budget.

Although last week's deliberations have

ESA SCIENCE PROGRAM: FUTURE LAUNCHES

Project	Objective	Planned Launch Date
Cassini/Huygens (M1)	Saturn and Titan	6 Oct. 1997
XMM (CS2)	X-ray observations	Aug. 1999
Cluster-2	Magnetosphere	1999–2000
Integral (M2)	Gamma-ray observations	Apr. 2001
Rosetta (CS3)	Cometary mission	July 2003
Planck (M3)	mm-wave observations	Oct. 2004 (TBC)
FIRST (CS4)	Far-infrared and sub-millimeter observations	mid-2007 (TBC)
Medium-4 (M4)	Planetary mission	2007 (TBC)
GAIA (CS?)	Interferometry	Beyond 2010
LISA (CS?)	Gravitational waves	Beyond 2010
Mercury (CS?)	Planetary mission	Beyond 2010

M: MEDIUM MISSION CS: CORNERSTONE MISSION TBC: TO BE CONFIRMED

ESA

restored some order to ESA's science program, the retrenchment was not popular. "We have lost a whole cornerstone mission, namely, the Mercury mission," says SSAC chair Lodewijk Woltjer, president of the International Astronomical Union. "We had to shift that out of the first decade [of the next century], we have no idea to when—this is a significant loss," he says.

The next scope. Even with the Mercury project out of the picture, ESA's science budget will be insufficient to keep all of the approved missions after 2000—Integral, Rosetta, FIRST, and Planck—on their original schedules. Europe's participation in two other international programs could also be compromised: "We will have problems with effective participation in the [NGST], and of course the Mars program, in which one would wish to invest substantially," says Woltjer.

The threat to participation in the NGST, the successor to the highly successful Hubble Space Telescope, is particularly worrisome to European astronomers. "If European astronomy does not become involved in the NGST, it will be a serious blow. ... It would be a disaster," says astronomer George Miley of Leiden University. The NGST would form an important part of NASA's proposed "Origins" program, which researchers hope will win presidential backing in the near future. The NGST will have a much larger mirror than Hubble, up to 8 meters compared to 2.4, and will allow astronomers to see objects three magnitudes fainter than Hubble's limit. "It will be a very powerful instrument for cosmology," says Rowan-Robinson.

"If this project is feasible, and if NASA decides to put the required money into it, then certainly European astronomers would wish to have significant participation," says Woltjer. Miley believes that ESA should even be prepared to sacrifice FIRST to allow participation with NGST: "I don't think that access to FIRST will be nearly as important for European astronomy as the NGST."

During last week's meeting, SSAC members decided to set up a small group of specialists to follow NGST development. Cavallo warns that any substantial request for funds must be made soon. "NGST is not yet part of our program, and would have to run against other competitors," he says, and in any event, all available funds are committed until 2012.

For the time being, Europe's space scientists are waiting anxiously for the politics to unfold. After the fate of the Cluster mission is determined next month, SSAC will ponder timetables again in April, and its recommendations will go back to the next SPC meeting in June. At that point, a clearer, if more distant, horizon should emerge.

–Alexander Hellemans

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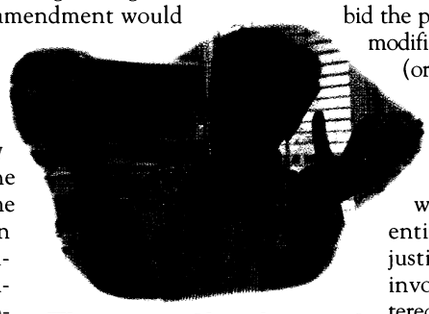
SWITZERLAND

Biologists Mobilize Against Anti-Genetics Referendum

In about a year, the people of Switzerland will vote on a constitutional amendment that, if approved, would give the country one of the world's most hostile environments for research involving transgenic animals. The proposed amendment would ban basic research involving the genetic manipulation of animals and would forbid the release of any genetically altered organism into the environment. While some work would be allowed on plants and microorganisms under strictly controlled conditions, opponents say the jobs of at least 1500 scientists and technicians would be threatened. Prominent scientists and drug companies warn that research would have to move abroad if the amendment is passed. "The negative impact on research here would be enormous," says Nobel laureate Rolf Zinkernagel, director of the University of Zurich's Institute of Immunology, whose own research would be affected.



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"The negative impact on research here would be enormous."
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A coalition of Swiss environmental, animal-rights, and political groups first proposed the Gen-Schutz (gene protection) initiative in 1993 and gathered 111,063 signatures calling for a nationwide binding vote—well over the number required by law to force the government to call a referendum. The vote will probably take place by early next year, and some surveys indicate that the proposal enjoys wide support. It would become part of the constitution if it wins a nationwide majority and is approved by more than half of the 26 Swiss cantons, or states.

Initially, scientists were slow to react. But the issue took on more prominence when Zinkernagel was named a joint recipient of the Nobel Prize in physiology or medicine last October, and proponents of the Gen-Schutz initiative made him a lightning rod for criticism of gene-transfer research. One animal rights group even alleged in newspaper advertisements that Swiss business leaders had influenced the Nobel committee in favor of Zinkernagel as a way of countering the initiative. Zinkernagel chose to ignore the ads to avoid drawing attention to them, but he says the attacks strengthened his resolve and that of others to speak out against the initiative. "We scientists must go out and explain to the people, in simple terms, what this is all about," Zinkernagel says.

The initiative would ban the production, use, and distribution of transgenic animals; forbid the patenting of genetically modified plants and animals (or parts thereof); and ban the deliberate release of genetically modified organisms into the environment. It would also require scientists to provide detailed justification of research involving genetically altered plants and organisms. Sponsors and supporters include 19 animal-protection groups; 19 political groups, mostly from the Green and Social Democratic parties; and nine environmental groups, including the Swiss branches of Greenpeace and the World Wildlife Fund; as well as agricultural, religious, medical, consumer, nutrition, and developmental-aid groups.

Exaggerated impact? The initiative's supporters—including a few scientists—contend that some Swiss researchers and pharmaceutical companies are talking up the potential effects of the Gen-Schutz initiative to try to scare the public. Daniel Ammann, a leader of the Swiss Gene-Technology Working Group (SAG)—the initiative's main sponsor—says that the amendment was carefully worded so that it would not damage Swiss medical research. Ammann says it would permit some use of gene technology and gene therapy for human medical research, as long as transgenic animals are not involved. He adds that this could include using genetically altered plants in a controlled laboratory environment, as well as industrial production of medicines through the use of genetically altered organisms other than animals.

Hans Scholer, a retired professor of microbiology at the University of Basel, says "The core of the initiative is sound, although a compromise is also possible." He told *Science*: "There's a lot of propaganda, much of it paid for by big companies, trying to scare people to vote against this initiative." But Scholer concedes that he is in the minority—no major scientific group backs the initiative.