

to sophisticated sensors (chemical, biological, radiological, electromagnetic, photonic, acoustic, or magnetic)."

Molecular-level understanding of life processes. This encourages coupling "modern computational power to our ability to manipulate biological systems at the molecular level" in a quest to "unravel the complexity of life at the molecular, cellular, and organismal levels."

Climate change science and technology. This priority calls for "investment in R&D that will address major climate policy decisions and provide a framework for understanding and addressing long-term climate change."

Education research. This priority calls for continuing support for strengthening math, science, and reading education as well as advancing the use of education technology.

"This is not a comprehensive list of all administration science and technology priorities," Marburger said. "It does not include priorities that fall within the purview of a single agency, things like particle physics, or health research, or chemistry, that are pretty well focused in a traditional department such as DOE or NSF. The priorities we have spelled out explicitly involve cross-cutting areas in research."

Much of the memo lays out the R&D investment criteria in the form of three "tests" that program managers at federal agencies are expected to use to set their funding proposals for FY 2004. "The focus for policy officials and program managers should not be on how much we are spending, but rather on what we are getting for our investment," the document says.

All program managers, the memo says, "should be able to show the extent to which their programs meet the following three tests."

► **Relevance:** "Programs must have well-conceived plans that identify program goals and priorities and identify linkages to national and 'customer' needs." Basic research gets some leeway in meeting the relevance test because, as the memo states, "OMB and OSTP recognize the difficulty in predicting the outcomes of basic research."

► **Quality:** R&D programs must justify how funds will be allocated to ensure quality R&D. NSF's merit-based, competitive process in awarding grants is cited as an example of how funding should work in other agencies.

► **Performance:** Agencies must develop measurement criteria and milestones that will allow for an

"independent determination" of performance. Although "identifiable results" are important, according to the memo, "the intent of the . . . criteria is not to drive basic research programs to pursue less risky research that has a greater chance of success."

Marburger described the three tests as "commonsensical," noting that "relevance, quality, and performance are things that every proposal already embodies in some way." He

also emphasized that the new criteria were for federal agencies, not individual researchers. "It's the agencies that are being held responsible for spending the money properly. We're not interested in adding to the burden of individual investigators."

This fall, officials from OSTP and OMB will meet with agencies to measure the budget requests against the new criteria.

JIM DAWSON

Recipe for LHC Success: Subtract Other Science, Add Accountability

Detailed spending records, revamped managerial responsibilities, redeployment of workers, contingencies for unexpected costs, and better communication. That's the prescription of an external review committee (ERC) set up to investigate the ills at CERN after the Geneva-based laboratory revealed last fall that the Large Hadron Collider, a proton accelerator awaited by particle physicists everywhere, will exceed its budget by 850 million Swiss francs (roughly \$574 million).

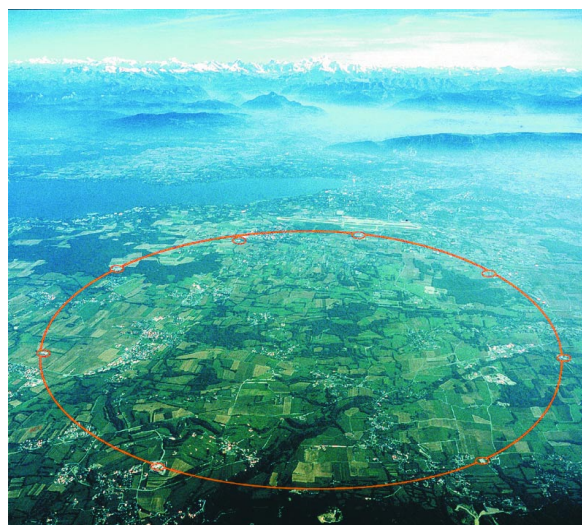
While placing blame for CERN's current financial predicament squarely on the lab's managers, the ERC praised the staff as "competent and dedicated" and underscored its confidence in the technical soundness of the LHC. Curtailing other scientific activities to focus on the LHC, the committee's report says, "is the price to pay for the future possession of this powerful tool."

CERN will take the medicine. Indeed, the committee's recommendations, which were presented in June, are in tune with proposals developed by CERN management and five internal task forces for getting the LHC back on track. "The ERC made its report, and I am quite satisfied," says CERN Director General Luciano Maiani. By the end of the year, Maiani says, "we will reshape the structure of reporting lines of the LHC." CERN will also revisit

► CERN has begun implementing accounting and organizational changes and is slashing programs that do not directly support the Large Hadron Collider.

the LHC's tight construction and costing schedules.

Among the measures already being implemented are the inclusion, for the first time, of staff salaries in cost calculations. Excluding those salaries introduces a bias when weighing whether to do a job in-house or to outsource it, says Robert Aymar, who



LUCIANO MAIANI, CERN's director general, and the lab's governing council have agreed on a strategy for dealing with the financial crisis bedeviling the Large Hadron Collider (top), under construction beneath the French-Swiss border.

chaired the ERC and heads the International Thermonuclear Experimental Reactor. "It can induce the wrong decisions and cost you a lot." CERN is also introducing a detailed accounting scheme whereby it will frequently check money spent against projected costs and incremental achievements.

These and similar measures—the ERC made some 20 recommendations—are intended to keep CERN tightly focused on successfully completing the LHC. The actual cost overruns will be covered through industry-related delays in the LHC's startup by two years, until 2007; by slashing non-LHC programs; and by drawing out payment of the LHC until 2010. For example, CERN's Super Proton Synchrotron and Proton Synchrotron will be used less, and will then be shut off for at least a year beginning in 2005. Some engineers and technicians from those accelerators will be transferred to work on the LHC.

The new measures, says Maiani, "are the realization of how the lab has to cope with the famous [budget] cuts made in 1996. I hope we will have a new common basis between the council, the CERN management, and CERN people. It was not easy to get there, but we are really aiming to go forward." (See PHYSICS TODAY, February 1997, page 58, and May 2002, page 30.)

Prioritize and sacrifice

"The real plus was that everyone agreed that this is what needed to be done," says Ian Halliday, who heads the UK's Particle Physics and Astronomy Research Council and is a delegate to the CERN council. "CERN is squirming, but they've accepted [the ERC's recommendations]. It's not a solution to the lateness. Not to the overruns. But at least we are beginning to get a clear picture. It's a first step."

CERN, adds Halliday, "[has] been told for six years now that the LHC is the priority. Cash is king—if other things are sacrificed, then so be it. Or raise money from elsewhere. Some [at the June council meeting] said it's a shame. Others said you have to prioritize. Both are true."

Indeed, what's changing at CERN is that the LHC is not only called the priority, it's now getting red-carpet treatment. The obvious and painful sacrifice is non-LHC research. One victim of the cuts is R&D for future particle physics facilities. Research on CLIC, a candidate for a next-generation linear collider, will continue, says Maiani, but at a minimal level.

CERN hopes to fill this gap by working with other European high-energy physics labs.

As for other research, says CERN physicist Rolf Landua, "we realize that the LHC equals the future of CERN. We have to say, 'My interests may be different, but if we don't get the LHC going, then there is no future to discuss.'" For his own group, Landua says, "Let's try to get out of the crisis in the best possible way, and to do whatever we can to keep a tiny niche of antimatter research alive."

But many CERN staff members and users have reacted to the plan with "discouraged resignation," says CERN theorist Alvaro De Rújula.

"Slashing both research and R&D may be suicidal. We may lose our scientific worth to a circumstantial policy, the way we lost much of our technical excellence to outsourcing requirements." Michel Spiro, who heads particle physics and astrophysics research at France's Atomic Energy Commission (CEA) and was just elected to CERN's scientific policy committee, adds, "I hope that some budget and human resources will be available to react and fertilize new ideas that come from the particle physics community. To see a big lab like CERN, which is very creative, focus on just one project until 2010 is a bit frightening." **TONI FEDER**

Synchrotron Partners Take Steps to Open SESAME

Even as violence escalates in the Middle East, plans for SESAME, a synchrotron light source intended to use science to promote peace in the region, are moving forward.

In May, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) officially took the project under its wing. This move is expected to grease political wheels and make it easier to raise the funds needed to realize SESAME (International Centre for Synchrotron Light for Experimental Science and Applications in the Middle East).

SESAME's host, Jordan, is footing the bill for a building to house the machine, and the project's members will pay the annual operating costs—about \$4 million plus salaries. But money to upgrade BESSY I, a decommissioned synchrotron donated by Germany to form the core of SESAME, and to outfit the machine with beamlines is still being sought, largely from nonmembers.

To help decide whether to contribute to SESAME, the European Commission is assessing the project technically, financially, and politically

to judge its chances of long-term success. Says Dieter Einfeld, who last fall became SESAME's technical director, "This evaluation is very important. If it's positive, I think the project will go ahead. If it's negative, the project could be dead." The assessment is supposed to be completed in the next month or so.

Assuming a positive report, the EC would next try to scrape together \$6–8 million to upgrade the main machine. Also riding on the coattails of the EC report is the hope of a US contribution: "If Europe agrees to build the machine," says William Brinkman, president of the American Physical Society, who is chairing an ad hoc group that is promoting SESAME, "we would go to work at getting our government to consider building the first beamlines." That, he says, might cost \$5–10 million. Brinkman and the APS got involved in SESAME earlier this year. In the wake of the terrorist attacks and the mounting unrest in the Middle East, says Brinkman, "we felt it was really important to put a bigger emphasis on connecting to physicists in the Muslim world."

Meanwhile, the design for SESAME



HOOMAN HASSANZADEGAN/SESAME

BOUND FOR JORDAN: BESSY I, the decommissioned synchrotron light source that will form the core of SESAME, sailed from Germany in June. It will seek a new life in Allaan, about 30 km from Jordan's capital city of Amman.