



PAUL GUINNESSY

Two workers check the wiring on part of the 7000-ton ATLAS detector.

bringing it back to room temperature can take more than six weeks. In a recent section test, a leak required time-consuming repairs. CERN has also experienced problems with regulating the compressors that cool the machine to 1.9 K. Says Evans, "Some sections have now been cold for three or four months and are working perfectly, except for a few of these teething problems."

In addition, researchers working on the CMS experiment discovered a noise problem in the photomultipliers when they observed cosmic rays as part of a test. "Fortunately, [the noise problem] disappears when we reach our operating standards, although we have no idea what is causing it," says Pawel de Barbaro of the University of Rochester. The delayed schedule is proving advantageous to the experiment teams, especially ATLAS and the CMS, says Evans.

But perhaps the LHC's weakest link will prove to be the initial injector, which fires particles into the ring and is a relic of LEP and earlier machines. The injector is old, says Evans. "It's very flaky and needs a major investment and refurbishment or it needs to be replaced." Aymar agrees and says that his concern is the lack of spare parts for the machine. Construction of a new \$150 million injector will start in 2012 when CERN finishes paying off the loans it took out to build the LHC (see PHYSICS TODAY, December 2001, page 21). Says Aymar, "Once the LHC is up and running, building a replacement injector will be a high priority."

Paul Guinnessy

Big boost in science funding authorized by Congress

Congress authorized billions of dollars more for science than the president requested. But authorizing is not the same as appropriating, and skeptics are saying "show me the money."

Just 22 months after Norman Augustine sat before a congressional committee to urge support for the recommendations in the landmark report *Rising Above the Gathering Storm*, the retired CEO of Lockheed Martin Corp was working the phones from his car as he zipped from meeting to meeting in Washington, DC. Congress was about to vote on the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act, which would authorize funding for science programs in almost every federal agency at levels higher than even advocates for science had thought possible.

Augustine, who was chair of the National Academy of Sciences committee that issued the *Gathering Storm* report (see PHYSICS TODAY, December 2005, page 25), was talking mostly to reluctant Republicans who were worried about voting for legislation that allocated \$21 billion more in domestic spending than President Bush had requested. Although almost everyone on the Hill was willing to support science funding increases called for in the administration's American Competitiveness Initiative, fiscal conservatives in Congress were reluctant to authorize a research budget that over the next seven years could be more than \$30 billion above the spending envisioned by the administration.

Representative Ralph Hall (R-TX), the ranking member of the House Committee on Science and Technology, was concerned about \$300 million authorized to establish the Advanced Research Projects Agency-Energy, an office in the Department of Energy (DOE) that would focus on high-risk energy-research projects. Other legislators were concerned about expanded science education programs and some 20 other science initiatives the administration had complained about in a letter to Senate majority leader Harry Reid (D-NV).

On 2 August, after the intense last-minute lobbying by Augustine and a host of other science advocates, the House passed the COMPETES Act 367 to 57, a veto-proof majority. The Senate also approved the legislation overwhelmingly, and it was sent to President Bush. On 9 August, despite earlier

threats to veto the legislation, Bush signed it into law.

Although the legislation gives substantial amounts of money to almost every field of science, rejoicing in the science community should be tempered, Augustine said. "I sent out a note this morning [the day the House passed the act] congratulating all of the people who worked on it. The first line of the note said, 'Congratulations.' The second line of the note said, 'Now, about the FY 09 budget, let's get to work.'"

"This is just one step in a many-year undertaking," he said. "We've got to maintain this year after year after year. As a mathematician would say, it's necessary but not sufficient." Augustine's fear, shared by many in the science community, is that next year Congress will move on to other priorities and science funding will slip. "It's hard to sustain things," Augustine said.

Augustine's other fear is that although the COMPETES Act authorizes billions of dollars for science, it doesn't actually appropriate. That process, done by House and Senate appropriations committees, will come in September when Congress returns from its summer recess.

That is also the fear of Stanley Williams, director of quantum science research at Hewlett-Packard. Williams has been outspoken for several years about what he sees as the decline in American science, both in education and federal research funding. "People like me have been trying to point out that there really is a problem," he said. "At the Washington, DC, level, what often happens is [politicians] nod their heads sagely, and then a piece of legislation is passed, and the funding doesn't come through, and the problem isn't solved. You go back, and they say they've already dealt with that problem."

Williams points to legislation, passed by Congress and signed by Bush in 2002, that authorized a doubling of the NSF budget over five years. The money was never appropriated by Congress, and Bush's later budget proposals fell far short of meeting the doubling goal.

The COMPETES Act puts NSF on the path for doubling its budget in seven years. But Williams is skeptical. "We attempted that doubling five years

ago, got a bill passed, and then nothing happened," Williams said. "It was essentially feel-good legislation, but to actually accomplish anything, the money has to be appropriated."

John Marburger, director of the Office of Science and Technology Policy, was pleased that the COMPETES Act included most of the programs Bush had called for in the ACI, but he was not pleased by the billions of dollars in extra funding contained in the bill. Indeed, the day before Congress approved the COMPETES Act, Marburger said the bill was "over the top" and could face a presidential veto. Marburger said the ACI "is more focused and tries to prioritize science funding within the constraints of the budget."

The *Gathering Storm* report, he said, listed many things that needed to be done to strengthen science in the US, "but it was done without too much regard for the realities of the budget." And Marburger echoed both Augustine and Williams in noting the difference between authorization and appropriations.

"I like it that Congress is so positive about getting money to science and science education," Marburger said. "It's really a good thing. But I know that when the appropriations bills come through and the dust settles, there won't be enough money to fund everything."

An analysis of the COMPETES Act by the American Association for the Advancement of Science shows that Congress funded the large increases the administration proposed in its FY 2008 budget for the physical sciences, then went further and authorized more money for every major nondefense R&D funding agency in the federal government. Many of those increases replaced funding cuts proposed by the administration. According to an overview prepared by the House's science and technology committee staff, if the COMPETES Act is fully funded, it will do the following:

- Keep research budgets at NSF, NIST, and DOE's Office of Science on a path to double over the next seven years.
- Provide \$43.3 billion for science, technology, engineering, and mathematics research and education programs across the federal government over the next three fiscal years.
- Increase funding to NASA's aeronautics program, which a National Research Council report recently said was in serious trouble because of a shrinking budget (see PHYSICS TODAY, September 2006, page 29).
- Convert NIST's Advanced Technology Innovation Program and authorize al-

most \$400 million in funding over the next three years.

► Create new K-12 science and technology education programs at DOE and authorize \$150 million to fund them.

► Give large increases to the National Oceanic and Atmospheric Administration, with climate change and ocean-related research receiving significant boosts.

While the White House is expected to pressure congressional appropriators throughout September to significantly scale back the money for the COMPETES Act, Augustine will likely be working the phones again, trying to make sure the appropriations match the authorizations.

"We can afford this," Augustine said. "We can afford two times as much as a country if we think it is important. Whether it is this amount, or 50% more, or 100% more, we can afford it. That is not an issue in my mind." **Jim Dawson**

Grants to women come up short in pilot study

In nuclear theory, women get about 50 cents for every dollar men get in grant money from the US Department of Energy. Why the discrepancy? And does it exist in other physics subfields too?

The American Physical Society's (APS's) Committee on the Status of Women in Physics decided to see how things stood for physics after learning that two studies—from the Government Accountability Office in 2004 and RAND Corp in 2005—found that some agencies, notably the National Institutes of Health, give smaller grants to women than men. The GAO study reported a "serious data limitation" from DOE, a major funder of physics research, so the CSWP started there.

"We picked one subfield, nuclear theory, for a pilot study because we had anecdotal information about problems in that area," says Roxanne Springer, CSWP vice chair and a nuclear theorist at Duke University. Later, DOE worked with the CSWP on a more complete analysis of the same data—comprising 57 research grants from fiscal year 2005. That includes individual and group grants, with awards to a total of 103 investigators, 9 of them women.

The analysis revealed that men got \$123 850 per year on average, compared with \$64 310 for women. The average for group grants was slightly higher than for individuals, but the gender disparity remained.

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