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Large Hadron Collider in crisis as magnet costs spiral upwards

David Adam, London

Europe's attempt to build the world's most powerful particle accelerator was plunged into crisis this week as project managers admitted that it faces cost overruns of several hundred million dollars.

CERN, the European particle physics laboratory, where the Large Hadron Collider (LHC) is being built, will face years of budget cuts and belt-tightening as a result of the overruns, its management told staff. But this will cover only a fraction of the extra costs, and CERN is preparing to take the awkward step of asking its 20 member states to cover the rest.

Scheduled to open in 2006, the LHC is intended to be the world's next major high-energy physics facility. But the technical challenge of designing and building the superconducting magnets needed to steer protons and ions through the LHC's accelerators has proven more difficult — and expensive — than CERN expected. Problems with such magnets contributed to the 1993 demise of the US Superconducting Supercollider.

CERN says that the higher costs of the magnets, together with greater installation and civil engineering costs, have put the core project some SFr480 million (US$300 million) over its original SFr2.6 billion budget. But scientists at CERN who have been briefed on the situation say it could cost at least SFr3.4 billion — SFr800 million more than initially planned — to get the LHC up and running. Prototype magnets already built have cost the laboratory about SFr150 million more than it expected, and some SFr220 million extra must also be found to install detectors and to pay for computers.

CERN now has until 7 November to come up with a rescue plan to present to its finance committee, made up of representatives from the European countries funding the facility. "The organization is reviewing various possible options including cuts in the scientific programme, reductions in spending within the organization, bank loans and extra contributions from member states," says Neil Calder, a spokesman for CERN.

At a crisis meeting of staff and users on 1 October, CERN director-general Luciano Maiani said that the organization was aiming for 10% cost reductions across all divisions. "Basically we're looking at austerity measures over the next few years to pick up the slack," says one CERN researcher.

CERN

Running short: CERN may turn to its member states for the cash to finish the Large Hadron Collider.

Some researchers expressed unhappiness that they first learned of the problems from an article in a local newspaper. Their irritation is shared by the CERN member governments who are paying for the project.

A spokesman for the Particle Physics and Astronomy Research Council, which pays Britain's annual £65-million (US$96-million) subscription to CERN, says that the situation is "potentially very serious". But he says he will wait for the November meeting before commenting on the possible implications for British physics and astronomy. ■

Senators call for biodefence boost

Jonathan Knight

A massive increase in public-health spending is needed to prepare the United States for a possible terrorist attack with biological weapons, two prominent US senators say.

In response to the attacks on the World Trade Center and the Pentagon on 11 September, Senators Edward Kennedy (Democrat, Massachusetts) and Bill Frist (Republican, Tennessee) say that the US government should spend $1.6 billion next year to bolster public health and biodefence.

According to a report from the General Accounting Office, federal spending on bioterrorism readiness, including research, amounted to about $350 million in the 2001 fiscal year, which ended on 30 September.

Although this is a significant increase from previous years, biodefence efforts are poorly coordinated, the report says. For example, several agencies disagree over which pathogens should count as potential threats. In addition, most hospitals are poorly prepared to detect or handle a massive outbreak of disease.

To remedy this, the Kennedy–Frist proposal includes $625 million for state and local health agencies — a sixfold increase.

"There does seem to finally be an acknowledgement that the public-health infrastructure is in deep disarray," says Alan Zelicoff, a biodefence expert at Sandia National Laboratory in New Mexico.

Mark Wheelis, a microbiology professor at the University of California, Davis, says that the large number of ways an attack could be perpetrated will make it hard to decide how best to spend the money. ■

CERN's head rejects mismanagement claims

Alison Abbott, Munich

Luciano Maiani, director general of CERN, the European particle physics laboratory in Geneva, has denied that mismanagement has led to cost overruns on the Large Hadron Collider (LHC) project.

CERN shocked its 20 member states last month by announcing cost overruns of SFr480 million (US$296 million) on the SFr2.6-billion project, and of a further SFr370 million on CERN's core budget during the LHC's construction period (see *Nature* **413,** 441; 2001).

"We've always been in control of developments," says Maiani. "This is a high-tech project of extreme complexity, and an overrun of 18% is not unreasonable."

But Maiani, who was head of the Italian Nuclear Physics Institute before taking up his position at CERN in 1999, accepts the charge that his management team failed to reveal the scale of the problem as soon as it became apparent in the spring. "We've learnt a hard lesson about the need for openness," he says.

The problems should have been identified last year, when the first cost-to-completion estimates for the LHC were due, Maiani admits. But he says that he was distracted at the time by preliminary results suggesting that detectors at the Large Electron–Positron (LEP) collider, which the LHC will replace, had picked up signatures of the Higgs boson — the fundamental particle that the LHC is designed to find.

CERN researchers were then torn between extending the LEP's life in a bid to confirm the finding, or switching it off to start work on the LHC. Maiani decided to pull the plug on the LEP — rightly as it turned out, as reanalysis of the preliminary results indicated little likelihood that the Higgs particle had actually been spotted. "The LEP decision fully absorbed the energy of both the scientists and the administration," says Maiani.

CERN

A hard lesson learnt: Maiani accepts that delaying admission of financial problems was a mistake.

A major project review was begun in March of this year, and final quotes for the supply of the LHC's 1,000 or so superconducting magnets — which Maiani decided to await before completing the review — were received from contractors in August.

"If I had the time again, I would have discussed the emerging financial difficulties with our scientists and with member-state delegations," he says. "But I decided to wait until we had solid numbers to discuss. This was probably the wrong decision — it backfired on us."

More unreasonable than the cost overrun, in Maiani's view, is the fact that the LHC project had to be launched on a tight budget with no financial contingency.

Asked how he will now proceed, Maiani warns of austerity ahead. "There's no doubt that we will have to streamline all of CERN's activities behind the LHC," he says. Smaller programmes in heavy-ion, neutrino and antimatter research will have to be cut back, and other laboratory costs will be reduced. He also suggests that loans could be sought to buy time — and hopes that member states will increase their contributions.

Maiani says he is confident that the project will get back on track, and even claims that last year's decision to turn off the LEP was much more difficult for him than resolving the new financial difficulties, which he insists are inherent in high-technology projects such as this. The technological progress of the LHC remains "rock-solid", he says. ■

Sanger Centre welcomes gene funds with a new name

David Adam, London

The Sanger Centre near Cambridge, UK, has announced a five-year plan to spend £300 million (US$435 million) on research to follow up on its role in the publication, earlier this year, of the human genome sequence (see *Nature* 409, 860–923; 2001).

The plan, which will be paid for by the Wellcome Trust, the world's largest biomedical research charity, includes increased efforts to understand gene function and expression, to develop bioinformatics tools and to draw comparisons between humans and model organisms such as the mouse. The centre is also changing its name to become the Wellcome Trust Sanger Institute.

"The new funding will allow the institute to make a contribution to global science and medicine as significant as its contribution to the Human Genome Project," says institute director Allan Bradley. "We will bring biology to the genome and translate the enormous amount of information encoded in our DNA into an understanding of gene function."

According to the new plan, the institute will work to identify as many genes as possible within the human genome and to predict their functions, as well as locating the regions that control their expression. The laboratory will also target disease genes, including those that contribute to cancers, building on a major project already under way to search for the genetic mutations that cause them.

One new project aims to identify genes on the X chromosome that are involved in primary or non-specific X-linked mental retardation, one of the most common genetic disorders. Another will focus on uncovering the genetic basis of disorders that have multiple genetic causes, such as diabetes, asthma and other allergies. This association study will use a map of 'haplotype' groups — inherited blocks of genetic markers — to be prepared by an international consortium of labs and biotech companies (see *Nature* 412, 105; 2001).

The institute will also establish a genetics programme to further the understanding of the role of genes in mouse development and physiology, and in human disease. "These new initiatives will complement and build on the institute's considerable strengths in genome data generation, automation and bioinformatics," says Mike Dexter, director of the Wellcome Trust. ■

16.5-kilometer-per-second dash through the gas and dust continually blown off a comet nucleus was an afterthought. Complicating matters, its star tracker, the spacecraft's only means of orienting itself, failed in 1999. With its camera jury-rigged as a replacement, "the encounter did not go the way we expected," said project manager Marc Rayman of JPL: "It went perfectly." By sheer luck, the spacecraft dodged a massive dust jet to return analyses of ions in the comet's hazy coma of dust and gas, infrared spectra of the nucleus, and black-and-white pictures sharper than any of comet Halley returned by a flotilla of spacecraft in 1986.

These detailed images revealed a terrain of diverse features. Each end of the nucleus has plateaus. A smooth, brighter plain at the center is emitting at least three columnar jets where the sun's heat is excavating a saddle-shaped depression. In addition, fractures crisscross the comet, several of them right in the thin neck of the bowling pin, according to planetary geologist Laurence Soderblom of the U.S. Geological Survey in Flagstaff, Arizona. "It's quite possible" Borrelly could break in two, either at the center or at the neck, he says. The way Borrelly seems to rotate would keep the jetting saddle continually illuminated while the comet is near the sun, adds comet specialist Donald Yeomans of JPL, hastening erosion at that spot. Eventually, the nucleus might even break into many pieces and vanish, just as comet LINEAR did in July 2000.

Deep Space 1 will meet a less spectacular end: In November, after more strenuous testing of its ion engine, its controllers will simply stop talking to it. **–RICHARD A. KERR**

PSYCHOPHARMACOLOGY

Drug Critic Sues After School Pulls Job Offer

A British psychiatrist and critic of antidepressant drugs is suing the University of Toronto (UT) and an affiliated mental health center for breach of contract after the center rescinded a job offer to him.

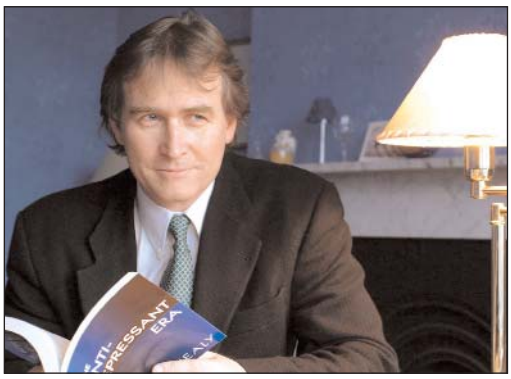
David Healy, a reader in psychological medicine at the University of Wales College of Medicine in Cardiff, claims that his academic freedom was violated after he gave a speech last fall criticizing drug companies and arguing that the popular antidepressant Prozac "can lead to suicide." His suit, filed in Toronto on 24 September, seeks reinstatement of the job offer at the Centre for Addiction and Mental Health (CAMH) or $9.4 million in lost salary and damages for libel. CAMH officials have told Healy—and explained in letters to their staff—that they felt his views are "extreme" and incompatible with the responsibilities he would assume.

Healy is a prominent historian of psychopharmacology who in recent years has testified as an expert witness for plaintiffs claiming injury from drugs like Prozac, known as SSRIs (selective serotonin reuptake inhibitors). In August 2000, CAMH formally offered him the post as clinical director of its mood and anxiety disorders program and professor of psychiatry at the University of Toronto, at an annual income of about $250,000. Healy accepted the written offer the following month.

On 30 November, Healy delivered a lecture in Toronto on "psychopharmacology and the government of self." In the talk, which he has given at numerous other locations and posted on his Web site (www.pharmapolitics.com), he discussed negative effects of antipsychotic and antidepressant drugs, including brain injury and suicides. The lecture caused quite a stir.

Less than a week later, CAMH chief physician David Goldbloom informed Healy that "While you are held in high regard as a scholar of the history of modern psychiatry … we believe that it is not a good fit between you and the role as leader of an academic program. … This view was solidified by your recent appearance." In a 17 May letter to his board of directors, CAMH head Paul Garfinkel wrote that Healy "has expressed extreme views that are inconsistent with published scientific evidence. These views go well beyond his peer-reviewed published work." Garfinkel said Healy's future colleagues were "shocked" by his presentation "to the point where the Centre felt that Dr. Healy would not have the necessary respect and support of staff."

Healy has sought support for his position, and last month 30 scientists—including Nobelists Arvid Carlsson and Julius Axelrod—signed a letter to the university saying that the case was an "affront" to academic freedom. Healy says that his views on psychotropic drugs should not have surprised



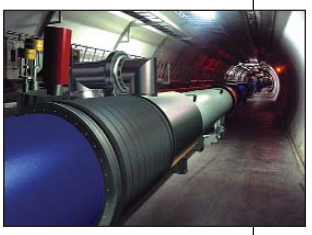
Costly words. David Healy's lecture led a Canadian mental health center to withdraw its job offer.

CREDITS: (TOP TO BOTTOM) CERN; COURTESY OF D. HEALY

ScienceScope

Budget Acceleration Europe's flagship particle accelerator, the Large Hadron Collider (LHC), is having budget troubles. The $1.6 billion project is facing a 20% budget overrun, officials revealed last month, with no easy solution in sight.

The increases are due to unexpectedly high excavation costs and rising prices for the LHC's 1236 superconducting magnets—which nudge charged particles along their 27-kilometer circular path—according to Luciano Maiani, director-general of CERN, the LHC's home lab near Geneva.



Next month, Maiani will have to present CERN's finance committee with a plan for paying the increased cost. It may involve obtaining extra loans and asking LHC partners, including the United States, to cough up more cash.

Physicist Gerardus 't Hooft of Utrecht University in the Netherlands worries that the money troubles could delay LHC operations, now set to start in 2006. But CERN officials aren't worried, saying there are "no technical reasons yet for a delay."

Retying the Knot Scientific collaborations between the United States and India and Pakistan have received a green light in the wake of the 11 September terrorist attacks.

The U.S. government cracked down after both nations tested nuclear weapons in May 1998, requiring U.S. organizations to obtain a license before shipping civilian materials deemed to have a dual military use to more than 300 institutions. The so-called "entities list" was trimmed somewhat in December 1999 and again in March 2000.

The latest easing, according to Indian officials, lifts the rules for most civilian R&D organizations, including many under the Defense Research and Development Organization. It follows a 22 September decision by President George W. Bush to waive prohibitions on trade in dual-use materials. Sri Krishna Joshi, a solid state physicist and president of the Indian National Academy of Sciences, welcomed the news, calling the restrictions "totally unnecessary." A small number of agencies involved in nuclear, missile, and space programs in the two countries remain under the restrictions.

What's New

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APS Homepage

What's New
by Bob Park
The American Physical Society

Friday, 12 October 2001 Washington, DC

1. 2001 NOBEL PRIZE IN PHYSICS: THE BOSE-EINSTEIN CONDENSATE.
Two Americans, Eric Cornell of NIST in Boulder and Carl Wieman of the University of Colorado in Boulder, both at JILA, shared the prize with Wolfgang Ketterle, a German citizen on the faculty at MIT. Based on the work of S.N. Bose, Einstein predicted this new, very-cold state of matter in 1924, but Bill Phillips at NIST had yet to invent laser cooling. It won him the 1997 Nobel Prize.

2. PASCAL'S WAGER: THE PODKLETNOV GRAVITY SHIELD STRIKES OUT.
In 1992, Russian physicist Eugene Podkletnov claimed that objects above a spinning superconducting disk show a 2 percent loss in weight. Why this should be so wasn't too clear, but it would be great for launching spacecraft, and you could build a perpetual motion machine. There are two possibilities: either this obscure Russian was mistaken, or the First Law of Thermodynamics is wrong. NASA put its money on Podkletnov (WN 15 Aug 97). Four years and $1M later, NASA thought maybe they saw a weight change of 2 parts per million, but couldn't be sure. "Maybe you need a bigger disk," Podkletnov suggested. That led to another $1M and another four years. Finally, at a conference on propulsion this year, NASA said that tests on the new shield were "inconclusive." That's NASA-talk for "it didn't work," but if NASA just said, "it didn't work," they would have to explain why they spent all that money an idea that violates the First Law. In fairness, however, we must point out that NASA also supported Ketterle's beautiful work on BE condensates. Hmmm. Perhaps there's more than one NASA.

3. HIGH ENERGY: GIANT ACCELERATOR FACES A COST-OVERRUN CRISIS.
The cost of developing the superconducting magnets for the Large Hadron Collider at CERN has led to overruns approaching $1B. Sound familiar? Building the "world's most powerful accelerator" means pushing magnet technology to a new limit. Cost overruns linked to the magnets doomed Isabelle in the early 80's, and the Superconducting Supercollider a decade later. Another decade has passed and the LHC is projecting a major overrun on magnet costs.

4. SECRECY: BUSH BACKS DOWN ON KEEPING INFORMATION FROM CONGRESS.
In times of grave national threats, people in every country trade freedom for security. It is, however, often difficult to restore those freedoms once the crisis passes. Angry that some lawmakers had apparently leaked classified information to the media prior to the attacks on Afghanistan, the President issued an order that barred all but a few key members from briefings. Senator Daschle insisted, however, that to fulfill its oversight responsibility, several committees must get secret information. In some cases, the law specifically identifies which committees must be kept informed. Still, it seems that in the present crisis, briefings on national security matters will be more limited.

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THE AMERICAN PHYSICAL SOCIETY and THE UNIVERSITY OF MARYLAND