Paper calls R&D "the lifeblood of our science." Arguing that current funding levels "are endangering the near- and far-term future of the field," it urges that R&D toward new accelerators "should be increased substantially."

The three leading options for accelerators with energies beyond the LHC and the LEP e^+e^- storage ring it is displacing are: an e^+e^- linear collider, a very large hadron collider (VLHC), and a muon collider. (See Maury Tigner's article in PHYSICS TODAY, January 2001, page 36.) Strong recent evidence for neutrino oscillation has focused attention on the notion that a useful first step toward a muon collider would be an intense neutrino source based on a muon storage ring.

The timeline for decisions by the international high-energy community will stretch over decades. "We expect that only one of each type of frontier facility will be built worldwide," says the White Paper, "and that they will be built in different regions."

'The most pressing issue'

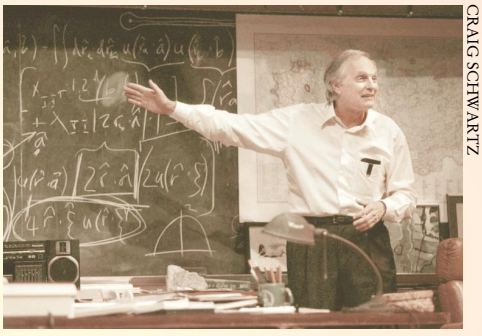
The e^+e^- linear collider concept is the most well developed, and the physics case for its construction is strong. Design work on various schemes for a collider in the 500-GeV regime is going on in the US, Europe, and Japan, and each of these regions is a potential host. The Germans, for example, are pushing for the superconducting design being developed at DESY in Hamburg. A decision is expected in two or three years. "The fundamental question is whether [the e^+e^-] machine is the desired candidate . . . that will restore the US to the energy frontier," says the White Paper. "Making this decision is thus the most pressing issue before our community."

A decision on the muon collider/neutrino source would come toward the end of the decade. Deciding about a VLHC will take longer. It will depend on what is discovered at the LHC. The feasibility of such a gargantuan machine, much bigger than the LHC, will also depend on R&D aimed at reducing the costs of both civil engineering and superconducting magnets. The White Paper foresees a decision early in the next decade.

At least one of these frontier accelerators should be built in the US, the White Paper argues. "The study of the fundamental issues bearing on the nature of matter . . . and the forces shaping the universe befits this nation. . . . Maintaining US leadership and training new generations [of high-energy physicists] demand an energy-frontier facility at home."

BERTRAM SCHWARZSCHILD

Alda Plays Feynman in *'QED'*


CRAIG SCHWARTZ

The scene is Richard Feynman's office at Caltech on a Saturday in 1986. Phone calls, office visits, and reminiscences weave a brisk, colorful tapestry of Feynman's life and personality—from the atomic bomb to quarks to picking locks to investigating the Challenger explosion, from playing bongo drums to sketching nudes to Tuva, and from his personal life to the analytical way in which he approached his own cancer.

In *"QED,"* Alan Alda plays Feynman. His portrayal "is uncanny—he's definitely got the spirit," says Tom Rutishauser, who used to drum with Feynman and is coaching Alda. In fact, it was Alda's fascination with Feynman that got things started, says playwright Peter Parnell. The play was inspired by Feynman's writings and Ralph Leighton's book *Tuva or Bust!*

"QED" premiered at the Mark Taper Forum in Los Angeles on 23 March, and is scheduled to run through 13 May. For more information, see http://www.Taper-Ahmanson.com.

TONI FEDER

Science Community Lobbies for Balance in Bush Budget

You can't increase one piece of science in America in research and leave other kinds of research in the doldrums," Senator Pete Domenici (R-NM), chairman of the Senate Budget Committee, said at a hearing on 6 March, about a week after President Bush released his budget blueprint for fiscal year 2002. With the exceptions of medical and military research, the picture the "blueprint for new beginnings" paints for the sciences isn't pretty. The uneven spread has members of Congress circulating letters and the science community lobbying hard for balanced funding increases across the sciences.

The blueprint, which was released on 28 February, would give the National Institutes of Health $23.1 billion for FY 2002, a 13% increase, on track for doubling its budget in five years, by 2003. And the Department of Defense would get $310.5 billion, a 4.8% increase, with $20 billion over five years for R&D, much of that for a national missile defense program.

Other funding agencies, however, would see flat or even falling budgets. The Department of Energy would get $19 billion—$700 million or 3% less than in FY 2001. And the blueprint specifies roughly $600 million in new spending, including a 5% increase for stockpile stewardship, for overseeing the country's nuclear weapons. That would mean cutting $1.3 billion from other existing DOE programs. "The administration hopes to protect the Office of Science at the expense of energy conservation and renewables, but Congress may not go along," says Mike Lubell, head of public affairs at the American Physical Society. "The ugly specter of lab closures could arise once again."

NSF and NASA would get tiny increases of 1.3% to $4.5 billion and 2% to $14.5 billion, respectively. Bush's blueprint proposes expanding NSF's math and science education programs, which, while welcomed by the agency, would nevertheless strain funding for other activities. Several NASA programs would be canceled, including the Solar Probe and an already threatened mission to Pluto that scientists had hoped to revive, and funds would be redirected to propulsion technology, the Mars program, and Earth sciences programs. The blueprint also calls for assessing, by 1 September, the possibility of moving ground-based astronomy from NSF's auspices to NASA's.

No science, no surplus

The budget back-and-forth is off to a late start this year, what with a new administration and delays caused by the election mess in Florida last fall, and it's too early to tell how funding will shake out for FY 2002, which starts on 1 October. A lot depends on what happens with Bush's proposed $1.6 trillion tax cut. The detailed

budget is expected in early April. But major changes are not expected in the broad outlines of Bush's blueprint.

"I am hoping we can improve the initial figures for research. They're not cast in stone yet," says Congressman Vernon Ehlers (R-MI), one of two physicists in the House of Representatives. "NSF is not adequate, and I am worried about DOE. I will put in a lot of time and effort to make sure we get equitable funding across science. In past years, in spite of a sometimes dismal early outlook, it's come out pretty well."

Even before the blueprint was available, various consortia of science groups wrote to the president urging, for example, that funding for DOE's Office of Science and NSF go up by 15% each. And in an op-ed column in *The New York Times* on 9 March, D. Allan Bromley, a nuclear physicist at Yale University who served as President George H. W. Bush's science adviser, summed up: "Congress must increase the federal investment in science. No science, no surplus. It's that simple."

But with the president's clear priorities—education, the military, health, and the tax cut—and no science adviser yet in place, says Bromley, "this year, more than most years, I have the feeling the budget will look like the administration's proposal." Last year's 9% across-the-board increase to science was an anomaly, he adds. "This year we are talking about at most an inflationary increase. . . . Nobody is against science and technology. They just don't realize how closely it is linked to the major thrusts of the new administration. We need to point that out." It may well be that scientific societies and others will find it difficult to make significant changes for 2002, Bromley adds. "We'll have to really focus on 2003."

TONI FEDER

ITER Gets Boost from European Commission

For decades, the promise of fusion energy has had a bad rap for hovering perpetually 20 or more years down the road. That's a reputation supporters may soon get a chance to change if cash comes through for the International Thermonuclear Experimental Reactor. In late February, the European Commission included 200 million euros (roughly $187 million) toward the $4 billion tokamak in its draft Sixth Framework Programme, the European R&D budget for 2003–06.

The inclusion of ITER, which is intended to show the feasibility of fusion energy, came after Europe's research ministers gave the project the nod. At an informal gathering in January, they discussed four scenarios: wiping out fusion research, cutting back to a US-style science-only fusion program, proceeding with an ITER that would be constructed abroad, or supporting ITER at a level such that it could be built in Europe. The research ministers favored pursuing the last two options simultaneously, according to observers.

"It's a big step toward proceeding with ITER," says Karl Lackner, who heads the European Fusion Development Agreement from Garching, Germany. "It comes in the wake of other steps, such as the proposal to consider Cadarache [the French nuclear research center] as a site. This sequence builds momentum."

Europe's ITER partners are Japan and Russia, the US having dropped out in 1998. Since then, the plans for ITER have been scaled down in size and cost (see PHYSICS TODAY, March 2000, page 65, and September 2000, page 56). At the soonest, construction could start around 2004, with operations beginning eight or so years later.

But fusion researchers' pleasure at the prospect of starting to build ITER is tempered by an overall cut in fusion funding. When the total Sixth Framework Progamme had to be trimmed by 300 million euros to 17.5 billion euros, fusion took the brunt, losing 100 million euros. That cut is widely seen as being politically motivated, since Budget Commissioner Michaele Schreyer is a member of Germany's Green Party, which opposes fusion energy.

Despite the cut to the fusion budget, Research Commissioner Philippe Busquin pumped up the amount earmarked for ITER, from 120 million to 200 million euros. Asked why by members of the European Parliament, Busquin said, "I think we have to think about this issue. We cannot postpone a decision [on ITER] any longer."

As it stands, the draft Sixth Framework Programme allots 700 million euros for fusion, including the ITER money, falling shy of the 788 million euros in the present budget, which runs through 2002. The European money covers about 40% of Europe's fusion research, with the rest coming from national budgets.

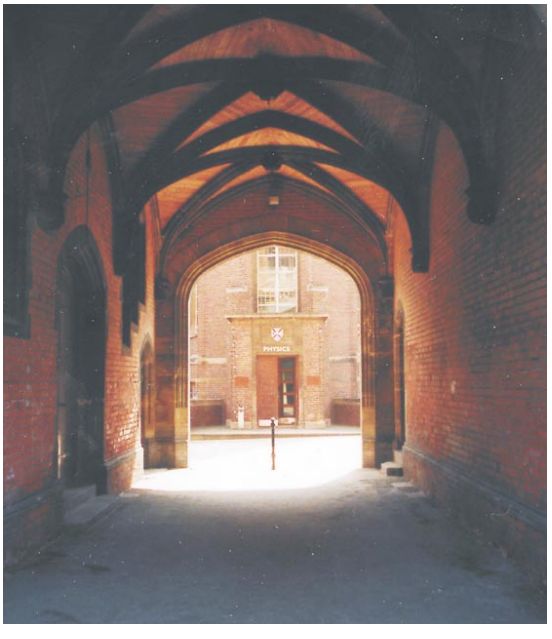
The shortfall is likely to pit ITER against other fusion projects, such as the Joint European Torus in the UK and the Wendelstein 7-X stellarator in Germany. "It poses a real dilemma," says Lackner. "But the fact that ITER is specifically mentioned means we should use this budget to start something new."

There's a "fighting chance" that fusion funding will be upped, Lackner adds. The Sixth Framework Programme—whose main areas are genomics and biotechnology, information technology, nanotechnology, aeronautics and space, food safety and health risks, sustainable development and global change, and citizens and governance in European society—still has to wind its way through both the European Council, which includes strong proponents of fusion, and the European Parliament, which appears to be divided on this issue. Changes in both the amounts and areas of funding are likely.

TONI FEDER

Belfast Boasts New Physics Center

Queen's University in Belfast is setting up a new physics center with £10 million ($14.4 million) that it recently netted in competitive bidding by Northern Ireland's two universities. Funding for the International Research Centre for Experimental Physics (IRCEP) comes out of a £40 million initiative called SPUR (support for university research), financed equally by the region's Department of Higher and Further Education, Training, and Employment, and by university and private donors.



QUEEN'S UNIVERSITY physics is about to expand.