

OMB'S ATTEMPT TO STOP FERMILAB UPGRADE HITS FANS IN CONGRESS

After a lunch at the White House for Republican leaders in Congress on 4 January, House majority leader Robert H. Michel of Illinois slipped President Bush a scribbled note asking him to "please take care of this.... It's very important." The note was attached to a letter addressed to Richard G. Darman, the President's budget director, and signed by all 24 members of the Illinois delegation in Congress. The letter came right to the point: "It has recently come to our attention that the Office of Management and Budget has rejected funding for important improvements to Fermi National Accelerator Laboratory.... We believe failure to fund these improvements would seriously impede important scientific research in America's leading accelerator laboratory. The competitiveness of the US in the field of high-energy physics is at stake."

When the next work week began on 7 January, Michel interrupted a staff meeting in his Capitol building office to take a call from Darman. According to one of those in the room, Darman told Michel, "You have friends in high places." The President, it seemed, had overruled OMB's decision and had ordered Darman to restore the Department of Energy's request for \$44 million in the fiscal 1992 budget to begin designing and constructing a new main injector ring at Fermilab. Bush had come to Fermilab's rescue just a few days before the 2026-page budget document was to be sent off to the printer.

Scientific frailty

The episode illustrates how fragile some scientific projects are in the Washington budget process. In fact, the effort to rescind OMB's ruling is a study in how such things get done with a little help from friends.

In 1983 Fermilab began running the world's first superconducting synchrotron, at 512 GeV. By 1987 it was producing experimental physics with countercirculating beams of protons and antiprotons, each with an energy of 0.9 TeV, from which the machine derives its name: the Tevatron. These are the highest-energy beams in the world; the previous record holder is a collider at CERN near Geneva, which can run continuously at a collision energy of 0.63 TeV or in a low-intensity pulsed mode at 0.9 TeV.

The Tevatron and its major particle

detector, called simply the Collider Detector Facility, have generated data of remarkable quality, confirming many of the predictions of the "standard model." A second large detector, the D-Zero, will be completed and begin operating this year. The standard model holds that matter consists of six kinds of quarks and six leptons. So far all these particles have been detected in experiments on various accelerators, except for the sixth quark, designated the top quark, and its associated neutrino. Analysis of data gathered from the CDF indicates that the elusive top quark must be heavier than 89 GeV.

Even before the Tevatron was fully operational, Leon Lederman, the lab's director at the time, planted the seeds of still higher energy and luminosity in hopes of producing top quarks in adequate abundance and determining their properties with great precision. This goal would require a more powerful linear accelerator and a new main injector that would raise the luminosity by a factor of 50 (to a peak of $5 \times 10^{31} \text{ cm}^{-2} \text{ sec}^{-1}$) and improve the intensity of fixed-target operations by a factor of 4. A plan to upgrade the linac was first submitted to DOE early in 1988, for funding in the fiscal 1990 budget. But DOE officials were only mildly interested. Their attention was already riveted on the Superconducting Super Collider, which had received President Reagan's approval a year before. They didn't want to be bothered about extending the useful life of the Tevatron beyond the year 2000, when the SSC would be operating at 20 times the collision energy of the Fermilab machine.

After Lederman retired in 1989, his successor, John Peoples Jr, revived the plan. Peoples argued that an upgraded Tevatron would operate comfortably above the luminosity that many physicists claim is required to discover the top quark or, alternatively, to find a flaw in the standard model. If the latter turns out to be the result, the Tevatron could possibly elucidate the mysterious Higgs mechanism (named after Peter Higgs of the University of Edinburgh). In any event, the upgraded Tevatron will be capable of whetting the scientific appetites of high-energy physicists by proffering a menu that includes new electroweak tests, precise measurements of $\sin^2 \theta_w$, and studies of top quarks, quark mixing parameters, *CP*

violation, and W and Z radiative corrections.

Approval of the \$22.8 million linac upgrade came in 1990. The project, to be completed next year, involves replacing the accelerating cavities and their aging power tubes with new copper cavities and modern klystron power sources. The linac's energy output will be doubled to 400 MeV, the intensity of the extracted beam will be increased for fixed-target physics, and the luminosity will be boosted for collider physics by about 50%.

Meanwhile, exactly one year ago, a subgroup of the High Energy Physics Advisory Panel reviewed DOE's particle physics program for the decade of the 1990s and assigned top priority to upgrading Fermilab's main injector (see *PHYSICS TODAY*, December, page 20). The new injector, the HEPAP subgroup declared, "guarantees that the Tevatron will remain the premier high-energy collider facility in the world in the pre-SSC era." The group, headed by Frank Sciulli of Columbia University, advised the "immediate commencement and speedy completion" of the new injector ring. Among its conclusions: Improving the collision rate of the Tevatron from 120 000 per second to more than 6 million per second will "position the US high-energy physics community for the optimal future exploitation" of the SSC by the end of the decade.

Political rivalry

Endowed with HEPAP's enthusiastic support, Peoples asked DOE in February 1990 for a total of \$173 million to design and build the new injector over the next three years. The injector would be a large-aperture, rapid-cycling proton synchrotron located in its own tunnel, separate from the main ring. Peoples proposed that DOE seek \$51.1 million in fiscal 1992 to start the design work, prepare the site and begin pouring concrete for the ring tunnel. But when DOE delivered its preliminary budget request to OMB in September, it had cut back his figure to \$44 million and stretched out construction to four years. OMB, for its part, say Administration sources, decided that it would be politically and fiscally infeasible to fund Fermilab's upgrade in the same year the Administration proposed to boost the SSC's budget 120%, to \$523.7 million.

"We thought we would be accused of excessive hubris for asking Con-

gress to upgrade Fermilab even as we requested a half billion for the SSC—a sum about equal to the annual budget for all of DOE's high-energy physics," says an OMB official. "It's no secret that DOE will be ramping up to more than a billion for SSC construction each year in 1995 and 1996."

Before Congress's Christmas recess, Representative J. Dennis Hastert, a Republican whose district includes Fermilab, learned that OMB had "zeroed out" the main injector. "We were told OMB didn't want to risk endangering the SSC appropriation by including construction of another high-energy physics facility in the same budget," Hastert recalls. When Hastert and Michel discussed the problem, they decided what was needed was friendly persuasion by the Illinois delegation. Though it was the week before Christmas, they were able to reach some of the most powerful figures in Congress. Dan Rostenkowski, the 17-term Democrat who

heads the House Committee on Ways and Means and the Joint Committee on Taxation, had no trouble getting Darman on the line to protest the cut. Hastert and Paul Simon, a Democrat who serves on the Senate budget committee, made the case for the upgrade with Henson Moore, DOE's deputy secretary. Hastert and Michel lobbied members from many districts, especially those from the SSC's home on the range in Texas. Their argument, says Hastert, was that "the SSC is not a sure thing and you'll need all the help you can get as it gets more expensive year after year."

In the end it was Michel's note to Bush that made the difference. On 10 January, OMB changed its mind and added \$43.5 million to the budget for the main injector. That amount is "excellent" scientifically and symbolically, says Peoples. "It's important as to whether we go forward at Fermi or we are left to wither."

—IRWIN GOODWIN

ACH DU LIEBER AUGUSTINE: A NASA COURSE TO AVOID DRIFT

With the ghost of the Challenger disaster and the specter of the flawed primary mirror on the Hubble Space Telescope and the hydrogen leaks in the space shuttles hovering over NASA, rumors persisted last summer that the White House wanted to change the course of the space agency. Sources in the Administration claimed that Vice President Dan Quayle, chairman of the National Space Council, favored an extensive inquiry into NASA's programs and performance to justify any new directions. But President Bush, who is more enthusiastic about space than any of his predecessors since Lyndon Johnson, objected to Quayle's plan, arguing that such an investigation might discredit NASA's leadership during Republican Administrations in the 1980s, when the initiative in space shifted to the Soviet Union. The President has championed space exploration as America's manifest destiny and has called for an expedition to the Moon by the year 2000 as a prelude to the main event: a mission to Mars, perhaps in 2019, the 50th anniversary of the first lunar landing. So it was agreed last July that the review should only look forward at the US space program. Even so, the report issued by a "blue ribbon" advisory committee on 10 December brought both the past and the future into sharp focus.

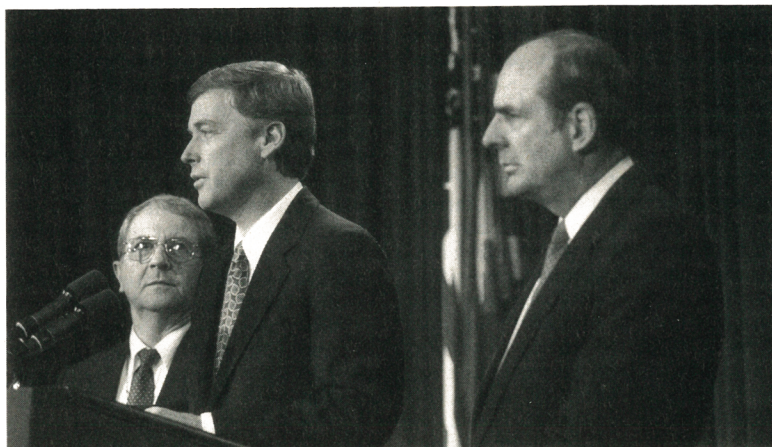
Only 48 pages in length, the docu-

ment makes sobering and sensible points. That the panelists were drawn largely from the space establishment gives their conclusions extra force. The 12-member committee was headed by Norman Augustine, the no-nonsense chief executive of Martin Marietta, an aerospace company with many NASA contracts. Five other members are from the aerospace industry, and one of those five, Thomas

O. Paine, was NASA's administrator in the Apollo years. Only three panelists can be called scientists—Laurel Wilkening, an astronomer who is now provost at the University of Washington; D. James Baker, a physicist at NASA's Jet Propulsion Laboratory at Caltech and president of the Joint Oceanographic Institutes; and Louis Lanzerotti of AT&T Bell Labs, a former chairman of NASA's space science advisory committee and current head of the National Research Council's Space Sciences Board. Lanzerotti was named at the last minute before the panel was formally announced, when the White House realized the panel lacked a "sufficient" number of scientists. Two panelists are former Congressmen: Edward P. Boland, who headed the House appropriations subcommittee that controls NASA's budget, and Don Fuqua, who led the House science committee and now heads the Aerospace Industries Association.

Lacking a clear purpose

The committee identifies the greatest failing of the US space program as its absence of a clear purpose. NASA has been trying to do too many different things with limited resources and has contributed to its own problems by underestimating project costs and safety margins, then cutting back smaller projects to keep its larger ambitions alive. The committee argues that NASA should give its highest priority to scientific research, devoting 20% of its annual appropriations to this and using unmanned rockets instead of the shuttle for most



STEVEN PURCELL/THE WHITE HOUSE

Augustine report examining NASA programs and policies is released to the news media by (left to right) NASA Administrator Richard H. Truly, Vice President Dan Quayle and the committee's chairman, Norman Augustine, CEO of Martin Marietta Corporation.