

Fermi News

Fermi National Accelerator Laboratory

Volume 21

Friday, January 9, 1998

Number 1

INSIDE

4 Near-Beam Physics

6 Dear Mr. Ellis

8 Profiles in Particle Physics: Chuck Marofski

9 Electrical Accident

10 Banners

U.S. and CERN Sign LHC Agreement

American scientists, including many from Fermilab, will help build the Large Hadron Collider in Europe.

By Judy Jackson, Office of Public Affairs

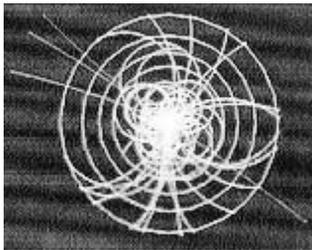
As they cleared security at the entrance to the Old Executive Office Building across the street from the White House, guests and dignitaries bound for the December 8 signing ceremony for the Large Hadron Collider donned mandatory plastic ID tags stamped with the words "Large Event." Looking around at the tags adorning the veritable Who's Who of U.S. particle physics and Washington science hands filling the ornate Indian

Treaty Room, CERN Director-General Chris Llewellyn Smith posed a question.

"By 'Large Event,'" he wondered, "do you think they mean the Higgs?"

Whether or not the new Large Hadron Collider to be built at CERN, the European Laboratory for Particle Physics in Geneva, ultimately identifies an event containing the putative mass-conferring particle called the Higgs boson, the ceremony confirming U.S. participation in the project was definitely a Large Event.

continued on page 2



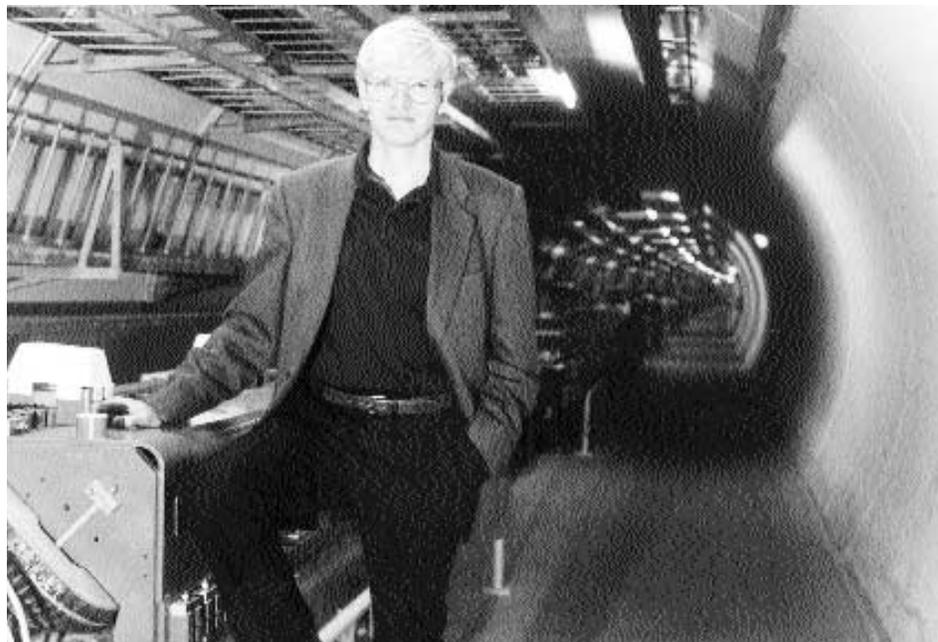
Simulation of a Higgs boson decay.

CERN Photo

NSF Director Neal Lane, Secretary of Energy Federico Peña, CERN Council President Luciano Maiani and CERN Director-General Chris Llewellyn Smith immediately after signing the LHC agreement in the Indian Treaty Room.



DOE Photo



CERN Photo

CERN's Director-General Christopher Llewellyn Smith in the tunnel that will hold the LHC.

LHC Signing

continued from page 1

An unprecedented partnership

In what they all described as an historic act of international scientific collaboration, U.S. Secretary of Energy Federico Peña, National Science Foundation Director Neal Lane, CERN Council President Luciano Maiani and Llewellyn Smith signed an agreement under which the U.S. will help build the new accelerator and two of its associated detectors. When it begins operating sometime after the year 2005, the LHC will take over the energy frontier from Fermilab's Tevatron, currently the world's highest-energy particle accelerator.

Although international collaboration has long been a hallmark of particle physics, with scientists from many nations getting together to build detectors and operate experiments, the new agreement calls for unprecedented worldwide partnership in the construction of an accelerator itself, traditionally the responsibility of the host country.

"When we sign this agreement," Peña said, "it will mark the first time the U.S. government has agreed to contribute significantly to the construction, through domestically produced hardware and technical resources, of an accelerator outside of our borders."

Besides CERN's 19 European member states, which for over 40 years have chipped in to build and operate the high-energy physics facilities at the laboratory, several non-member states—including the U.S., Canada, Japan, India and Israel—have agreed to contribute to the new LHC collider and detectors. The U.S. contribution, largely in the form of accelerator and detector components built in the U.S. to

be delivered to CERN, will total \$531 million over eight years, with \$450 million coming from the Department of Energy and the remaining \$81 million from NSF. In fiscal year 1998, Congress appropriated \$35 million for LHC work. When experiments begin in another decade, about 25 percent of American experimental particle physicists say they plan to collaborate on experiments at the LHC.

Physics without borders

Llewellyn Smith cited the universality and openness of science as a reason that scientific research should be carried out in international collaborations, not hemmed in by borders or cultures.

"The signature today of the cooperation agreement between the United States of America and CERN is an historic event," he said. "It is an important step towards the first-ever global collaboration in a large scientific construction project. American participation in the Large Hadron Collider will inject a wealth of scientific experience, excellence and characteristic exuberance into the project."

The LHC, whose total price tag will equal about \$6 billion, will occupy an existing 16-mile tunnel that currently holds the Large Electron-Positron Collider. The LHC's collision energy of 14 TeV will be seven times higher than that currently achieved at the Tevatron. Its energy will reach a scale at which physicists believe they may find the answers to fundamental questions about the origins of particle mass. They hope the LHC may also offer a pathway to physics beyond the well-worn Standard Model, the current theoretical picture of particle interactions.

Fermilab, the LHC and the future

U.S. participation in the LHC will have important consequences for Fermilab. The Technical Division's Jim Strait is the project manager for the U.S. contribution to the accelerator, leading a collaboration that includes Brookhaven, Lawrence Berkeley and Fermilab. Much of the R&D and fabrication for advanced superconducting quadrupole magnets for the accelerator's interaction regions will take place in Fermilab's Technical Division.

In addition, in 1997, officials of DOE and NSF asked Fermilab to oversee project management for the CMS detector, one of the LHC's two major detectors. Fermilab is the host laboratory for U.S. CMS, for which Fermilab physicist Dan Green is technical director.

"Physics is a discipline without national borders," Green said. "Since the possibility of basic discoveries in particle physics is large at

" American participation in the Large Hadron Collider will inject a wealth of scientific experience, excellence and characteristic exuberance into the project."

~ Christopher Llewellyn Smith



the energy frontier, it is vitally important that U.S. physicists have the opportunity to participate as full partners in the LHC adventure. The recent agreement between CERN and the U.S. ensures that partnership.”

Although it might seem puzzling that Fermilab would welcome the opportunity to help build the accelerator that will one day supersede the Tevatron, Laboratory scientists hailed the signing ceremony as a landmark in international cooperation that will benefit not only particle physics research but Fermilab itself.

“Collaborating with CERN on LHC is good for Fermilab because it is good for science,” Strait said. “The science of LHC is compelling, and we can help ensure that it is done more quickly, through our work on the accelerator, and better, through our work on CMS. Our work on LHC keeps Fermilab and the U.S. high-energy physics community deeply involved in the physics at the energy frontier, and our work on the detector and accelerator will help keep our technological abilities at the forefront. This will help make us a credible host for the construction of a future higher-energy collider. The only way such large facilities can be built is by worldwide collaboration, and our contribution to the construction of the LHC will help establish the principle and habit of accelerator builders working together across international boundaries.”

However, the path to a future U.S. accelerator is by no means certain. Although they repeatedly cited the LHC agreement as an excellent precedent in global collaboration and a model for other fields, both European and U.S. officials were careful to avoid establishing any *quid pro quo* for future accelerator construction. In response to a reporter’s question whether Europe is now committed to support U.S. high-energy physics facilities in the future,

continued on page 11

Computer simulation of the LHC as it will appear in the tunnel that currently houses CERN’s Large Electron-Positron Collider.



Photo by Fred Ullrich

At Fermilab’s Technical Division, Fermilab engineer Jim Kerby explains the progress of work on high-gradient LHC quadrupole #1 to CERN’s Win Middelkoop and Lyn Evans, and Brookhaven’s Mike Harrison. U.S. LHC accelerator Project Manager Jim Strait looks on.



Photo by Reidar Hahn

Purdue University physicist Sergei Medved works on a piece of a piece of the CMS detector in Fermilab’s Lab 7.

LHC Signing

continued from page 3



Photo by Reidar Hahn

Fermilab physicist Jim Freeman and University of Rochester technician Dan Ruggiero inspect a megatile scanner for the CMS detector.

DOE's Martha Krebs replied that the LHC agreement was most useful in establishing a general framework for collaboration in large scientific projects in many fields, not simply in high-energy physics.

"Does that mean that there is no agreement from Europe?" another reporter pressed.

Llewellyn Smith replied that looking at international collaboration "project by project, in a given field, is not a good idea. However, this agreement will make it more likely that many people in many different fields will find it easier to reach international agreements."

Civics 101

Reaching the international agreement for U.S. participation in the LHC was by no means easy. Representative James Sensenbrenner (R-WI), Chairman of the House Science Committee, among others in Congress, raised strong objections to the U.S.-CERN agreement as originally proposed, impelling DOE and CERN officials to modify the terms of U.S. involvement.

"We have had a crash course in the American system of government," Llewellyn Smith told the gathering. "Although at times it seemed to be much more complex than particle physics—and I am still not sure that I know the answer to the question: who decides in Washington?—we seem to have survived to the end of the course."

The Europeans should probably not put away their Washington guidebooks quite yet. As U.S. particle physicists know, when one congressional budget cycle ends, another begins. Observing the jubilant festivities surrounding the signing ceremony, a senior congressional Appropriations Subcommittee staffer smiled.

"This is great fun," he said, "but next year it will be back to square one." ■

LAB NOTES

Environmental Report

The 1996 Report to the Director on the Fermilab Environment is available at the following Web address
http://eshdbsrv.fnal.gov/Envir_Reports/.

URA Scholarship Information

Candidates for Universities Research Association (URA) scholarships are reminded that applications are due March 1. Applications are available from and should be returned to Personnel, WH 15SE, Mail Station 124.

Scholarships are awarded on the basis of S.A.T. (Scholastic Aptitude Test) scores. URA awards a number of scholarships to regular, full-time Fermilab employees' children who are currently high-school seniors and who will begin a four-year college degree program next fall. The maximum amount of the scholarship is \$3,000 for tuition and fees and is renewable for four years if the student progresses in good academic standing. Applicants will be notified regarding the scholarships in early April.

David Schramm 1945-1997

Dr. David Schramm, vice-president for research and distinguished professor of astrophysics at the University of Chicago and a member of Fermilab's Board of Overseers, died when his plane crashed near Denver, Colorado, on December 19, 1997. Dr. Schramm had a long and close association with Fermilab. The next issue of *FermiNews* will contain an article on Schramm and his work.

Chez Léon

M E N U

Lunch served from
11:30 a.m. to 1 p.m.
\$8/person

Dinner served at 7 p.m.
\$20/person

For reservations, call x4512
Cakes for Special Occasions
Dietary Restrictions
Contact Tita, x3524

Lunch Wednesday January 14

Cannelloni
with Seafood Filling
Caesar Salad
Pear and Hazelnut Tart

Dinner Thursday January 15

Mussels Steamed in
White Wine and Thyme
Veal Piccata
with Capers and Pine Nuts
Sautéed Spinach
Risotto
Profiteroles

Lunch Wednesday January 21

Rouladen
Noodles with
Cream and Caraway
Vegetable of the Season
Linzertorte

Dinner Thursday January 22

Potato and Leek Soup
Monkfish with
Cognac Cream Sauce
Rice Pilaf with
Peas and Pine Nuts
Apple-Stuffed Crepes
with Maple Caramel Sauce