Proposing the Office of Pan American Collaboration

Leon M. Lederman

The Fermi National Accelerator Laboratory (Fermilab) is a large facility—used by physicists from about 80 universities in the US and from about 28 foreign countries—devoted to the study of elementary-particle physics. Its major instrument is a 400-GeV proton accelerator; under construction is a superconducting accelerator designed to raise the energy to 1000 GeV. A very impressive array of advanced technology—developed in the course of accelerator construction and instrumentation development—supports rather exotic basic research into the structure of matter and energy; on a typical day, one can attend seminars on cryogenic developments, microprocessors for information handling, and the interface of quarks and cosmology.

During most of 1980, I corresponded with Latin American physicists concerning collaboration at Fermilab. A hospitality center at Fermilab would be a place where experimental physicists could come to learn an advanced technology and, at same time, pick up some of the excitement of frontier research in particle physics. My objective was to have Fermilab assist and participate in the advance of physics and associated technology in Latin America. The inspiration was clearly the Trieste Center, but my stress is on experimental science and technology. In January of 1981 I attended an international assembly in Bogota and visited the Instituto de Fiscia (UNAM) in Mexico City. It was there, in consultation with Director Jorge Flores, that the idea of a Pan American symposium was born. Funding for the US participation and advice was forthcoming from the NSF's Division of International Programs to supplement my DOE-supported work at Fermilab. The symposium took place in Cocoyoc, Mexico on 5–7 January 1982.

The symposium demonstrated, first of all, that there was a viable Pan American community of high-energy physics. Some ten Latin American countries were represented at the meeting. We were told that this is rare in Latin American physics—that aside from a very strong summer-school program, the last assembly of so many Latin American institutions took place over ten years ago. The meeting had about 50 attendees with strong delegations from the US, Brazil and Mexico. One "quasi" Canadian (Richard Taylor of SLAC) and an informal CERN observer (Georges Charpak) also participated.

Leon M. Lederman is director of the Fermi National Accelerator Laboratory, Batavia, Ill.

Latin American physicists discussing the Pan American Center at Fermilab. From left to right: Miguel Awschalom (Argentina), Jorge Morfin (Mexico), Moyses Kurchnir (Brazil), Carlos Hojvat (Argentina), Juan Bofill (Venezuela) and Ugo Huerta (Mexico).

In addition to reviewing the substance, current status and future expectations of high-energy particle physics, the symposium provided an excellent opportunity to survey the state of physics research and education in Latin America and to explore the possibilities of increased collaboration with US laboratories. One form of collaboration would be to provide assistance to groups interested in becoming users of the high-energy facilities. Another form would be to provide a stimulus to experimentalists in any field of physics who would profit from exposure to the advanced technology associated with high-energy laboratories. Implicit in our objectives is the assumption, perhaps even deep conviction, that a strong physics capability is a necessary component in the potential for technological development.

The following symposium topics were found to be useful for Latin American physicists contemplating collaboration with US high-energy facilities:

Using HEP facilities. Taylor described how users form collaborations, manage their university obligations and carry out research at the remote labs. User groups can be important spurs to local industry in constructing the technically sophisticated devices that users typically bring to the accelerator laboratory. The ICFA (International Committee on Future Accelerators) statement on utilization policy, which has been agreed to by all of the world's HEP laboratory managements, should be known to Latin American scientists. The statement declares that these facilities are open to *all* users on a worldwide basis, the only criteria of selection being scientific merit and technical competence of the proposal. If experimental high-energy physics is deemed to be a useful activity to any institute in the world then the admission fee to any of the world's accelerators is a compelling scientific idea.

Forming a group. Michael Kreisler (University of Massachusetts), who is currently collaborating with Columbia University of Mexico in a BNL/Fermilab experiment, reviewed the requirements for forming a small but viable HEP group. A relevant example has been the Canadian experiment of depending on accelerator facilities abroad to do high-energy physics. This involvement has now developed to the point where the Canadian physicists are interested in the possibility of constructing an electron ring at one of the large proton machines.

Sociology of large teams. The value of working with a large HEP team as an educational experience has pros and cons. On the one hand, working in a well-led group provides opportunities for innovation and opportunities to learn sophisticated technologies. New PhDs in high-energy physics become skilled in these techniques but they also experience the excitement of dealing with data at the frontier of science. On the other hand, there are opportunities for abuse—overly narrow specialization, use of "black box" apparatus and the possible damping of the free

continued on page 74

guest comment

continued from page 9

spirit. However, diligent attention and sensitivity on the part of senior scientists in the group can minimize the possibility of pitfalls and ensure a valuable graduate-student experience.

PhD distribution and production. In terms of scientific manpower there are vast differences between, for example, Brazil (600 PhD physicists in a population of 120 million) and Honduras (3 PhDs in a population of 3 million). For reference, the US has 25 000 PhD physicists in a population of 200 million. This figure may be as good an indicator of development or at least the potential for development as any statistic. Of the roughly 1200 physics PhDs in Latin America, roughly half are active in research. Production of PhDs is roughly 150–200 per year, with more than half being obtained abroad. The population base is 350 million with a total GNP of $500 billion.

Social implications. Michael Moravcsik (University of Oregon) points out that high-energy physics is a central fact of our intellectual age and all who aspire to build up their local universities must participate in it, not only for the scientific prestige associated with achievements but also because the emerging world view is a seminal cultural development. The "grand old man" of Mexican physics, Marcos Moshinsky, said, "Strong physics, with its implied grasp of the basis of technology, is necessary for self-confidence, self-reliance, and ultimately self-sufficiency." Furthermore, the cultural appeal of high-energy physics attracts the most talented people, and they grow to have vast influence outside of their fields of specialization. Bright and versatile practitioners go off and, for example, make contributions to free-electron lasers, apply theoretical tools from high-energy physics to propagation of sound in oceans or apply their accelerator expertise to building tokamaks for nuclear-fusion energy. The application of quantum field theory to condensed-matter physics and particle accelerators to medicine, microelectronics and radiation processing was also noted.

Graduate education itself has social implications for most of Latin America because, in general, it must be done abroad. The trend is away from the US and towards Europe because of the cost and because of the more difficult admission standards of US graduate schools.

Names are important; "Institute" and "Center" do not have the right connotations in Latin America, so we have evolved "Office of Pan American Collaboration" (OPAC).

US interest. The interest of other laboratories in addition to Fermilab is clear: Both SLAC and BNL were represented at the symposium and both are

clearly available as hosts to collaboration. If we generalize to include the multipurpose laboratories such as Argonne, then the offering of scientific fare becomes enormous. Fermilab, with pardonable pride, customarily provides facilities for physicists from about thirty countries and is therefore well set up, with housing, a foreign visitor desk, language lessons, counseling and so on. All the laboratories involved in HEP provide science, which is the compelling cultural attraction. The associated technology makes the visit socially redeeming. The Latin American physicists present at the symposium country by country expressed enthusiasm for the prospect of an OPAC.

It is my feeling that we are experiencing something very serious, perhaps historic. If one believes that the technological gap between North and South tends to produce an unstable world, then we are moved to diminish this gap. The profit to the US in taking vigorous leadership is on several levels:

- ▶ Physicists trained here will use our technology
- ▶ The human connections forged in this important enterprise must have positive political benefits
- ▶ An explosion in physics in Latin America will substantially broaden the base out of which, by the usual fluctuations, comes the creative thinker whose breakthroughs will change our lives, increase our comforts or a least preserve the technological society upon which we now depend.

What happens next? Fermilab is already "open" and several theorists have come for short stays. We are shipping donated *Physical Reviews* to libraries in need and are setting up purchasing mechanisms for physics apparatus. We are anxious to receive both physicists and technicians when these visits would benefit the sending institution. We have advised and encouraged the first HEP users group from Mexico. We are seeking modest foundation and international agency support to provide supplementary living costs; private funding minimizes the political complexity of involving governments. Institution-to-institution agreements are simple and should be the rule insofar as this is possible. If, in the course of the next few years, Fermilab and its sister laboratories can play host to 20, 30 or 50 teachers and researchers from Latin America, each of these will in turn touch hundreds of students and colleagues and the leverage will be very great. Being even more optimistic, we can look forward, perhaps in five or ten years, to the serious notion of a Pan American Accelerator Laboratory: a hemispheric Centro Americano de Investigaciones Nucleares. □