Physics monitor

next element would be a superconducting solenoid, where several designs are under study. The hadron calorimeter with iron absorber and gas active medium would surround the magnet.

Muons would be measured by an outer layer of drift tubes, by the existing L3 muon chambers outside the hadron calorimeter and by the central tracker, with its ultimate resolution of 3.6 parts in a thousand.

With the LHC Experiments Committee now in business, the overall goal is to present a fairly detailed description of the LHC experimental programme, including machine, detectors and the relation to the rest of CERN's experimental programme, to CERN's governing body, the Council, at the end of 1993. Council would then be in a position to start the approval procedure for the whole LHC project. However the broad outline should be clear enough for a preliminary report on the emerging plans for the experimental programme early this year.

DPF Big One

At its latest venue at Fermilab from 10-14 November, the American Physical Society's Division of Particles and Fields meeting entered a new dimension. These regular meetings, which allow younger researchers to communicate with their peers, have been gaining popularity over the years (this was the seventh in the series), but nobody had expected almost a thousand participants and nearly 500 requests to give talks.

Thus Fermilab's 800-seat auditorium had to be supplemented with another room with a video hookup, while the parallel sessions were organized into nine bewildering streams covering fourteen major physics topics.

With the conventionality of the Standard Model virtually unchallenged, physics does not move fast these days. While most of the physics results had already been covered in principle at the International Conference on High Energy Physics held in Dallas in August (October, page 1), the Fermilab DPF meeting had a very different atmosphere.

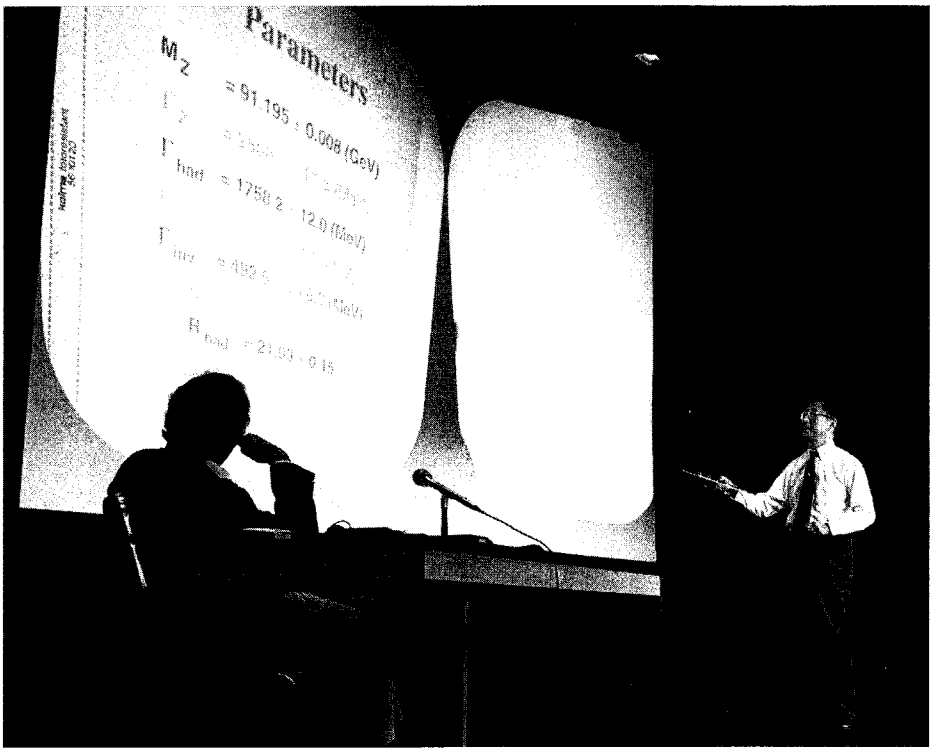
Major international meetings like Dallas attract big names from far and wide, and it is difficult in such an august atmosphere for young researchers to find a receptive audience. This was not the case at the DPF parallel sessions. The meeting also adopted a novel approach, with the parallels sandwiched between an initial day of plenaries to set the scene, and a final day of summaries.

With the whole world waiting for the sixth ('top') quark to be discovered at Fermilab's Tevatron proton-antiproton collider, the meeting began with updates from Avi Yagil and Ronald Madaras from the big detectors, CDF and D0 respectively. Although rumours flew thick and fast, the Tevatron has not yet reached the top, although Yagil could show one intriguing event of a type expected from the heaviest quark.

Frank Sciulli of Columbia presented initial results from the HERA electron-proton collider at DESY Ham-

At Fermilab in November, the American Physical Society's Division of Particles and Fields meeting attracted about a thousand scientists.

At the Fermilab DPF meeting, Sam Ting summarizes the findings of the experiments at CERN's LEP electron-positron collider. (Photo Reidar Hahn)



burg. These initial snapshots of an intriguing new experimental conditions have been aired several times already (December 1992, page 11), but Sciulli could show HERA's first charged current event.

The physics from CERN's LEP electron-positron collider was described by Sam Ting of MIT, abandoning temporarily his traditional role as spokesman of the LEP L3 experiment to do an excellent job in assembling the contributions from Aleph, Delphi, and Opal as well.

After a well-balanced presentation of LEP's considerable contribution to orthodox electroweak and quark physics, Ting could afford the luxury of pointing to possibly unorthodox LEP Z decays producing a pair of leptons (electrons or muons) accompanied by two high energy photons. Curiously, four such decays from L3 and now two from Delphi report photon pairs carrying about 60 GeV of energy. The events were subsequently described in detail in the parallel sessions by Boleslaw Wyslouch of MIT for L3 and Jesus Marco of Santander for Delphi, who were carefully questioned (see page 9). These LEP photon pairs quickly became the meeting's talking point.

Charles Baltay of Yale had a sample of 10,000 Zs produced using polarized beams at Stanford's SLC linear collider and collected by the SLD detector. Knowing the spin orientation of the decaying Zs makes for a particularly rich data sample, which will be augmented next year when the SLC resumes running.

Speaking on the high energy physics-astrophysics connection, Daniel Sinclair of Michigan concentrated on high energy gamma sources and on atmospheric neutrinos.

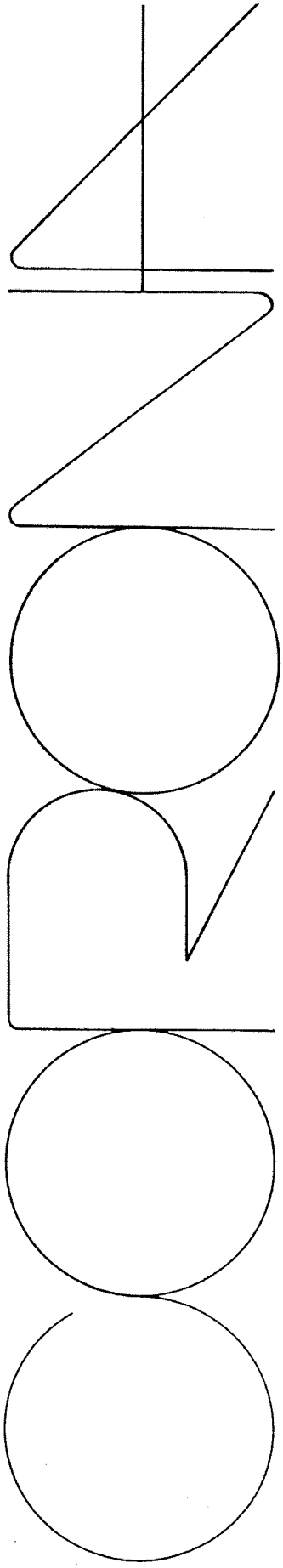
High energy gamma rays from massive stellar synchrotron radiation emission were first seen in secret data from satellites looking for nuclear tests. It was soon established that the bursts came from outside the solar system but nevertheless the data still stayed secret for a while. However sightings began to accumulate and with NASA's GRO satellite in orbit, gamma astronomy has now become big business (July 1992, page 20).

For atmospheric neutrinos, Sinclair underlined the discrepancy between muon-type and electron-type signals seen in big underground detectors (September 1992, page 4). However the traditional difficulty of compiling solid neutrino data suggests other types of experiment are needed for to complement the traditional water Cerenkov readings.

On non-accelerator experiments, John Wilkerson of Los Alamos read the death sentence for the 17 keV neutrino, explaining how pioneer 17 keV neutrino 'findings' had now been explained by multiple scattering. This was covered in detail later in the parallels by Andrew Hime, who pointed out that some 17 keV results nevertheless still stand. In the same session, David Caldwell of Santa Barbara underlined the difficulty of these neutrino measurements – 'everybody has found this to be a difficult business'.

Speaking on accelerator developments, Maury Tigner of Cornell explained how the initial 1980s euphoria on possible new accelerator developments has largely evaporated, with the emphasis now more on traditional approaches to new energy and luminosity frontiers. For detectors, Murdock Gilchriese of Berkeley remarked how luminosity ceilings have been lifted, with 10^{33} apparently no longer the problem it appeared ten years ago.

The final day's plenary sessions started with coverage of the sacro-



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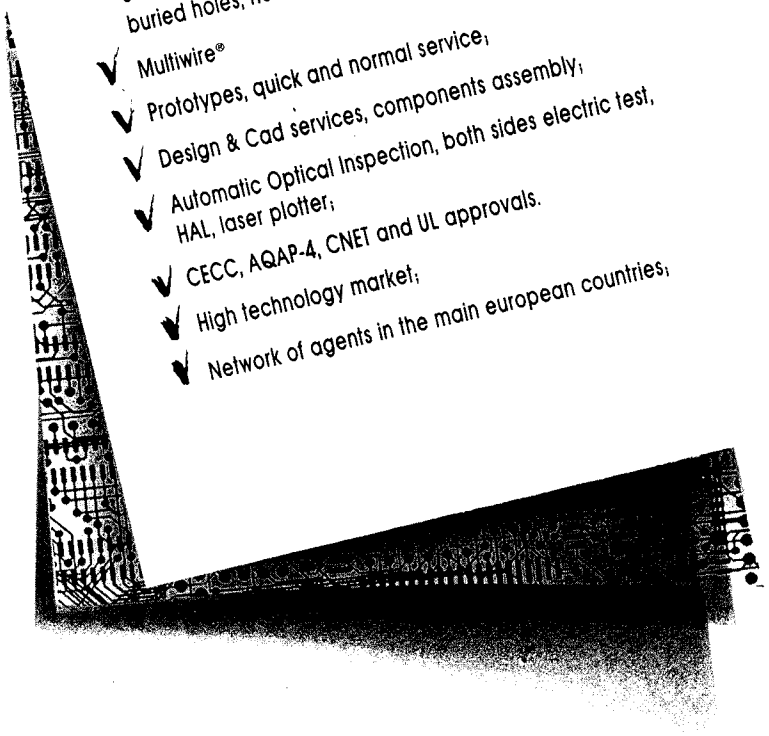

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Former Fermilab Director Leon Lederman called for improved public awareness of particle physics.
(Photo Reidar Hahn)

sanct Standard Model, with Keith Ellis of Fermilab in the quark corner, and William Marciano of Brookhaven as the electroweak contender. Ellis highlighted the consistent set of measurements now in place for the quark/gluon content of hadrons (structure functions), and how the kinematic coverage of these measurements is being extended with the advent of the HERA proton-electron collider at DESY, Hamburg.

With electroweak measurements appearing to confine where the sixth ('top') quark will turn up, Marciano warned against being too influenced by central 'predictions' for the top. Whatever its mass turns out to be, it will be much heavier than anything else, and this needs to be explained.

John Cumalat of Colorado (charm), David Cassel of Cornell (bottom) and Walter Toki of SLAC (tau leptons) summarized the wealth of detailed data now building up on flavour physics. The final afternoon turned to theory, with Stephen Sharpe of the University of Washington describing the aims and achievements of lattice theory, while David Gross of Princeton covered recent theoretical developments, including attempts to explain the existence of quantum chromodynamics.

Winding up the meeting, Leon Lederman was in fine form. After surveying the continued intactness of the Standard Model, he turned to the current level of support for high energy physics in the US. He deplored the general public's lack of information on science in general and high energy physics in particular, which according to Lederman translates into ignorance and apathy at congressional level. This should be countered, he urged, by well defined and thought out information campaigns organized by national science societies.

The meeting was organized by physicists from Fermilab and local universities. Chairmen of the local organizing committee were Rajendran Raja and John Yoh from Fermilab.

CERN
A tale of two photons

When precision data from the several million Zs carefully collected over several years by the four big experiments – Aleph, Delphi, L3 and Opal – at CERN's LEP electron-positron collider have otherwise consistently underlined conventional physics, a hint of something unexplained quickly packs the seminar rooms.

In 1991, the L3 experiment turned up two examples of Z decays producing a muon pair accompanied by a widely separated pair of high energy photons, with the photon pair in each case taking some 60 GeV of energy (actually 58.8 and 59.0 GeV). Nothing to get excited about at the time, but ongoing data analysis tuned into this channel. This year two more events turned up, one again with a muon pair accompanied by a 60 GeV photon pair, the other with an electron (electron-positron) pair and a 62 GeV photon pair.

At first L3 preferred to keep this quiet, and the news was not announced at the major international meeting in Dallas last August.

The first public announcement of the four unexplained events (out of a total of 1.6 million Z decays) came in a LEP Experiments Committee session at CERN in October.

At the same session, Delphi spokesman Ugo Amaldi publicly