With its ability to cleanly identify a fraction of neutrino events by observing recoil protons, the Soudan detector will be able to test this idea experimentally. As with other major underground facilities, Soudan has also been considered as a distant target for a beam of synthetic neutrinos, in this case from Fermilab, searching for neutrino oscillations after 730 kilometres. If the atmospheric neutrino result is due to oscillations, many of Fermilab's muon neutrinos would become tau or electron neutrinos on their way to Soudan. This would decrease the fraction of the 900 interactions per year containing final state muons, and provide an unambiguous signal of neutrino oscillations.

Attractive features of this proposal are both the operating Soudan 2 detector and the possibility of building a bigger detector at the same site. When the US Department of Energy approved the excavation in 1983, they allowed for future follow-on experiments by funding a space large enough for a second major detector after Soudan 2. Several ideas are now being developed. The neutrino beam from Fermilab is expected to be ready in 1998, after completion of the planned 5 kiloton year exposure for nucleon decay. With the construction of Soudan 2 modules completed, the experiment is now on the threshold of a long programme of exciting particle physics measurements in its underground laboratory.

Fermilab Director John Peoples is ICFA Chairman 1993-5.

ICFA

The 23rd meeting of ICFA (International Committee for Future Accelerators) was held on 13 January at the Japanese KEK Laboratory. This committee, set up in 1976, promotes international collaboration in the construction and exploitation of very high energy accelerators, and organizes topical workshops and meetings.

At the KEK meeting, there was major discussion on planning for a future TeV electron-positron linear collider, envisaged as the next very large accelerator following the SSC and LHC proton collider projects. Already there is considerable international R&D collaboration for such a machine, and ICFA is much involved in promoting this collaboration and providing forums to discuss the accelerator and physics issues which arise as the project advances.

The DESY, Hamburg, Laboratory in May will host an ICFA seminar on 'Future Perspectives in High Energy Physics'. These seminars, held every three years, are among the most significant in-depth international reviews of the state of high energy physics, covering both the science itself and the essential accelerator tools. A major topic at the DESY Seminar will be TeV electron-positron linear colliders.

ICFA people

In January, John Peoples of Fermilab became ICFA Chairman (until December 1995), succeeding Alexander Skrinsky of Novosibirsk. Long-serving (since 1978) Secretary Owen Lock (CERN) retired from ICFA in December, his place being taken by Roy Rubinstein (Fermilab). Continuity is provided by Helga Schmal (CERN), who remains as Assistant Secretary.

Unification, small and large

Fruitful exchanges between particle physics, astrophysics and cosmology have become a common feature in the last decade. In January, Coral Gables near Miami was the stage for a 'Unified Symmetry in the Small and the Large' meeting.

Coral Gables is a famous physics venue. In January 1964, the year that the quark model of hadrons emerged, Behram Kursunoglu initiated a series of particle physics meetings that continued for 20 years and formed a regular focus for this development. The final such meeting was in 1983, coinciding with both the 80th birthday of field theory pioneer Paul Dirac, who worked in Florida towards the end of his career, and

the discovery of the W bosons at CERN.

The resurrected Coral Gables meeting began with historical accounts of the emergence of Big Bang cosmology, by Robert Ralph and Herman Alpher, while Andrei Linde proposed our expanding universe as a small part of a stationary system, infinite both in space and in time.

The observational status of Big Bang cosmology was reviewed by Bruce Partridge, John Mather and Martin Harwit, emphasizing the cosmic background radiation, where temperature is now measured by the COBE satellite detectors to 2.726 ± 0.010K. The tiny fluctuations observed by COBE pose problems for standard cold dark matter models.

Edward ('Rocky') Kolb reported on new studies on the electroweak phase transition, based on an analogy with the physics of liquid crystals. Richard Holman discussed the fate of global symmetries at energies near the Planck (grand unification) energy, and Paul Steinhardt talked about tensorial and scalar metric fluctuations in the light of the COBE results.

Anthony Tyson gave an impressive description of dark matter studies using gravitational lensing, now emerging as a unique tool for indirectly observing intervening dark matter. A neutrino mass of 10 electronvolts could account for observed dark matter distributions, but fails to provide the necessary seeds for galaxy formation. A conservative limit for the cosmic mass density (Ω) is 0.2.

Theoretical problems of gravity and cosmology were dealt with by Behram Kursunoglu, Robert Brandenberger and Katherine Freese. Leonard Susskind emphasized the clash between general relativity and quantum theory arising through black hole singularities and their evaporation. Louise Dolan, Pran Nath and A. Jevicki looked at supergravity and superstring theories.

In the neutrino physics session chaired by Frederick Reines, Paul Langacker and Stephen Mintz reviewed the status of the solar neutrino problem, while Frank Avignone reported on the ongoing search for neutrinoless double-beta decay, providing an upper limit of 1.4 eV on a Majorana neutrino mass. Pierre Sikivie covered the ongoing search for axions.

After a theoretical introduction by Boris Kayser, the programmes of CP-violation studies, including the B-particle sector, at electron-positron colliders and at hadron machines, were outlined by Jonathan Dorfan and Vera Lueth respectively. While Dallas Kennedy reported on sensitive radiative electroweak corrections, Edward York-Peng Yao and Martin Einhorn looked at the growing use of effective Lagrangians to describe heavy particles at low energy.

Alan Krisch emphasized the importance of polarized beams for strong interaction studies, especially nonperturbative quark field theory (QCD) effects, and Frederick Zachariasen described new analytic methods to derive the heavy quark potential. Chiral QCD liquids and their role in the physics of heavy nuclei and neutron stars were covered by Brian Lynn. E.C.G. Sudarshan described a new way to look at the decays of kaons. Stephen Pinsky, Charles Thorn and Mark Samuel looked at special particle topics, while Peter Carruthers described galaxy distributions in an unconventional way, linking them to the properties of multihadron spectra.

A substantial part of the time was given to speculations on the nature and origin of Standard Model constants, especially fermion masses. After an introduction by Yoichiro Nambu, Sydney Meshkov, Harald Fritzsch and Pierre Ramond outlined a new view of quark and lepton mass spectra as signals of new types of broken symmetries, opening a possible window to physics beyond the Standard Model.

Gordon Kane reviewed supersymmetric possibilities at high energies.

The revived Coral Gables meetings will now continue, hopefully seeing the emergence of physics beyond the Standard Model. This year's meeting was organized by Behram Kursunoglu of Coral Gables' Global Foundation, assisted by Sydney Meshkov (SSC), Stephen Mintz (Florida) and Arnold Perlmutter (Miami).

From Harald Fritzsch

Behram Kursunoglu - putting Coral Gables on the physics map.