Top, a 'typical' event seen in the new streamer chamber of the European Muon Collaboration's experiment at CERN. However a small fraction of the events show high multiplicity of produced particles (bottom). In both pictures, the undetected muons are clearly seen.

Good quantitative evidence in favour of this model was obtained in the historic study at SLAC several years ago which measured the tiny (0.01 per cent) asymmetries in the scattering of polarized electrons due to electroweak interference. In high energy muon-nucleon scattering, larger values of momentum transfers are accessible and the electroweak interference effects should be about a hundred times stronger. This has now been observed in the NA4 experiment by comparing the scattering of positive and negative muons.

The experiment uses a 40 m-long carbon target along the axis of a 50m-long toroidal magnetized iron spectrometer which traps the scattered muons.

will be used with a big polarized target developed by CERN, Liverpool and Rutherford (see May 1981 issue, page 154). This study will also make use of the new downstream Cherenkov counters.

...electroweak effects with muon beams

Preliminary results from the NA4 experiment (Bologna/CERN/Dubna/Munich/Saclay) using high energy muon beams in the North Area of the CERN 400 GeV proton synchrotron reveal delicate effects due to the interference between weak and electromagnetic interactions. Although there are possible factors still to be taken into account, the results underline once again the standard electroweak model.

Unusual view of the 50 m toroidal iron spectrometer of the NA4 experiment at the CERN SPS which has seen some electroweak interference effects in high energy muon-nucleon scattering.

(PhotocERN 289.8.78)
Data has been taken with both positive and negative muon beams at energies of 120 and 200 GeV. The difference between the observed deep inelastic scattering cross-sections reflects the electroweak interference effects. Preliminary analysis of more than two million events shows agreement with the standard model. The painstaking work of applying small experimental corrections and looking for potential sources of systematic errors is continuing.

UNDERGROUND
Soudan mine experiment

Six hundred metres below the surface of the earth in northeastern Minnesota, the Soudan 1 detector awaits a proton decay. This 31-ton device was constructed by high energy physicists in a hundred year-old iron mine, to take advantage of the dense rock overburden as a cosmic ray shield. This is the largest underground iron mine in Minnesota, and was operated until 1963. It is now a National Historic Site and is open to tourists during the summer season as part of Tower-Soudan State Park.

The detector began data collection early last summer. It is composed of a block of iron-loaded concrete, 3 m by 3 m by 2 m high, instrumented with 3456 gas proportional tubes. These 2.7 cm diameter steel tubes are arranged on a 4 cm lattice in 48 layers, with alternate layers at right angles in order to provide two stereo views of each event. The detector is surrounded by a scintillation counter shield, covering the top and four sides. The device is triggered when one or more tubes are hit in each of three out of four adjacent layers.

Originally a Minnesota/Argonne collaboration, the Soudan 1 experiment has been joined by a group from Oxford. Together these physicists have now proposed building a 1000-ton tracking calorimeter, 60 m deeper in the same mine. This proposed Soudan 2 detector would use 5 m by 5 m proportional wire/cathode strip planes to view ionization drifting in from calorimeter elements up to 50 cm away. The scheme provides fine granularity in a large device with compact electronics. In addition to having good spatial resolution, Soudan 2 would measure energy loss to assist particle identification and separation of electromagnetic and hadronic tracks. These characteristics will be particularly useful in identifying branching modes of observed proton decays.

While the Soudan 2 proposal is being discussed with the funding agencies on both sides of the Atlantic, the painstaking work of applying small experimental corrections and looking for potential sources of systematic errors is continuing.