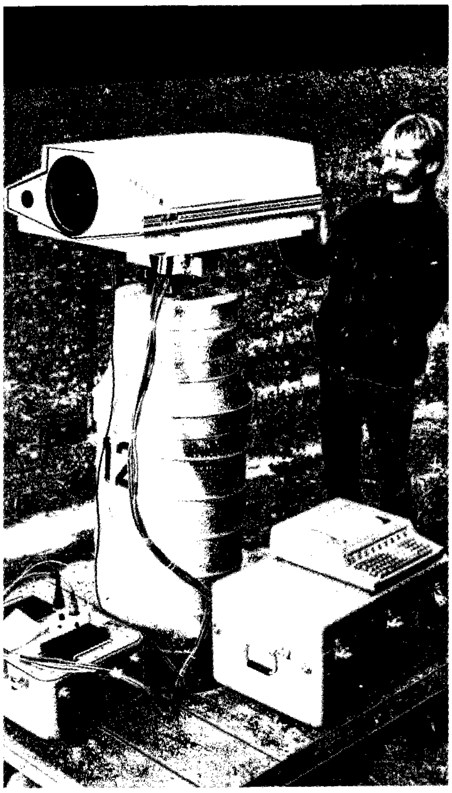
The 'Terrameter' being used for LEP survey work at CERN. This instrument takes simultaneous measurements at two laser frequencies to compute the refractive index of air and permit measurements to a few parts in ten million.

(Photo CERN 125.12.83)



One of the Berkeley contingent in a Berkeley / Corvallis / Studsvik experiment at the CERN Synchro-Cyclotron is Glenn Seaborg, seen here (left) speaking with Chinese Premier Zhao Ziyang (right) when he visited Berkeley during his recent US tour.

(Photo LBL)

the ring, altering the verticals to an extent which produces a variation of over 10 cm across the LEP diameter.

For LEP survey work, manual methods will as far as possible be automated to simplify both the measurement procedures and the recording of the mountain of necessary data. At CERN, a microprocessor-driven unit has been developed which can be used by non-specialists and is programmable in easy-to-use BASIC. Frequently-used routines can be stored in memory and used as required. If necessary, the instrument can communicate with a computer through a standard (RS232) link.

The new techniques developed at CERN over the years have improved the reliability, speed and accuracy of geodetic measurements. Examples are the 'distinvar' device, special magnet alignment jacks, a self-aligning reflector for a laser interferometer, and an alignment system using nylon wire.

Thanks to superb instruments and accumulated expertise, the CERN geodesy experts are able to face each new challenge with confidence.

The new 'forty-niners'

Nucleus-nucleus collisions at intermediate energies (from about 10 - 100 MeV/nucleon) are of great interest to nuclear physicists and chemists. This is a transition region between low energy reaction mechanisms (below 10 MeV/nucleon) with long nuclear mean free paths, and higher energy mechanisms with the short mean free paths of nucleons in nuclear matter.

Increasing the projectile energy from 10 to 100 MeV/nucleon passes several important nuclear milestones (including the velocity of sound in nuclear matter and the Fermi energy) which may trigger changes in reaction mechanisms.

The oldest machine at CERN, the 600 MeV Synchro-Cyclotron (SC), which came into action back in 1957, is playing an important role in these studies. For the past four years, experimental teams from France, West Germany, Sweden, Norway, Denmark and the US have used its intense 85 MeV/nucleon carbon-12 beam to study such diverse phenomena as pion production below threshold, and projectile and target fragmentation.

Recently the SC Accelerator Group has added yet another attraction to the already impressive list of SC heavy-ion options (see next page) with a super intense (500 nA) beam of 49 MeV/nucleon carbon-12 less three electrons. On 9 February, this, the most intense intermediate ener-

CATALOGUE OF CERN SC BEAMS

	(MeV/N)	intensity (Parts./sec)
Proton	602	$> 3 \times 10^{13}$
$^{3}He^{++}$	303	$> 3 \times 10^{12}$
$^{3}He^{+}$	85	$> 10^{13}$
$^{12}C^{4+}$	85	$> 10^{12}$
$^{15}N^{5+}$	85	$> 10^{11}$
$^{18}O^{6+}$	85	$\sim 3 \times 10^{11}$
$^{16}O^{6+}$	107	5×10^{9}
$^{14}N^{5+}$	97	$\sim 10^{9}$
$^{20}Ne^{7+}$	94	$\sim 5 \times 10^{9}$
$^{20}Ne^{6+}$	70	8×10^{9}
$^{20}Ne^{5+}$	49	3×10^{11}
$^{12}C^{3+}$	49	$> 10^{12}$

gy heavy ion beam in the world, was delivered to the target of an experiment by a Berkeley / Corvallis / Studsvik team. This allowed detailed measurements of target fragmentation and incomplete fusion that were previously impossible.

The California-based contingent in this group (which includes Glenn Seaborg) has come to CERN to seek experimental treasures with 49 MeV/nucleon carbon ion beams and gold targets, and has earned the name 'the new forty-niners'.

As well as its high intensity, the new beam has a time structure permitting certain multi-detector experiments. There could still be a lot of gold in them thar SC hills!

(From Walt Loveland)

SIN
Muon SINDRUM

Electrons and muons like to go their own separate ways, and in all weak interactions observed so far, 'muonness' and 'electronness' remain unchanged. However any sign of an electron-muon affinity would be valuable fuel for new theories seeking to extend our understanding of particle behaviour, and would immediately open up a new horizon of physics.

Over the past two years, the SINDRUM spectrometer has been built at the Swiss SIN Laboratory to search for the classically forbidden decay of a positive muon to three electrons, eventually down to a sensitivity of one part per million million. This would be a thousandfold improvement on the present limit of 1.9×10^{-9} from a 1976 Dubna experiment.

SINDRUM uses a solenoid coil producing a magnetic field of up to 0.6 T in a cylindrical volume 110 cm by 75 cm. The space and time coordinates of the decay electrons are measured in four concentric thin (30 mg/cm^2) wire chambers and a

Below, layout of the SINDRUM detector used at SIN to search for signs of the classically forbidden decay of a muon into three electrons.