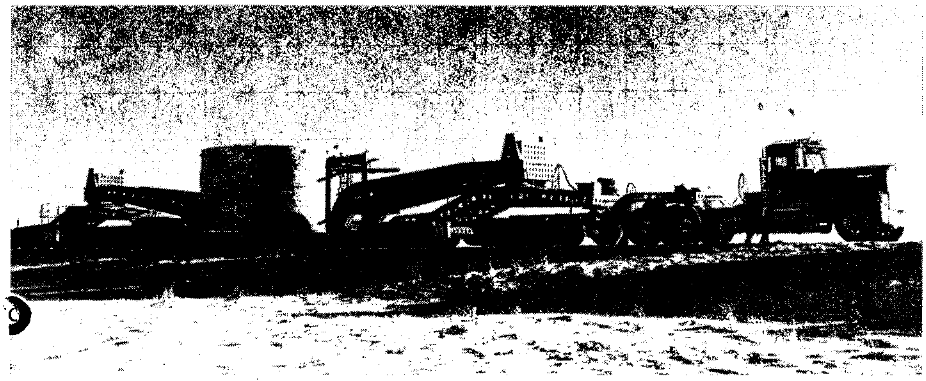
The huge rebuilt superconducting magnet of the Argonne 12 foot bubble chamber being trucked across Wyoming en route for its new experimental duty in a spectrometer on the PEP storage ring at SLAC. It was a spectacular exercise in organization and in transport techniques.

(Photo Argonne)



A separate, but identical uranium target will be provided for fast neutron radiation damage experiments. There will be no moderators near this target and only heavy elements will be used for reflectors to inhibit neutron moderation. A switching magnet will be used to direct the proton beam to the desired target. It is expected that initially about a quarter of the time will be devoted to radiation damage measurements and the rest to neutron scattering.

Both targets will be water-cooled, and some of the moderators will be cooled to cryogenic temperatures to provide slower neutrons and narrower pulses.

Provision has also been made for a high energy proton test beam which can be used to test detectors planned for use at Fermilab or elsewhere. Thermal neutron irradiation facilities are also planned since such facilities are no longer available elsewhere at Argonne following the shutdown of the CP-5 reactor.

Moving magnet

The famous 12 foot bubble chamber completed its programme of physics at the ZGS in February 1978, shortly after approval of a proposal to build a High Resolution Spectrometer for use on the PEP electron-positron storage ring at SLAC. This proposal was made by a team from Argonne, Indiana, LBL, Michigan, Purdue, and SLAC, and involved using the huge superconducting magnet from the bubble chamber as the basis for a general purpose solenoidal spectrometer that would give high momentum resolution on charged tracks.

The magnet has an iron yoke weighing 1600 tons and extensive modifications to the iron were done during 1978 to change the system from the vertical field configuration used with the bubble chamber to the horizontal field configuration required for PEP.

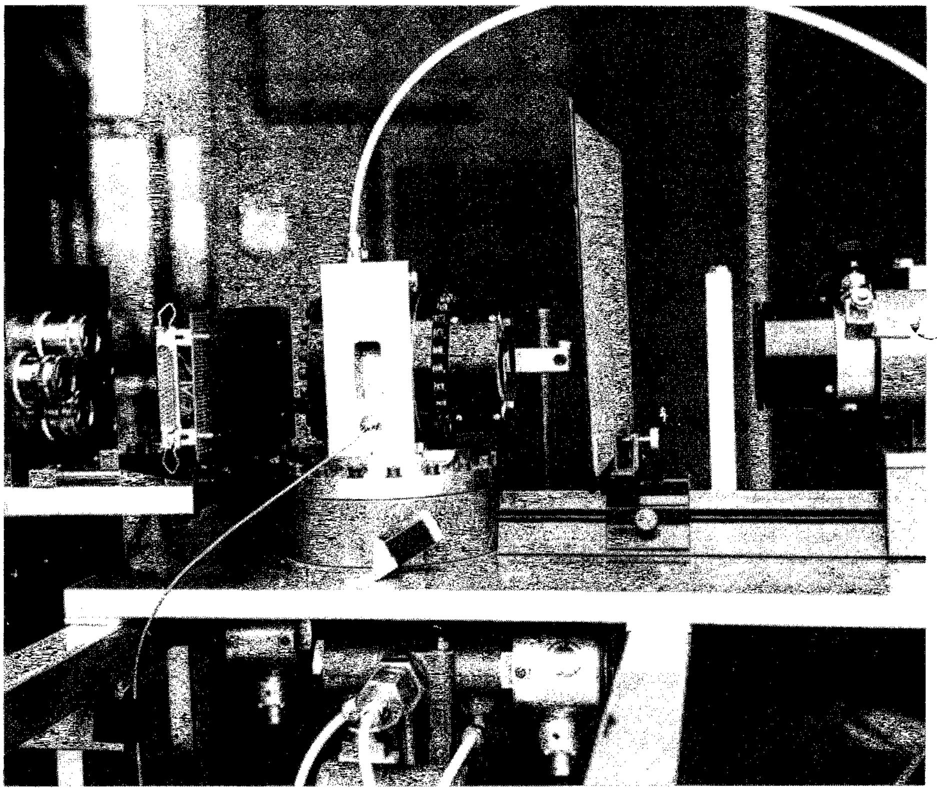
Rework of the cryostat started in September 1978 and required the removal of a 1-inch thick aluminium vacuum can, 60 layers of superinsulation and the aluminium radiation shield. Panels were then cut out of the thick stainless steel cryostat and new saddles were installed to support the superconducting coil when turned 90° into its new orientation. Instrumentation wires, current leads, fill and return lines, and emergency vent stacks all had to be put into new locations. Finally, everything was welded back together, the radiation shield reinstalled, new superinsulation wrapped around the entire can and the vacuum shell rewelded.

The coil was turned in May 1979 and supported in a temporary frame. The modified helium refrigerator was connected and a cryogenic test of the magnet and refrigerator was done during July and August. By the end of September, the magnet was blessed as ready for shipment to SLAC.

Several modes of transportation between Chicago and San Francisco had been under consideration. The complete coil and vacuum container was slightly too big for the C5 A cargo plane and was also either too wide or too high (depending on the orientation) to clear the rail tunnels and bridges. Barge travel was ruled out because of worries about moves from shallow-draft to ocean-going barges and because of the high cost. It was finally decided to ship by truck. Individual road permits were obtained from seven States (Illinois, Iowa, Nebraska, Wyoming, Utah, Nevada, and California) since the load was both over wide (18.5 feet), requiring two lanes, and over weight (107 tons). This whole autorization took about a year and was an education in the operation of a Federal system of government.

A special trailer was constructed by Siebert Trailers of Stockton, California to the design of Stan Jones, who owns the successful bidding company. The tractor-trailer had 18 axles and a total of 110 tyres. With the magnet loaded, the total weight was 323 000 lbs. The 140 foot-long truck travelled mostly on Interstate 80 from Chicago to San Francisco. It started its journey from Argonne on 5 November and reached SLAC on 22 November, Thanksgiving Day. The criteria set by the individual States required the vehicle to cross most bridges at a speed of a few miles per hour and the maximum speed was 50 mph on the Salt Flats in Utah.

Delays came from things like a switchover from night to daytime



The Berne Infinitesimal Bubble Chamber — BIBC — specially designed to look for charm decays. Only 6.5 cm in diameter and 3.5 cm deep, it must be one of the smallest bubble chambers used for physics.

(Iowa to Nebraska), a change in the axle configuration (Nebraska to Wyoming), a football game crowd, and a snowstorm in Wyoming. The Sierra mountains were crossed via the Kit Carson Pass with the help of an additional pusher drive unit and an additional puller in front equipped with snow chains. The load attracted considerable attention from trucking enthusiasts in all States!

The magnet arrived at SLAC in excellent condition and reassembly with the iron has started at PEP. It is hoped that the experiment will be in operation before the end of the year.

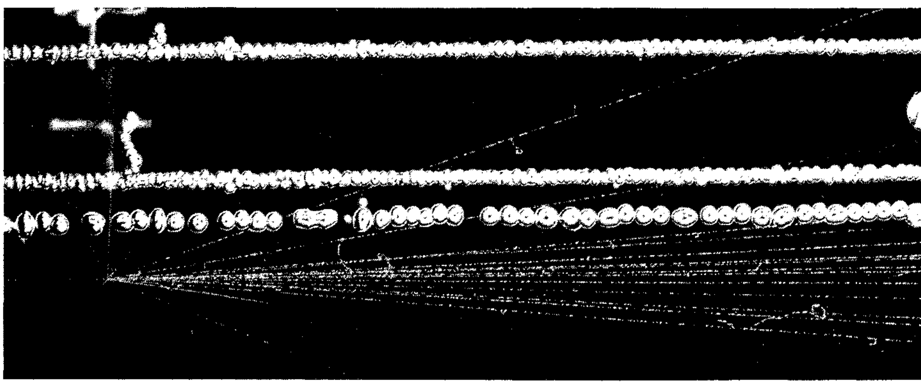
CERN
Bubble chambers get smaller

Over the years, bubble chambers have been built bigger and bigger as physicists have searched for rarer types of interaction. However the last year has seen a sudden reversal of this trend with the introduction of some very small chambers specially designed to look for the production and decay of charmed particles.

The lifetime of charmed particles has been a controversial subject ever since the discovery of the charm quantum number. At first experimental results were in considerable disarray, but last year saw experiments homing in on a theoretically desirable value of 5×10^{-13} s.

Now new results (see March issue, page 16) indicate that the lifetimes of charged and neutral charmed mesons could be different. Experiments to measure the charm lifetime continue to make news.

To extend the data available, two small bubble chambers have been built for use at CERN. One has a diameter of 20 cm, operates at some 50 cycles per second and is filled with liquid hydrogen (see September 1979 isue, page 258).



A typical interaction in BIBC. The 'old' tracks from previous particles have bubble diameters of several millimetres.

A second, built by a team from the University of Berne led by Beat Hahn and Edwin Hugentobler, is now in operation. This cylindrical detector is only 6.5 cm in diameter and 3.5 cm deep and must be one of the smallest bubble chambers ever used for physics. Because it uses heavy liquid, it could give an indication of how the charm reactions vary with different nuclei, so complementing the data obtained from hydrogen targets.

The rapid cycling chamber is known as LEBC (Little European Bubble Chamber) and the heavy liquid detector is called BIBC (Berne Infinitesimal Bubble Chamber), to