can expect a net benefit, without negative net financial or personnel impacts.

The TR30 experience also taught TRIUMF a number of practical lessons in effective collaboration:

Technology transfer must be viewed as a body contact exercise - knowledge is only transferred effectively through direct meetings between the scientists and the industry representatives;

Technology transfer is usually a much more lengthy process than is originally anticipated by either party;

Technology transfer requires committed individuals on both sides to ride through the inevitable rough spots;

The staff working on both sides must feel that they are being treated reasonably and equitably. Commitments must be kept, and any special rewards must be agreed to by both parties, including representatives of non-participating staff.

In recent years, technology transfer from government-funded research laboratories to industry has been an increasingly popular aim of governments. TRIUMF now has several years' experience with Ebco Industries in transferring cyclotron technology to the marketplace, and both parties have found that although there are invariably unexpected hurdles, these can be overcome with goodwill and effort on both sides.

For TRIUMF it has been a beneficial experience, although not without its challenges. TRIUMF staff have responded well to the new demands and requirements of commercial activity, although for some it has meant learning new processes for maintaining confidentiality and meeting rigid external deadlines.

If there has been one key to success, it has been the commitment by senior management on both sides to find ways to make technology transfer work.

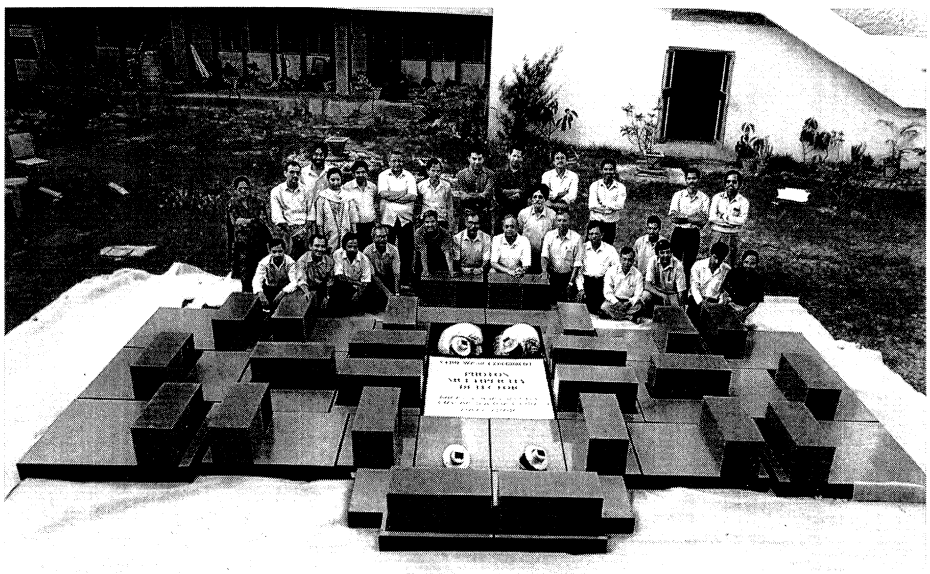
INDIA
Photon multiplicity detector

The team of Indian scientists from Calcutta's Variable Energy Cyclotron Centre, Bhubaneswar Institute of Physics, Panjab (Chandigarh), Rajasthan (Jaipur) and Jammu in collaboration with GSI Darmstadt have contributed a large and highly granular preshower photon multiplicity detector (PMD) for the WA98 experiment at the CERN SPS proton synchrotron.

This experiment studies high energy collisions of lead ions and will measure both charged particle and photon multiplicity in a large overlap region.

The motivation for measuring photon multiplicity in ultra-relativistic heavy ion collisions stems from theoretical predictions of changes in the relative production of photons and charged particles in the phase transition of hadronic matter to quark-gluon plasma and its subsequent hadronization.

The photon multiplicity detector consists of a matrix of scintillator pads placed in light-tight boxes and mounted behind the lead converter plates. The light from the scintillator pads is transported to the readout system using wavelength shifting (WLS) fibres. Developing on the team's earlier experience with a smaller version for the WA93 experiment (September 1991, page 16), several modifications were incorporated to improve light collection and transport. Use of improved WLS fibres, short WLS pieces to minimize self-absorption, and thermal splicing with long clear fibres were some of the important changes incorporated. Tests showed signficantly improved light collection.



The boxed modules of the Photon Multiplicity Detector after final assembly in India before despatch to CERN.

The scintillator pads were fabricated at all the five collaborating centres in India and the complicated assembly in the detector box modules carried out at the Variable Energy Cyclotron Centre, Calcutta. More than 400 lead converter plates were machined in Calcutta to rigorous tolerances of 0.2 mm. The assembled detector box modules and lead plates were shipped to CERN in spring 1994 for tests and installation.

The WA98 PMD consists of over 50,000 scintillator pads of sizes varying from 15 to 25 mm square and are assembled in 26 light-tight box modules. Each fibre matrix of 38 rows and 50 columns is read out using an image intensifier and CCD camera system. At present the PMD uses 26 readout cameras from the old UA2 experiment, including 20 units on loan from CERN.

The detector covers an area of 21 square metres in the forward region. Its total weight with the stand and lead converter plates is about 6 tons. A central hole about 1 metre square avoids problems with overlapping showers. The detector took its first data during the lead ion run late last year (December 1994, page 15).

COMPUTER OPERATING SYSTEMS
HEPiX news

In October the North American and European Chapters of HEPiX (the HEP UNIX group established to share worldwide high energy physics experience in using the UNIX operating system - March 1994, page 18), held meetings at Fermilab and Saclay.

The two-day Fermilab meeting attracted over 30 attendees from some 12 sites in the US, as well as representation from CERN.
The three-day European meeting two weeks later was attended by some 70 people from 30 sites in Europe, the US and Japan.

Both meetings featured some common themes such as the growth in the use of AFS (the Andrew File System) for distributed access to central filebases, and the continuing trend away from mainframes towards farms of UNIX workstations and/or servers.

Other topics of interest included an update of the POSIX standards efforts, an online presentation of an experimental graphics interface, first impressions of new utility for batch job control in UNIX, the latest news on the spread of the HEPiX login scripts and a review of trends in magnetic tape technology.

Detailed minutes are in preparation and will be published in the HEPNET.HEPiX news group in due course. In the meantime, the transparencies presented in many of the sessions at both conferences can be consulted via the World-Wide Web at URL http://wwwcn.cern.ch/hepix/meetings.html

In September came a suggestion that both Chapters should merge to better share experiences and pool resources into specific working groups. This was discussed and agreed. Now a single HEPiX organization exists, with conferences alternating between Europe and North America, interspersed with meetings to coincide with the Computing in HEP (CHEP) series, where meetings are held every 18 months. The schedule for the next two years is Prague (May 31 to June 2), Rio de Janeiro (September 25 - 27), US or Canada in Spring 1996 and Europe in Autumn 1996.

It was also agreed to set up some working groups, the first devoted to AFS-related matters. Others will be announced in the HEPiX newsgroup. A Steering Committee is being formed, and a call for more volunteers for it and for the working groups will also appear in the newsgroup shortly.

Alan Silverman