

Soviet Union, as a logical next step in storage ring development after the newly-commissioned BEPC machine in Beijing.

Attracting almost 200 participants from 12 countries, including 40 accelerator physicists, the workshop began with plenary sessions, with working groups subsequently examining various aspects of machine and detector design, and physics prospects.

Machine discussions began with John Jowett's design for a double ring machine with a single clash-point. Electrostatic separators would enable each ring to carry 24 bunches and a fat beam current of half an ampere. Other designs also used a two-ring scheme. Gus Voss of the German DESY Laboratory suggested using about 400 bunches and 'crab crossing' to increase the luminosity to 5×10^{33} . Susumu Kamada of the Japanese KEK Laboratory outlined the idea of a tau-charm factory in the TRISTAN Accumulator Ring. During an evening session, Juan Antonio Rubio of CERN and CIEMAT (Madrid) outlined Spanish plans to build a tau-charm factory near Seville.

While the accelerator physicists deliberated how to build a tau-charm factory, the rest of the participants studied how to use it for research. CERN's Alvaro de Rujula launched discussions among the physics and detector groups, pointing out the complementary particle physics frontiers of high energy and high luminosity.

The working group on tau physics stressed how the tau lepton and its neutrino are less well understood than the other leptons, largely because of the small supply available so far. Current tau measurements still allow large deviations from the Standard Model, and 'new physics' could emerge from higher statistics. Tau decays

would be an excellent testbed for the Standard Model, and the tau neutrino mass could also be fixed.

Led by Rafe Schindler, the charmed meson working group examined precision measurements of inter-quark couplings, leptonic decays of D mesons, neutral D mixing and rare D decays. There was also plenty of interest in the possibility of observing CP violation in the D meson system either directly or through mixing.

Fifteen years after its discovery, charmonium (charmed quarks and antiquarks bound together) is still an exciting field. A group led by Walter Toki examined the potential of a tau-charm factory for glueballs (particles composed of the gluon carriers of the inter-quark force), quark/gluon hybrids and exotic four-quark states. An enormous number of J/psi and psi-prime decays would provide a good probe of the force between charmed quarks.

Organized by Jasper Kirkby, the detector group produced a design using fairly low-risk technologies (a high-resolution central tracking chamber with large solid angle, and a crystal electromagnetic calorimeter) that nevertheless satisfied the stringent constraints imposed by the physics and accelerator groups. Particle identification and full coverage of all emerging particles (hermeticity) are stressed, the latter accomplished using an outer fine-grained neutral hadron tagger, and allowing good coverage of tau neutrinos.

On the final morning of the workshop, John Jowett concluded for the machine builders. A double-ring electron-positron collider operating in the tau-charm energy range could indeed be built with the desired luminosity, but it would require a dedicated injector/accumulator to 'top off' the beams fre-

quently, keeping the machine near its peak luminosity. At the highest currents, multibunch instabilities and ion trapping in the electron ring would need a lot of attention.

In a final summary, Martin Perl of SLAC, who discovered the tau lepton more than a decade ago, estimated a tau-charm factory to have a useful research lifetime of 10 to 15 years. The physics, he observed, 'would be broad, deep, and exciting.'

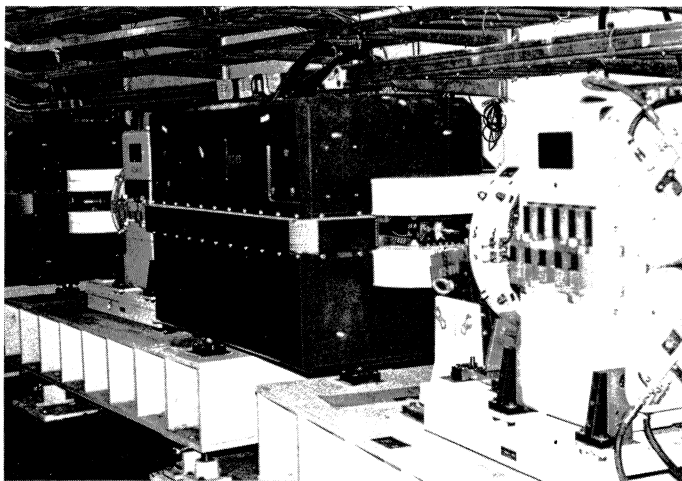
From Rafe Schindler

ANNIVERSARY 25 years without CP

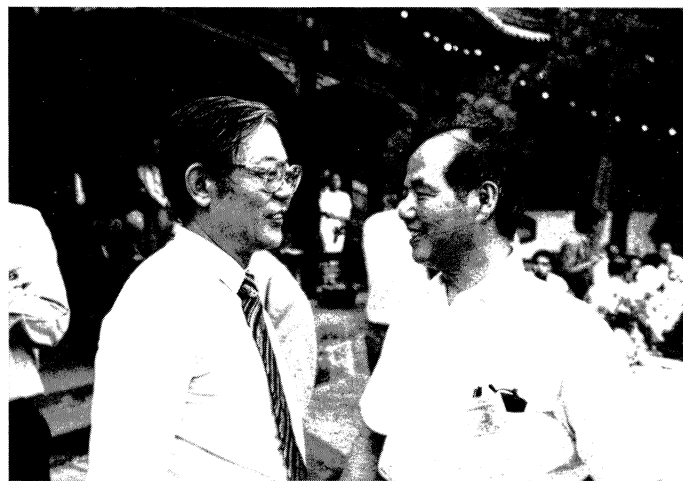
In 1964 a small group of Princeton University physicists led by Jim Cronin and Val Fitch performed a landmark experiment at Brookhaven. Using a double-arm spectrometer, they showed that long-lived neutral kaons occasionally decayed into a pair of pions – violating the hitherto sacrosanct CP symmetry of combined mirror reflection and particle-antiparticle switching (April, page 4).

From May 21-26 scientists gathered at the Château de Blois, southwest of Paris, to celebrate the 25th anniversary of this achievement. In an opening session, surveys and reminiscences of the principal experiments on CP violation were presented by Robert Adair, Abraham Pais and Jack Steinberger. Surprisingly absent from this nostalgia was any detailed discussion of the Cronin-Fitch experiment that started all the fuss.

That afternoon the four principals in the 1964 experiment outlined their current research pro-



A magnet cell of the new Beijing electron-positron collider.



Zhou Guang Zhao, left, president of the Chinese Academy of Sciences, and T.D. Lee, both directors of the new China Centre of Advanced Science and Technology

(CCAST), pictured early in June at a Beijing physics symposium that was to end prematurely. (Photo M. Jacob)

CHINA

Early in June, two workshops organized in Beijing by the China Centre of Advanced Science and Technology (CCAST), a spin-off of World Laboratory, had to terminate abruptly. The meetings, on fields, strings and

quantum gravity, and on relativistic heavy ion collisions, were scheduled to run for at least another week.

Participants at the meetings from abroad had been impressed by the new Beijing el-

ectron-positron collider, now in operation, and the achievements of their Chinese colleagues and Chinese industry, and hope that the road to further progress and collaboration will remain open.

jects. James Christenson sung the praises of D0, the next-generation detector due to start operation next year at the Fermilab proton-antiproton collider (May, page 16). Cronin discussed the Chicago Air-Shower Array being installed around the Fly's-Eye Detector in Utah, while Fitch reviewed the work of his group and others in the search for a fifth force. René Turlay of Saclay closed the day with a summary of the progress being made for CERN's new LEP electron-positron collider and the expectations for its first round of physics.

Ensuing sessions focussed on current research in CP violation and the B mesons (carrying the fifth 'beauty' quark). Prominent among these are the NA31 experiment at CERN and Fermilab E731, which looked for evidence of direct CP violation in neutral kaon decays. Ken Peach of Edinburgh reiterated the previously reported NA31 result (July/August 1988, page 7) giving an additional insight into CP

violation. Bruce Winstein of Chicago looked at the emerging analysis of the Fermilab experiment, but would neither confirm nor refute the NA31 result.

Looking at the ratio of CP violating and CP conserving neutral kaon decays into pairs of pions, the phase difference between the results for neutral and for charged pions is a crucial test of CPT conservation (CP plus time reversal symmetry). Before the meeting, this difference hinted at a possible violation, but both experiments came in with values consistent with zero. The physics cornerstone of CPT could consider itself saved.

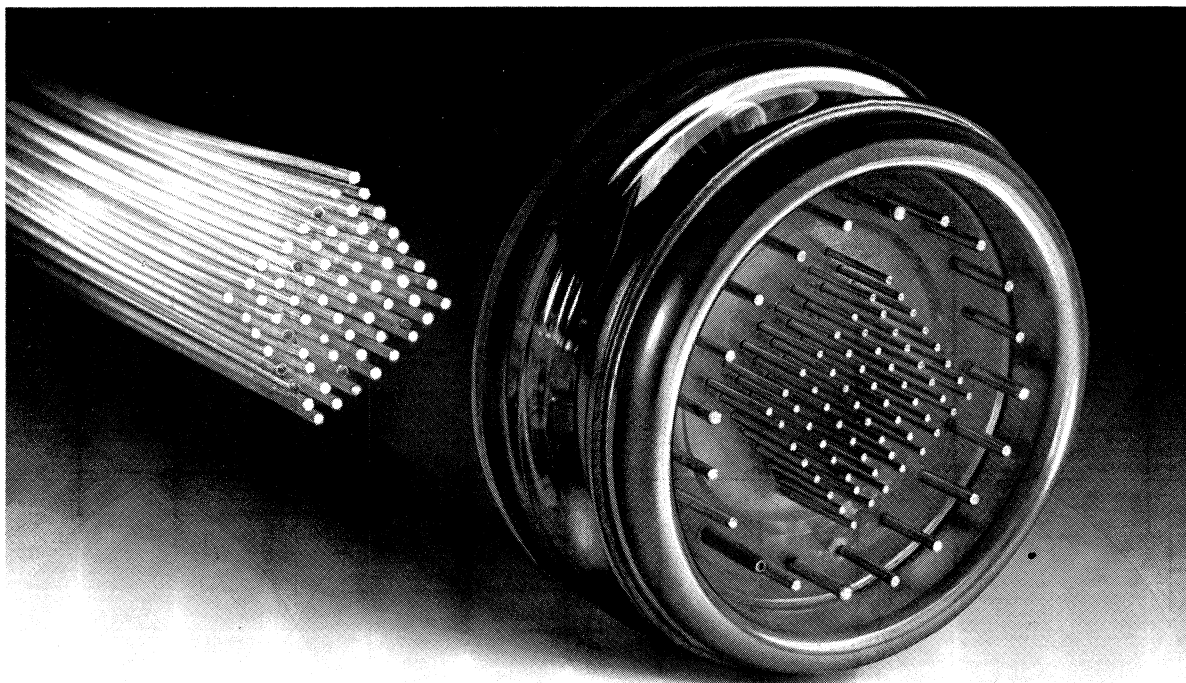
On Wednesday morning Henning Schroder of DESY and Persis Drell of Cornell presented updated results on B decays from the ARGUS and CLEO collaborations respectively. They found themselves in complete agreement on the level of neutral B mixing, while the ARGUS evidence for charmless B decay (September 1987, page 3) has withered away. Haim Harari of the

Weizmann Institute explained the implications for the Standard Model, surmising that the long-awaited sixth 'top' quark is probably heavier than 100 GeV.

The meeting concluded with a day devoted to astrophysical and cosmological implications. Of central interest was the baryon asymmetry of the Universe during the first picosecond of the Big Bang. 'We are here,' noted Rocky Kolb of Fermilab, 'as a result of CP violation'.

Closing, Lincoln Wolfenstein of Carnegie-Mellon said that progress had come very slowly in 25 years of trying to understand CP violation. But progress was indeed being made, and would continue to be made by increasingly refined experiments and theoretical analysis. 'Nature has been performing an elegant striptease,' Fred Gilman had remarked a few days earlier. 'We just have to be patient and enjoy it.'

From Michael Riordan



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