

Then came presentations on current projects in Europe, the US, the USSR and Japan. A topic of much discussion was the intra-beam scattering which counteracts cooling, especially for intense beams. This discussion was further stimulated by the news from Novosibirsk (presented by V. Parkhomchuk and D. Pestrikov) that cooling had been perfected to the extent that virtually all longitudinal momentum spread in a proton beam had been destroyed, thus suppressing intrabeam scattering. In such beams, the particles become strung out in an equally spaced (few microns) chain, like a row of beads.

Beams cooled by electrons offer interesting possibilities for atomic physics, exploiting for instance electron capture by very slowly moving ions and subsequent atomic effects.

All this and much more was covered in the meeting, which also featured a round-table discussion on controversial matters between F. Mills of Fermilab, H. Herr and J. S. Bell from CERN, Parkhomchuk and Pestrikov from Novosibirsk, and F. Krienen, now at Stanford. Fred Mills also gave the concluding talk, summarizing what had been covered in the previous three days.

Full marks to the Karlsruhe organizing committee under the chairmanship of Helmut Poth for a timely meeting which provided a valuable impetus to electron cooling at a time when it is changing from

a scientific curiosity to a widely exploited technique. The Proceedings will shortly appear as KfK Report 3846 (Documentation Office, KfK, Postfach 3640, 7500 Karlsruhe 1, West Germany). The next electron cooling conference will surely have many more working projects to review.

*(Information from Helmut Poth)*

## DESY Theory Workshop

Held during the 'Festwoche' which marked the 25th anniversary of the German DESY Laboratory last year, the traditional DESY Theory Workshop concentrated on weak interactions of heavy quarks and on non-standard models for weak interactions, together with a progress report on lattice gauge theories with fermions. The organizing committee (H. Fritzsch, F. Gutbrod, D. Haidt, H. Lehmann, D. Schildknecht) had invited eleven lecturers to present experiments and theoretical ideas in these fields. Also many short communications contributed interesting material.

After presentations of results on heavy particles (carrying the beauty quantum number), C. Jarlskog (Bergen / Stockholm) gave a comprehensive review of our present knowledge on the question of how the three known quark families mix. The pattern of quark mixing has been pinned down tightly. While the mixing of the first and second family is fixed by the sine of the famous Cabibbo angle (0.23), the mixing between the second and third family is of the order of its square and the mixing between the first and the

*Together at last year's ECOOL electron cooling meeting at Kernforschungszentrum Karlsruhe (KfK), left to right H. Poth (KfK), F. Mills (Fermilab), A. Citron (head of KfK Nuclear Physics Institute), and D. Möhl of CERN. The ECOOL International Advisory Committee was made up of Poth, Mills and Möhl together with A.N. Skrinsky of Novosibirsk, who was not able to attend the meeting.*



third is at most of the order of its cube.

The weak decays provide a valuable filter for heavy quarks in electron-positron jets, especially when several jet variables are analysed in conjunction. As R. Marshall (Rutherford) showed, a consistent picture for heavy quark fragmentation has emerged. The axial charge of the b-quark can well be measured due to the asymmetric angular distribution with respect to the beam axis. It agrees with the standard model predictions.

The ARGUS Collaboration working at the DORIS II ring at DESY was represented by J. Stiewe (Heidelberg). He showed, among many other results, evidence for the  $F^*$  (charmed, strange) meson at a mass of 2114 MeV. Also five good candidates for antideuterons have been observed, the rate being qualitatively in accordance with ther-

modynamic expectations.

B. Stech (Heidelberg) devoted the main part of his talk to weak decays of heavy mesons. He was able to describe successfully the bulk of non-leptonic two-body decay data. Furthermore he discussed possible relations between quark masses, mixing and charge conjugation/parity (CP) noninvariance.

S. Nussinov (Tel-Aviv) reviewed various methods to derive mass inequalities. Partially motivated by potential-like models, many mass inequalities have been obtained in lattice quantum chromodynamics, using various levels of rigour.

Although the standard electro-weak model seems to work beautifully, there are good reasons to go beyond it, as D. Schildknecht (Bielefeld) emphasized. One way is to consider the W and Z particles as composites, which naturally

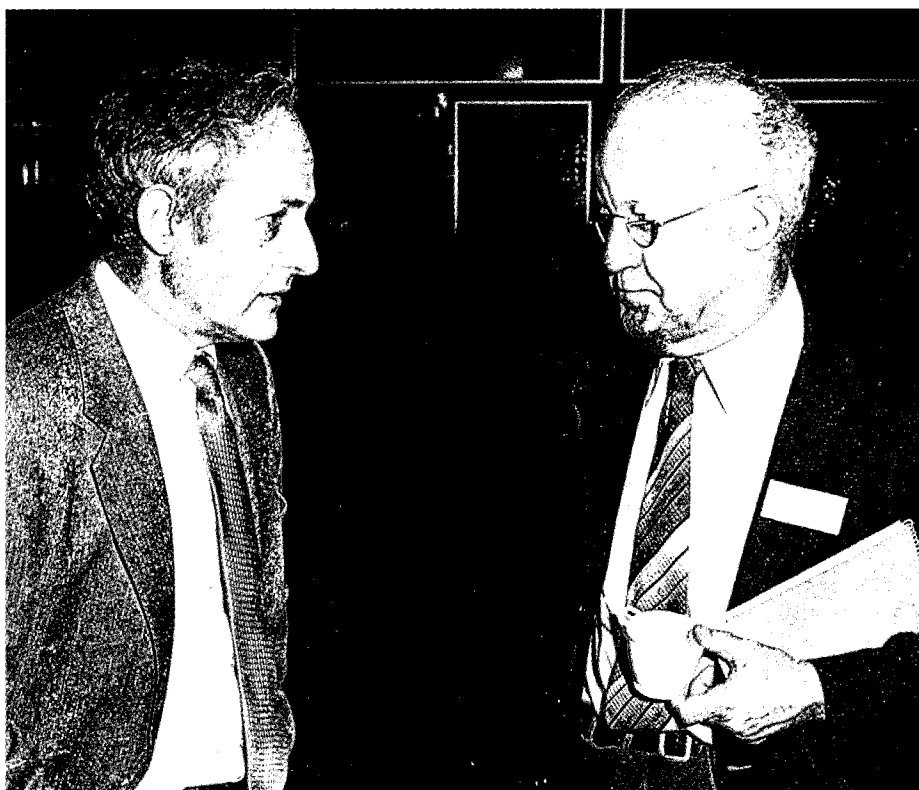
leads to departures from the standard model. These ideas predict a rich spectrum of heavy particles in the 200 GeV range, and consequently many unusual events in high energy collisions.

J. Kogut (Urbana) reported on attempts to describe fermions by lattice theories, where progress is being made.

Several unexpected experimental findings were presented by T. Walsh (Minnesota) in his talk on exotic particles (with masses below 1 TeV), in particular Z decays accompanied by photons, anomalous jets from the CERN Collider, etc., which are the source of much speculation.

In the concluding lecture M. Peskin (SLAC) explained present thinking on the Higgs particle. Several ideas give limits or suggest ranges for its mass, giving many options for experimental searches. The zeta particle at 8.3 GeV (see September 1984 issue, page 266) did not fit easily into the expectations for a Higgs particle, and now is no longer healthy. Perhaps we will have to wait some time for the discovery of the Higgs particle, with its central role for mass generation.

*(From Fritz Gutbrod and Harry Lehmann)*



*Left, E. Lohrmann (Hamburg) and R. Dalitz (Oxford) at last year's Theory Workshop at the German DESY Laboratory in Hamburg.*

*(Photo DESY)*