

CERN Courier Archive: 1974

A LOOK BACK TO CERN COURIER VOL. 14, NOVEMBER 1974, COMPILED BY PEGGIE RIMMER

BROOKHAVEN

Present and future programmes

The Brookhaven National Laboratory [established in 1947] for many years enjoyed a pre-eminent reputation among high-energy physics research centres. In its heyday, many of the major discoveries fell to the 33 GeV Alternating Gradient Synchrotron, AGS, which was the highest energy machine in the world. The inevitable leap-frogging has since taken place and facilities at Serpukhov, CERN and the FermiLab have extended the fields of research beyond the reach of the BNL machine. There is therefore the keenest interest in BNL's project for the future – the very high-energy collider ISABELLE.

Of course, the major activities remain centred on the high energy physics programme and the operation and development of the AGS. The experimental programme has been fed by beams from an internal target, by two fast ejected beams to the 80-inch and 7-foot bubble chambers, and by a slow ejected beam to a variety of counter experiments.

Financial restrictions forced the close down of the 80-inch chamber at the



end of September. The chamber came into action in 1963, collecting some 12 million photographs for seventy experiments. Its particular moment of glory came in 1964, with the identification of the omega minus [three strange quarks] in the experiment led by N P Samios. The bubble chamber burden is now taken up by the 7-foot chamber sitting in the North Experimental area, where it is fed by a neutrino beam.

In the East Experimental Area an internal target provides a neutral kaon beam, a separated 3 GeV/c negative kaon beam and test beams. The slow ejected beam, via two splitting stations and a bending station, can

Several months ago the foam fire protection system for the 7-foot bubble chamber came on automatically because of an electrical design fault in the manufacturer's circuit. The incident provided a vivid demonstration of the system's ability to flood the entire building with extinguishing foam very quickly. Clean-up was completed in about a day and left the bubble chamber whiter than white.

give protons onto four targets. An experiment fed by target A is by a MIT/Brookhaven team led by S C C Ting, to continue the study of the electromagnetic properties of the nucleon by measuring electron pairs emerging from proton-proton collisions.*

**Fascinating news from this experiment at the beginning of November: they believe they have seen a new particle (baptised the J particle) of mass 3.1 GeV which decays into an electron-positron pair. The electron-positron ring SPEAR at Stanford also has seen it. Another tantalising contribution to the hadron/lepton relationship.*

● Compiled from texts on pp388–391.

DUBNA / ORSAY

Collaborative look at the nucleus

Dubna's Laboratory of Nuclear Reactions under G N Flerov got together this year with the Orsay mass spectroscopy group of R Klapisich to bring their combined talents to bear on the study of the nucleus.

The Laboratory has one of the world's finest heavy ion machines – a 3-m cyclotron capable of accelerating ions to energies of 8 MeV per nucleon with intensities up to 200 μ A. The Orsay group has a high reputation in nuclear and mass spectroscopy. The team has done notable work at the CERN proton synchrotron particularly on a series of sodium and lithium isotopes. Their spectrometer is a mobile instrument that could be readily transported to the cyclotron.

An agreement was reached between Dubna and the Institut National de Physique Nucléaire et de Physique des Particules for 500 hours of beam time. The experiments began in June and were completed at the end of August.

The collaboration has been fruitful for both parties and it is likely that they

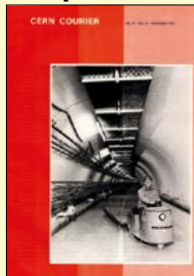


The Orsay mass spectrometer swings into the air outside the Laboratory of Nuclear Reactions at Dubna.

will get together again, perhaps when the 4-m cyclotron, now under construction, comes into action and opens the door to a new range of nuclear studies.

● Compiled from texts on pp391–392.

Compiler's Note



The fascinating footnote of course concerned the J/ψ meson (charm-anticharm), named J at BNL, ψ at Stanford. Sam Ting and Burton Richter shared the 1976 Nobel prize for this discovery that sparked the 1974 November Revolution in particle physics and furthered acceptance of the Standard Model. Additional evidence had come in 1975 when a charmed Λ baryon (comprising an up, down and charm quark) was recorded in the BNL 7-foot bubble chamber. This clinched arguments for the existence of a second generation of matter.

Unfortunately, the ISABELLE 200+200 GeV proton collider was dropped in 1963, unfinished. However, parts of its tunnel, experimental hall and magnet infrastructure were salvaged and reused for BNL's Relativistic Heavy Ion Collider (RHIC), approved in 1991 and operational in 2000. This was the first heavy-ion collider and is still the only spin-polarised proton collider. RHIC produces like-on-like collisions of copper, gold and uranium ions, as well as colliding protons, deuterons, helium-3 and copper on gold.



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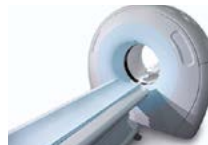
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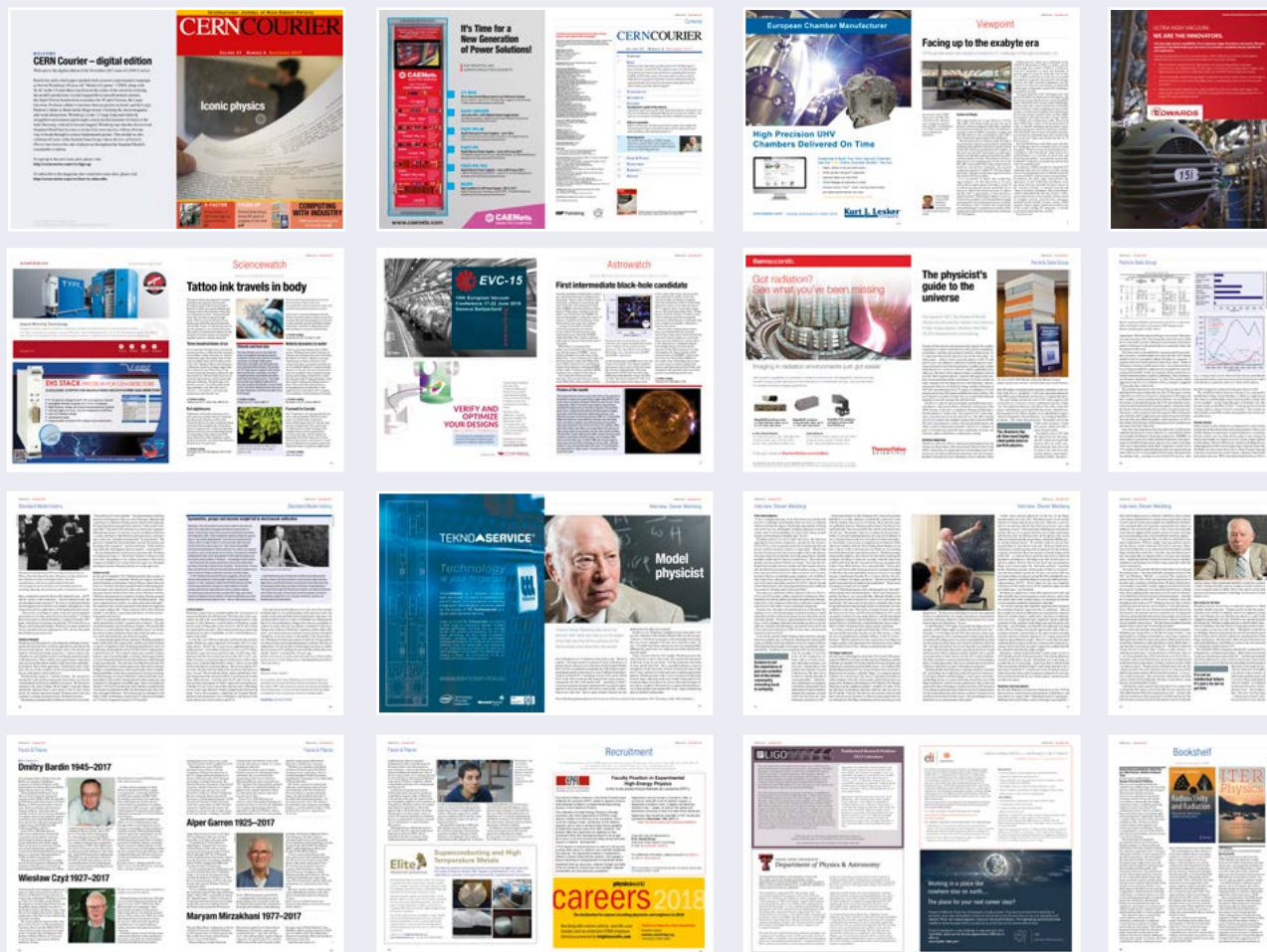


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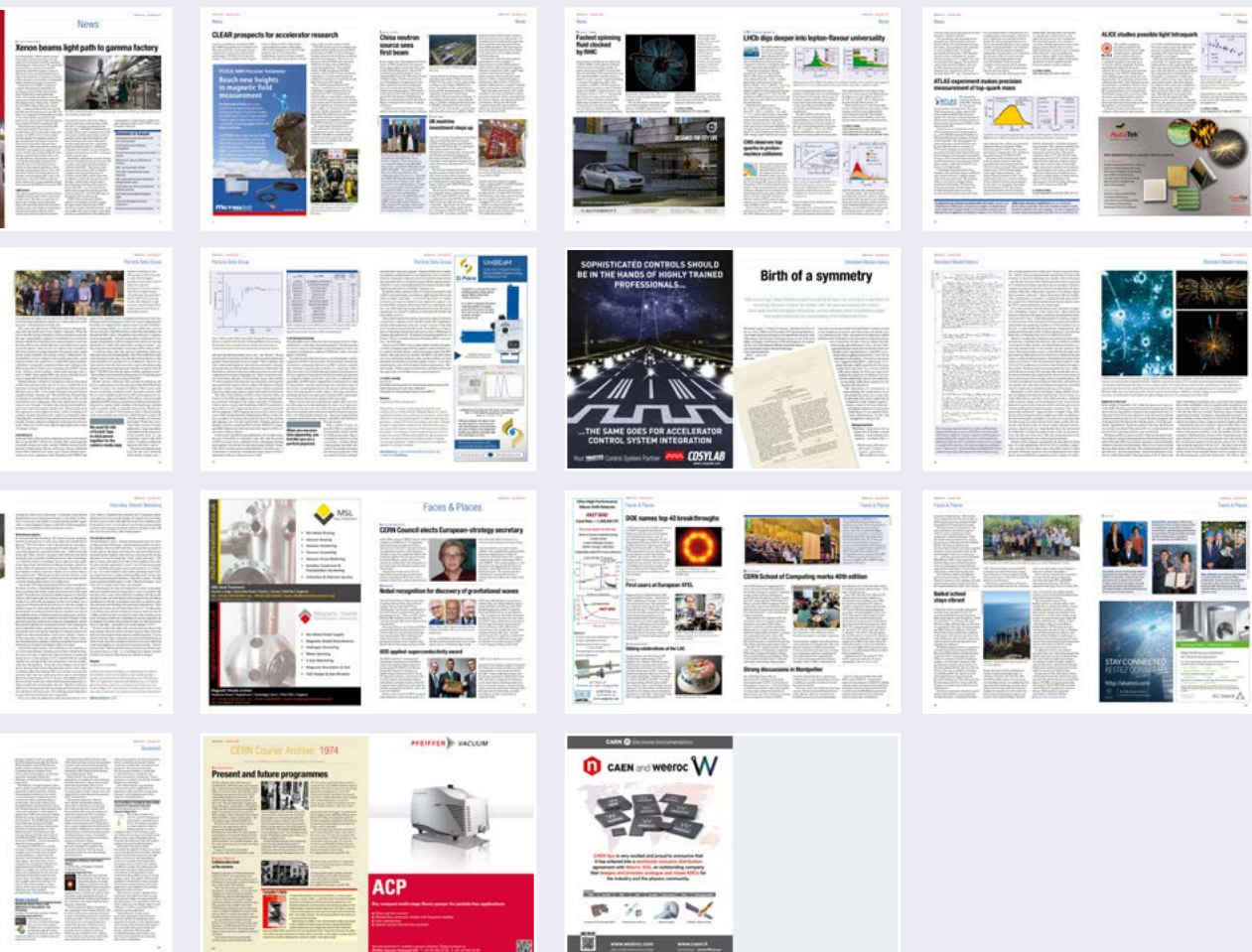
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WELCOME

CERN Courier – digital edition

Welcome to the digital edition of the November 2017 issue of *CERN Courier*.

Rarely has such a short paper sparked such a massive experimental campaign as Steven Weinberg's 50 year-old "Model of Leptons". CERN, along with SLAC in the US and others, has been at the centre of the action in verifying the model's predictions: it took Gargamelle to unearth neutral currents, the Super Proton Synchrotron to produce the W and Z bosons, the Large Electron–Positron collider to measure their properties in detail, and the Large Hadron Collider to flush out the Higgs boson. Unifying the electromagnetic and weak interactions, Weinberg's iconic 2.5 page-long and relatively straightforward manuscript brought a much needed moment of clarity to the field. But today, with all its bosons bagged, Weinberg says that the electroweak Standard Model has become a victim of its own success, with no obvious way to break through to a more fundamental picture. This month we also celebrate 60 years of the Particle Data Group, whose *Review of Particle Physics* has been at the side of physicists throughout the Standard Model's remarkable evolution.

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