

# CERN Courier Archive: 1969

A LOOK BACK TO CERN COURIER VOL. 8, APRIL 1969, COMPILED BY PEGGIE RIMMER

## PARTICLES

# Quarks are still elusive

An experiment at the CERN proton synchrotron PS has searched, unsuccessfully, for the elusive quarks. If, as is postulated, different combinations of more fundamental objects called quarks explain the orderly grouping of the observed particles, individual quarks must carry a charge  $\frac{1}{3}$  or  $\frac{2}{3}$  of the electron charge, providing an excellent handle to get hold of them if they exist.

The PS was operated at 27 GeV and the proton beam was directed onto a target in the magnet ring. The beamline was tuned to a 'supermomentum' of over 30 GeV/c so that particles carrying normal charge would not find their way through the beamline magnets. On the other hand, a particle of about 10 GeV/c carrying  $\frac{1}{3}$  charge would be guided to the detectors.

The experiment pushed detection techniques down to a production cross-section of about  $10^{-39}$  cm<sup>2</sup>, a hundred times lower than previously investigated. Advantage was taken of the fact that particles carrying  $\frac{1}{3}$  charge will produce  $\frac{1}{9}$  of the ionization of a normal particle. Scintillation counters were set to record only particles giving such low ionization and a streamer chamber was installed which gives tracks of a density depending on the ionization (the first use of a streamer chamber at the PS). Particles with charge of  $+\frac{1}{3}$  and  $+\frac{2}{3}$  were looked for but none was found.

A quark search has also been carried out by Soviet scientists at the higher energies available from the Serpukhov 76 GeV machine, but again without success. It can be concluded that the likelihood of observing quarks at existing accelerator energies is now very remote.

● Compiled from texts on p101.

## EPS European Physical Society inaugural conference

With a blaze of trumpets, announcing the Mayor of Florence, the inaugural conference of the European Physical Society EPS opened in the splendour of the Palazzo Vecchio on 8 April. More than 850 scientists attended and for five days Florence was the scene of reviews of "The Growth Points of Physics" by leading figures from European science. A plenary session on "Trends in High Energy Physics" was shared by L Van Hove and T D Lee.

Van Hove reported on interesting developments in evolving a systematic description of collisions of strongly interacting particles, using the "Veneziano model". This model has absorbed the ideas



*G Bernardini, president of the EPS, addresses the inaugural session of the conference in the Palazzo Vecchio, Florence. Behind him are the heralds and standard of the Mayor, L Bausi (centre); on the right is CA Funaioli, representing the Italian government. (Image credit: Foto Torrini.)*

that 1) Regge trajectories could continue to higher masses well beyond the investigated region, populated by a limitless number of particles, and 2) some form of duality exists between the production of resonances and the exchange of particles.

Lee reported on latest developments in electromagnetic and weak interaction theories, concentrating in particular on problems arising in weak-interaction theory when the "first order" equations are extended to higher order. When, for example, the higher-order theory is used to calculate the mass difference between the charged and neutral pions, the result comes out as infinity.

Two of the highlights were brilliant talks by A Hewish (Cambridge) on "Pulsars" and by D W Sciama (Cambridge) on "The Recent Renaissance of Observational Cosmology". The dramatic experimental observations and fascinating thinking in the field of astronomy over the past few years make it the fastest "growth point of physics" at present.

In his talk on "The Old Days at the Cavendish" P M S Blackett pleaded that experimenters should have their eyes wide open for the "accidental" observation. Two of the most exciting recent observations in astronomy have been "accidents". One was the detection of the first pulsar (CP1919) in July 1967, when the Cambridge telescope picked up radio signals pulsing with remarkable regularity every  $1\frac{1}{3}$  second. By now about 40 pulsars are under investigation. They are believed to be beamed synchrotron radiation (a "lighthouse" effect) coming from spinning neutron stars, the remaining cores of super novae explosions.

Another "accident" was the detection in 1965 of the background radiation of the universe. Radio telescopes can pick up this isotropic radiation, corresponding by now to a temperature of about 3 K, which lingers from the first tens of seconds of the mighty explosion  $10^{10}$  years ago, at the origin of our universe. This has given heavy weight to the "big bang" theory as opposed to the "steady state" theory of the evolution of the universe.

Since, when dealing with cosmological phenomena, matter is being considered under extreme conditions such as are produced in high-energy particle collisions, research at accelerators is an important input to cosmological theories.

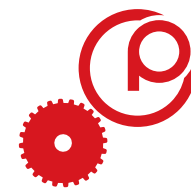
● Compiled from texts on pp106–107.

## Compiler's Note

Existential studies and unexpected observations are ever the stuff of dreams. While physicists hunt for the elusive Higgs deep inside the LHC detectors, hominologists are searching remote corners of the Siberian wilderness for the elusive Yeti, faster-than-light neutrinos (to be confirmed) kindle fanciful notions of time travel and exoplanets recently discovered by NASA's Kepler telescope have given new impetus to the quest for ancient signals from extraterrestrial intelligence inhabiting the so-called Goldilocks Zones around distant stars. Who needs science fiction?

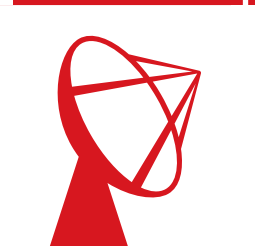


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COSYLAB supplied the booster control system as well as controls for storage ring magnet power supply, apple2 undulator and protein crystallography and powder diffraction beamlines to the Australian Synchrotron. I confirm that the Synchrotron Controls team were able to work collaboratively with COSYLAB staff to arrive at a good solution which met all requirements. The systems were delivered on time to their contractors and that the software worked "straight out of the box".



Alan Jackson, former Technical Director of the Project (ASP)



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Gianluca Chiozzi, Head of the Control and Instrumentation Software Department (ESO)

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