



CERN's Silver Jubilee



Twenty-five years ago an experiment in scientific research and international co-operation was started on a site at Meyrin, just outside Geneva. A European Laboratory was created for research into the physics of fundamental particles - and today offers extensive facilities which are unique in the world. Over the past 25 years the work performed at the CERN Laboratory has earned an international reputation for the quality of the scientific results and its technological developments.

In the beginning ...

The European Organisation for Nuclear Research (CERN Laboratory) officially came into being on 29 September 1954 when sufficient ratifications were obtained from Member States. By the beginning of 1955 twelve Member States had signed the Convention: Belgium, Denmark, the Federal Republic of Germany, France, Greece, Italy, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom and Yugoslavia. Austria joined in 1959. Spain was a Member from 1961 to 1969 but had to withdraw, as did Yugoslavia in 1962, for financial reasons. Poland, Turkey and Yugoslavia have the status of Observer States.

Excavations began on the Meyrin site in May 1954 to construct a 600 MeV synchro-cyclotron and a 28 GeV proton synchrotron with all their experimental and administrative support facilities. The synchro-cyclotron came into operation in August 1957 and one of the first achievements was to observe the direct decay of a pion into an electron and a neutrino. Experiments at the synchro-cyclotron have specialised in the field of nuclear physics, and today a considerable effort is put into the study of short-lived nuclei and properties of the muon.

The proton synchrotron began operating in November 1959. It was the first machine using the strong focussing principle and was for a time the most powerful accelerator in the world. Its programme was notable for the early experiments with neutrino beams from 1961 (a speciality which continues even today) and the detailed results on baryon and meson spectroscopy. Technical developments have included pioneering work on detector systems - such as the multi-wire proportional chamber - the construction of very large bubble



Professor H. Casimir addresses a distinguished audience at the Official Ceremony held on 23 June to mark the 25th Anniversary of CERN. With him on the rostrum are Professors L. Van Hove, V. Weisskopf, J. Teillac and Dr J. B. Adams (Photo CERN).

chambers and spectrometers, and the application of powerful computing techniques to the data acquisition and analysis of the results.

In comparatively recent years, intersecting proton storage rings and a super proton synchrotron have been added (see later in this issue) to maintain CERN's role in the forefront of particle physics research.

Anniversary Celebrations

The 25th Anniversary Celebrations opened with an official ceremony on 23 June, when Ministers and important personalities from the Member States, representatives of local authorities and distinguished friends visited the CERN Laboratory. Professor Teillac (President of the CERN Council) presided over the Ceremony and Professors Weisskopf and Casimir were invited speakers. The occasion was marked by a tour of the Laboratory and an exhibition demonstrating the technological advances which have emerged from the work of CERN during the past 25 years.

On 29 June a concert, offered in honour of CERN by the Swiss Confederation and Municipality and Canton of Geneva, took place in Geneva's Victoria Hall. The programme included a specially commissioned work

by local composer Mathieu Vibert and played by the Orchestre de la Suisse Romande.

30 June was a "CERN Day" at the European Physical Society's International Conference on High Energy Physics held in Geneva. A fete will be held on the site for CERN staff and their families on the actual day of the anniversary - 29 September - and a Symposium for scientific and technical Press is being arranged for 8-9 October.

Since the beginning, UK physicists have played an important role in experiments carried out at CERN. With the development of facilities, international collaboration has become widespread and it is now usual for teams from half a dozen countries to be involved in one large experiment. More than one third of the current CERN experiments involve British physicists.

This issue of the *Bulletin* contains information on two current experiments involving British collaboration at CERN (selected almost at random!). One involves setting up a new spectrometer at the intersecting storage rings and the other highlights recent results of a charm search using a high resolution bubble chamber at the super proton synchrotron.

The CERN ISR ...

The Intersecting Storage Rings (ISR) came into operation at the CERN Laboratory in 1971. High energy proton beams (up to about 30 GeV) are sent in opposite directions around two interlacing storage rings. At eight regions where the beams cross the particles collide *head-on*, yielding interesting phenomena equivalent to that produced by a conventional synchrotron of 2,000 GeV.

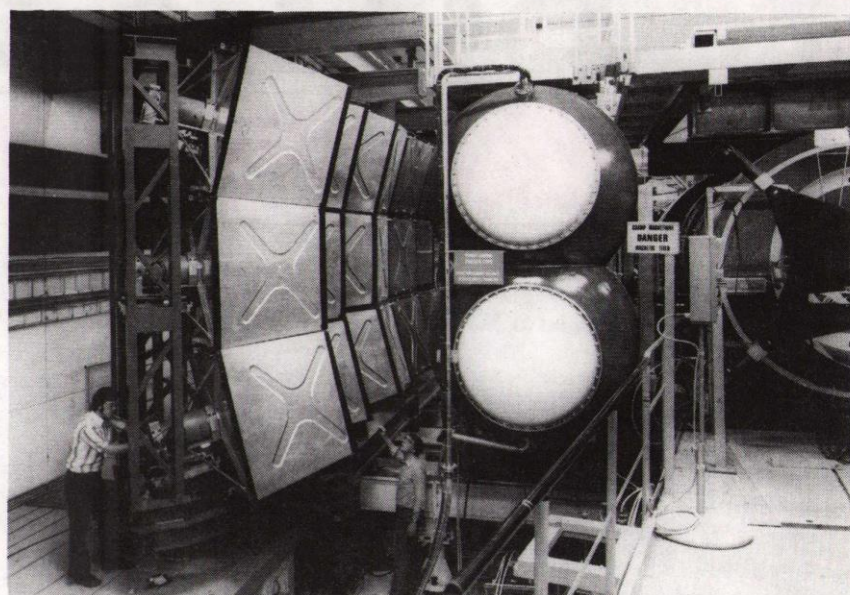
Several important discoveries have emerged from the proton-proton scattering experiments at the ISR, including the fact that the proton size increases at higher energies. A large effort has been put into the study of jets of particles which emerge almost at right angles to the proton directions. The presence of these "hard" collisions supports the concept of the granular structure of the proton, and that the jets come from the head-on collisions of sub-nuclear particles (quarks, etc) within the protons.

... a new spectrometer

A new axial field spectrometer, recently installed in intersection region 8, has been specially designed to intensify the study of "hard" scattering processes. The apparatus has been prepared by a collaboration from CERN, Copenhagen, Lund, Rutherford Laboratory and Tel Aviv. The Rutherford Laboratory involvement is particularly appropriate since Lord Rutherford himself achieved fame doing similar experiments with atoms in 1911 - which led to the discovery of the atomic nucleus. The new ISR experiment will study the production of jets of particles, identifying the particles using sets of Cerenkov counters. We thank Dr Mike Albrow for the latest news of the axial field spectrometer experiment:

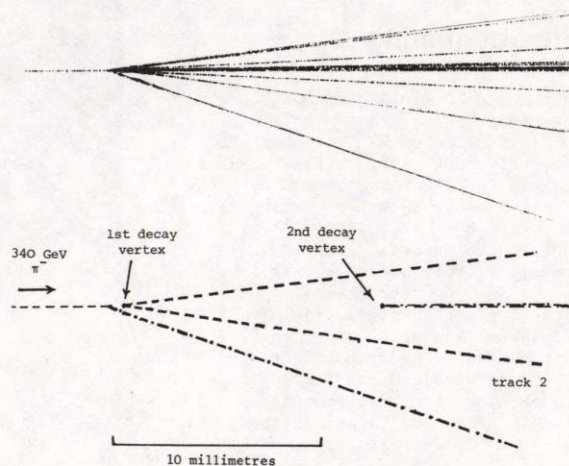
The heart of the experiment is a cylindrical drift chamber (being built by CERN) which surrounds the vacuum chamber where the proton-proton collisions occur. This chamber contains 2,000 wires parallel to its axis. By recording the pulse height from each wire a full 3-dimensional reconstruction of the tracks of the produced particles is obtained, and the slower particles can be identified from the ionization they produce. The chamber is in an axial magnetic field of 0.5 Tesla provided by a "Helmholz Coil" type magnet with a novel open structure.

The fast particles produced over one steradian of solid angle are further recorded in a set of six large proportional chambers, each 2m x 4m, being built at the Rutherford Laboratory. Two of these have been installed, with the remainder eagerly awaited for the autumn. Besides recording the anode wire hits, and using them in a trigger with an on-line processor, the cathode planes are divided in strips and read out using delay lines - thus measuring three coordinates in a single gap. There are three arrays of Cerenkov



Above: View of the new axial field spectrometer during installation at the CERN ISR. (Photo CERN).

Right: Direct evidence of the production of a pair of charmed particles as recorded by the LEB in a high energy pion beam at the CERN SPS. The event clearly contains two decay vertices (as shown in the figure) and there is an additional downstream strange particle vee (not shown).



counters: one of silica aerogel (made by Lund), a high pressure gas counter (the two Siamese twin cylinders in the photo) built by Copenhagen, and finally a wall of 18 atmospheric pressure gas counters (the oddly shaped boxes on the left of the photo) provided by Rutherford Laboratory. Each box covers 15° in polar angle and 15° in azimuth and contains a large glass mirror with a concave spherical surface and a flat mirror of stretched aluminized Mylar. The Cerenkov light is focussed on a 5 inch photomultiplier tube positioned at the centre of the back face.

The above equipment is being set up to take physics data in the autumn. Next year the apparatus will be supplemented with uranium calorimeters, for triggering directly on jets of particles, and a superconducting quadrupole system which will increase the collision rate by a factor of about 8. By that time antiproton beams should also be available for the ISR, so that very high energy antiproton-proton collisions can be studied in the same apparatus.

The CERN SPS ...

CERN's largest accelerator is the Super Proton Synchrotron (SPS) which began operation in June 1976 at an energy of 400 GeV, and reached a peak energy of 500 GeV at the end of 1978.

The SPS beamlines have been carefully designed to deliver high quality, high intensity beams into several experimental halls. A varied experimental programme has been pursued since the start-up, involving several sophisticated sets of complex apparatus and data acquisition systems. The SPS experiments are by far the largest part of the CERN research programme.

There are also plans to use the SPS as a proton-antiproton colliding beam machine. This will open up a domain of high energy physics with collision energies equivalent to a conventional accelerator of energy 155,000 GeV. The proton-antiproton project is due to be ready for experiments in 1981.

... produces charm in LEBC

There is exciting news from the high resolution bubble chamber LEBC (Little European Bubble Chamber) which is searching for direct evidence of charmed particles at the CERN SPS. This physics programme was originally envisaged for the Rapid Cycling Vertex Detector following the closure of Nimrod, and is based on refining the bubble chamber technique to detect the small size of tracks expected in charmed particle decays. Calculations indicate that a spatial resolution of 30 micron is required to detect charmed particles with a lifetime greater than a few $\times 10^{-13}$ second. The experiment is being performed by a collaboration from Brussels University, CERN, Oxford University, Padua University, Rome University, Rutherford Laboratory and Trieste University. We thank Dr Colin Fisher for news of the first results.

The high resolution bubble chamber LEBC was built at CERN in record time by Heinrich Leutz and his colleagues using the materials and methods developed for the track sensitive target technique. The Rutherford Laboratory group have been directly involved in the specification and design of the high resolution optical system. The chamber contains only about 1 litre of liquid hydrogen, being 20cms in diameter and 4cms deep. The construction is entirely of Lexan with no seals or rough edges to produce spurious foaming, etc - it is a small clean bubble chamber. This is important for rapid cycling, however this aspect of the performance has yet to be explored. The chamber has been run at 7, 16 and 40 Hz, and appears to be satisfactory. The expansion, which uses a hydraulic system scaled down from the design (by Alain Hervé of CERN) used in the Rapid Cycling Bubble Chamber is achieved by pushing directly the back wall of the chamber.

During a first run of 8 hours under controlled conditions of resolution (50 micron) and bubble growth time (200 microsecond), about 7,000 triggered pictures were taken containing about 2,000 high resolution events. As a result of scanning these pictures, several candidate events for charmed particle production have been found. Approximately 1,000 events have been looked at in the UK by the Oxford University and Rutherford Laboratory groups, and a very good candidate for a pair of charmed particles has been found (see photograph).

The event would normally be classified as a 12 prong plus a neutral vee - a strange particle decay. Closer inspection however shows that although the forward jet contains finally six particles it starts off as four. Moreover it is clear that the additional two particles originate from a point. Either a very fast vee decay occurs here or a charged track decays into three. Either interpretation fits very well our expectations for charm. Even closer study shows that track 2 cannot come

Lectures

RUTHERFORD LECTURE LECTURE THEATRE, R22 - 1515hrs

6 Sept: Dr A H Gabriel/Appleton Lab.
"Astrophysics research at
Appleton Laboratory, Culham"

The programme of research at Culham is carried out in close collaboration with many university groups within the UK, in addition to some foreign groups. The work falls into three main areas:

- studies of the sun based upon measurements from space
- studies of other astronomical objects both from space and the ground
- plus an associated laboratory programme aimed at determining the fundamental data required for interpretation of observations.

A unifying theme is that of plasma diagnostics using atomic spectroscopy, mostly in the X-ray and ultraviolet spectral regions. Two major space projects are currently underway. The first is an X-ray spectrometer experiment for the study of solar flares to be launched in January 1980 on the Solar Maximum Mission Satellite. The second is an experiment to study the solar corona in the XUV region to be flown on the Second Spacelab flight in 1982.

NUCL. PHYS. COLLOQUIUM H8 AERE HARWELL - 1530hrs

6 Sept: Dr W Davidson/ILL
"High resolution γ -ray studies
at ILL following neutron
capture"

THEP SEMINAR SOUTHAMPTON - 1430hrs

23 Aug: Professor H Goldberg/NE Univ
"Is the η part glueball? A
possible solution to the
U(1) problem"

directly from the origin but emerges from a point about 0.5 millimetre downstream. We therefore have two decay points at 0.5 and 13 millimetre consistent with a charm pair in addition to the strange particle (which could come either from the main vertex or from the shorter of the two decays). This is probably the best candidate for direct charm production in hadronic interactions ever observed.

A second run of LEBC in the beginning of July produced 110,000 triggered pictures, which contain about 70,000 high resolution (30 micron) events. The picture quality appears to be excellent and scanning is now in progress.

One can reasonably expect to see the start of a programme of new physics using this technique which will occupy several teams in the 1980s. The high resolution technique can be used with the larger Rapid Cycling Bubble Chamber given a suitable camera, and this promises to be an extremely powerful tool when combined with the detailed analysis of the final state provided by a downstream spectrometer.

Training

Courses:

LOUGHBOROUGH UNIVERSITY OF TECHNOLOGY

17-19 & Design of Microprocessor
24-26 Sept: Systems for Control
Applications

16-21 Sept: Laboratory Health and
Safety

24-28 Sept: Microprocessors and
Applications in Process
Control

24-28 Sept Materials Refresher Course

26-28 Sept: Water Pollution
Measurement and Monitoring

22-26 Oct: Industrial Energy
Management

28-31 Oct: Noise Control in Industry

INSTITUTION OF ELECTRICAL ENGINEERS

25-27 Sept: Small Computer Systems

26-28 Sept) Finance and
(London)) Accounting for
27-29 Nov) Engineers
(Leeds):)

NATIONAL CENTRE OF TRIBOLOGY

25 Sept: Gears - Design,
Lubrication and Failures

UNIVERSITY OF SALFORD

17-20 Sept: Principles of Tribology

3-5 Oct: Industrial Audiometry

Conferences:

INSTITUTION OF ELECTRICAL ENGINEERS

26-28 Nov: Developments in Design
and Performance of EHV
Switching Equipment

INSTITUTION OF MECHANICAL ENGINEERS

28-29 Sept: Conference for Associate
Members, Graduates and
Students - Managing
People and Technology

EUROPEAN FEDERATION OF CHEMICAL ENGINEERING

18-20 Sept: Second World Filtration
Congress

SUMMER SCHOOL ON CHARGE-COUPLED DEVICES

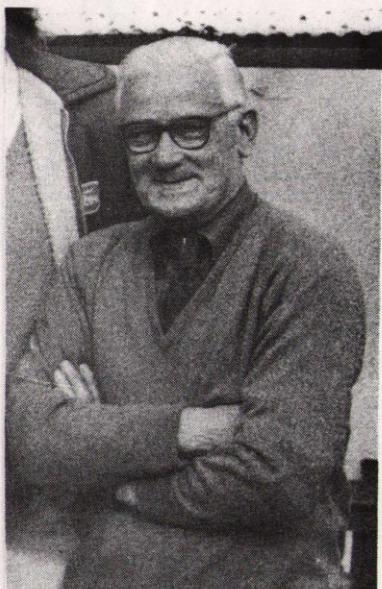
A two-day residential Summer School on the applications of charge-coupled devices to signal processing and imaging is to be held at the Department of Electrical Engineering, University of Surrey on Thursday 6 and Friday 7 September 1979.

Further details may be obtained from Training Section, R20, Ext 6285/266.

Portable Tool Testing

The test carried out during July has now been completed. The current marker is red and is marked, "Do not use after November 1979". Portable electrical equipment marked otherwise or has no marker should be considered unsafe and must not be used.

All such items should be returned to Electrical Services Section, R18. Alternatively ring Mr A Hipwell, X573.



Good Luck Jim

On Tuesday 31 July, Jim Knight of the Physics Apparatus Group retired after 17 years at Rutherford. He was presented with a quartz clock and cheque by Mr Derek Moore, together with a letter from the Director.

Derek Moore looked back over Jim's career; in the Royal Engineers and REME in the 1939-45 African campaign, in the Pullman cars on the Brighton Belle, and then back to the Army. Jim worked in Building 351 at AERE and then moved to the Chilton site with NIRNS and SRC, working in R9, R18, R8 and now in R12 with the Physics Apparatus Group.

Recapping on Jim's sporting achievements, Derek mentioned his successes in the Brighton Mitre Cycling Club, when he held seven track event records during 1937 and 1939, and in the Sussex track event championships in 1947.

In his retirement we hear that Jim is thinking about breeding budgies, so we all hope he enjoys his life with the birds - the feathered variety, of course!

Rutherford Wives

We look forward to seeing old friends and meeting any recent arrivals at the September Coffee Morning on Friday 7 September at The Cosener's House in Abingdon from 10.30am until noon. Young children are welcome too! For further information please contact Gillian Litt (Abingdon 26009) or Dorothy Gibson (Abingdon 25250).

Rutherglen Memorial Prize

The fund, which was set up in memory of the late Professor J G Rutherglen, is used to finance an annual award to a postgraduate student in experimental particle physics from one of the universities associated with the electron synchrotron NINA. The award for 1979 will be divided between Mr S H P Geer of Liverpool University and Mr W J Haynes of Sheffield University.

Angling

RUTHERFORD v BRITISH RAIL, 21 JULY

After Rutherford's defeat of British Rail last year, revenge was taken this year with a decisive win by British Rail.

As a stiff breeze made float fishing difficult, the angler with the best catch of the day changed after three hours to ledger tackle, using a No 12 hook and bread paste. The reward - a 4lb 8oz tench in a few minutes. This catch by Dennis Day of Rutherford made him the individual winner, although the final result was:

British Rail - 11lbs
Rutherford Laboratory - 7lb 5oz

Well done Dennis!

Film Badge Notice

It is Period 9, colour strip ORANGE. Please check that you are wearing the correct film and all old ones are returned.

Next Film Change - Monday 10 September.

Undelivered Mail

Correspondence for Dr T Yamanaka has arrived on site. If anyone can help with clues to Dr Yamanaka's whereabouts please contact Mrs R Newberry, R20, Ext 510.

Trade Exhibition

There will be an exhibition by Cambian Electronic Products Ltd from 1000 - 1600hrs on Thursday 23 August in front of the main entrance of R25.

Sales to Employees

Sales of scrap metal/plastics as set out in RLN 12/73 will be made on 24 August and 7 September at the scrap compound, rear of R40, from 1200-1230hrs.

OVERSEAS Visits

C J S Damerell to CERN from 21-28 August to work on NALL.
J A Blissett and B T Payne to DESY from 26 August to 8 September to work on Tasso.
F E Close to Budapest and Dubrovnik from 1-23 September to attend Summer Schools.
J Barlow to Monaco from 2-7 September to attend 1979 Decus Europe Symposium.
W A Smith, M Waters and R P Hand to Monaco from 3-7 September to attend 1979 Decus Europe Symposium.
W A Smith to Munich, 7 September, to attend Colloquium on energy in buildings.
J Barlow to CERN from 7-15 September for discussions.
D A Gray to Leningrad from 8-19 September as guest of Leningrad Nuclear Physics Institute.
S W Lovesey to Warsaw from 8-13 September to attend International Conference on Polarised Neutrons in Condensed Matter Research.

Golfing Society

The Summer Meeting took place in brilliant sunshine at the North Hants Golf Club on 3 July, when Rutherford golfers figured prominently in the prizes. A round under Stableford rules for the Sir John & Lady Cockcroft Trophy resulted in Rodney Cusack (16) AERE with 37pts and Alec Coulson (3) AERE with 34pts, the 19+ prize going to Gordon Walker (22) Rutherford with 26pts.

The President's Tankard was contested for, as a medal round, against SSS-70 for the day, and the leaders were Geoff Manning (15) Rutherford with 70nett and Ron Roberts (10) Rutherford with 73nett, the 19+ prize going again to Gordon Walker with a 74nett.

The combined scores meant that the Coulson Trophy leaders were Rodney Cusack with 143nett and Geoff Manning with 146nett.

The Scratch Championship was even for the 15th time by Alec Coulson with 151gross and Jack Brownlie with 160 gross.

As a result of the meeting the Wally Baker Trophy, for all year consistency, is led by Geoff Manning with 81pts and Rodney Cusack with 74pts.

Christian Fellowship

All are warmly invited to attend the following meetings on Thursdays in the R2 Conference Room at 1230hrs led by:

23 August: Dennis Williams
30 August: Robert Harrison
6 September: Jim Sinclair from AERE



Deadline for Insertions

BULLETIN

1000hrs Tuesday 4 September

Editor: Jean Banford

Room 23, Building R20
Rutherford Laboratory
Chilton Didcot Oxon OX11 0QX
Abingdon (0235) 21900 Ext 484

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