

Last month at CERN

Conferences

August and September being the traditional peaks of the universities' long vacation, there was, as usual, much travelling to and from CERN in this period. Many students came to the laboratory for the first time, to gain first-hand experience of its research programmes. Many members of the staff travelled to one or other of the Conferences or Summer Schools being held in various parts of the world, and the usual large number of visitors from other laboratories, particularly those in the U.S.A., called in at CERN before or after attending the same conferences.

For the **students**, the CERN Programme was further developed this year, and the 100 who came for various periods attended a comprehensive series of lectures and visits, lasting 1½ hours or more practically every morning (Monday to Friday) from 20 July to 24 September, as well as taking part in the work of the Laboratory. A fuller account will be given in next month's *CERN COURIER*.

One of the most important of the conferences was the **Fifth international conference on high-energy accelerators**, held at Frascati, in Italy, from 9 to 16 September. This is the conference founded by CERN in 1956 and now held under the auspices of the International Union of Pure and Applied Physics every two years, alternately in the U.S.A., U.S.S.R. and Western Europe. The last time it took place in Western Europe was in 1959, at CERN*, and at that time the 28-GeV proton synchrotron was not yet finished (in fact the first beam circulated round the ring whilst the conference was in progress). Subsequent meetings were at Brookhaven in 1961 and Dubna in 1963**. This year, most of the accelerators under construction in 1959 are in full operation and more attention was given during the discussions at Frascati to detailed aspects of the design of machines such as the CERN intersecting storage rings and 200-GeV and 300-GeV synchrotrons. CERN's Director General, Prof. V.F. Weisskopf, opened the conference and thirty-five other scientists and engineers from the Organization also took part.

Almost immediately afterwards, from 19-25 September, over seventy physicists from CERN, not to mention many other who are working at CERN though not forming part of its staff, travelled to Oxford (U.K.), for the **International conference on elementary particles**, organized by the Rutherford Laboratory and bringing together some five hundred scientists from over thirty countries in the world.

This conference, following those at Aix-en-Provence in 1961* and Sienna in 1963**, is the third in a series instituted primarily for the benefit of the young European physicists working in the field of sub-nuclear research and held in alternate years to the main 'Rochester' international conferences.

A few days before (15-17 September), a more general **Conference on nuclear and particle physics** was held at the University of Liverpool under the auspices of The Institute of Physics and the Physical Society (U.K.). Prof. Ch. Peyrou, leader of CERN's Track Chambers Division, gave an invited talk on baryon resonances.

The extreme importance of electromagnets in the work of laboratories like CERN was reflected in the participation of members of the Organization in an **International symposium on magnet technology** at Stanford University, U.S.A., during 8-10 September.

Another important conference took place in the Free University of Brussels, during 14-16 September. This was the **Third Colloquium of the 'Institut Interuniversitaire des Sciences Nucléaires'**, devoted to the **use of elementary particles in nuclear-structure research**. Since the last international conference in this field, organized by CERN and the Weizmann Institute in 1963**, the use of the CERN synchro-cyclotron for nuclear-structure experiments has increased considerably. Many of the physicists carrying out the experiments at CERN (mostly on the interactions of muons and pions with nuclei) reported on their work at the Brussels meeting.

Towards the end of September, members of the CERN staff, and ex-members, were among the lecturers contributing, for the third successive year, to the **International school of physics 'Ettore Majorana'**, held at Erice, Sicily under the direction of Prof. A. Zichichi, of CERN, and sponsored by CERN, the Italian Ministry of Public Education, and the North Atlantic Treaty Organization. Some 80 students, from about 30 different countries, attended the School, which was devoted to both theoretical and experimental aspects of the structure of elementary particles.

During the same period (27 September - 10 October), other members of the CERN staff went to Herceg Novi, Yugoslavia, scene of the 1964 CERN Easter School, to lecture in an **International school of elementary-particle physics** organized jointly by the 'Département de Physique corpusculaire' of the 'Centre de Recherches nucléaires' at Strasbourg and the University of Belgrade (sponsored by the Yugoslav Nuclear Energy Commission).

Specimens of omega minus found in Europe

At the Oxford conference in September, three examples were reported of the famous omega-minus particle, which had been sought for several years in Europe but which had seemed more and more to be a native only of the U.S.A. This is the particle that was predicted as a consequence of the 'eightfold-way' version of the symmetry theory SU_3 and provided striking confirmation of the theory when it was discovered in an experiment at Brookhaven National Laboratory early in 1964 (see *CERN COURIER*, vol. 4, p. 27, March 1964). Until recently only five examples had been found, all in photographs obtained on that side of the Atlantic.

Two of the new examples were photographed in the 152-cm British hydrogen bubble chamber at CERN, during a run with 6-GeV/c negative kaons. The best one, for which details have been published in *Physics Letters**, was found after 400 000 photographs had been scanned,

* *CERN COURIER*, no. 3, p. 3 (October 1959).

** *CERN COURIER*, vol. 3, pp. 143-145 (November 1963).

* *CERN COURIER*, vol. 2, no. 2, pp. 10-12 (Feb. 1962).

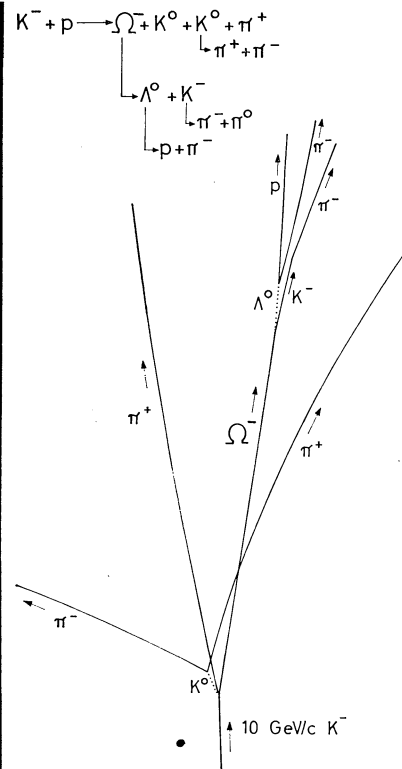
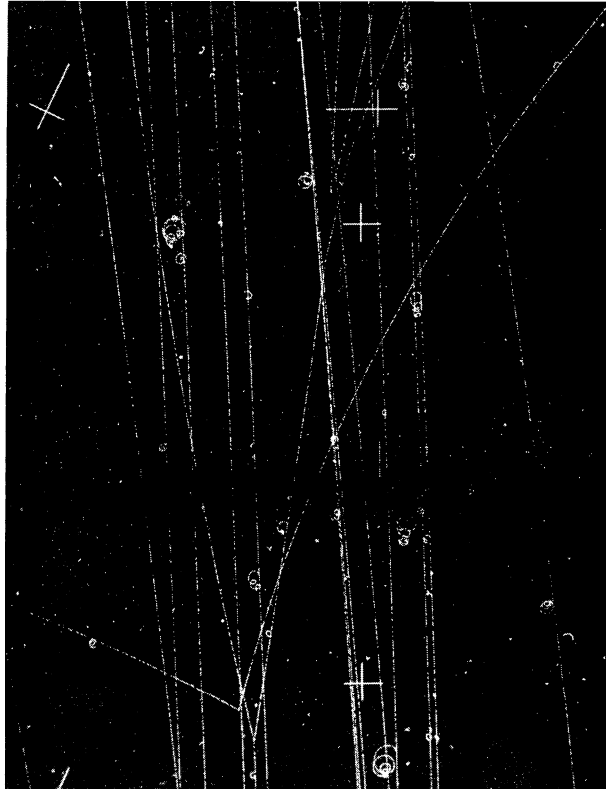
** *CERN COURIER*, vol. 4, pp. 3-6 (Jan. 1964).

*** *CERN COURIER*, vol. 3, p. 35 (March 1963).

* *Physics Letters*, vol. 19, pp. 152-4 (1st Oct. 1965).

Photograph of an interaction between a negative kaon and a proton, taken with the 152-cm British bubble chamber at CERN, in which one of the products was an omega hyperon. As indicated in the accompanying diagram, the omega decayed into a lambda (neutral and therefore leaving no track) and a negative kaon, after which the lambda in turn decayed into a proton and a negative pion whilst the kaon disintegrated into a negative pion and a neutral pion (again invisible). Two neutral kaons and a positive pion were also produced in the initial interaction and one of these kaons decayed into two charged pions. Identification of all the particles, including those not seen, was made from measurements on the tracks and subsequent computer calculations.

N.B. To see the event more clearly, hold the page horizontally at eye level and look along the tracks.



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in which the sum of all the kaon tracks amounted to some 5000 km! From analysis of the many tracks appearing on the photograph it was deduced that the omega was produced in an interaction between a negative kaon and a proton in which a neutral kaon and a positively charged kaon were also produced. The neutral kaon decayed into a positive and a negative pion, the omega into a neutral xi hyperon and a negative pion; the xi then decayed into a lambda and a neutral pion and the lambda in turn into a proton and a negative pion. The mass of the omega was calculated as 1666 ± 8 MeV and its lifetime 1.85×10^{-10} second.

The second example reported at Oxford was not so clearly defined, but the most likely explanation of the event in question is that an omega minus was formed.

The third omega, revealed in the photograph shown (with its explanation) on this page, was also produced in the British bubble chamber at CERN, but this time in the experiment that used a radiofrequency-separated beam of kaons of 10 GeV/c momentum.

Underlining the difference in effort required nowadays to find such an 'elementary particle', compared with that needed to discover the neutron, say, or the positron, is the fact that the paper in *Physics Letters* appears under the name of the 'Birmingham, Glasgow, Imperial College, Munich, Oxford and Rutherford Laboratory Collaboration'. Underneath are the

names of the 51 university and other physicists involved! Acknowledgements are also given to the crews of the CERN proton synchrotron and the British bubble chamber, the computing unit at Imperial College, the computer programming staff at the Rutherford Laboratory, and the scanning and measuring teams.

The 10 GeV/c negative-kaon experiment that has produced the third omega is being carried out by a collaboration of groups in Aachen, Berlin, CERN, London (Imperial College) and Vienna. In this respect, at least, the claims of CERN to be both an inspiration and a servant of physics in Europe seem to be not without foundation!

Experimental programme at the PS and SC

During the first two weeks of September no new experiments were introduced at the **synchrotron**, and those previously mentioned in *CERN COURIER* were continued in one way or another. The **CERN heavy-liquid bubble chamber** provided a further 150 000 photographs of stopped positive kaons, during its 4½-days run. The **81-cm liquid-hydrogen bubble chamber**, filled with deuterium, ran during both weeks under review and took about 40 000 new photographs of 5-GeV/c negative pions as well as about 160 000 of 5-GeV/c positive pions.

At the **synchro-cyclotron**, the whole 'holiday' period of August and September was one of intense activity.

A number of experiments were, completed in time for preliminary results to be presented at various conferences, and others took their place. Further details of all these will be given in the December issue of *CERN COURIER*.

'Rencontres internationales de Genève'

Once again this year, members of the CERN staff took their place among the distinguished representatives of the Arts, Letters and Sciences who participated in the 'Rencontres internationales de Genève', held from 31 August to 9 September. The theme of this year's cycle of public lectures and debates (the twentieth) was 'Le robot, la bête et l'homme' (automata, animals and man), and in six evening lectures, eight speakers presented their ideas on the essential differences[^] that enable us finally to distinguish man from animals, on the one hand, and machines on the other.

Roger Caillois, writer, editor of the international review *Diogenes*, was followed by Guido Calogero, philosopher of the left, and Henri Niel, philosopher theologian, Jacques Monod, biologist, and Julian de Ajuriaguerra, doctor and psychiatrist, director of the Psychiatric Clinic of Geneva, Stanislaw Ulam, mathematician and computer expert, Ernest Ansermet, mathematician and musician, renowned conductor of the 'Orchestre de la Suisse Romande', and Jean Bruller (Vercors), artist and writer. Each of their lectures was followed the next day by a public debate in which the arguments were taken up and

expanded by a wider panel of speakers, and a special debate was held on the subject of 'Automation and its social effects'. Included in the framework of the *Rencontres*, there was also a series of special film showings, related to the general theme, as well as a concert by the 'Orchestre de la Suisse Romande' under the direction of Ernest Ansermet.

Among the discourses, probably the most interesting for those from CERN was that given by Dr. Ulam, with the title 'La machine créatrice?', in the course of which he summarized the basic operations carried out by computers and speculated on the way in which they might assist Man to understand more of himself. The speaker was introduced by Prof. V.F. Weisskopf, CERN's Director General, and both Prof. Weisskopf and Prof. L. Kowarski were among the personalities of many nations who participated in the debate. Whilst in Geneva, Dr. Ulam also gave a seminar at CERN on a rather different subject: 'Some ideas about quasers'.

'Grand Conseil' visits CERN

Two events in September serve to underline the efforts being made on

all sides to increase mutual understanding between the citizens of Geneva and those who come from other parts of Europe to work at CERN.

The first of these was on 18 September, when the elected representatives of the people of Geneva, the members of the 'Grand Conseil', led by their President, Mlle E. Kammacher, spent the morning visiting CERN. In the unavoidable absence of the Director General (in England for the Oxford Conference) the visitors were received by the Directorate Member for Administration, Mr. G.H. Hampton, and were then given an introductory talk on the work of the Organization by Roger Anthoine, Head of Public Information. After a tour of the Laboratory in the care of some of the volunteer Saturday guides from the CERN staff, the Councillors returned to the Administration building where a reception had been arranged by the 'Conseil d'Etat'. A speech of thanks was made by Mlle Kammacher, to which Mr. Hampton replied. The morning was brought to a close by M. André Chavanne, Councillor of State in charge of Education in Geneva, who spoke in very favourable

terms of the advantages that Switzerland could derive from having a laboratory such as that of CERN on its territory.

'Rencontres de midi'

On 27 September it was the turn of the CERN staff to learn something more about Switzerland. In the first of the talks arranged under the general title 'Rencontres de midi', M. Charles Duchemin, Councillor of State of Geneva responsible for the Department of Internal Affairs and Agriculture, gave an instructive account (in French) of 'Democracy in Switzerland and Geneva'.

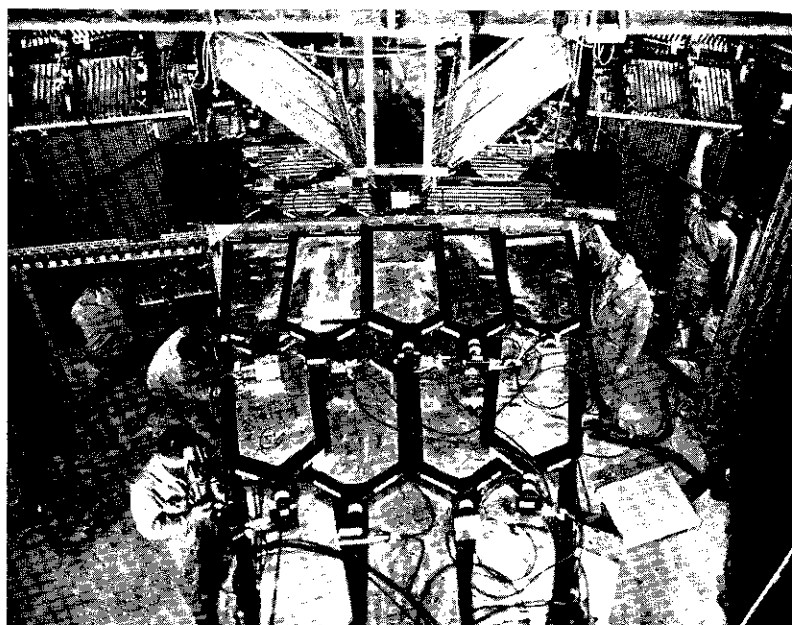
This series of talks, arranged jointly by the CERN Welfare Section and the Staff Association, will take place on the last Monday of each month, during the lunch hour. It is hoped that the contributions of distinguished speakers from both Switzerland and France will enable many members of the CERN staff to learn much more about the customs and political systems of the countries in which they now find themselves.

Visitors

Among the more important visitors to CERN in the past few months, apart from scientists from other laboratories, a few stand out for special mention.

Thus, on 12 July, members of the **Permanent Delegation of Greece** to the European Office of the United Nations Organizations, with members of the Greek Consulate in Geneva, were received. On 3 and 4 August, Mr. **S. Kenneth Johnsen**, Head of an architectural committee concerned with the design of the 200-GeV proton synchrotron in the U.S.A., spent some time at CERN adding to the information and impressions he is gathering of existing laboratories. The following week, on 13 August, Prof. **P. Lelong**, Chairman of the Scientific Research Committee of France, visited the Organization.

On 2 September, CERN received members of the '**Commission de Gestion**' of the '**Conseil des Etats**', one of the two parliamentary bodies of the Swiss Confederation. Another diplomatic visit took place on 11 September when members of the **Hungarian Mission** in Geneva spent the morning at CERN ●



This impressive array of scintillation counters and spark chambers forms part of the equipment for detecting the decay of long-lived neutral kaons into pairs of neutral pions (one of the complementary series of experiments on CP invariance discussed in the September issue of CERN COURIER), set up in the PS East experimental hall by a group of physicists from the Rutherford Laboratory, the 'Technische Hochschule' of Aachen, and CERN. The kaons decay inside a tunnel formed of 100 overlapping plastic scintillation counters, each 80 cm x 50 cm, the top layer of which can be seen in the centre of the photograph. At the end of the tunnel are two sets of spark chambers, with interleaved plastic scintillation counters for triggering; above them are corresponding arrays of strip mirrors, to enable them to be viewed from the top, and large mirrors on either side which reflect their side views in the photograph. The spark chambers are arranged for the detection and subsequent measurement of electron showers arising from the decay of two neutral pions coming from a kaon decay, whilst the scintillation counters detect those cases where a third pi-nought is also produced in the decay.

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