

The European Organization for Nuclear Research (CERN) came into being in 1954 as a co-operative enterprise among European governments in order to regain a first-rank position in nuclear science. At present it is supported by 13 Member States, with contributions according to their national revenues: Austria (1.92 %), Belgium (3.78), Denmark (2.05), Federal Republic of Germany (22.47), France (18.34), Greece (0.60), Italy (10.65), Netherlands (3.87), Norway (1.46), Spain (3.36), Sweden (4.16), Switzerland (3.15), United Kingdom (24.17). Contributions for 1963 total 92.5 million Swiss francs.

The character and aims of the Organization are defined in its Convention as follows

'The Organization shall provide for collaboration among European States in nuclear research of a pure scientific and fundamental character, and in research essentially related thereto. The Organization shall have no concern with work for military requirements and the results of its experimental and theoretical work shall be published or otherwise made generally available.'

Last month at CERN

During January and February, the **electric power supply** to CERN was considerably disturbed, as a result of distribution difficulties suffered by the whole Swiss network. Owing to the dry summer last year and the exceptionally cold winter, the water level in the reservoirs supplying the hydroelectric generating stations had become generally low, and this, coupled with the difficulties of supplying coal to the thermal power stations, had reduced the capacity available. The situation became critical at the beginning of 1963.

On 17 January, as mentioned in the last issue of *CERN COURIER*, there was a total failure of the supply, due to the overloading of a high-tension cable between Germany and Switzerland. At that time, this cable was providing the major part of the energy used in Switzerland. During the next few weeks, the general demand in Switzerland remained at a very high level as a result of the cold, whilst production fell considerably in all parts of Europe. Switzerland's neighbours, France, Italy and Germany, had to interrupt or to cut down considerably their deliveries of power.

Under these circumstances, major users such as CERN were requested at the beginning of February to reduce their consumption as much as possible. On the 6 February, the 'Services Industriels', in Geneva, began to impose voltage reductions amounting to five or ten per cent over the whole of their 18-kV network. For CERN, this meant that all, over the site, systems for maintaining the voltage at a constant value had to be readjusted. From 8 February a programme of restricted use was put into operation, with the approval of the 'Services Industriels', limiting the overall power consumption at CERN to 5 MW.

To fit into this overall load, about a quarter of the usual requirements, the Directorate decided on various cuts in the experimental programme, and precise limits had to be enforced to control the overall power consumption of the accelerators and associated equipment. For example, tests on the magnet for the **1.5-m British bubble chamber** had to be postponed until 25 March, as the power that would have been consumed was too high.

One result of these difficulties with the main power supply was that the operating period of the **proton synchrotron** for the first fortnight of the month was extended by 24 hours, over Sunday 10 February, giving a total running time for that period of 280 hours.

The accelerator then had to remain out of operation for practically the whole of the following week, start-up being postponed until the Friday afternoon, 16 February. At the end of this run, on 25 February, a long **shut-down** period began, during which the

fast ejection system is being installed, final preparations for the neutrino experiments are being made, and targets and beams are being installed in the new East experimental area.

Although much of the development effort on both accelerators is directed towards increased beam intensity, there are occasional opportunities for ingenuity in the other direction. One of these was when the Wilson cloud chamber, operating on only one pulse in 50 in the π beam, required a specially small number of particles per burst, whereas users of the other 49 pulses wanted as many as they could get. As a result, when the accelerator was started up on 15 February, it was with a **programming system for the proton beam in the linac**, ensuring that every 50th pulse was automatically reduced in intensity by two-thirds.

Another interesting installation on the accelerator, tried out for the first time in February, was a method for **recording beam intensities on punched paper tape** suitable for feeding into the 'Mercury' computer. The current in the third tank of the linac (just before injection into the synchrotron itself), and the final accelerated beam intensity were recorded separately, so as to obtain a detailed pulse-by-pulse comparison from which the degree of correlation between them could be deduced.

The **synchro-cyclotron**, too, suffered from the power restrictions, and no experiments were possible during the week 15-22 February. However, although this was a set-back for the physicists, good use was made of the opportunity for maintenance and other work on the accelerator. In particular, the decreased radioactivity of the vacuum tank towards the end of the week made possible a new set of measurements of the magnetic field at different currents.

For practically the whole operating period of the synchrotron during February, the **Saclay/École Polytechnique 81-cm hydrogen bubble chamber** was in use in the m_2 beam, photographing interactions of positive and negative kaons with protons. In three weeks, 386 000 good-quality pictures were obtained, each showing the tracks of about ten incident kaons. The momentum of the kaons was the highest yet

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The cover photograph illustrates one of the less well-known aspects of research at CERN, the studies carried out by the Nuclear Chemistry Group of the Nuclear Physics Division. Framed by the bottles and flasks appropriate to this subject, Henri Bersinger works on a chemical analysis.

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Roger Anthoine

Editor:
Alec G. Hester

CERN, Geneva 23, Switzerland
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Last month at CERN (cont.)

attained in a separated beam, and the photographs include tracks of some 1 150 000 positive kaons at 3 GeV/c, 1 210 000 negative kaons at 3 GeV/c, and 1 500 000 negative kaons at 3.5 GeV/c. The background of other particles, even at the highest momentum, was less than 20 %.

The objects of the experiment are to search for the existence of a new particle (the omega hyperon, Ω , with a 'strangeness' number of -3), and to gain further information on known aspects of kaon-proton interactions and the properties of the xi hyperons. Investigation and analysis of the photographs is being shared among ten laboratories: University of Amsterdam, University of Bologna, a British group (Universities of Birmingham, Glasgow, and Oxford, Imperial College of London University, and the Rutherford Laboratory), 'École Polytechnique', Paris, 'Centre d'Études Nucléaires', Saclay, and University of Stockholm.

The **École Polytechnique 1-m heavy-liquid bubble chamber** also obtained some 250 000 photographs showing interactions of positive kaons stopping in the liquid, continuing an experiment on 'selection rules' in kaon decay, together with some 30 000 pictures of stopped negative kaons for the investigation of hyperfragments. Unfortunately, operation of this chamber had to be limited, because of the shortage of electricity, and the higher values of magnetic field could not be used even when the chamber was running.

Among the other experiments at the synchrotron in February was the first use at CERN of **acoustic spark chambers**. This type of detection instrument is similar to the spark chambers currently used, consisting basically of a set of parallel plates in which alternate ones can be pulsed to a high voltage. The pulse is applied after the passage of a specified charged particle and the spark that then occurs in each gap follows the track of the particle. In this case, however, the sound wave from each spark is detected by four miniature microphones placed some 10 cm or more from each edge of the gap. The time between the application of the high voltage and the arrival of the sound at each microphone is measured electronically, and from the four values obtained the position of the spark in each gap can be calculated, in practice by feeding the information into an electronic computer.

These measurements were a test run of the apparatus for an experiment to measure the elastic and near-elastic proton-proton scattering at very small angles. Six chambers were used, in conjunction with analysing magnets and scintillation counters. The time measurements from each chamber were recorded on punched paper tape and ana-

lysed on the Mercury computer, the position in space of each proton track being obtained to an accuracy of ± 0.25 mm.

From 25 February to 2 March, an **International conference on high-energy physics and nuclear structure** was held at CERN, organized in co-operation with the Weizmann Institute at Rehovoth, Israel. The conference, which was attended by about 100 scientists from 13 different countries, in addition to those at CERN, is described more fully on page 35 of this issue.

His Excellency Mr. **Gaston Palewski**, the French Minister of State for Scientific Research, paid a visit to CERN on the afternoon of 14 February as the guest of Mr. François de Rose (Ministre plénipotentiaire and Representative of France on the CERN Council), Prof. L. Leprince-Ringuet (Vice-president of the Scientific Policy Committee), and Prof. V.F. Weisskopf (Director-general). Also in the party were Mr. Philippe Baudet, Ambassador of France to Switzerland, Mr. Gabriel Ardant and Mr. Tezenas du Montcel.

Many of the delegates to the United Nations Conference on Science and Technology, held in Geneva early in February, also took the opportunity to visit CERN. Prominent among these was Mr. **René Maheu**, Directeur-general of UNESCO, who was shown around on 12 February, accompanied by Prof. Paulo B. de Carneiro, President of the General Conference of UNESCO, Prof. V.A. Kovda, Director of its Department of Natural Sciences, and Mr. Y. de Hemplinne, Secretary of the Department. On the 15 February, **Lord Casey**, Chairman of the Commonwealth Scientific and Industrial Research Organization and Leader of the Australian delegation to the U.N. conference, visited the Laboratory, with Mr. G.B. Gresford and Mr. C. Magee.

Members of CERN also had a chance to get to know something of the U.N. conference when a symposium, **'Techniques for tomorrow's world'**, was organized on 14 February by the Staff Association, in the current series of evening lectures on subjects of general interest. Under the chairmanship of Prof. Marussi, of the University of Trieste, the leaders of the Delegations from India, Prof. H. Bhabha, the United States, Dr. MacDermott, and the Soviet-Union, Dr. Fedorov, exposed in a highly interesting way their own thoughts on the conference and answered many questions from the audience on the applications of science and technology in the less developed areas of the world.

Earlier in the month, from 5 to 7 February, CERN was host to the **'European Organization for astronomical research in the southern hemisphere'** (ESO), whose Council met here under the chairmanship of Prof. J.H. Oort

(Netherlands). The organization at present includes Belgium, the Federal Republic of Germany, France, the Netherlands and Sweden as member states, with Denmark as an observer. It has been set up primarily to instal powerful optical instruments in the southern hemisphere, so that that part of the galaxy can be studied to an extent comparable with what is already possible in the northern hemisphere.

This is the second time that members of a new European scientific organization have used CERN as a meeting place as well as an example, the first being the meeting which led to the formation of the European Space Research Organization.

The Director-general and a number of senior physicists from CERN took part in a two-day discussion meeting at the Royal Society, in London, on the 21 and 22 February. With the title **'Recent European contributions to the development of the physics of elementary particles'**, the meeting had been organized by Prof. C.F. Powell, of the University of Bristol and present chairman of CERN's Scientific Policy Committee, to give the Fellows of the Society a review of the present state of knowledge of elementary particles and the prospects for the development of the subject in the future.

Out of fifteen papers presented, six were by scientists now at CERN: Prof. V.F. Weisskopf gave the opening talk on 'Elementary particle physics — its development and future', Prof. G. Bernardini spoke on 'Neutrino and muon physics', Prof. E.H.S. Burhop on 'Recent experiments with emulsions', Prof. L. Van Hove on 'Progress in our theoretical understanding of elementary particles', Dr. K. Johnsen on 'Features of the next generation of proton accelerators', and Dr. C. Rubbia on 'Recent experiments with the CERN synchro-cyclotron'. In addition, Prof. B. Gregory of the École Polytechnique, Paris, who is closely concerned with bubble-chamber experiments at CERN, spoke on 'Recent experiments with bubble chambers', and Dr. J.B. Adams, formerly Director-general, described the 'Design and performance of the CERN proton synchrotron'. All the papers presented, which were framed so as to be intelligible to scientists outside the particular field of high-energy physics, are being published by the Royal Society.

During his visit to London, Prof. Weisskopf was guest of honour at the Annual Luncheon of the **Parliamentary and Scientific Committee**, on 21 February. The Committee is an unofficial group bringing together members of both British Houses of Parliament and representatives of industry and of scientific and technical institutions. With all shades of political opinion represented, it acts as a common meeting ground for parliamentarians and scientists ●