

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 (1.96%), Belgium (3.85), Denmark (2.09), Federal Republic of Germany (22.86), France (18.66), Greece (0.60), Italy (10.83), Netherlands (3.94), Norway (1.48), Spain (1.68), Sweden (4.25), Switzerland (3.20), United Kingdom (24.60). Contributions for 1964 total 107.2 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.'

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The cover photograph shows the interior of the vacuum tank of the 600-MeV synchro-cyclotron, at CERN, opened for work during the January/February shut-down. Clearly visible are the two circular pole faces, 5 metres in diameter, of the 19 500-gauss electromagnet which is responsible for the spiral orbits of the accelerating protons. The 'dee' used to accelerate the protons can just be seen in the rear half of the gap. Goggled and masked as protection against radioactive dust, Rémy Blanc and Gérard Critin (of the cleaning staff) are cleaning the inside of the tank. Between them and the 'dee' can be seen the exit port for the extracted proton beam. The apparatus in the centre of the magnet gap was being used for measurements on the magnetic field.

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Last month at CERN

During January news was given that **Prof. V. F. Weisskopf, Director-general** of CERN since August 1960, would not after all be leaving the Organization this year. It was announced that, at its session in December, Council had extended his term of office for a further period of twelve months, until August 1965.

A number of changes in the organization and senior personnel of CERN have taken place, and these came into force on 1 January. The new **Directorate Member for Research** is **Prof. Bernard Gregory**, Professor at the École Polytechnique, Paris, responsible for the physics programme of the highly successful Saclay/École Polytechnique 81-cm liquid-hydrogen bubble chamber at CERN, and chairman of the Track Chamber Experiments Committee from 1960 to 1963. His appointment will be part-time until 1 August, after which it will be whole-time. **Prof. G. Puppi**, his predecessor as Directorate Member for Research, remains closely linked with CERN with a part-time appointment as Guest Professor.

In the course of the normal rotation of the post of **Leader of the Accelerator Research Division**, **Dr. A. Schoch** has taken over from **Dr. C. Zilverschoon**. **Dr. K. Johnsen** is responsible for the work of the interim supplementary programme.

Dr. F. Grütter has been granted leave of absence for one or two years to work in the Lawrence Radiation Laboratory, Berkeley, U.S.A. The **Engineering Division**, of which he was leader, no longer exists as a separate entity, and most of the staff are now the responsibility of the MPS Division. Other groups have been transferred to the divisions for which they were already working.

In the **Site and Buildings Division**, **P. Tirion** has been appointed 'Head of Services' and will be responsible for: transport and labour pool; workshops; stores; cleaning services and clothing issues (these two formerly under Administration Division). The leader of the division, **Ch. Mallet**, will thus be more free to concentrate on the 1964 supplementary programme.

The **Personnel Division (PE)** has been formed under **G. Ullmann** and has taken over most of the work of the Administration Division, which has been dissolved. Exceptions are: the cleaning and clothing service, already mentioned; the Purchasing Office, which has been transferred to Finance Division; Staff Housing Projects (but not individual questions and installation), Fire and Site Security Service, gardening, space allocation, and the Scientific Conference Secretariat, which are now the responsibility of B. W. Gamble, under the Directorate Member for Administration; the Translation and Minutes Service and the Public Information Office, responsible directly to the Directorate Member for Administration.

When the proton synchrotron began operation again after the Christmas shut-down, the 'main user' was an experiment in the East hall, using the o_3 beam and the **École Polytechnique 1-m heavy-liquid bubble chamber** equipped with an internal liquid-hydrogen target. This is the first time in Europe that such a technique has been used and, in spite of the inevitable pioneering troubles, the run was completely successful. Over half a million photographs were obtained. The beam was set to give negative pions, first of momentum 8 GeV/c afterwards of 16 GeV/c; these interacted with protons in the target, and the tracks arising from the reaction products were photographed in the freon filling of the chamber. Because this liquid has both a greater density and greater effective atomic number, neutral particles, especially gamma rays, neutral kaons (K^0_2) and neutrons, have a probability of decaying into observable particles some 20 to 500 times higher in the heavy-liquid chamber than in a liquid-hydrogen chamber of comparable size. The idea of separating the functions of target and chamber in this way was therefore specially evolved for the study of neutral products of the pion-proton interaction.

The arrangement had in fact been first tried before Christmas, when the **proton synchrotron** established another of its

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National Synchrotron Study Group formed in France

"Whilst the existing machines throughout the world have led to the discovery of many more phenomena than could have been imagined in the realm of the so-called 'elementary particles', fundamental research requires ever higher energies so as to be able to probe ever further into the physics of the infinitely small; to uncover the structure that might exist and the laws that are obeyed in the very heart of these particles. Since the design and construction of a large accelerator takes some six to eight years, French physicists believe that it is now time to begin the study of a large national accelerator, which they think should produce energies of sixty-thousand-million electronvolts (60 GeV).

Advised by its Committee for Large Accelerators, the Office of the Delegate-General for Scientific Research has requested the Commissariat à l'Énergie Atomique (Atomic Energy Commission) to undertake such a study, and a

research agreement has been concluded to that effect, receiving the approval of the Minister of State for Scientific Research and Atomic and Space Questions on 9 July last.

To carry out the task thus assigned to it, the Commissariat à l'Énergie Atomique has set up under its Physics Directorate a 'Groupement d'Études du Synchrotron National' (National Synchrotron Study Group), which has already started work. The study group will be able to call upon valuable outside assistance, notably from high-energy laboratories independent of the Commissariat and from the National Geographic Institute, on questions of geodesy. It aims to produce a report, together with a preliminary design, in the shortest possible time, so that the Government can be in full possession of the facts to enable it to decide whether the project for the construction of the large machine should be included in the next quinquennial plan."

Extract translated from the 'Notes d'Information' of the Commissariat à l'Énergie Atomique, 15 Oct. - 1 Nov. 1963.

Last month at CERN (cont.)

periodic records by operating continuously for three weeks instead of two. Actual running time was from 2 p.m. on Wednesday 4 December until 6 a.m. on Sunday 22 December, and for most of this period the **Saclay/École Polytechnique 81-cm hydrogen bubble chamber** was also in operation, in the m_3 beam in the South hall. The beam was adjusted to give in turn antiprotons of momentum 5.7 GeV/c, positive kaons of 3 GeV/c and 3.5 GeV/c, and negative kaons of 3 GeV/c. Altogether some 480 000 photographs were obtained to study the interactions of these various particles with the protons of the liquid hydrogen.

It is of interest to note here that during 1963 some **2.5 million bubble-chamber photographs** (each consisting of three stereoscopic views of the same event) were obtained at CERN. This brings the total to more than six million since work with bubble chambers started here in 1960.

In the fourth week of January, there were altogether **nine experiments** in various stages of operation around the synchrotron, the highest number so far achieved. The machine was run to give a final proton momentum of 18.1 GeV/c, with one pulse every two seconds and a 'flat top' (during which the protons circulate with their final energy) of 300 milliseconds. Four targets were in use: some 65 per cent. of the protons in each pulse struck target no. 1, and in every fourth pulse the remaining 35 per cent. struck target M60, on the

special target assembly fitted between the poles of one of the synchrotron magnets; in the remaining three out of four pulses, 25 per cent. of the total beam struck target no. 6 in the South area, and 10 per cent. target no. 61, in the East area.

From target no. 1, four beams provided secondary particles for five experiments in the South hall. Of these, the g_1 beam (pions) was used for the continued investigation of the beta decay of the lambda particle. The m_3 beam (shortened by the removal of one electrostatic separator) was set to give antiprotons for a development of the former 'Papep' experiment, now designed to detect pairs of muons as well as electrons from antiproton annihilation and therefore renamed 'Papep' (proton-antiproton annihilation into lepton pairs). Stretching right across the hall was the d_{15} beam, being used again for the experiment on the production of gamma rays in the 'peripheral' collisions of pions with protons, and its extension, d_{15a} , for tests on the possibility of indirectly detecting and identifying neutral particles by means of spark chambers in the magnet from the Wilson cloud chamber. The s_3 beam was used by the emulsion group for tests on track distortion in folded emulsions at low temperatures. Target no. 6 marked the beginning of a pion beam in the North experimental hall, in use for a new experiment set up to search for a possible 'diproton', formed in the interaction of a pion with a deuteron.

In the East area, target no. M60 was producing particles for the o_4 beam, serving the 81-cm hydrogen bubble

chamber which had been transferred to the East hall, near the bubble chamber building. The o_4 beam is, in fact, a branch of the long o_2 beam, now containing three of CERN's 10-metre electrostatic separators, which was set up for experiments with the British 150-cm bubble chamber. Owing to a number of 'teething troubles', this chamber was still not able to start experiments in January, so the Saclay chamber was moved in to take its place in the schedule. At the end of the month, photographs of 8-GeV/c positive pions and 10-GeV/c protons were taken for the 'High-energy collaboration' (Aachen, Berlin, Cambridge, CERN, Hamburg, Krakow, Prague, Stockholm, Vienna and Warsaw). Also from the M60 target, a monitor beam (61) was being used in preliminary tests for an experiment on the charge exchange of pions. Target no. 61 provided scattered protons for the c_8 beam, to test apparatus being set up to measure proton-proton scattering at small angles.

At the **synchro-cyclotron**, the Christmas shutdown, beginning at 7 a.m. on 23 December, was continued through January and into February. During this time the work was mainly concerned with preparations for the installation of the polarized proton source later this year. A great deal of the cabling for the accelerator was renewed and some modifications were made to the vacuum system. The supporting straps for the tuning fork (which controls the frequency of the oscillatory accelerating voltage) were also renewed. We hope to give further details in the next issue of **CERN COURIER** ●