

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 (1.90%), Belgium (4.07), Denmark (1.95), Federal Republic of Germany (19.15), France (20.81), Greece (0.60), Italy (9.90), Netherlands (3.77), Norway (1.58), Spain (4.21), Sweden (4.15), Switzerland (3.23), United Kingdom (24.68). The budget for 1962 is 78 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

At the 21st Session of the CERN Council, held on 13 June (see p. 4), a formal application by **Yugoslavia** was considered, for a change in the status of their country from that of Member State to that of Observer. This request, brought about by Yugoslavia's continued

difficulty in devoting a very high proportion of its scarce resources to high-energy physics, was unanimously agreed to, thus reducing the number of CERN Member States to 13. Their country's new status will not affect the nine Jugoslavs at present employed at CERN, but any who wish to work here in future will have to come as Visiting Scientists.

3 GeV/c. To do this, particles need to be collected at a very small angle to the internal proton beam, so that the first beam magnet had to be put as close to the accelerator vacuum tank as possible. In fact the first two magnets, which have both focusing and bending properties, were specially designed for this beam, the first magnet fitting closely round a specially shaped target section of the vacuum tank.

The other beam, known as k_2 , provides separated positive or negative **kaons** of low energy for experiments in hydrogen or heavy-liquid bubble chambers. It can also be used to give antiprotons. Because of the large loss arising from the decay of slow kaons in flight, the beam must accept rather large numbers of particles as well as provide good separation of the kaons from all the others. The beam was designed and constructed by members of the Track Chambers Division, together with visitors from the École Polytechnique (Paris) and elsewhere. Apart from the usual magnets and lenses, two electrostatic separators are incorporated, one on loan from Saclay and one from Padua. The beam performed more or less as predicted and is at present being used for an experiment in the École Polytechnique heavy-liquid bubble chamber, with positive kaons of momentum 800 MeV/c.

On 28 June the first of the magnet coils arrived for the **CERN 2-m hydrogen bubble chamber** now being erected in the East bubble-chamber building. The magnet yoke was completed some time ago, and has since been fitted with hydraulic supporting jacks and its electrically driven wheels, running on parallel tracks, which will enable the two halves of the magnet to be drawn apart when necessary. The bridge from which the chamber body will be supported has also been mounted on its wheels. Movement of both the bridge and magnet has been tested, as well as the

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The cover photograph was taken inside the proton-synchrotron ring building during the May shut-down. To the right of L. Marrer and P. Richard a bending magnet of the new beam a_2 can be seen, while to their left is one of the 100 magnet sections of the accelerator. On the extreme left, a pumping station and part of the target box for the old beam k_1 is visible. An article on the PS shut-down begins on p. 4.

Photo credits: all photos by CERN/PIO.

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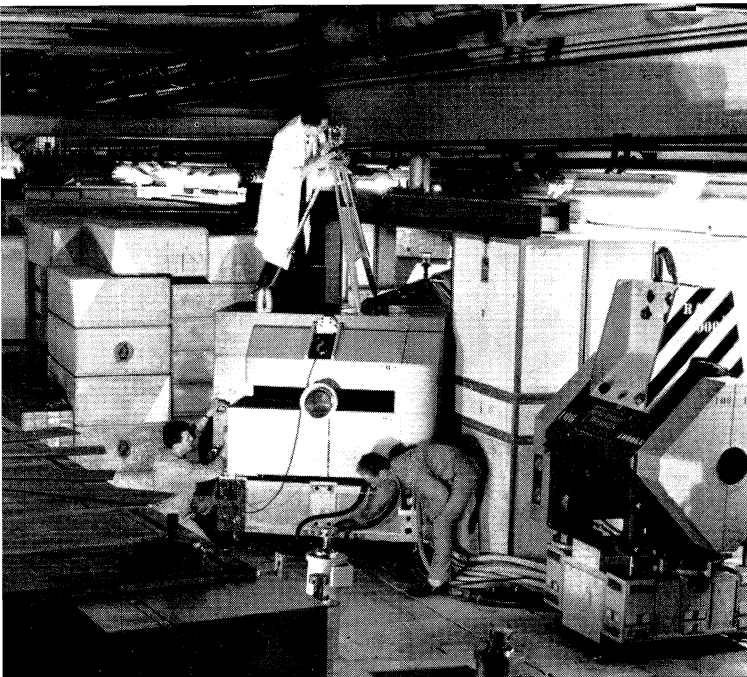
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L. Marrer, L. Grandclement and P. Richard at work on the positioning of a bending magnet in the new beam a_2 . All components for forming the beam must be aligned with a high degree of accuracy and a great deal of effort is involved. For instance, construction of this beam included :

- a) dismantling of the old beam a_1 (shielding inside and outside the ring, 3 magnets and 7 lenses, Argonne chamber, etc.);
- b) installation of the new beam a_2 (shielding, 5 magnets and 3 lenses, Argonne chamber, special vacuum tank in straight-section 6, vacuum pipes, etc.);
- c) electrical interlock between beam transport and main control room.

The next shut-down is at present determined largely by the programme for commissioning the East area and by the experimental programme in general. Major work foreseen is the installation of special vacuum chambers in two magnet units and three straight sections, for the fast and slow beam-ejection systems, and the opening of the tunnel wall at the East junction. Although originally envisaged to begin in the middle of July, this shut-down is now expected to be for about eight weeks from the end of August, this period being more convenient from the point of view of the experimental programme and of staff holidays.

WORK TO BE DONE

It has been explained that once the date and duration of a shut-down have been fixed it is advisable to concentrate as much work as possible into it. How is this arranged ?

Each group in the MPS Division keeps a list of the maintenance work that is necessary, this list being constantly brought up to date. Many jobs can be carried out during the normal period each week when the machine is not running. For example a spare pick-up station enables each one round the ring to be removed for maintenance at the beginning of one week and replaced the next. Such work is of little importance from the shut-down point of view.

At the other extreme, it must be remembered that two or more jobs scheduled for a shut-down period may clash with each other. It is no use trying to lay new cables in the floor ducts while a new shielding wall is being built on top of them. Therefore, once a month Robert Gouiran, engineer in charge of the 'floor' work of the Apparatus layout (ALO) group, collects together information from all the groups and produces a list which is discussed by the Deputy Division Leader, Peter Standley, and the heads of the three groups most concerned — Franco Bonaudi (ALO), Giorgio Brianti (Controls) and Milan Georgijevic (Power and magnet). Others, such as Gordon Munday (Experimental planning group), Bernard Hyams, (experiments co-ordinator in the Nuclear Physics Division), and of course Pierre Germain, the Division Leader, are consulted or kept informed of decisions. Yet more information and ideas come from other committee meetings that are attended by the group leaders, and from personal conversations.

From the work lists, discussions, and varied sources, the first vague ideas on future shut-downs evolve until the date, duration, and programme of work to be done are all settled. Finally, when the time comes, everything must go smoothly to ensure that experiments can be resumed on the day decided ●

Last month at CERN (cont.)

special joints in the bridge supports that ensure vertical alignment of the wheels under all conditions of loading. Further progress has been made with the hydrogen refrigeration system, including installation of the compressor.

Another event in June connected with the new bubble chambers was the successful pressure testing of the **hydrogen safety sphere**. Some 520 tons of water were forced into the 10-m-diameter steel vessel to produce a pressure of 24 atmospheres. A novel, if somewhat exacting, way of carrying out his final examination was chosen by the Inspector from the 'Association suisse de propriétaires de chaudières à vapeur', who spent several hours floating

in an inflatable dinghy to check the whole of the inside surface as the water was drained away.

On 1 June, the **Engineering Workshop** was transferred from the **Engineering Division** to the **Site and Buildings Division**, to improve co-ordination with the Main Workshop and enable work to be shared more effectively. In addition, most members of the Mechanical Group will be 'loaned' to other Divisions, to whom they will be directly responsible, though administratively they will remain part of the Engineering Division. A new Mechanical Section is being formed to study special design problems. The Electrical Engineering Group will be expanded, and among other responsi-

bilities will deal with all future electric sub-stations on the site.

These changes have been brought about largely by changing needs. During 1961 and the first half of 1962, the Engineering Division has concentrated on the planning, ordering and erection of the various services required in the East experimental area of the proton synchrotron. The completion of the installation work is now drawing near, and most of the facilities will be available to other Division during the second half of this year.

In June, 13 **motor generator sets** for beam-transport magnets, with a total output of 4.3 MW, were tested. A first trial run of the large motor-generator



Gilberto BERNARDINI

Directorate Member for Research

Among the things learned at the Council Meeting on 13 June was the news that Prof. Gilberto Bernardini is to leave CERN next year. Thus the Organization will lose one of its senior members, who has been with it since its earlier days.

Gilberto Bernardini was born in the Italian city of Firenze (Florence), in 1906, and received his early education at the 'Scuola Normale Superiore' in Pisa. He did not at first intend to become a physicist, but did so in time to be caught up in the excitement and progress of the years following the discovery of the neutron. Some of his early research work was on the production of neutrons by the action on beryllium of alpha particles from polonium, and the interactions of the neutrons with other elements.

In 1938 he was appointed Assistant Professor at the University of Florence, and in 1939 Professor at the University of Bologna. By this time he was doing experiments on cosmic rays, using Geiger counters and coincidence methods, first to study the various components of the radiation and then to measure the lifetime of the cosmic-ray mesons (muons). This work was continued using the new techniques of nuclear emulsions and high-altitude balloons, after his appoint-

ment as Professor at the University of Rome in 1946.

Gravitating to the United States, like so many others at that time in search of the most up-to-date facilities, he went as Visiting Professor of Physics to Columbia University in 1950, where he investigated the scattering of pions on nuclei, and nucleonic cascades, using the Nevis cyclotron. There too he learnt from I. I. Rabi of the very early moves towards the creation of CERN, and played an active part in spreading the movement among his fellow countrymen in the U.S. and in Italy. From 1951 to 1956 he was Research Professor at the University of Illinois; among his experiments there he studied the production of photopions just above threshold, using secondary gamma rays from the 300-MeV betatron, to measure the pion-nucleon interaction constant.

When the time came at CERN to prepare experiments, in 1956, he came back to Europe, as Director of Research in the Synchro-cyclotron Division. It seemed obvious to him that the best way to use the 600-MeV accelerator was not just as a training ground for the big machine that was to come later, but to enlarge and extend the work done with similar cyclotrons by carrying out very

careful high-precision experiments on problems of particular theoretical interest. The policy that he established then, and continued when he became Director of the Division in 1958, has been amply justified by the number of important results obtained, particularly those concerning the properties of the muon.

In January 1961 the CERN reorganization resulted in his appointment as Directorate Member for Research. By then he was already feeling that he had been long enough at CERN, and that he ought to obey the call to return to his University post and to the more individualistic life that he preferred, but he was persuaded to stay longer. His task on the Directorate, with the various experimental committees on the one hand and the Scientific Policy Committee on the other, is that of guiding the experimental programme in the most fruitful direction. The vast field of study that high-energy physics has now become and the heavy expense of so many of the possible experiments are only two factors that make this an almost superhuman task. How well his irrepressible energy, imagination and devotion to physics enable Prof. Bernardini to tackle it can be appreciated to the full only by those who work with him ●

sets for powering the magnet of the CERN 2-metre hydrogen bubble chamber, and for other track chambers, is planned for July, and a 10-MW cooling system for beam-transport and track-chamber magnets will be commissioned. The installation of other equipment, such as d.c. distribution systems, remote-control and current-measuring systems, demineralized-water distribution pipe-work etc., is also far advanced.

Also in June, **A. H. Achermann**, head of the Mechanical Engineering Group, presented a paper on 'Rubber supports for the transport of heavy loads' to a conference on 'Modern Rail Transport' held at Graz, in Austria. **J. J. Hirsbrunner** returned from the 'National Institute for Research in Nuclear Science', England, where he has spent six months working

on the 1.5-m bubble chamber and on the Nimrod accelerator. Representatives of a German company came to inspect the facilities for making and transporting **concrete blocks** on the CERN site, with a view to using the same methods for the movable shielding of the DESY accelerator at Hamburg.

A good start was made with a new series of **public lectures** in Geneva on Wednesday, 27 June, when Professor **J. Robert Oppenheimer**, Director of the Institute for Advanced Study in Princeton, U.S.A., delivered an address on 'Science and Culture'. The main lecture hall of the University was crowded, together with several other rooms where the talk was received by means of television and loudspeaker. This series of lectures,

under the general title 'Science and Society', is being organized jointly by the International Labour Office, the World Health Organization, the World Meteorological Organization, the University of Geneva, and CERN, whose Director-general, Prof. V. F. Weisskopf, was responsible for the idea.

Saturday 2 June was a record day for **visitors**, 528 of them coming for a 1½-hour tour of the site, preceded by an introductory talk and showing of the CERN film 'Matter in Question'. The 'Services Industriels' of Geneva were the first to arrive, followed by a group of 260 Government civil engineers from France. In the afternoon came members of the 'Nederlandsche Vereniging'

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BOOKS

In his preface, Eibert H. Bunte, the author of **Between stars and atoms** (London : Michael Joseph, 21s.) states that his book 'is written for the baker, the business man, the accountant and the shorthand typist', adding : 'the expert and the already interested layman can leave it unread without any scruples. They, however, form a small minority'. It is thus an introduction to scientific knowledge, neither textbook nor science fiction, but a 'translation' of 'the most important facts and suppositions concerning modern science... into simple words comprehensible to everyone'.

This claim has, of course, been made many times before. One may well ask if this book is better than the others, but the better question is 'does it fulfil its self-appointed task ?' On the whole, one would say it does, the only qualification being that such a book can deal only with some of 'the most important facts' rather than all of them. These facts, as the title implies, come largely from the fields of space research and nuclear physics: the very large and the very small. The author returns many times to the subject of size, with many interesting examples in his attempt to make really comprehensible the vastness of the universe or the minuteness of the atomic nucleus. In fact the whole book is refreshingly straightforward in approach, emphasizing basic ideas or ways of thought rather than the detailed applications of science in technology. In this way too, the essential 'openness' of scientific knowledge, the feeling that it will never be complete, is demonstrated, and even the controversy and disagreement that can exist among scientists concerning a specific theory (three possible answers are given for the 'age' of the high-speed space traveller compared to that of the man who stays at home, each with reasons !).

Among the topics discussed are the earth and moon, gravity, eclipses, the sun's planetary system, meteors, comets, stars and galaxies, are we alone in space ? ; space and time, and relativity, how far can we travel in space ? ; the 'philosopher's stone', atoms and radioactivity, neutrons and nuclear reactors, nuclear fusion and unlimited fuel ; elementary particles, high-energy physics and the apparatus used in its study ; probability ; how the universe began, and how it might end.

There are a few mistakes, some of which cannot be completely explained away by the need for simplicity, but on the whole they are outweighed by the interesting, easily read text, translated from the original Dutch by Ian F. Finlay. In spite of the statement in the preface, even the initiated might find some new ideas ; the typists and business men for whom the book was written will not find out how an atomic bomb works, but they may gain an insight into something that is really more important — how 'science' looks at the universe and how it goes about the problem of discovering its secrets.

A.G.H.

The **Annuaire-guide international de l'énergie atomique et des autres énergies, 1962** (Paris, Olivier Lesourd is the latest edition of the former 'Guide de l'énergie'.

Primarily a reference book for those interested in the supply of energy in France, its 400 pages are divided into seven thumb-indexed sections : equipment, general information, atomic energy, coal, electricity, liquid fuels, and gas.

The first section is a comprehensive 'buyers guide', with names and addresses of suppliers of material listed under some 200 sub-headings. Further information appears in the form of advertisements and 'notices techniques'. The next twenty pages are devoted to international bodies concerned with energy in general, similar French organizations, and attempts being made throughout the world to harness new sources of energy. In the third section (the longest) articles on 'European industry and the atom' and 'European co-operation in the development of atomic energy' are followed by information on the International Atomic Energy Agency, the European Nuclear Energy Agency, Euratom, etc., and by a comprehensive chapter on the governmental and industrial organizations concerned with atomic energy in France. The addresses of the principal authorities in other parts of the world are also given, sometimes with more extended information. The remaining sections are shorter and confined to France, but give essentially the same kind of information for the older forms of energy.

Inevitably a book of this kind is out of date before it is published, and it is necessary to note that much of the information in this one applies to 1960 or earlier. However, as a general reference to the supply of energy in France and Europe this volume contains much valuable information.

A.G.H. ●

Last month at CERN (cont.)



A new appearance was given to the restaurant terrace for the CERN annual party on 8 June.

from Geneva and Lausanne, and a group from the firm of Ansaldo San Giorgio, Genoa. Delegations from the Rotary Clubs of Mannheim, Turin, and Bourg-en-Bresse brought the day to an end.

On Friday 22 June, Mr. **Roger W. Tubby**, United States Ambassador to the European Office of the United Nations, paid a visit to CERN, accompanied by Mr. G. Tesoro and Mr. Love, of the U.S. Mission in Geneva. They were welcomed by the Director-general, Prof. V. F. Weisskopf, and conducted round the site by S. A. ff. Dakin (Directorate Member for Administration) and R. Anthoine (Head of Public Information).

The **CERN Annual Party**, held on Friday 8 June, was attended by more

than 700 people. Well organized by P. Agostineffi and his helpers, the party was most successful, thanks to the two dance bands, 'Merry Makers' and 'Bruno Grasselli', that played in turns for the whole evening. The 'CERN girls' — young firemen of the Security Service — gave a demonstration of their athletic skill characterized by its energy and speed, while at midnight the main auditorium was filled for a performance by A. Roberts, from Argonne, and his wife Janice, who held the audience spell-bound with their songs of high-energy physics and the trials of academic life. The evening drew to a close with an excellent cold meal served by the restaurant, dancing being interrupted once more for a display of burlesque gymnastics by the Lissajoux brothers, both of them CERN firemen ●