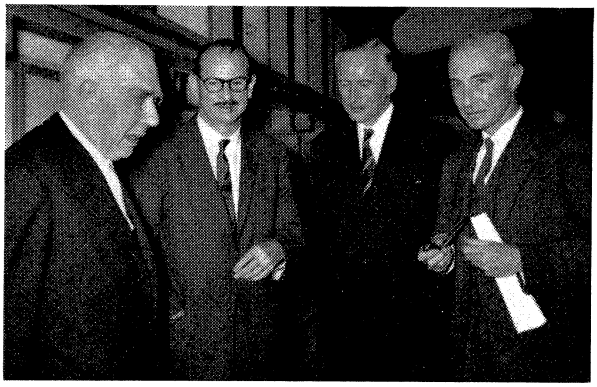
CERN COURIER



N° 8
March 1960

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

Professor H.W.B. SKINNER

Last January, CERN put out the saddest press release in its short history. In the few words of this communiqué, the Organization announced with deep regret the sudden death in Geneva, in the evening of 20 January 1960, of Prof. Herbert W. B. Skinner, Head of the Department of Physics, Liverpool University, United Kingdom.

Herbert Wakefield Banks Skinner was born in Ealing, London, on 7 October 1900. After attending Rugby School he went up to Trinity College, Cambridge. There, at the Cavendish Laboratory, he started research under Lord Rutherford and remained with him for 5 years. In 1927 he went as a research fellow to the University of Bristol, where he later became a lecturer. At Bristol he continued his work on excitation processes for spectra in gases at low pressure, which had led him to discover that light excited by an undirectioned stream of electrons was polarized. He carried out research on the soft X-ray spectroscopy of metals and, with H. M. O'Bryan, was able to show that detailed information could be obtained from such spectra about the electronic structure of metals and, to a lesser extent, of insulators. "This, said Prof. Skinner a few months before his death, I consider to be my main research work and it continued up to the war". In fact, this work was responsible for his election to the Royal Society in 1942.

In 1932—1933, H. W. B. Skinner held a Rockefeller fellowship at the Massachusetts Institute of Technology.

Early in the war, he joined the Telecommunications Research Establishment at Swanage and subsequently at Malvern, to work on centimetric radar then in its infancy. In this capacity, he patented — in conjunction with B. A. Ward and A. H. Cooke—the transmitter-receiver switch which was adopted so that one aerial could be used for both purposes.

In 1944, with the basic work on centimetric radar complete to a stage, he joined Sir James Chadwick's atomic group and was sent to Berkeley, USA, to work on the eletromagnetic isotope separation method for uranium. Returning to England in 1946 he was the first scientist to take up residence at the A.E.R.E., Harwell, where he was successively Deputy Chief Scientific Officer and Chief Physicist. Besides helping to get the establishment started, he was in charge of the General Physics Division which, amongst other things, built an electromagnetic isotope separator and a large cyclotron with 110 in. poles, giving a proton beam of about 170 MeV. He also served on the project committees for the Windscale reactors, the Capenhurst isotope plant and the Dounreay fast reactor.

It was in 1949 that Herbert Skinner was appointed successor to Sir James Chadwick at the Lyon Jones Chair of Physics, University of Liverpool. The University was then creating a nuclear physics laboratory, including a 156 in. synchro-cyclotron, designed to produce 400 MeV particles and incorporating a new beam-extracting device supplying unusually high-intensity particles. The project was completed in 1955.

On account of his experience, Prof. Skinner was called upon late in 1952 to become adviser to the CERN synchro-cyclotron group, then designing the 600 MeV accelerator. He played a valuable part in this work, members of the group recall, and ever since he took a deep interest in CERN's affairs.

At the time of his death, Prof. Skinner had come to Geneva to take part in a meeting of European physicists discussing the future experimental research programme for CERN's 25 GeV proton synchrotron.

Professor Skinner married in 1931 Erna Wurmbrand, who survives him with one daughter.

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The cover photograph shows part of the CERN site with, in foreground, the large 25 GeV proton synchrotron and, in the background, facilities of the Site and Buildings Division. Inset, picture showing Prof. Niels Bohr, E. M. McMillan, C. J. Bakker and J. R. Oppenheimer talking after the synchrotron inauguration, on February 5. (UKAEA Photo)

The Last Two M

On 5 February CERN witnessed the most memorable event of its existence : the inauguration of the big 25 thousand million electronvolt (25 GeV) proton synchrotron. It had been laid down in the Convention for the establishment of CERN, in 1953, that a machine of energies above 10 GeV, should be constructed. Later, because of the discovery of the alternating gradient focusing principle, the nominal energy of the machine was increased to 25 GeV. The ceremony of 5 February marked the successful completion, well ahead of schedule, of the most daring project ever undertaken in the accelerator field. This ceremony also testified to the success of European co-operation, which shows the way our old continent should follow.

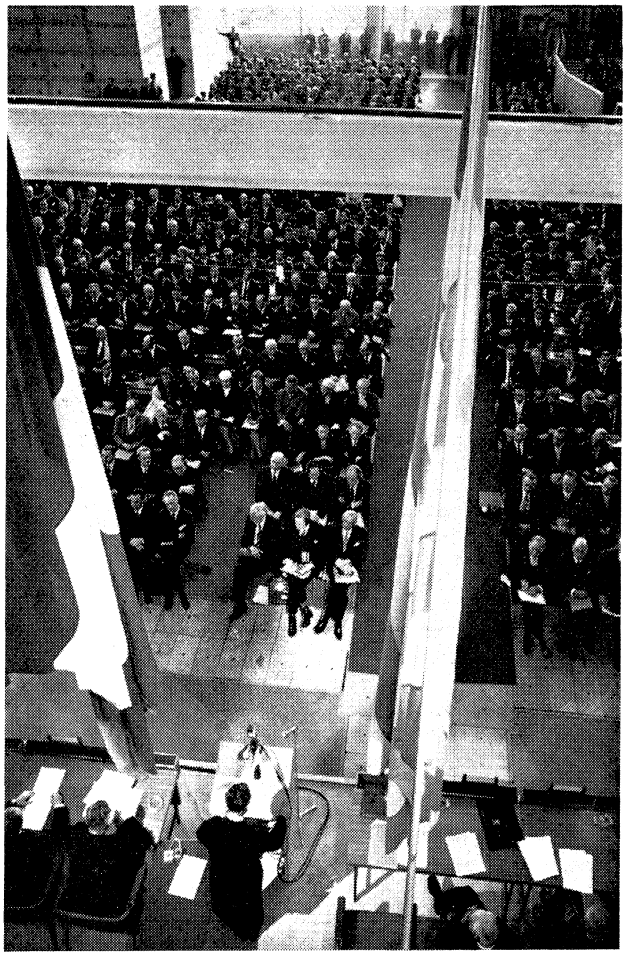
At present, the big South experimental hall is beginning to look more like a laboratory. It had been cleared in order to receive CERN's guests for the inauguration but now its radiation shielding walls are once more sheltering Cerenkov counters, bending magnets, electronic racks and scintillation counters. Placed on the paths of the beams extracted from the machine, all this apparatus is, or will be used by the experimental teams from the synchro-cyclotron.

Further along the beam path at the western end of the experimental hall, a light partition has been placed behind the concrete shielding wall. This is a protection against the hydrogen vapour that might escape from the 30 cm bubble chamber which is being assembled here. The group in charge of this chamber will start its experimental work on March 21 and pursue it.

The first teams of experimental physicists have installed their apparatus between the walls of concrete blocks near to the counter room. Their electronic equipment stands beside the transparent jacket covering the high pressure (up to 70 atm.) ethylene supply centre for the Cerenkov counter.

A syncopated rhythm can also be heard there, coming from the com-

...nths at CERN



The inauguration of the proton synchrotron took place on February 5 at CERN, in the presence of some 300 distinguished scientists, diplomats and international officials. This view shows the PS south experimental hall during the speech of M. F. de Rose, President of CERN Council. (Magnum photo)

pression and expansion of the valve-testing apparatus for the propane chamber; this chamber may be completed in the autumn. The construction of the 150 cm cloud chamber is going according to plan : parts of it, including the body, are at present being machined in the Main Workshop.

The big accelerator is being run in concurrently with the above activities. In December the number of particles accelerated, in other words the intensity of the beam, reached a top level of about 7 x 10^9. The present intensity is about 5 x 10^{10}, i.e. 50 thousand million particles per pulse. The desired figure, 10^{11}, is thus drawing closer.

In January, a 24 GeV proton beam was allowed to strike an aluminium target 0.5 mm thick. The experiment was made in order to study the composition of the negative beam (antiprotons, etc.) obtained. Without any special focusing, the counts registered on a 25 cm^2 scintillation counter placed 70 m away, revealed a large number of antiprotons per pulse.

As regards research on new accelerators, it has been decided to concentrate on beam storage rings.

The modifications to the **600 MeV synchro-cyclotron,** started on 15 November, are almost completed. The arrangement of the cables has been altered to allow a quicker change-over from one experiment to another. Work to increase the electric power available is also under way. A 1000 kW generator will supply the power needed for the 30 cm hydrogen bubble chamber installed at the PS ; this exchange of power will continue until the PS south generator hall comes into operation.

The stochastic equipment for the synchro-cyclotron has been installed and has undergone electrical tests without a beam ; it will be finally installed after the results of the other modifications to the machine have been measured.

The new radiation shielding wall separating the accelerator from the neutron room has been completed. The new structure includes seven channels through which pi- and mu-mesons ranging between 70 and 200 MeV will pass. Neutron beams will be available, as in the past. A special channel consisting of twenty-four quadrupole lenses with a 19 cm diameter pipe has been installed to the west of the pi-meson beams ; it will supply a high flux of negative mu-mesons. It is expected that the machine will start producing particle beams again in March and that experimental work will be resumed in April.

On 20 January a meeting of European physicists was held at CERN in order to discuss various aspects of **the experimental programme for the big synchrotron.** The sudden death in his hotel of Professor H. W. B. Skinner, of Liverpool University, unfortunately cast a shadow over the meeting. The agenda of the conference included a progress report on the PS, the preliminary research programme to be adopted for the big machine, the experiments carried out with the PS using emulsion techniques, progress reports on the 150 cm British hydrogen bubble chamber, the 100 cm French propane bubble chamber and the French 80 cm hydrogen bubble chamber, as well as the research programmes to be chosen for these different chambers while at CERN.

Those attending **the Fifteenth Session of the CERN Council** met on the morning of Saturday, 6 February. The members of the Council examined proposals for the **internal reorganization of CERN** to adapt the Organization to the new phase of work in which research will predominate instead of construction. Moreover, some of the present divisions have become too large to be managed by one man. Owing mostly to these reasons, it was proposed to replace the present six divisions by about twelve of a more convenient size. The question is still under consideration and a decision will be taken in June at the Sixteenth Council Session.

The agenda of the Council also included an item dealing with the arrangements concerning the construction and operation of a 150 cm cloud chamber, jointly by **CERN and the Swiss Federal Institute of Technology, Zurich (ETH).** This item will be considered by the Finance Committee and discussed at the June Session of the Council.

EYES ON SCIENCE

5 February, a great day for European science, opened with a throng of journalists assembled in the main auditorium of the European Organization for Nuclear Research.

A hundred and ten press correspondents were seated in the auditorium opposite eight distinguished scientists lined up on the platform beside Mr. François de Rose, President of the Council. A steady fire of flashes and questions was met with calm and objective replies. The correspondents of the biggest news agencies and papers and the most outstanding members of the cinema and television newsreel world, were face to face at CERN with a group of distinguished scientists such as can rarely have been assembled for the benefit of the press.

Facing the newsmen, apart from Mr. de Rose, were the following :

Professor Niels Bohr, Director of the "Universitetets Institut for Teoretisk Fysik" at Copenhagen ; Nobel Prizewinner for Physics in 1922" for his studies on the structure of atoms and the radiation emanating from them" ; member of the Danish delegation to the CERN Council.

Professor Francis Perrin, French High Commissioner for Atomic Energy; member of the French delegation to the CERN Council.

Professor Edoardo Amaldi, Professor of Physics and Head of the Physics Department of the University of Rome ; President of the CERN Scientific Policy Committee and member of the Italian delegation to the CERN Council ; Vice-President of the "Comitato Nazionale per le Ricerche Nucleari".

Sir John Cockcroft, member of the United Kingdom Atomic Energy Authority ; Nobel Prizewinner for Physics in 1951 for "the transmutation of atomic nuclei by artificially accelerated atomic particles" ; member of the United Kingdom delegation to the CERN Council.

Professor E. M. McMillan, Nobel Prizewinner for Chemistry in 1951, Director, Lawrence Radiation Laboratory, University of Berkeley, California ;

Professor J. Robert Oppenheimer, physicist and theoretician, Director, Institute for Advanced Study, Princeton, USA.

Professor Cornelis J. Bakker, Director-General of CERN, previously Director of the Zeeman Laboratory of Amsterdam University and of the Nuclear Research Institute of the same town.

Mr. John B. Adams, Director of the CERN Proton Synchrotron Division, previously at Harwell.

After the photographers had laid siege to the platform, Mr. de Rose said how pleased he was to see that so many journalists were interested in the scientific event being celebrated that day.

"There is no need for me to introduce the scientists gathered here to-day", he said, referring to the European scientists seated beside him. "However, I would like to say, how delighted we are to welcome Prof. McMillan and Prof. Oppenheimer, who have come to show the interest taken by the United States in our success."

After having outlined the day's programme, Mr. de Rose briefly recalled the reason for CERN's existence. "After the war", he said, "it seemed that the European countries, which until then had played a leading part in scientific research, and especially in fundamental physics, would no longer be able to construct the necessary equipment, on account of its complexity and high cost. From a scientific point of view it was a catastrophe. From a political point of view, it meant that just when science was playing an increasing part in bringing renown to individual countries, in the evolution of civilization and in the influence exerted by nations on civilization, the European countries were in danger of losing their weight and their influence. This was contrary to the wishes of the countries that were to form CERN. They have given European research scientists instruments comparable to those which other more powerful nations were able to construct unaided.

Mr. J. B. Adams then gave an idea of the significance of the machine. "For a time it will be the biggest accelerator in the world", he said. "But what really matters is the fact that it accelerates protons to almost three times the energy of its predecessor, the 10 GeV synchrophasotron at Dubna in Russia."

Mr. Adams then mentioned the other accelerators under construction and finally stressed the ability of the team of designers recruited from all over Europe to design and build the accelerator.

It was then the turn of the audience. Questions and answers got under way, the answers being provided by the person with the most experience in the field.

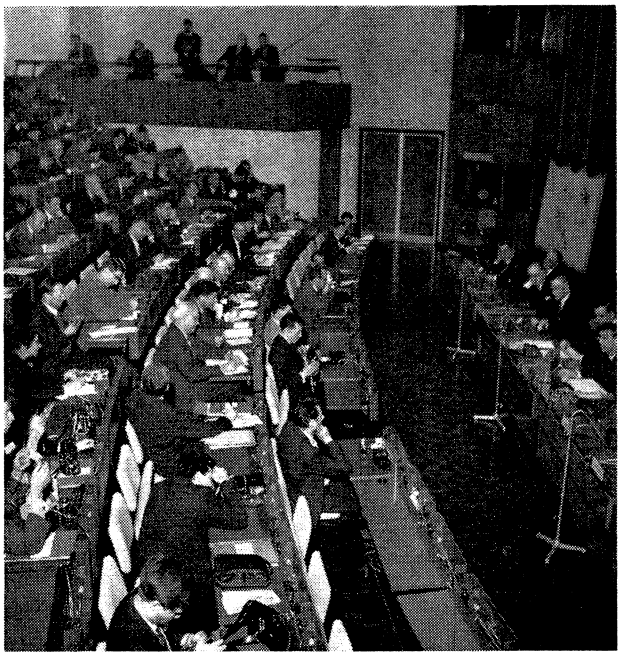
Question : What research programme has been planned by CERN ?

Prof. Bakker : We are entering a new field in which we hope to find some unknowns. You can imagine how difficult it is to design a programme to find unknowns. In any event, the first thing to do is to see what happens when 28 GeV particles strike a target. About 30 elementary particles are known in physics. All these, including those with a very short lifetime, will be produced in greater numbers by the proton synchrotron than by existing accelerators. In particular it will produce all the anti-particles, anti-protons for instance, and will make the study of anti-matter possible. An attempt will also be made to discover how far Maxwell's laws of electro-magnetics remain valid in the immediate vicinity of the elementary particles. Generally speaking, as Professor Joliot-Curie pointed out, "experiments should be prepared so as to be sure of obtaining certain data from nature, while leaving the way open for the discovery of new facts".

Question : Will the machine be available to anyone wishing to use it for experiments, or only for the CERN staff ?

Prof. Amaldi : It is provided that between 40 and 50 % of the experiments can be carried out by teams of scientists from institutions in the Member States bringing their own ancillary equipment to CERN. However, because of the high energies of the accelerated particles, this apparatus is nearly as complicated as the accelerator itself. This calls for arrangements to be made in advance. Experiments will probably be carried out by groups consisting of both CERN staff conversant with the machine and scientists belonging to national teams. Such co-operation is of the highest importance.

Another aspect of co-operation between national teams and CERN teams must be mentioned : that relating to the bubble chambers which reveal the particle trajectories. These costly and complicated devices provide a very great number of photographs of nuclear events. However, they pose another problem : that of finding the way to analyze these numerous documents, to tell whether they have recorded a given phenomenon and, if so, to take measurements and interpret them. Because such a mass of photographs will be produced by the CERN and national bubble chambers, a certain proportion



In the morning of February 5, a press conference held in the CERN auditorium, confronted a hundred newsmen with nine of the leading authorities on fundamental nuclear research. From left to right on the picture on top of page 5 : Prof. Perrin and Amaldi, Sir John Cockcroft, Prof. Bakker, Messrs. F. de Rose and Adams, Prof. Bohr, McMillan and Oppenheimer. (Bertin photo)

of them will be entrusted to university laboratories for analysis. Thus, in a few months time a great many people all over Europe will be working on the bubble chamber photographs produced at CERN. This will constitute an additional link, an aspect of European co-operation which will extend far beyond the limits of CERN itself.

Question : Can you quote a specific example to show that international co-operation makes it possible to solve scientific and technical problems which could not be tackled by any national team alone, and can reference be made to one of CERN's earlier achievements ?

Prof. Oppenheimer : A year and a half ago observations made in the United States on one of the elementary particles, the pi-meson, indicated that it never produced electrons in its radioactive decay. However, the theoretical work which had been done until then cast strong doubts on these observations. In the autumn of 1958, an international group under the direction of Professor Bernardini repeated the observations using the small CERN accelerator, proved that previous results were inaccurate and showed that harmony also prevails in this field of physics. This first major result obtained at CERN was acclaimed all over the world.

Question : Will the new machine make it possible to discover a formula unifying all the laws of nature ?

Prof. Bohr : This question refers to the great expectations we have from this new field on the border of our knowledge, where we might discover a universal law applicable to all known particles. Their number appears very great to the scientists, who will certainly endeavour to find out whether we are on the right path.

Question : What other accelerators could be an improvement on this one ?

Mr. J. B. Adams : We are studying new ways of accelerating various particles. Thus, we are interested in machines in which the targets could move in the opposite direction to that of the accelerated particles. The PS has fixed targets ; it is obvious that if the target moved in the opposite direction to the protons, the effective energy would be higher. This could be achieved by using as a target another particle beam moving in the opposite direction. We are designing an intersecting beam machine along these lines.

Question : Are countries which are not members of CERN allowed to co-operate ?

Prof. Amaldi : Yes. Other scientists besides those from the Member States have access to CERN, where anyone is free to come and talk with European scientists.

Mr. de Rose : In this connection, I should like to mention the Ford Foundation which puts considerable sums at CERN's disposal to enable scientists from non-member countries to come and work here without involving the Member States into any additional expenditures.

Prof. Bakker: We have thus welcomed scientists from all over the world : from Japan, Australia, India, South Africa, Israel, etc. On several occasions, Russian scientists have come to CERN to attend our conferences and some of them have stayed on to follow our work. CERN is open to everyone and we are extremely glad to welcome any scientist who comes to work among us.

Question : Is there any automatic equipment to analyze the large number of photographs taken on the bubble chambers ?

Prof. Amaldi : Yes. Various machines have been constructed for this purpose. "Frankenstein" in Prof. McMillan's laboratory is the most highly developed of all. There is a Division at CERN which has developed similar instruments, the IEP. This Division has maintained close contact with the universities interested in this technique and it also possesses several instruments of this kind.

Question : Will theoretical predictions be verified by the PS ?

Sir John Cockcroft : Experience shows that it is difficult to foresee what may happen when a new machine of this kind goes into operation.

Prof. Oppenheimer : At present our knowledge is not sufficient to show us what to seek and what to find. It has been rather a matter of finding questions to ask the machine ; such questions concerning the structure of elementary particles have recently been proposed ; this machine could help us to find the answers, especially through the neutrinos which it will produce.

At present, we have good reason to think that we shall soon be able to "put our house in order". Not that we have been stupid until now, we hope, but because we lacked certain clues ; this is one reason for today's excitement.

Many pointers lead us to suppose a natural order, but there are also many things which appear to be random : big numbers, the size of which cannot be explained, arrangements which appear arbitrary and which are not properly understood...

We still have a long way to go before we can teach this in school with a feeling we know what we are teaching.

Question : Is the Conference on the Peaceful Uses of Atomic Energy permanently in contact with CERN ?

Professor Perrin : CERN has no connection with this Conference, which is primarily concerned with the applications of atomic energy, whereas CERN is engaged in purely fundamental research. However, we have kept in touch; on the occasion of the second United Nations Conference, we announced the decay of the pi-meson into an electron and a neutrino.

In future the scientific results obtained at CERN will continue to interest those responsible for international co-operation in the atomic energy field, quite apart from any thought that practical applications will result from the scientific progress made at CERN.

It is certainly dangerous to say that no practical applications will ever emerge from activities which further our knowledge. In any event, research at CERN is in no way influenced by any idea of possible applications.

As regards the machine, its most important feature, in my opinion, is that it will create beams of "strange particles".

After the CERN machine has been running for a few years these should become well-known particles and I believe this is the essential qualitative gain we expect from this new accelerator.

Question: When will the machine be fully run in and how many hours a week are at present devoted to research ?

Mr. Adams : At present the machine is working three days a week, three shifts a day, from 8.30 a.m. to 10 p.m. During two of these shifts, the afternoon and evening one, the machine is accelerated. The afternoon shifts are devoted to testing, and the evening ones to nuclear physics experiments. This timetable will be followed until the middle of the year, when we should have trained enough operators and be more familiar with the machine. Perhaps at the end of the year about six shifts will be available for experiments.

The newsmen had thus shown their interest in the scientists present and the scientific subjects in which they were expert.

There were still four hours to go before the official inauguration.

Correspondents and photographers were invited to spend part of this time visiting the synchrotron. About sixty guides from the PS placed their knowledge at the disposal of the journalists.

Their explanations helped the journalists to understand better the mysteries of the big accelerator ; they were shown : the experimental hall, the linear accelerator, the inflector, the radial tunnels, the ejection system and the alternator room.

Finally, lunch was offered to the journalists and photographers attending the afternoon ceremony.

The official inauguration of the big CERN synchrotron took place at 3 p.m. on 5 February 1960. For all those responsible for disseminating the news it had in fact begun at 10 a.m., and in some cases even earlier.

For those in charge of organizing the ceremonies, it had really begun six weeks earlier, when the CERN Council, at its 14th Session, had set the date of the inauguration at 5 February. In the meantime, a thousand and one problems had had to be solved, such as those involved in issuing invitations to hundreds of scientific and diplomatic personalities... meeting and arranging transport for the most important of them... drafting and printing documents of all kinds, from the invitation cards to the inaugural brochure...

paring the PS South Experimen- preparing the PS South Experimen- recording the speeches and translating them, as well as a host of other papers stamped "urgent" ... marking out the routes to be followed by the visitors.., receiving official guests... running the evening cocktail party, etc...

All those concerned closely or remotely with the success of this red letter day in CERN's history, felt a justifiable pride in helping to mark the achievement of their colleagues who had built the synchrotron.

The inauguration

"In a moment, I shall have the great honour to conclude the inaugural ceremony by pressing a button... with my warmest wishes that it may lead to new fruitful contributions to our knowledge and understanding of nature".

As he spoke those words, Professor Niels Bohr, the most senior of all the distinguished physicists assembled at CERN on 5 February, in fact pressed two buttons. One released a bottle of champagne suspended to the girders of the South Hall. The other put the lifting hook of the big travelling crane in motion. A moment later, the bottle of "Royal Brut" dropped down and crashed against the 15-ton concrete block. Slowly lifted by the crane, this block revealed a dark channel in the radiation shielding wall, through which high energy beams are to pass in future.

Professor Bohr's symbolic gesture marked the climax of a day which was the most memorable in the history of CERN : the official inauguration of the biggest particle accelerator, or biggest "atom-smasher", in the world, but also the largest and most costly scientific instrument ever commissioned for pure research.

Personalities present

Mr. François de Rose, President of the CERN Council, opened the proceedings by saying that certain personalities had sent in their apologies for being prevented from attending at the last moment : Mr. Max Petitpierre, President of the Swiss Confederation, Mr. Engen, Secretary of State at the Norwegian Ministry of Foreign Affairs, Mr. Harmel, Belgian Minister of Education, Mr. Joxe, French Minister of Education and Prof. Bogoliubov, a Russian scientist.

However, although some of the leading personalities, were unavoidably absent many of them had been able to come to CERN on that day, notably Professor Balke, Minister of Atomic Energy of the German Federal Republic, Mr. Cals, Minister of Education, Arts and Science of the Netherlands, Lord Hailsham, Minister of Science of the United Kingdom, Mr. Medici, Minister of Education of Italy, and by Mr. Spühler, Head of the Swiss Department of Postal Services and Railways.

Many distinguished scientists were paying a special visit to CERN and among them were four Nobel Prize-winners for Physics : Professors P.M. S. Blackett, N. Bohr, W. Heisenberg and E. M. McMillan. Also present were Drs. M. Christofilos and Courant (United States) O. Dahl (Norway), and Profs. M. Danysz (Poland), J. Errera (Belgium), C. Gorter (Netherlands), L. Leprince-Ringuet (France), J. R. Oppenheimer (United States), P. Scherrer (Switzerland) and W. Thirring (Austria).

Among the Directors and representatives of International Organizations visiting Meyrin for the inauguration, were Prof. P. Auger (UNESCO), Dr. M. G. Candau (World Health Organization), Mr. S. Cole (International Atomic Energy Agency), Mr P. de Groote (Euratom), Mr. P. Huet (European Atomic Energy Agency), Mr. D. Morse (International Labour Office) and Mr. P. Spinelli (European Office of the United Nations), as well as Mr. S. Stone, of the Ford Foundation.

Finally, about thirty firms who had played a part in the construction of the PS had sent representatives to the inauguration.

Mr. de Rose's speech

Altogether there were 300 distinguished guests as well as press representatives and the whole of the synchrotron team in the big PS Experimental Hall, where Mr. de Rose delivered the first of the inaugural speeches.

The main points of his speech were as follows :

"Ministers,

First of all, I should like to express to you my gratitude for attending this ceremony. Your presence, that of the Presidents or Secretaries-Ge-

neral of fifteen international bodies and that of eminent scientists from twenty different countries truly make this a unique occasion. Never in history has the inauguration of a machine built for scientific research caused such a stir of interest on the part of Government authorities and of public opinion."

"Today's ceremony", he continued, "cannot be accounted for only by the fact that the prodigious scientific and technical achievements of the last few years have made us particularly alive to the importance of scientific discoveries. It testifies to the political significance, in the most exalted sense of those words, of the fulfilment of the task which the Member Countries of the Organization had given the Council, the Director-General and his staff. It is a tribute to the success of the greatest co-operative venture for the furtherance of human knowledge to reach its goal so far on an international scale."

After having recalled the aims of CERN, Mr. de Rose gave an account of the circumstances which led up to its establishment after the war and paid tribute to those who helped to create CERN.

"Our work could then begin. The Council under the presidency of Mr. Robert Valeur, and subsequently of Sir Ben Lockspeiser, had to take important decisions and provide for our budget. As Director-General we first had Professor Bloch, then Professor Bakker. It is the latter who, since 1955, has directed the growth of this novel enterprise and has ensured success both in scientific research and international co-operation. Impressed by his authority and his ability, all the Member States requested him to remain at the head of the Organization during the new phase on which we are now embarking, that of the full exploitation of our proton synchrotron. It augurs well for the future that he has accepted."

"The big machine was entrusted to Mr. John Adams. It is difficult to find suitable words to express our admiration and our gratitude to him. But I know that both he and Professor Bakker would not wish to be singled out from their colleagues, from those who have shared with them the burden of problems and responsibilities, and from those who, at all levels, have performed their task with enthusiasm and devotion."

"I would also like to point out our debt to European industry. The equipment of this research centre no doubt forms the most extraordinary mosaic, if we consider the origin of the millions of supplies and components of all kinds which have gone into its construction. Many industrialists have been asked for greater precision and higher quality than ever before. The success of our accelerator, which has hardly had any teething troubles, and which at once exceeded its maximum scheduled energy by 15 %, is that of Mr. Adams and his team, who designed and assembled it. It is also a success for the industrialists, engineers, technicians and workmen of our countries, who have executed our orders so well."

"The presence of so many distinguished guests from the Member Countries of our Organization bears witness to the importance of this event. May I also say how glad we are to see here today the representatives of non-member countries, particularly those whose power has until now enabled them to make independent efforts far surpassing those of which our countries were capable individually. The fact that the United States of America has sent representatives to the inauguration of a machine, which is today the most powerful in the world, and the congratulations we have received from scientists of the Soviet Union, seems to me a proof of the importance which these two nations attach to no longer being alone in fundamental physics research, a proof of their pleasure at the news that Europe has decided to continue to play her part and that she is able to do so. Who knows whether one day the idea of co-operation, which has proved a necessity for our countries, will not impose itself on a wider scale and whether CERN will not then discover a new field of activity."

"This memorable day's celebrations mark the official handing over of our big accelerator to the research workers. This means that the active scientific life which has gone on around our first research machine will now be intensified and reach full development. Even before reaping any harvest of scientific results, which we hope will be plentiful, our achievement has made an original and basically useful contribution."

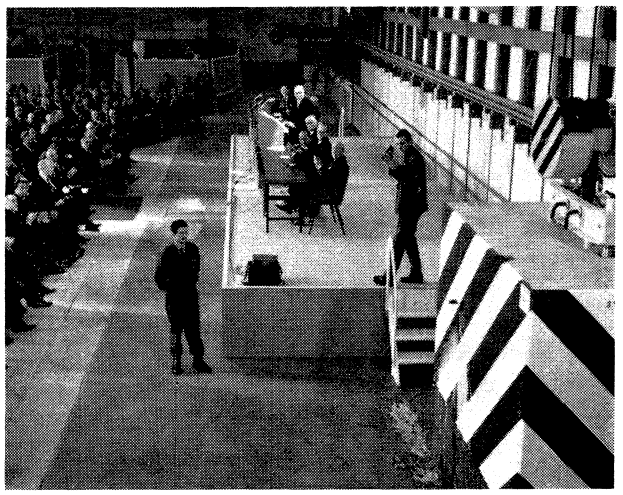
of the proton synchrotron

To conclude, Mr. de Rose expressed the faith of CERN in the unity of our culture and in the universal value of its message. "The men who meet here," he said, "to work together on a completely pacific and disinterested task, are united by a common desire for knowledge and subject to the same rules of intellectual honesty."

"We are gathered here today on what is unquestionably one of the landmarks of the civilization of the present century. The scientists who are the life-blood of CERN belong to a category of men destined to have an enormous influence on the future of our planet. It is in accord with the will of the Governments and peoples who have given them this marvellous research instrument that the message emerging from their work should also be the message of the value of collective effort and of the solidarity of mankind."

The picture on top of the opposite page shows the arrival of Lord Hailsham (centre) at Geneva Airport where he was met by M. Tombet, Chancelier d'Etat and M. Tièche, from CERN. (photo by Geneva airport press service).

The photograph at the bottom of p. 6 shows some of the Italian officials during the ceremony, including M. Medici, Minister of Public Education (left) and M. G.B. Toffolo, Consul-General (right) : in the background is Sir John Cockcroft. Inset in the middle of the page, the inaugural bottle of Champagne striking the protective concrete block. (U. Nussbaumer photos)



Amid MM. de Rose, Willems and Bannier and Profs. Amaldi, Bakker, Heisenberg, McMillan and Oppenheimer, Prof. Niels Bohr stands on the platform, after performing the symbolic inaugural gesture (UKAEA photo; the photographs on p. 9-10-11 are, from top to bottom, by R. Sterchi (3) and U. Nussbaumer (5).)

Professor Amaldi's speech

Professor Amaldi, Chairman of the CERN Scientific Policy Committee, then gave an account of the accelerators with an energy of more than 1 GeV already in service :

Brookhaven, Berkeley and Dubna.

"The CERN synchrotron, producing protons of 28 GeV, marks the next step in the process of development of the experimental means of investigation towards higher energies" he added.

"In 1952, when the Brookhaven Cosmotron was inaugurated, CERN was in its infancy : the energy of its machines was not yet fixed and very little was known about the possibility of applying the principle on which the proton synchrotron is based, whereby the particles are kept in a small region around the equilibrium orbit by means of a magnetic field of alternating gradient. The Convention creating CERN as a permanent organization was signed in July 1953 and entered into force in the autumn of the following year. The first machine of CERN, the synchro-cyclotron came into operation in 1957 and started producing results of considerable scientific importance in the summer of 1958. However, the main purpose of CERN was from the beginning the construction of the proton synchrotron. This machine was operated successfully for the first time in November 1959."

"Thus the speed of development of CERN has been adequate to catch up with the fast progress of high energy physics, bringing the European countries to the front of this most important field of research. This success is mainly due to the ability of the staff, whose work under the leadership of the Director-General has amply fulfilled the most optimistic hopes of the Member States. In particular, we should express our gratitude to all the staff of the PS, and to John Adams, who has led it to even greater success than expected. The actual operational energy of the PS is around 28 GeV, whereas, according to the original programme, it was only intended to be 25 GeV ; and what is still more important, the intensity of the circulating proton beam is higher than the expected value by a factor of 10."

"We should always remember that such an achievement as the one we are celebrating today would not have been possible without the support and understanding of our Member States. They realized the importance of fundamental research and unsparingly provided the financial resources and released the men necessary to make our joint enterprise a success. In the name of all European scientists working in this field of high energy physics, I should like to express to our Member States our very deep gratitude."

Then, recalling the contribution made by the existing extremely high energy machines, Professor Amaldi stated that "new properties of pi-mesons, heavy mesons, nucleons and anti-nucleons and hyperons have been observed and established, providing basic experimental data for a theoretical picture of what we think today to be the ultimate structure of matter. The existence of new pion-nucleon states, the associated production of particles and the existence of a new quantum number, the non-conservation of parity in weak interaction processes, the existence of two types of neutral heavy mesons of the same mass, but different mean lives and interactions, the existence of 2 new neutral hyperons, the high value of the nucleon-antinucleon cross-sections, are all experimental facts of fundamental significance which condition all present and future efforts at building a theoretical picture of the physical world. What will come out of the experimentation with high energy machines of the size of the CERN proton synchrotron in the future is very difficult to foresee. New phenomena may be hidden there behind the difficulties of experimentation on particles in this very high energy region. But even without essentially new facts, the efforts made in the construction of the PS are amply justified by the importance of a systematic investigation of the properties of all known particles and their interactions in the range of energy from a few GeV up to 10 or even 30 GeV."

Professor Amaldi also expressed his faith in the talents of the younger generations of scientists, in scientific traditions and in the European spirit of co-operation, before recalling that CERN "is also the meeting point of scientists working in their national institutions. The simple existence of CERN has greatly stimulated the construction of accelerators in many national institutions of the Member States, while a larger part of the work done in the CERN laboratory is due to teams coming from national institutes with their own equipment. The exchange of ideas between the CERN physicists and physicists from national institutes constitutes the basis on which the research programme is ultimately worked out."

" We are conscious ", concluded Professor Amaldi, "that the traditional spirit of liberalism which has characterized the European universities for many centuries pervades this new organization which, for all of us, is and should always be, in the future, one of the main centres of co-operation between the scientists of all countries of the world. "

Professors McMillan and Oppenheimer and the Russian physicists

Professor McMillan, Director of the Lawrence Radiation Laboratory of the University of California, explained in what capacity he had come to CERN :

" I have been charged first of all," he said. "to convey to you the congratulations of the American Atomic Energy Commission. Then, I have been asked to congratulate CERN on behalf of the Lawrence

Laboratory. Finally, I wish to express my warmest congratulations to all my friends who are members of the CERN staff."

"In 1952, when I heard "strong focusing" mentioned for the first time, the idea appeared to me to be theoretically sound but nevertheless rather difficult to put into practice. Since then, I have followed its development both at Brookhaven and at CERN. I learnt that the equipment assembled here came from all over Europe."

"Then came the great day which was to testify to the success of an experiment which had called for such a great number of people and so much equipment from so many different places; at the end of November, I received a telegram announcing that the machine had run. This gave me the greatest of pleasure and especially because many of my friends were involved in constructing the PS. It is my opinion, and I have had considerable experience in constructing accelerators, that this machine is by far the most complicated of all. Nevertheless, the beam energy obtained exceeds all expectations; in addition, the intensity is also very high.

Thus, the time has now come to carry out experiments in high energy physics. I think I am right in saying that the experimenters were not expecting the construction to succeed so soon and that for the present there is not a great deal of experimental equipment ready for use with the machine. The following stage will therefore be that of setting up the instrumentation.

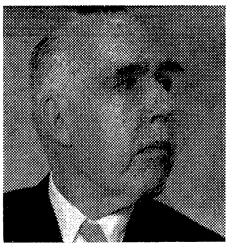
I will close by re-affirming the importance which I attach to this kind of international co-operation, which is a fine portent for the future; I wish CERN great success in all its endeavours."

Professor J. Robert Oppenheimer, Director of the Institute for Advanced Study of Princeton, delivered messages to the assembly from the American Society of Physics and the Council of the United States National Academy of Sciences.

"I have also been asked to give you the good wishes of the small group of physicists who work at Princeton", he continued. "We are very dependent on the findings that CERN is about to make and we are very grateful that this development which could easily have taken another decade to accomplish did not do so."

Professor Oppenheimer continued with a few personal remarks:

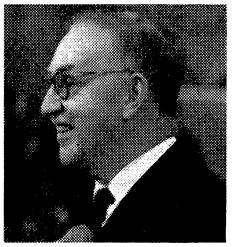
For the «Courier» Readers



The main human lesson drawn from investigations of phenomena ever more removed from ordinary experience is the recognition of the inseparability of objective knowledge from our ability to put questions to nature by means of experiments suited to give unambiguous answers. It is therefore imperative that physicists taking part in such inquiry can have the opportunity of getting experience about all aspects of the situation. This would, however, be impossible for scientists from countries with more limited resources, if it were not by means of such cooperative efforts as those we are witnessing in CERN.

The world-wide community of physicists are today united in the feeling of sincere gratitude to all those who have made this new enterprise in international co-operation possible.

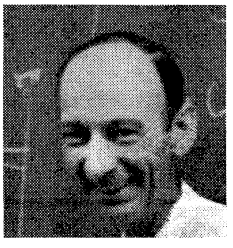
Prof. N. BOHR
Nobel Prizewinner for Physics.
Director, Copenhagen Institute for Theoretical Physics.



The proton synchrotron has been designed to allow us to probe still more deeply into the sub-atomic world. It is never possible to predict what we will find. From the first generation of accelerators which came into operation in 1932 we were able to produce the first transmutation of elements by artificially accelerated particles. We could produce radioactive isotopes in quantity for the first time and produce neutrons galore. The second generation of accelerators produced mesons and enabled the physics of nucleons to be greatly developed. The third generation produced hyperons, K-particles, anti-protons and anti-neutrons, and revealed the whole family of strange particles.

The fourth generation of accelerators, of which this is the first, will investigate still further this family of strange particles. We particularly want to know whether it is now a closed family or whether there is room for new members. We will use these strange particles to explore still further the sub-atomic world. We would like to know whether quantum mechanics continues to describe nature as the particle energies are steadily increased. We will also study the way in which the so-called weakly interacting particles such as pi-mesons behave at much higher energies. They may perhaps begin to interact much more strongly and this will be of great interest to nuclear physicists. The practical results, if any, of this work cannot be predicted from past experience. Practical developments follow when they are least expected.

Sir John COCKCROFT
Nobel Prizewinner for Physics.
Member of the U.K. Atomic Energy Authority.



I don't need many words to point out the significance of the CERN PS staff performance. The sure, deliberate and rapid manner in which the PS was brought into operation, was a magnificent demonstration. Already, the field above 20 GeV looks interesting! We hope to join you there soon.

Dr. G. K. GREEN
Chairman, Accelerator Development Department Brookhaven National Laboratory.

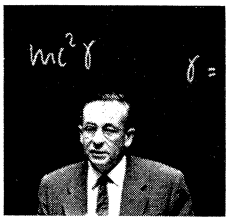
For the «Courier» Readers

The successful completion of the CERN proton synchrotron is one of the most exciting events in European Science since the last war. This is true first of all from the point of view of scientific interest : the physics of elementary particles is the basis of physics and natural science as a whole, for it enables to explain and understand out of a common basis, the interactions of various forces and the different kinds of matter which can be observed in nature.

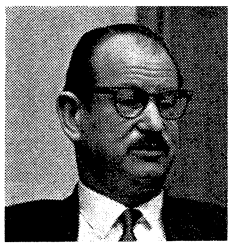
Moreover, this great and unexpectedly rapid success of the most powerful tool for research on elementary particles now existing in the world, shows how successful European Science can be if the joint efforts of many European countries are concentrated on one important aim.

Prof. W. HEISENBERG
Director, Max Planck Institut für Physik und Astrophysik
Vice-President, CERN Council

On behalf of scientists and all workers of the Joint Institute for Nuclear Research, Dubna, we send scientists, engineers and workers of CERN, our best congratulations... Putting of this powerful accelerator into operation opens new ways for successful development of science of matter structure and processes taking place in the atomic nucleus. We wish CERN scientists great success in development of the science for the wellbeing of mankind.



The Scientists of the Dubna Institute, U.S.S.R.



Designing, constructing and getting the 25 GeV synchrotron into operation so fast is a remarkable achievement, in view of the fact that this is a more complicated and sophisticated machine than any other particle accelerator in existence.

On behalf of the American scientists and of the United States Atomic Energy Commission, I would like to pay tribute to the European nations that made CERN possible and to our many European scientific friends.

What are the implications of this machine ? The world already has accelerators furnishing nuclear projectiles with a kinetic energy of up to 10 GeV. What occurs from this energy down is already being well explored but there remains the question : "What happens in the field of higher energies ?" The only way of knowing is to try, and this is what CERN and Brookhaven will do very soon.

Now, there are proposals to build machines of still higher energies. And here another question arises : will more and more powerful accelerators supply more and more of the same data on fundamental physics ? In other words, is it worthwhile to supply more of the same ? What will happen up to 30 GeV will give a very good answer to this and will, no doubt, have an influence on future plans for accelerators.

Thus, big accelerators like CERN's and Brookhaven's will perform a technical orientation job, besides doing fundamental research in the domain of the elementary particles.

Whatever the findings may be, we can be sure of one thing : that high energy phenomena will be thoroughly explored, thanks to the co-operation between the owners of very high energy accelerators.

Prof. E. M. McMillan
Nobel Prizewinner for Physics.
Director Lawrence Radiation Laboratory, Berkeley, U.S.A.

"I am one of those who owe everything of their formal education to Europe. There are many of my generation in our country who are in this situation."

"I speak for myself but perhaps for all of us, in saying that we are glad that we can be confident that our children and our children's children will be coming back to Europe for a renewal of the great tradition which binds us together."

After Mr. F. de Rose had read the telegrams of congratulation from Russian scientists : on the one hand Emilianov, and on the other Alikhanov, Vladimirsky and Nikitin, and finally from Blokhintsev, Djakov, Wang-Kan-Chang, Bogoliubov, Veksler and Dzelepov, Professor Bakker addressed the assembly.

The Director-General replies

Professor C.J. Bakker, Director-General of CERN, replied to the previous speakers and, on behalf of the staff of the Organization, expressed his gratitude for the appreciative remarks made about them.

Drawing a parallel between the first ceremony held on the CERN site - the laying of the foundation stone in 1955 - and the inauguration of 5 February 1960, Prof. Bakker expressed his regret at the absence of three people who had played a prominent part in the early days of CERN : Mr. Max Petitpierre, President of the Swiss Confederation, Sir Ben Lockspeiser, President of the CERN Council in 1955, and Prof. Bloch, the first Director-General.

"For obvious reasons, the ceremony then had to be held in the open air," added Prof. Bakker. "Today we had the choice between several buildings on our site ; we have chosen this hall not so much because it is well suited for an inauguration but because we thought it would be appropriate to have the inaugural ceremony close to the synchrotron in this hall where experiments with the PS will be performed."

"In four and a half years CERN has built a large number of laboratories ; our 600 MeV synchro-cyclotron has been in operation since 1957 and many scientific results of high standard have already been obtained with it by the CERN staff and the physicists who have come especially for this purpose from our Member States. Now we inaugurate the CERN 25 GeV proton synchrotron. It is the world's largest accelerator - at least for the time being ;

it is a fine machine which is ideally suited to experimental work."

"A new and extremely interesting period lies ahead of us when the experimental work which has just started will get going."

Prof. Bakker continued by saying how proud the CERN staff were that CERN has now found its place among the world's big scientific laboratories and that it has become a real international centre for high energy research and a meeting place for physicists from all over the world. "I want to tell our colleagues from the United States, from the Soviet Union and from all over the world," added the Director-General," how much we appreciate their participation in large numbers in the international conferences on high energy physics organized by CERN, and how glad we are when they come to stay with us for longer periods."

Prof. Bakker then addressed the distinguished personalities in the audience : "I should like to express to them, on behalf of the staff of CERN, our deeply felt gratitude for the way their Governments through their representatives on the Council of CERN, direct and support our activities. Whatever discussions take place in the Council and whatever decisions are taken, they are always based on the firm resolve to make this co-operative European effort embodied in CERN a full success. And it is this spirit of our highest governing body which to a large extent is reflected in the devotion of the CERN staff to their work."

"I should like to conclude by giving you the assurance that the staff of CERN will continue to work in the spirit of co-operation and with the devotion that had led to its present achievements and to the standing of CERN in the scientific world."

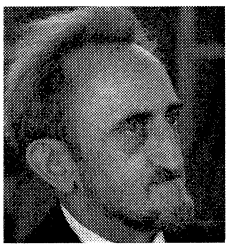
The inauguration

Professor Niels Bohr, who was to perform the symbolic gesture of inauguration, was the last to speak :

"I need hardly recall", he said, "how through the ages scientists from all parts of the world have added to the common human heritage of knowledge about that nature of which we are part.

In our days, the exploration of the world of atoms has largely increased our insight into the constitution of matter, elucidated and co-ordinated by viewpoints developed on the basis of the discoveries of Planck and Einstein in the first years of this

For the «Courier» Readers



What is the significance to Western Europe of possessing a big machine which puts it in the forefront of fundamental research in physics ?

The pooling of European countries of scientific and technical efforts is in itself significant. It is of primary importance to have a machine such as the PS in Europe instead of another continent, where our scientists would no doubt have access to it but in restricted numbers and for limited periods. For the general progress of science, it is important for the European effort to be in harmony with that of the United States and the USSR.

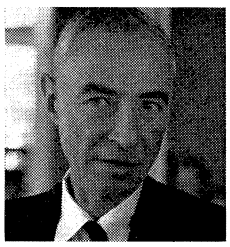
An even more momentous consequence of carrying out fundamental research in Europe will be to attract brilliant young scientists. Progress in science will be solidly based on European cultural traditions. These traditions will permeate into this field and among individual scientists. Such an interplay of ideas will eventually infuse new life into national cultural institutions. For, as a rule, higher education loses its vitality if it does not keep in close touch with research. There was therefore no hope of keeping higher education up-to-date without a centre such as CERN in the fundamental research field.

National research centres with smaller machines also exist in Europe and there must be close links between them and CERN.

Finally, if the teams are to work together it is also essential for CERN to receive not only qualified physicists but also young people whom it will help to train. Besides research, this will be the other major task of the Organization.

CERN today holds a leading position. Tomorrow it will share this honour with Brookhaven. In any event, CERN will remain one of the best research and training centres. This is essential both for its own future and that of research in Europe.

Prof. F. PERRIN
- French High Commissioner for Atomic Energy.
- Member, CERN Scientific Policy Committee.



We wish you a future of new discovery, of increased understanding of nature, as a bright example of that co-operation which is required of us, for our survival and for the flourishing of high culture...

... We salute the vision and devotion of those who have made possible the proton synchrotron. We recognize not only that it marks a technical achievement of high significance, but also that it is a symbol of the common enterprise of people from many nations to give to all mankind new understanding of the forces that shape our physical environment.

... May those that work at CERN in the years to come find there, in steadily growing knowledge of the wondrous order of nature and of nature's laws, ever renewed challenge for the questing mind and ever deepening satisfaction for the questing spirit.

Prof. J. Robert OPPENHEIMER
- Director, Institute for Advanced Study, Princeton, U.S.A. (speaking on behalf of the American Physical Society and of the National Academy of Sciences)

Flags of 13 Member States and the large shielding wall between the accelerator and the South experimental hall, serve as a background for the platform where Prof. Amaldi, Chairman of CERN's Scientific Policy Committee, delivers one of the inaugural speeches. (RA photo)

century. These discoveries have initiated a new era in natural philosophy and the rapid progress has above all been due to a most far-reaching and intensive international collaboration."

"For one who had the good fortune as a young man to join the group of physicists working under the inspiration of Rutherford shortly after his discovery of the atomic nucleus, and who, through a long life, has followed at close hand the great development to which it gave rise, a comparison between the simple apparatus by which the initial discoveries in nuclear physics were made and the masterpiece of physical engineering, whose completion we are celebrating today, calls for treasured memories as well as for most encouraging expectations. Indeed the history of physical science in this century has been a true adventure equally marked by a sequence of surprising discoveries and by a corresponding steady progress of the art of experimentation."

"It may perhaps seem odd that apparatus as big and as complex as our gigantic proton synchrotron is needed for the investigation of the smallest objects we know about. However, just as the wave features of light propagation make huge telescopes necessary for the measurement of small angles between rays from distant stars, so the very character of the laws governing the properties of the many new elementary particles which have been discovered in recent years, and especially their transmutations in violent collisions, can only be studied by using atomic particles accelerated to immense energies. Actually we are here confronted with most challenging problems at the border of physical knowledge, the exploration of which promises to give us a deeper understanding of the laws responsible for the very existence and stability of matter."

"The main human lesson drawn from investigations of phenomena ever more removed from ordinary experience is the recognition of the inseparability of objective knowledge from our ability to put questions to nature by means of experiments suited to give unambiguous answers. It is therefore imperative that physicists taking part in such inquiry can have the opportunity of getting experience about all aspects of the situation. This would, however, be impossible for scientists from countries with more limited resources, if it were by means of such co-operative efforts as those we are witnessing in CERN."

"The world-wide community of physicists are today united in the feeling of sincere gratitude to all those who have made this new enterprise in international co-operation possible. When, in a moment, I shall have the great honour to conclude the inaugural ceremony by pressing a button, which will open a channel in the protection wall through which the high energy beams will pass in the actual research work, I do this in deepest admiration for what has here been achieved due to great foresight and purposeful planning and with my warmest wishes that it may lead to new fruitful contributions to our knowledge and understanding of nature."

Five seconds later, the inaugural champagne was streaming down the shielding block which was being raised by the winch of the travelling crane.

The CERN proton synchrotron had been inaugurated. Thus, amidst the applause of those present and the photographers' flash lamps, came the climax of six years of effort.

CERN would now turn to the exploitation of the machine. The Organization possessed the largest accelerator ever built. Europe has set an unprecedented example of international co-operation. The world had been given the largest instrument ever to be available for pure and disinterested research.

A view of the audience during the inauguration ceremony of the CERN 25 GeV proton synchrotron. (RA photo).

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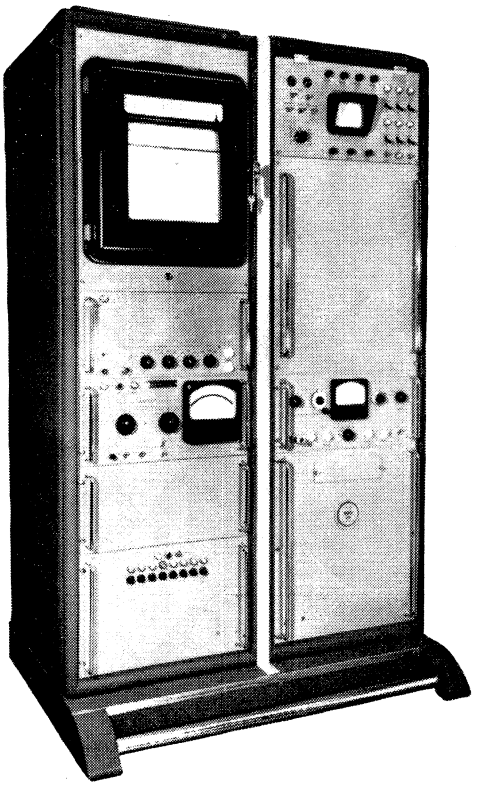
60 - Channel pulse height analyzer with magnetic core memory - SA 60 M



- Number of channels : 60
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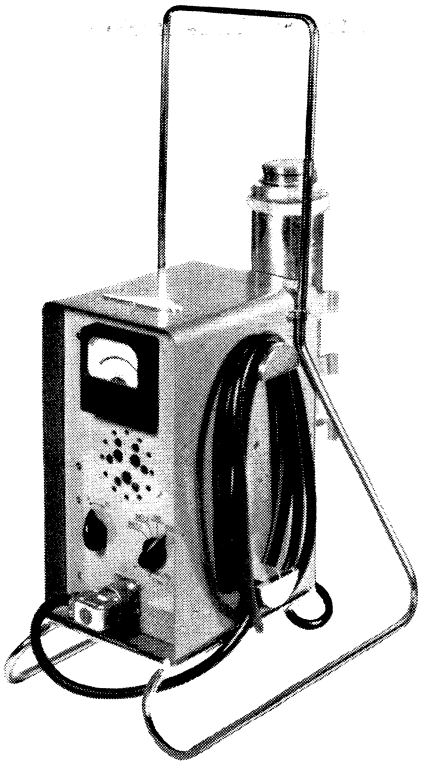
- channel width accuracy : 1 % except channel 1
- Variable threshold : permits analysis of 160 channels
- Resolution : 500 µ s
- Channel capacity : 65 535 pulses per channel
- External gating signals : coincidence : negative : 5 V. 1 µ s
- Spectrum display :

  — CRT oscilloscope
  — pen recorder
  — output provisions for typewriter recording



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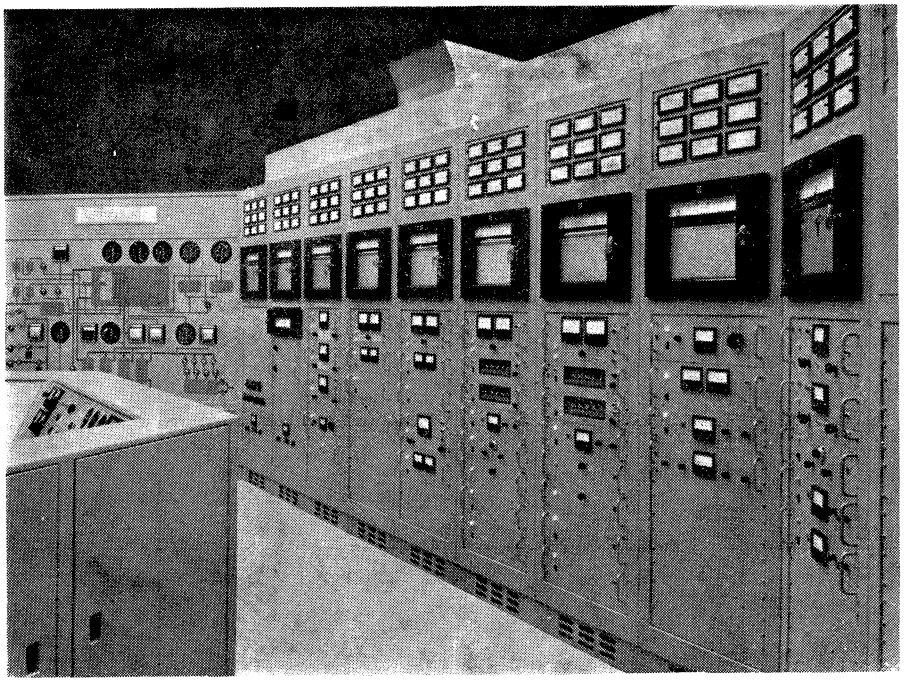

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Instrument panel for a 20 MW High Flux tank-type reactor. Graphic panel at the left includes flow and pressure meters for the cooling circuits. Centre section houses neutron flux measuring channels with recorders for flux and period as well as recorders indicating coolant temperatures. Right-hand panels contain radioactivity monitors for water and gas circuits. Indication of abnormal operating conditions is provided by annunciators above recorders.

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