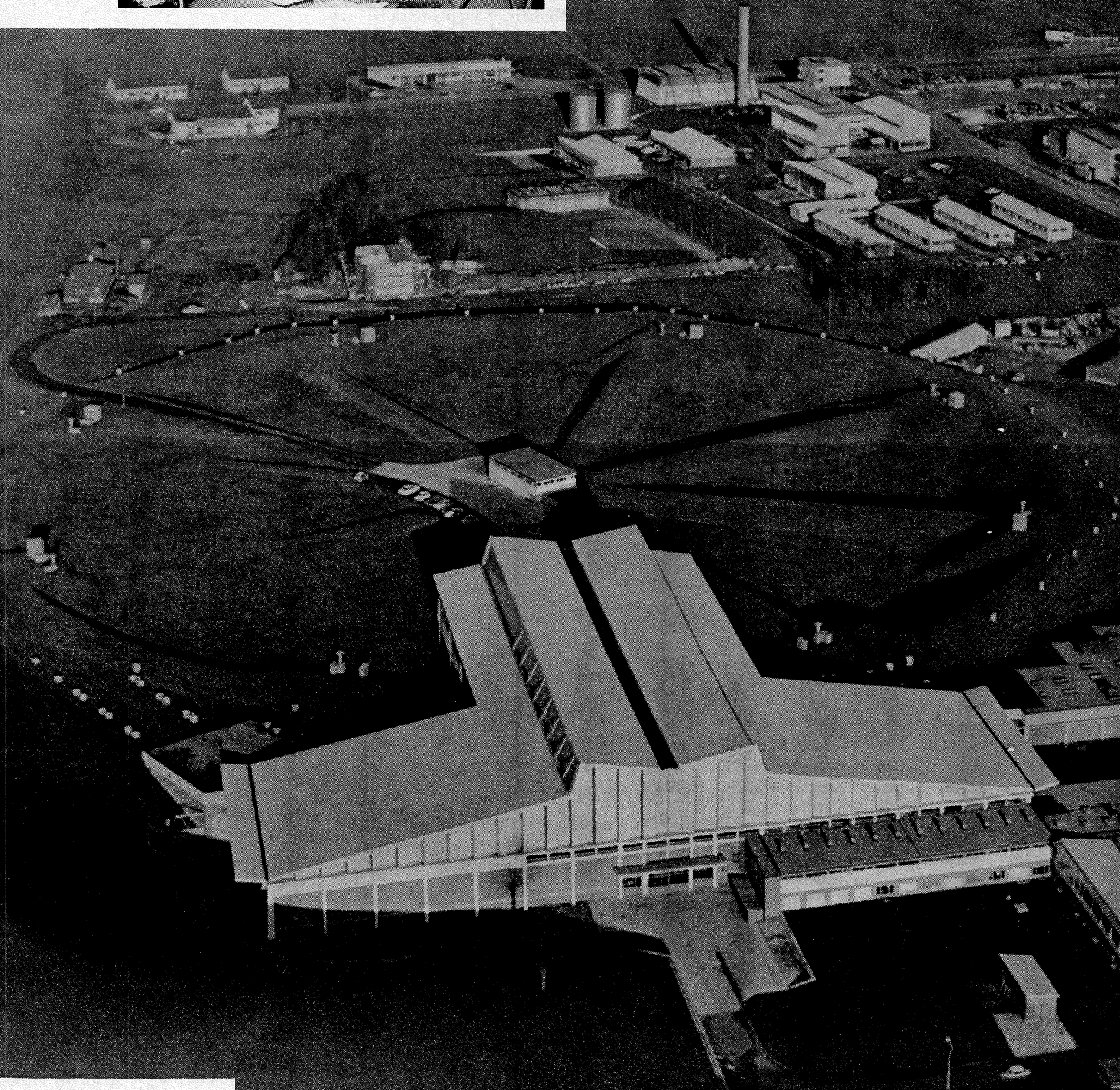


COURIER CENTRAL



N° 11
June 1960

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

J. B. ADAMS

Acting Director-General

After the tragic death of Prof. C. J. Bakker, the Council of CERN held an emergency meeting on May 3, 1960.

Following this session, Mr. F. de Rose, President of the Council of the European Organization for Nuclear Research, announced the appointment of Mr. J. B. Adams, Director of the PS division to the post of acting Director-General.

Number 2 - September 1959 - issue of the "CERN COURIER" already introduced Mr. Adams.

John Bertram Adams was born in Kingston, Surrey, on May 24th, 1920.

During the early days of atomic energy projects in Britain, he joined the Ministry of Supply, which at the time was responsible for atomic research and developments in the United Kingdom. In 1946 he went to the Atomic Energy Research Establishment, Harwell, to work initially on the design and later on

the construction of a 110 inch synchro-cyclotron. This 175 MeV machine was the first high-energy proton accelerator built after the war: it has been operating without interruption since 1949.

Also in Harwell he developed from 1950 to 1952, high frequency klystrons with a 20 megawatt pulsed output, intended to power linear accelerators.

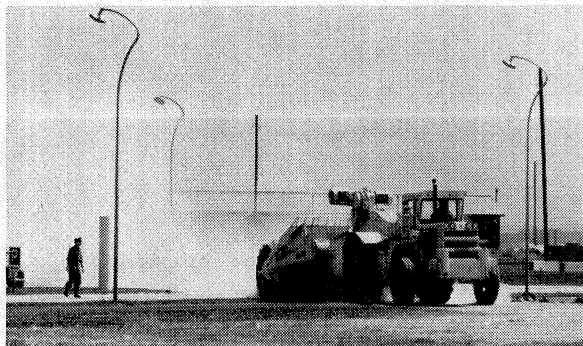
In 1953 the Ministry of Supply released J. B. Adams to help design and build the 25 GeV proton synchrotron then under consideration for CERN. He was appointed Director of the PS Division in 1954; in this capacity he organized the construction of CERN's huge new nuclear research tool—the world's largest today.

The success met in this enterprise brought to Mr. Adams, as well as to the team he was leading, the admiration of the scientific world. On June 2,



soon after his appointment as acting Director-General, Mr. Adams was awarded the title of Doctor honoris causa by the Geneva University. In July the University of Giessen, Germany, will award the Roentgen Prize to him, as representative of the designers and builders of the large European synchrotron.

In the middle of 1959, Mr. Adams was appointed Director of a new Controlled Thermonuclear Research Laboratory in the United Kingdom.



Last month at CERN

Motors roaring furiously, mechanized diesel monsters have levelled the mound next to the PS, where later on the installations of the Eastern experimental area will stand.

Exceptionally, this column will cover a longer period than the usual four weeks. Indeed the changes which the Public Information Office has undergone after the loss of its Senior Officer and later on, the Director-General, have delayed the publication of this issue of the "CERN COURIER". We shall therefore consider the main events at CERN since our last number which appeared on May 1st.

The **600 MeV synchro-cyclotron** is again being continuously used for nuclear physics experiments. The changes made in the machine early this year allow several experiments with secondary particles of different energies to be conducted simultaneously. At the end of June, several teams of physicists were operating CERN's "small" proton accelerator. The "neutron" experimental room was fitted up to allow separate experiments using neutrons and also the work of three counter

teams experimenting with mu mesons at 280, 125 and 80 MeV. Finally in the room where 600 MeV protons end up, a team of physicists from Bologna University have installed a 20 cm hydrogen bubble chamber.

On June 1st, the **SC electronic workshop** announced that it had carried out its 1000th job since 1957. The activities of this workshop will be described in a subsequent article of the "COURIER".

The **main workshop** is finishing the machining of a 150 cm cloud chamber, one of the largest instruments for the observation of particles ever built. Another spectacular piece of equipment is being built by the workshop: a pneumatic platform (see "CERN COURIER" No 2) intended to support the heavy 6 m-long electromagnet for the "g-2" experiment.

The **big synchrotron** operates from 8.30 a.m. to midnight, on the days when

it is used for nuclear physics experiments or studies of accelerated particle beams. The installation of a particle buncher between the 500 keV pre-accelerator and the linac, as well as the improvement of the ion source, meant an increasing value of injected current i. e. the amount of particles.

This value first reached 10 milliamperes which supplied an accelerated beam of 1.4×10^{11} particles per pulse. This happened last May, six months after the first 25 GeV beam was obtained. Since then the injected current has reached an intensity of 15 mA, the peak intensity of the beam being accordingly 2.1×10^{11} protons per pulse, a remarkable intensity at an energy of 25 GeV!

On Monday, June 13, began the **second long run** of the synchrotron. It lasted till Thursday morning, 72 hours in all, during which the fine performance of the machine allowed the physicists to use the beam for 96% of the time originally forecast. It was a "counter experiment": several groups of physicists used a secondary particle beam of 3 to 25 GeV, in connection with scintillation, Cerenkov and other counters. No bubble chambers were used in this ex-

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« CERN COURIER »

was started in 1959 at the initiative of Prof. C.J. Bakker, Director-General of CERN. It is published monthly for the staff of the European Organization for Nuclear Research and distributed to members of the Organization, to scientific correspondents and to anyone interested in problems connected with the construction and operation of particle accelerators or in the progress of nuclear physics in general.

Editor

Roger ANTHOINE

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The cover photograph shows in the foreground, the large 25 GeV proton synchrotron; the inset picture shows Prof. C.J. Bakker (right) and Mr. J.B. Adams chatting informally during the 1956 conference on high energy accelerators. This photograph symbolizes the main news that occurred in CERN's history in April: the loss of Prof. Bakker who was to be replaced ad interim by Mr. Adams. (Photo Cadoux)

periment, but a 100-litre liquid hydrogen target was mounted in the path of the secondary particles.

With the help of the large accelerator an **important observation** has been made for the first time. The analysis of a secondary particle beam showed the presence of energetic deuterons at 3.5 GeV. Later on, the same phenomenon was observed at an energy of 10 GeV. The deuteron is the nucleus of heavy hydrogen, composed of a proton, plus a neutron.

That such a combination can survive the impact of high-energy particles or that they can materialize after the impact, put a big question mark in front of the physicists.

On June 20th, giant scrapers levelled the protective hill beside the road leading to the PS. That was the beginning of the civil engineering work on the **Eastern experimental area**. By mid-1961, new buildings for bubble chambers and associated apparatus will stand there.

About the **housing problem**, some important news was heard June 3, at a press conference held by the leaders of the "Terra & Casa" group. A project has been drawn up by this society, sponsored by the Comité des Associations de Fonctionnaires Internationaux à Genève" (CAFIG), for building 205 flats in Versoix, to house some 800 people. This project should ease the problem of housing staff — the most serious problem CERN has to face nowadays.

Ed.

Other People's Atoms

This is the second of a series of three articles on high energy physics in the United States, in 1959.

This article covers the main activities of the LAWRENCE RADIATION LABORATORY, at Berkeley, California.

BERKELEY'S LAWRENCE RADIATION LABORATORY

72-inch hydrogen bubble chamber

Construction and testing of Lawrence Radiation Laboratory's 72-inch liquid hydrogen bubble chamber was carried to a point of initial success; the first pictures of high-energy particle tracks in the 72-inch chamber were obtained on March 24, 1959.

Design and construction of the chamber has taken 5 years and required 65 man years of scientific effort. A variety of entirely new problems had to be solved: for instance, the window through which the chamber is viewed is the largest piece of glass of optical quality ever cast. It had to be gasketed to the metal chamber with a vacuum-tight joint at liquid hydrogen temperature, and the whole had to withstand the mechanical shock of the expansion of the chamber.

The Bevatron Contributions

The 6.2 BeV proton synchrotron of the University of California was used with the **72-inch liquid hydrogen bubble chamber** to study the interactions of high energy antiprotons (momentum = 1.65 BeV/c) with the hydrogen nuclei (protons) in the bubble chamber. One of the problems that had to be solved before this experiment could be performed was how to separate the relatively scarce number of antiprotons from the very copious number of lighter particles in the beam passing into the bubble chamber. (There are about 20 000 light particles for every antiproton in such a beam). A system of magnets and electrostatic separators has been used to reduce the number of light particles per antiproton from 20 000 to 3 without seriously affecting the transmission of antiprotons. With this system it is possible to shoot about 1 antiproton for every second Bevatron pulse into the bubble chamber. Approximately one-half of these antiprotons interact with the hydrogen nuclei of the bubble chamber. To date more than 20 000 such interactions have been observed. Among these interactions more than 10 cases have been observed of the creation of a new type of antiparticle: the antilambda hyperon which had previously been observed only once. (*)

The separation scheme described above to remove light particles from a beam of antiprotons actually was first developed and used to remove light particles (pi mesons) from a beam of negative K mesons in an experiment in which the K mesons were shot into a 15-inch liquid hydrogen bubble chamber. The beam separation techniques developed during the past year constitute a great advance in this field and have made possible several experiments heretofore considered very difficult. The object of this particular experiment was to look for the neutral so-called xi-zero hyperon—an elementary particle which had been predicted on theoretical grounds but never observed experimentally. Seventy thousand pictures were taken and analyzed. One unmistakable example of a xi-zero hyperon was observed. This one event was sufficient to confirm the theoretical predictions of the existence of this particle.

The **15-inch liquid hydrogen bubble chamber** also was used for further studies of the associated production of the so-called "strange" particles (K mesons and hyperons) as well as the interaction of these particles with hydrogen and deuterium. Much information about these processes has been obtained during the past year but undoubtedly much more will be needed before strange particles become less "strange" and more susceptible to theoretical interpretation. The 15-inch bubble chamber can also be filled with liquid deuterium.

The **30-inch liquid propane bubble chamber** also was exposed to both the separated negative K and the antiproton beams. The experiment involving

(*) See « CERN COURIER » N° 2, September 1959.

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MEYRIN, APRIL 29

On April 29 the staff of CERN, together with members of the family of the late Director-General, Prof. Cornelis Jan Bakker, and his friends from Geneva, gathered in the main auditorium to pay tribute to his memory.

Mr. J. B. Adams, speaking on behalf of CERN, said:

"We are assembled here today to pay tribute to the memory of Prof. Bakker. We are the people with whom he lived and worked during the years that he was Director-General of CERN ; the members of his family, his friends and scientific colleagues from other laboratories and the staff of this Organization. It is as one large family that we mourn his sudden and most tragic death. Today several of his friends and colleagues, reflecting the different aspects of his life, will, in their own fashion, pay tribute to his work."

"Mrs. Bakker felt, and we agree, that he would have preferred a simple ceremony in this Conference Room where he so often presided over our scientific meetings, and I sincerely hope that in listening to our tributes today she will take comfort in her sorrow in knowing just how very much her husband was appreciated by all of us."

"Here at CERN Prof. Bakker left his mark for all to see and for the whole scientific world to applaud. I wonder how many of us, working in this Laboratory, realize how much he sacrificed in accepting to be our Director-General. Like most of us he left his country and his friends. But, unlike most of us, he knew that he would not be able to take a personal part in any particular experiment. He knew that he would have to stand by while others experienced the joys of discovery that had once been his. His task was to steer this Organization through the early years of its existence and his heavy responsibility was for the whole Organization. All this he knew and all this he accepted for CERN."

"Men use their lives in diverse ways but particularly to be admired are those who in a life of honourable service try by their works to leave the world in some way a better place. Prof. Bakker was such a man. His satisfaction, his joy was in the whole of CERN. He lived and cared for this Organization and there can be no memorial to him more fitting and more permanent than this Laboratory."

Then, the following spoke of other aspects of the life and work of Prof. Bakker :

- * Mr. Albert Picot speaking on behalf of the Geneva Authorities.
- * Prof. G. Bernardini speaking on behalf of the CERN physicists.
- * Prof. S.A. Wouthuysen speaking on behalf of European visiting scientists and Dutch Staff members.
- * Dr. S.J. Lindenbaum speaking on behalf of Brookhaven and Berkeley Laboratories.
- * Mr. A. Decae speaking on behalf of the Staff of CERN.

At the end of the ceremony those present in the auditorium paid a final tribute to the memory of the late Director-General by standing in silence for a minute.

O PROF. BAKKER

DRIEHUIZEN, MAY 3

On a clear morning of May, Professor Bakker's ashes were brought back to the Netherlands. A CERN delegation took part in the last public tribute paid to the Director-General of the Organization at the Driehuisen cemetery, near IJmuiden, a few miles from the sea.

Speaking on behalf of the Dutch Government, H. E. Mr. J. M. Cals, Minister of Public Education, Arts and Science, said how much the personality of Prof. Bakker had helped to consolidate the unity of the international organization which is CERN and how much Prof. Bakker wanted CERN to be a symbol of international scientific co-operation. "In Holland", said Mr. Cals, "science is much indebted to Prof. Bakker for his collaboration with the Dutch Organizations for nuclear physics and fundamental research".

Turning then to Mrs. Bakker, the Minister told her how much the Netherlands, CERN and international science sympathized with her in her sad loss. He then made the following statement: "By Royal decree, dated April 11th, H. M. the Queen of the Netherlands, expressed the great appreciation of the scientific and personal qualities of Prof. Bakker: she bestowed upon him the title of Knight of the Order of the Dutch Lion. According to the customs of our country, this nomination should have been made public on H. M. the Queen's birthday, last Saturday. Since I am unable to hand this decoration to Prof. Bakker, I would like—with the Queen's permission—to speak about the award of this honour. We wish it to be the ultimate sign of the Dutch Government's desire to preserve the memory of this outstanding man."

On behalf of CERN, Mr. F. de Rose, President of the Council, underlined the part played by Prof. Bakker in the success of CERN in the field of science and international co-operation. "We all know", he said, "that a team is as good as its leader". Mr. de Rose was very closely acquainted with the problems which the Director-General had to face and knew that the confidence he inspired usually led the Council to share his opinion. This confidence was the reason why the Council had unanimously requested Prof. Bakker to remain in office during the new phase of the scientific exploitation of CERN's research equipment.

"A man like Cornelis Jan Bakker", added Mr. de Rose, "never dies entirely. Prof. Bakker leaves a powerful, efficient organization. In the difficult circumstances now facing CERN, it can draw the necessary strength to carry on its task from the large reserve of faith, enthusiasm and wisdom built up by Prof. Bakker."

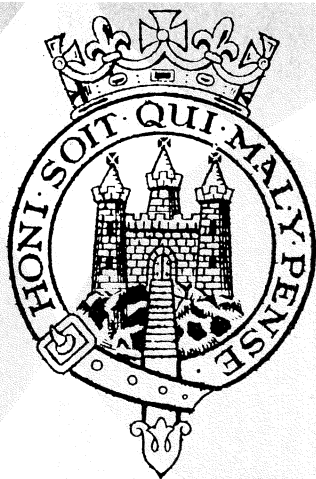
"I am also sure that the success met by CERN under Bakker's leadership goes far beyond mere research in high energy physics. Nowadays scientists assume responsibilities which extend well outside their laboratory work. In building up CERN as a strong centre of culture in this century, in making CERN a striking example of the virtues of peaceful, collective effort, Prof. Bakker helped to illustrate the beneficent character of science and the will of the research workers, who devote their lives to it, to create international co-operation and a better understanding among men."

"Prof. Bakker", concluded Mr. de Rose, "will remain alive in our memories and hearts. His task will be carried on. This is the best tribute we can pay him."

Prof. J. de Boer, President of the CERN Committee in the Netherlands, spoke on behalf of the Dutch scientific organizations and institutions, of the Academy of Science, of the University of Amsterdam, and of a great number of friends, colleagues and students of Prof. Bakker. He briefly recalled the life of our late Director-General, from the time when, as a pupil of Prof. Zeeman, he was experimenting on atomic structure and spectra, until his departure for Washington where he was to speak to the American Physical Society on the work done at CERN.

Prof. de Boer then told Mrs. Bakker once more, how all those who knew her husband shared in her sorrow.

"All of us wish to help you now and in the future", he said before concluding, "I hope that it will help you at this sad moment to know what respect and gratitude we all have for the work done by Cornelis."



Royal visit to CERN

The Duke of Edinburgh

The Duke of Edinburgh was born on June 10th, 1921.

He served in the Royal Navy throughout the war, in the Home Fleet, in the Mediterranean and the Far East.

The Duke of Edinburgh has shown particular interest in scientific and industrial developments. In 1951, he was appointed President of the British Association for the Advancement of Science. Since that time he has paid numerous visits to scientific and industrial establishments of all kinds, both in the United Kingdom and the Commonwealth.

In 1959 he represented the British Association for the Advancement of Science at scientific meetings in India and Pakistan.

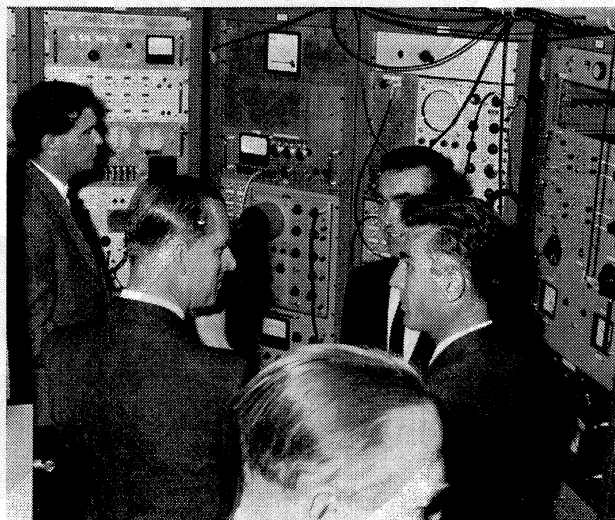
Film of the Duke's visit to CERN. Below, from left to right: the welcome by Messrs. F. de Rose, Sir H. Melville, S.A. ff Dakin... two shots taken inside the Council Chamber during the introductory speech of Mr. de Rose... three pictures of the synchro-cyclotron where the Duke and his party were greeted by Prof. G. Bernardini. Right, from top to bottom: the arrival of the Duke at the synchro-cyclotron, explanations by Prof. Bernardini... the departure of the Duke towards the proton synchrotron... explanations by Mr. J.B. Adams at the PS and a group of "Cernites" waiting for the visitors to go by. Above, the Duke takes great interest in the grouping of the control room of the PS linac. In the upper left corner of this page, the Duke of Edinburgh's crest.

The Duke of Edinburgh paid an informal visit to CERN on April 28th.

Flying his own "Heron" from Malta to Britain, he had landed at Geneva airport the evening before.

The Royal party arrived at CERN at 10 o'clock in the morning of April 28th. With the Duke were Rear-Admiral C. D. Bonham-Carter, H. E. Sir William Montagu-Pollock, British Ambassador to Switzerland, Mr. D. Balfour, H. M. Consul-General in Geneva and Mr. H. L. Verry, United Kingdom delegate to the CERN Council.

After being greeted at the entrance to the Administration Building by Mr. F. de Rose, President of the



Council of CERN, Mr. Adams and Mr. Dakin, Sir John Cockcroft and Sir Harry Melville, U. K. delegates to the Council of CERN and Prof. P. Scherrer, representing the Swiss Confederation, the Duke went to the CERN Council Chamber.

Mr. de Rose gave there a short introductory talk: "The reason for creating CERN was that in our various countries it was realized after the war that the tools for the people who try to understand matter, were



growing so enormous that it was becoming increasingly difficult for any of our nations in Europe to build them single-handed. Our Governments realized that if we were not to fall behind at a moment when scientific developments had become so important for all the problems which confront mankind and when probably science held the only solution to problems which appear sometimes to get out of hand, it was necessary that, in the field of science, European countries should unite. This problem therefore was a scientific problem, certainly, but also a political one."

"You will see the results to-day. After seven years of work, we have for the moment the largest particle accelerator in the world", Mr. de Rose then explained how the 25 GeV proton synchrotron had reached an energy of 28 GeV—28 thousand million electronvolts.

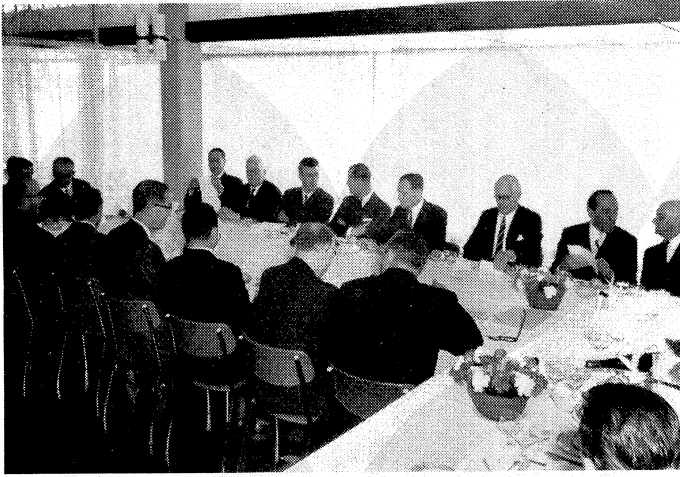
"We are specially proud because we started this machine at the same time when in the United States at Brookhaven they were starting a similar one. Well, ours has been operating since 24th November and our United States friends have not yet been able to announce an equal success, although we hope very much that it will come in the near future."

Mr. de Rose then described how CERN works. "It is at the service of all the scientific centres in our various countries and the time of this machine will be divided probably half and half between the CERN scientists and scientists coming from our Member Nations. Already in your country, in mine as well as others, people are preparing equipment to come and make their experiments with this machine. And, of course, we blend those teams with people from CERN so to create a complete feeling of unity."

"This Organization is clearly the largest effort that has ever been made for international co-operation in science and we are glad to say that it has been a great success. I should mention the names of two of your compatriots, Sir Ben Lockspeiser who was my predecessor as President of the Council and who really played a decisive part over the difficult launching period, and John Adams, who was entrusted with the task of building that enormous machine the like of which there has never been in the world."

A short discussion followed ; some of the questions and answers exchanged were :





Above a view of the CERN canteen during the lunch offered to the Duke of Edinburgh in which authorities of Geneva and senior CERN officials also took part. Below, from left to right: Prof. Bernardini taking leave of the Duke in the synchro-cyclotron Division... the Duke being welcomed by Mr. Adams at the PS... listening to an explanation of the normal acceleration process of protons... hearing about the principle of pick-up electrodes and of bubble chambers... Messrs. de Rose, Adams and Dakin bidding farewell to Prince Philip. On the right hand page a facsimile of the letter of thanks received from Buckingham Palace after the visit.

H.R.H. — "Do you have any problems of language at all?"

Answer. — "There are two common languages, which are broken French and broken English! Anyway, with a blackboard and a piece of chalk scientists always understand one another."

Q. "Is your scientific programme tailored to the interests of people that you have got here, or, having decided on the programme, do you then go out and try to recruit people to do the work?"

A. "There is a constant flow of visits from national laboratories to CERN and there is a framework of senior scientists who hold the place together. We think that we shall be finding the people and working out the programme at the same time, because the process of working out the programme will be a process of consultations between CERN and the Member States. And very often if a country wants to do a particular experiment it will also want to send a team to participate in it."

Q. "How do you arrange to keep the staff reasonably balanced between the Member Countries?"

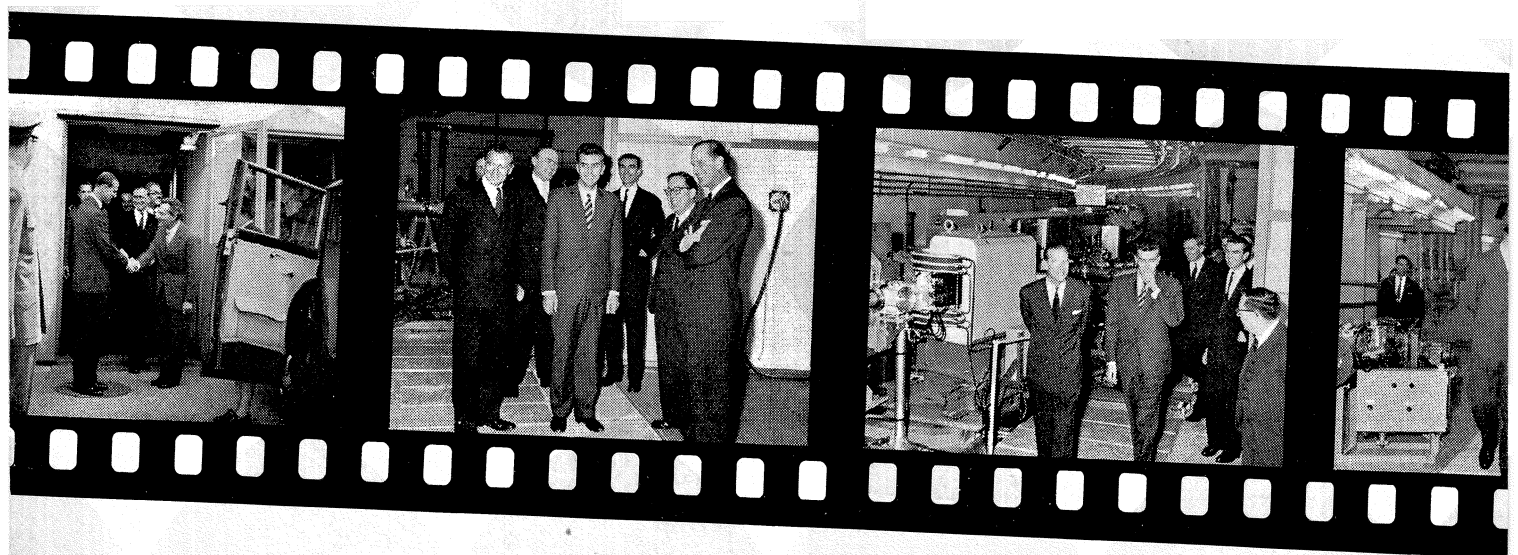
A. "Our rules say that we pay first attention to ability and after that to getting geographical balance. In practice the proportion is not far from the percentage contributions."

Q. "Have you got a waiting list of people or teams who want to come and do experiments here?"

A. "One of our most serious problems during the next year or two is going to be the priority problem around the big machine when the countries really start to claim the use of machine time. We already have a waiting list. It is a very large machine and there are very many people who want to use it."

Q. "How do you cope with the accommodation for your staff and visitors?"

A. "This is one of our biggest headaches. So far we have just about managed to find places for our people in furnished and unfurnished flats. We have had to have very serious discussions with the local authorities and we had to make special arrange-



ments because Geneva is vastly overcrowded, and it gets more and more difficult. So far we are just ahead of the game."

- Q. "You are not thinking of building your own flats or cottage blocks?"
- A. "The most we shall do is to have a block of one-room flats for the very short term visitors and particularly the young men who come as fellows. But we would rather not, on the whole, put too many CERN people too close together."
- Q. "What have you got in mind for the future? Having built this machine, what next?"
- A. "Well, that's a big problem. We have a group who are investigating new principles of acceleration to see whether it is possible to go into higher energies than 25 GeV. But before we present a new project we will have to be absolutely sure that it is feasible and that it is justified. For the moment we are going to work with the present 25 GeV machine to see what results we can get, because no one has ever explored what happens when you bombard matter at such an energy. We do not really know whether we are going to discover anything new by going beyond 25 GeV. After we have been working with this machine for one year or longer we shall know much more."

After this talk, the Duke and his party visited the Main Auditorium and had a brief bird's-eye view of the Site as a whole from the roof of the Administration Building. Then they visited the "small" accelerator, the 600 MeV synchro-cyclotron, where they were shown round by Prof. Bernardini and senior staff.

At the huge 25 000 MeV proton-synchrotron the party followed the logical sequence of pre-acceleration, injection and acceleration of the proton and then proceeded to the South experimental hall, central control room and the power station, explanations being given by Mr. Adams and senior staff.

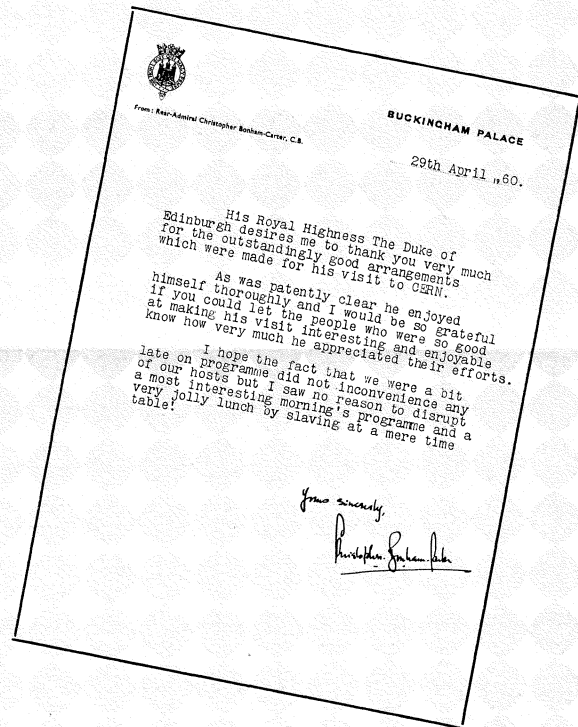
At the Scientific and Technical Services Division, the Duke and his party were met by Dr. Goldschmidt-Clermont, in the absence of Dr. Kowarski, and were shown radiation monitoring devices, instruments for

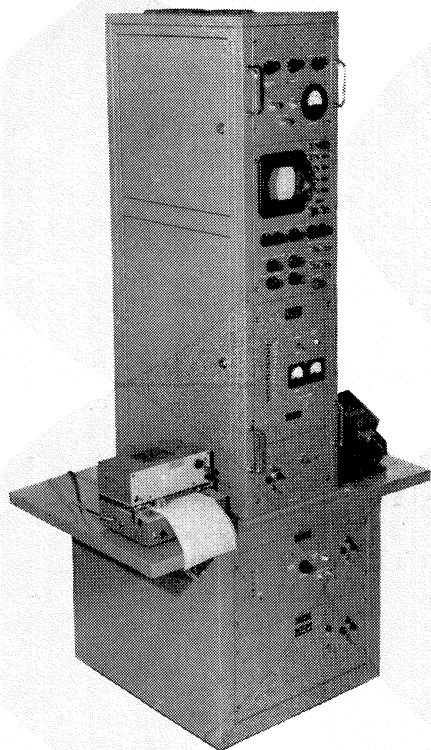
the evaluation of the photographs of nuclear events and the electronic computer.

After an apéritif, the visit ended in the CERN canteen with a luncheon at which were present, besides the Royal party and guests, Mr. J. Treina, President of the Council of the Republic and Canton of Geneva. Mr. L. Billy, Mayor of Geneva, Dr. Steiger and senior staff of CERN.

The Duke left CERN at 2:50 p.m. That this was later than planned was evidence of the interest he had taken in what he saw and the many questions he asked.

As Prof. Bernardini said, "his questions were much deeper than those usually asked during general visits. I must admit I had to think hard before answering." As for Mr. J. B. Adams, he remarked that "Prince Philip would have needed three days, not three hours to get all the answers to the questions he wished to raise about the technique explained to him".





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Other People's Atoms *Continued from page 3*

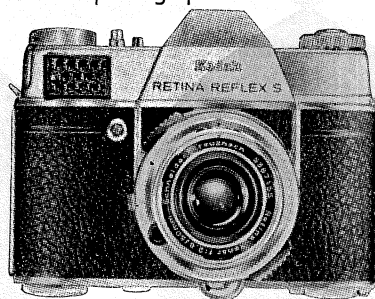
negative K interactions in propane was designed to measure precisely the mass of the negative xi-hyperon (the negatively charged counterpart of the neutral xi-zero hyperon) to study the interaction of the more common lambda-zero hyperons with free protons, and to observe the decay characteristics of lambda-zero hyperons with free protons, and to observe the decay characteristics of lambda-zero hyperons. The antiproton exposure was designed to study further the antiproton-nucleon annihilation process in order to answer questions about the number and the kind of particles produced in the annihilation process, and to determine if certain types of particles have directional correlations when emitted together in an annihilation process.

Another bubble chamber, the **21-litre liquid xenon** chamber constructed at the University of Michigan also is being used for experiments at the Bevatron. The distinguishing characteristics of this bubble chamber is that it is a very efficient detector for certain neutral radiations such as gamma rays as well as being a good detector for the usual charged particles. It thus is possible to study the neutral decay modes of the strange particles directly, whereas such experiments are extremely difficult, tedious, and sometimes impossible in bubble chambers filled with hydrogen or propane.

Several **counters experiments** have been performed to study the interaction and annihilation of antiprotons with protons and deuterons. These experiments generally complement, rather than overlap, the corresponding bubble chamber experiments. Results show that antiproton-nucleon interactions at all energies measured so far (0 to 2 BeV) have a considerably larger cross section than the corresponding nucleon-nucleon processes●

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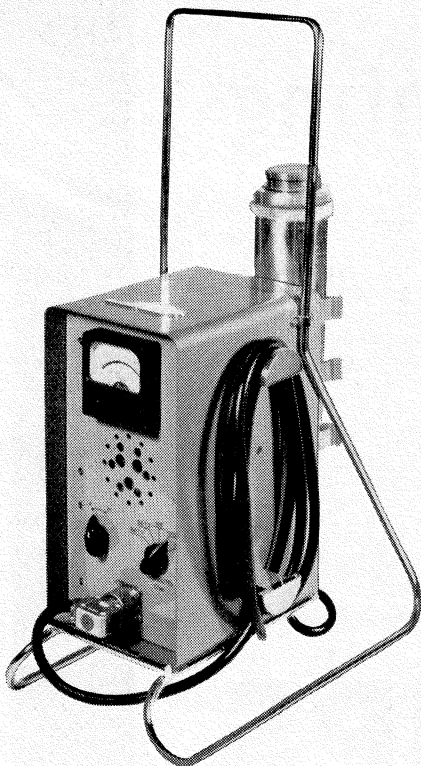
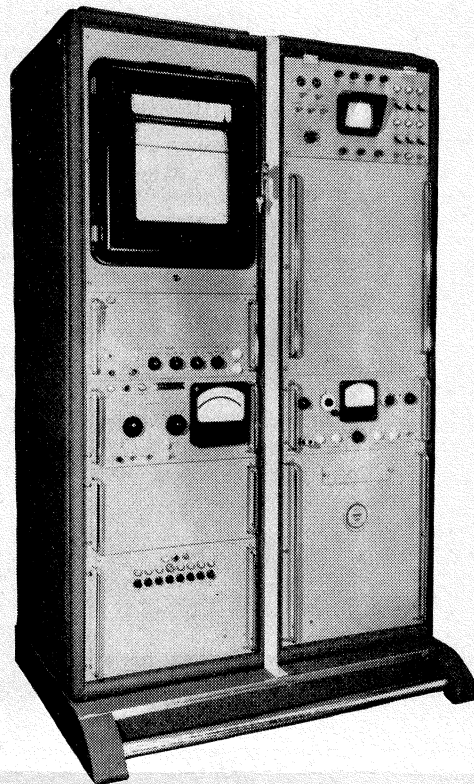
S.A.I.P.

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

- Number of channels : 60
- channel width : 1 Volt to 0,1 Volt
- 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

cost for the analyzer	39 700.— NFF/FOB PARIS
extra cost for the recorder	4 340.— NFF/FOB PARIS
extra cost for the scaler and for the typewriting machine	8 762.— NFF/FOB PARIS



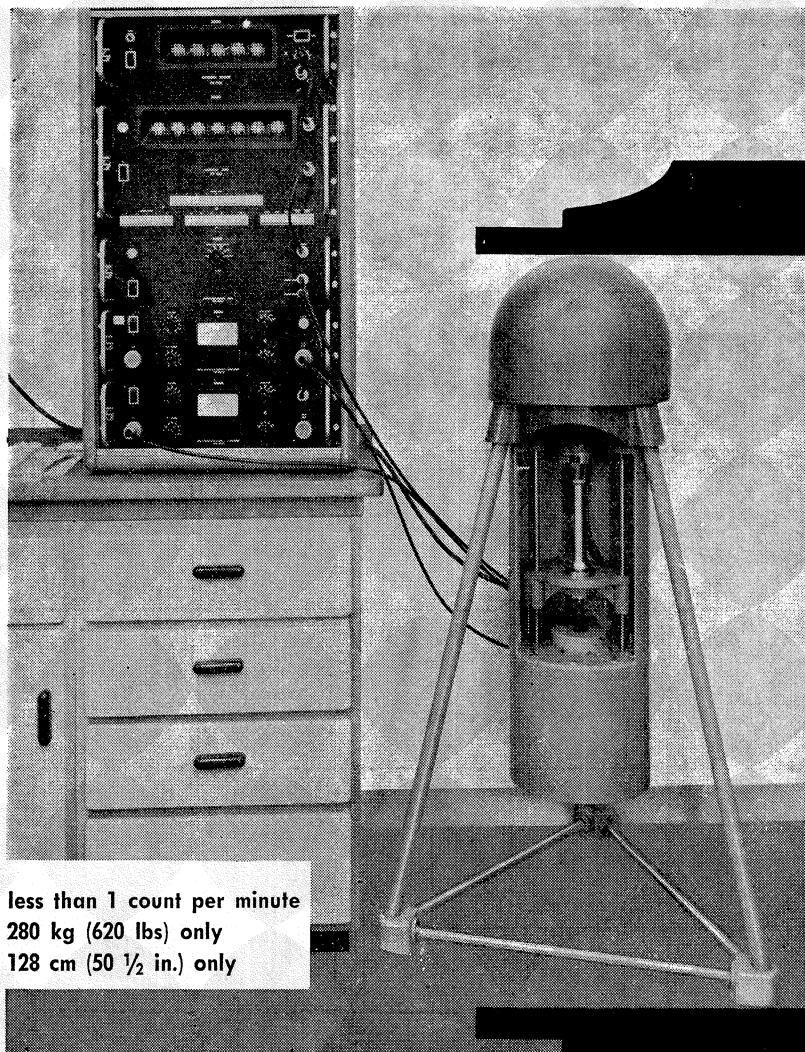
Fast neutron detector - DRNR

- Interchangeable scintillation probes
- High sensitivity to fast neutrons
- Fast response
- Fully transistorized
- Supply : rechargeable dry accumulators

cost of the detector : 3 670.— NFF/FOB PARIS.

Other activities

- Scintillation spectrometers
- Transistorized scalars
- Proportional counters
- Single and multichannel pulse height analyzers
- Ratemeters
- Amplifiers
- 2 π and 4 π flow counters



Background : less than 1 count per minute
Weight : 280 kg (620 lbs) only
Height : 128 cm (50 1/2 in.) only

128 cm

low-level beta counting

Low-level beta counting is brought to an elegant and simple solution by the novel Philips anti-coincidence assembly, type PW 4127, together with its associated electronic equipment.

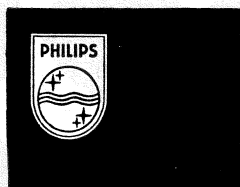
The assembly comprises two radiation-sensitive elements only, viz. a low-level beta counting tube*), and a single guard tube which replaces the conventional array of dozens of guard tubes hitherto required for low-level work. By virtue of this unique design tons of shielding material are eliminated; the electronic circuitry is considerably simplified, and hence overall reliability is greatly improved. Reproducibility is guaranteed by the fixed geometry of the sample with respect to the counting tube.

With a background of less than 1 count per minute, it is now possible to measure in a 300 mg sample a beta activity (e.g. Sr⁹⁰ or Tl²⁰⁴) of $(5 \pm 0.5) \times 10^{-12}$ Curie in only one hour.

***) Two types available:**

type 18515 for measuring low-energy beta radiation, with a 1.5 mg/cm² mica window;

type 18516 for general low-level beta work, with a 10 mg/cm² Cr-Fe window.



PHILIPS

nuclear equipment