

34th Session of CERN Council

The 34th Session of the CERN Council was held on 14 and 15 June under the Chairmanship of Dr. G. Funke.

Progress Report

The Director General, Professor B. Gregory, singled out a few significant experimental results from the research over the past six months.

One of the most interesting, and puzzling, recent results came from an experiment on large-angle proton-proton scattering. When high energy protons are directed onto a hydrogen target, the resulting scattered and recoil protons come off from the target predominantly travelling in the direction of the incident beam. Very few emerge at large angles, up to 90° to the direction of the incident beam (in the centre-of-mass system); in other words the cross-section for large angle scattering is very low. However, using a slow ejected proton beam has produced a sufficient number of these events to make it possible to investigate this region. At a given momentum the cross-section falls off exponentially as the angle increases and this can be characterized by a scattering parameter. This parameter was determined at 20 GeV/c and then at progressively lower momenta.

It became obvious that the results would not tie up easily with results previously obtained at much lower momenta at Berkeley. The momentum region (around 9 GeV/c) in between that covered at Berkeley and that covered at CERN was therefore investigated and revealed an anomaly in the behaviour of the cross-section.

Another experiment involving groups from CERN and Liverpool University, UK, using the hydrogen bubble chambers, found two resonances (one of them possibly identical with a resonance identified in a missing mass spectrometer experiment at CERN). They used anti-proton beams of momenta 3 and 2.5 GeV/c and measured the annihilations with the protons in the chambers resulting in six observed pions (three positive and three negative). They were able to show that there are two resonances, at 1717 MeV and 1832 MeV, which decay into four pions.

A missing mass spectrometer experiment, which yields high precision in the measurement of particle mass, showed a two-peak structure for the A_2 meson, indicating that there are probably two separate particles in that mass region.

The Director General also referred to the analysis of the decay of the eta meson into two charged pions and a gamma, which gave no evidence of the violation of charge symmetry in the electromagnetic interaction. (This was covered in CERN COURIER vol. 7 p. 45.)

A Conference, organized by the Weizmann Institute and CERN, held at Rehovoth in February, showed the great interest in nuclear structure research at present. About 90 % of the experiments on the 600 MeV synchro-cyclotron at CERN are now devoted to nuclear structure problems.

Improvement Programme and ISR

The improvement programme for the existing CERN facilities can be considered in two parts — that concerned with particle detection equipment and that concerned with the 28 GeV proton synchrotron itself.

Progress has been made this year on two items of future detection equipment. One is the very large hydrogen bubble chamber project (discussed separately below); the other is the item for electronics experiments. A working group has been set up to draw up the specification and to design a large magnetic spark-chamber. The aim is to set-up an array of spark chambers in a magnetic field of large volume. The project is known as the 'Omega project' and it is hoped to present a report from the working group by the end of the year.

On the proton synchrotron, the first phase to increase the repetition rate of the machine, is progressing well. The motor-alternator set of the new power supply for the main magnets has arrived at CERN and work on the new accelerating cavities has reached the stage where a model cavity has been installed in the synchrotron ring for tests.

The second phase to increase the intensity of the proton beam, involves a higher injection energy into the main synchrotron ring. Various ways of achieving this have been studied and attention has moved from the initial idea of building a linear injector of 200 MeV energy to replace the existing one of 50 MeV, to the construction of a slow-cycling synchrotron with an energy possibly as high as 800 MeV. This 'booster' is now conceived as



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four rings, of 50 metres diameter, stacked vertically one on top of the other.

It has emerged in the course of these studies and their inter-relation with the ISR project, that the 'luminosity' (which can be thought of as the number of charged particles that can be packed into a given beam size) in the proton synchrotron could probably be increased by a factor over ten. This would have great advantages for conventional operation of the synchrotron itself and particularly for the intersecting storage rings where, if the factor of over ten could be achieved in each of the colliding beams, the interaction rate could be increased by over a hundred. It is hoped that a report on the booster studies will be presented to the Council in December.

Construction of the intersecting storage rings is proceeding to schedule. The excavation work for the ring tunnel has reached the stage where about one third of it is complete. Several of the main items of equipment for the rings are now out to tender.

300 GeV Project

The Council received the Report of the European Committee for Future Accelerators (summarized on page 103). It was introduced by Professor Amaldi who again underlined that work on the Report had involved scientists from throughout Europe whose hard work and enthusiasm had been most impressive.

In the discussion that followed Professor Puppi, on behalf of the Scientific Policy Committee, said that Europe could now go ahead with reinforced confidence in the 300 GeV project from the points of view of the

Page 108 : Site work for the intersecting storage rings now at an advanced stage. Many tons of earth have been removed and excavation for the beam tunnel is about on third complete.

Left : Professor E. Amaldi, Chairman of the European Committee for Future Accelerators, photographed in the CERN Council Chamber.

appropriateness of the machine itself and of the great interest of the physicists. Technically, scientifically and psychologically there were now no barriers to setting up the 300 GeV Laboratory.

Dr. J. B. Adams, a former Director General of CERN, drew attention to the rise in the cost of the experimental work per physicist over the next years which emerged from the ECFA model programme. This, on average, came to approximately 4% per year which was no more than the sophistication factor that we had come to expect in this type of work. Implicit also in Report was the question of priorities and where there was a limitation on funds, these priorities needed to be established. Support for the 300 GeV project would seem to be essential if Europe was to continue in this field, which, in turn, implied that the home support for the international Laboratories should be maintained. This meant that if financial cuts had to be imposed these would need to come first from the national programmes.

Dr. W. Francis, speaking for the United Kingdom, said that British nuclear physicists regarded the 300 GeV as of the first priority. But the rates of growth of manpower and costs envisaged in the ECFA Report were greater than the rates expected in the UK. The corollary of this was that if and when the 300 GeV came into operation the UK would have to give lower priority to participation in CERN-Meyrin and in their own national laboratories.

Prof. Perrin speaking for France went further by saying that whereas in France there was a national proposal for a 45 GeV accelerator, this would only make sense if the 300 GeV project went ahead. If for some reason, Europe decided not to proceed, then there would be little point in proceeding with the 45 GeV project because the only significant research would then be done in other Continents. The priority for France was first the 300 GeV project, second the support of CERN-Meyrin and third the national programme.

In reply to a question on the future of ECFA, Professor Amaldi said that many people had expressed the view that ECFA should continue to exist in some form. It would be important to have the utilization studies for the 300 GeV machine under continual revision to keep pace with

developments in physics and technology. Other work, such as examining more data on national programmes could be useful. The best way of keeping ECFA active, if it is decided that this would be beneficial, will be discussed at a meeting later this year.

New Convention

In accordance with decisions taken at the Council Meeting in December 1966, formal preparation has been going on since the beginning of this year, on a new Convention which would accommodate CERN-Meyrin and the proposed 300 GeV Laboratory. This would enable the two Laboratories to operate under one Council, with common Scientific Policy and Finance Committees to look after the scientific programmes and expenditure at the two centres. Although it is hoped to achieve substantial common membership of the two Laboratories, the new Convention needs to safeguard the interests of participants in the various projects. Nevertheless, since the existing Convention has functioned so well, as few changes as possible are being made.

There was a long discussion on the draft new Convention and related documents. The drafting committee arranged to meet in Stockholm on 28 June to go through the Convention again taking into account the views expressed at the Council Meeting. Any Member State, wishing to do so, could send legal experts to this meeting of the drafting committee. It is hoped that a final version of the new Convention will be ready for presentation to the special Council Meeting in September, and that Governments will be able to take a decision on the Convention in December.

Sites

Further information on the studies being carried out on nine possible sites for the 300 GeV Laboratory offered by Member States were presented in two volumes 'Sites for the Proposed CERN 300 GeV Proton Synchrotron' (document CERN/644/Rev. Vol. 1 and Vol. 2). The nine sites under investigation are

Austria	Göpfritz
Belgium	Focant
Federal	
Republic of Germany	Drensteinfurt

1. Professor Wolfgang Paul who relinquishes his post as Director of the Physics I Department to return to Bonn University.
2. Professor Giuseppe Cocconi, who succeeds Professor Paul, lecturing at CERN on one of his favourite topics - astrophysics.

France	Le Luc
Greece	Aspropyrgos
Italy	Doberdo
Spain	El Escorial
Sweden	Uppsala
United Kingdom	Mundford

The first volume was assembled by the CERN Study Group and contains general information and comparative tables on the various sites. It covers data such as geographical location, available area, topography, nature of terrain and seismic activity of the region, water and electricity supplies, and accessibility. The aspects which would concern personnel were also investigated, such as climate, recreation, housing, educational facilities, and proximity of nearest towns. These last are also important with regard to the availability of local man-power and industry.

The second volume was compiled by geological and geotechnical experts from the respective Member States and gives technical details of the sites.

Several speakers at the Council Meeting emphasized that it is still too early to make judgements at this stage on the respective merits of the sites. The Working Group (Mr. J. H. Bannier, Mr. A. Chavanne and Professor J. K. Bøggild, all from countries not offering a site) set up at the last Council Meeting to study the Site Reports and the problem of site selection, will give their views on the various proposals probably at the Council Meeting in December, at the same time presenting the report of Dr. Bjerrum, the consultant geologist. The final decision on the site will therefore not be taken until 1968.

Serpukhov collaboration

The Council authorized the Director General to sign an agreement with the USSR State Committee for the Utilization of Atomic Energy along the lines of a draft Convention which has been prepared by representatives of CERN and the Soviet Union. Some points of detail have still to be cleared with the Soviet authorities but it is hoped that the agreement can be signed in the very near future.

The agreement concerns collaboration at the 70 GeV proton synchrotron which is



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nearing completion at the Serpukhov Laboratory. It will give European scientists access to what will be for several years the highest energy accelerator in the world. More information about this collaboration will be given probably in the July issue of CERN COURIER.

Large Hydrogen Chamber

An agreement concerning the construction of a very large hydrogen bubble chamber was authorized by the Council. The chamber which has a diameter of 3.5 metres, will be built as a joint project by CERN, France and the Federal Republic of Germany. It is scheduled to cost 84 million Swiss Francs, the finance being provided equally by the three partners. A steering committee with one representative from each party will supervise the project.

This new chamber is one of the major elements of the improvements programme at the CERN proton synchrotron. It will be described in detail in an article in the August issue of CERN COURIER.

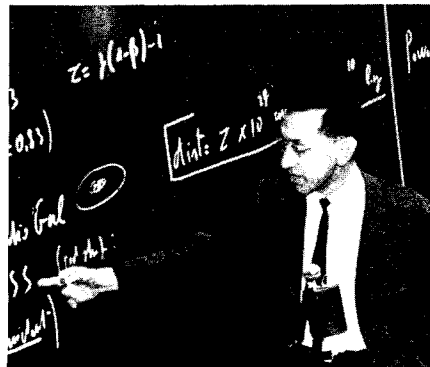
The Council expressed its gratitude to France and Germany for their willingness to make this extra, important contribution to the future of European physics at CERN.

Appointments

Professor G. Cocconi was appointed Director of the Physics I Department for the next three years in succession to Professor W. Paul.

Professor Wolfgang Paul had expressed the wish to return to the Federal Republic of Germany to direct the Physics Institute at Bonn University. He has been at CERN since 1964, first as joint Head of the Nuclear Physics Division and then, following the internal reorganization in June 1966, as Director of the Physics I Department. He will remain in close contact with CERN by virtue of his position as Chairman of the Electronic Experiments Committee (the committee which prepares the programme of experiments using counters and spark chambers for the proton synchrotron).

The Council expressed its thanks to Professor Paul for the contribution he has



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made to the work of CERN during the past three years. During this time the programme of electronics experiments has greatly increased in importance and has involved, for the first time, extensive collaboration with other Laboratories and universities throughout Europe.

Wolfgang Paul has been Professor at Bonn University since 1952. It was there that in 1958, he led the work on a small electron synchrotron (500 MeV) which was the first machine in Europe to operate using the strong focusing or alternating gradient principle to achieve beam focusing. He has also played a leading role in the project for a 2.5 GeV electron synchrotron at Bonn which came into operation in March of this year.

Professor Giuseppe Cocconi joined CERN in 1963, though he was here previously for two years in 1959-60. He has been active in sub-nuclear physics research for many years, both in Europe and in the United States. His particular interest is the study of strong interactions and, for example, he led the team which carried out the important experiment on large-angle proton-proton scattering referred to in the Director General's progress report to the Council.