

43rd Session of CERN Council

The Council met at CERN on 18, 19 June under the Presidency of Professor E. Amaldi. In the photograph, left to right, are : J. B. Adams (Director designate of the 300 GeV project), B. Gregory (Director General of CERN), E. Amaldi, G. H. Hampton (Director of Administration).

300 GeV Project

The main topic of interest at the Council meeting was, of course, the 300 GeV project where the first reactions were heard from the twelve Member States of CERN to the alternative proposals to construct the accelerator alongside the existing Laboratory. The background to these proposals has been explained in the last two issues of CERN COURIER (page 107 and page 146). We restrict ourselves here to describing the proposals as they were presented to the Council. Following discussions in the European Committee for Future Accelerators (ECFA), the Scientific Policy Committee and within CERN itself, there have been a number of modifications to the initial presentation of two months ago.

The proposals are to build a 300 GeV proton synchrotron adjacent to the existing CERN Laboratory. Using a separated function magnet lattice for the main ring (which enables high energies to be reached with a smaller diameter ring than using a combined function lattice) and having one main ejected beam-line (rather than several emerging tangentially) the machine can be accommodated on a site on the opposite side of the Geneva-St. Genis road without intruding on built-up areas.

The 28 GeV proton synchrotron would be used as a ready made injector and, to get physics at higher energies going as quickly as possible, a beam-line would be built from the main ring to the West Experimental Hall which has been built alongside the Intersecting Storage Rings. (The West Hall will soon be equipped with advanced experimental equipment — the 3.7 m European hydrogen bubble chamber and the magnet—spark chamber assembly, 'Omega'.) Whilst the main ejected beam-line and new experimental area (North Experimental Area) were being constructed, higher energy physics would be under way in the West Hall.

To leave the way open for the use of pulsed superconducting magnets which could take ultimate peak energies much higher, the missing magnet design would be used and, at the start, conventional magnets would be ordered to fill up only

half the ring (corresponding to an energy of 150 GeV). After three or four years, when the potential of superconducting magnets is better known, the decision could be taken whether to go straight to 300 GeV, by ordering the remaining conventional magnets to fill up the ring, or to leave room for the later introduction of superconducting magnets to give 400 GeV, or higher, peak energy.

A possibility for a subsequent stage then opens up; the initially installed conventional magnets could be replaced by further superconducting magnets and the peak energy taken to 800 GeV or above. (This future possibility is not included in the project which Member States are now being asked to support.)

To use the 28 GeV synchrotron as injector imposes a definite ratio between the diameters of the two machines. Protons would be accelerated to 10 GeV in twenty bunches with the existing machine and these bunches would then be injected so as to distribute them evenly around the circumference of the 300 GeV ring. The discrete bunches would then be allowed to smear into a ribbon beam (debunching)

before the radio-frequency accelerating system came on to re-form them into bunches for acceleration to the peak energy. For this process to be done with maximum efficiency, given the fixed diameter of the 28 GeV machine, the 300 GeV machine must have a diameter of 1.8 or 2.2 km. (Less efficient possibilities are 1.98 and 2.09 km). The initial proposal was for 1.8 km, but since costs do not depend dramatically on diameter, the 300 GeV accelerator could be distributed more liberally around a bigger circumference. This would then give the possibility of a still higher peak energy when packing this circumference with superconducting magnets at a later stage. The decision here depends on the site survey revealing the extent of the molasse rock, and on the solution of problems which might arise from intrusion on inhabited areas with a diameter larger than 1.8 km.

Construction of the accelerator is planned to cause as little disturbance as possible to the environment. The main ring would be tunnelled in the molasse rock some thirty or more metres below ground (mainly dependent on the findings of the



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A schematic diagram showing the proposed interlacing of the existing CERN installations with the 300 GeV accelerator. Beam-lines built underground would transport 10 GeV beams from the existing proton synchrotron to the 300 GeV (the PS serving as injector) and high energy beams from the 300 GeV to the West Experimental Hall (enabling higher energy physics to begin earlier using detectors which are already under construction).

site survey) and radiation levels on the surface would be well below tolerance. Farming of the land, etc. could quite feasibly continue exactly as at present. Six small buildings would be needed over the six machine straight sections but in an area of this size would be lost in the landscape.

Only where the ejected beam-line is tapped to bring beams to the surface and the North Experimental Area is constructed, together with offices and laboratories, would land need to be specifically reserved. This requires parts of a strip of land about $\frac{1}{2}$ km wide and 4 km long.

The main ring and the beam-lines connecting with the 28 GeV accelerator and with the West Hall cross the Franco-Swiss border. This introduces special problems but such problems have been solved before in the existing Laboratory which also crosses the border. At present there is no site offer (in the sense of the previous site offers from Member States for construction of a new Laboratory) from France and Switzerland and the conditions

on which the site could be made available have not been negotiated. The same is true for the essential services of electricity and cooling water and for the general conditions like housing and education affecting staff coming to join the project. It is hoped that these problems can be resolved before the end of this year.

The aim is to start the 300 GeV project at the beginning of 1971 and we now come to the vital figures on cost and timescale. The cost estimate for the total 300 GeV project spread over eight years is 1112 MSF. It divides as follows :

— the machine itself	584 MSF
— Laboratory and services	182 MSF
— preparation for research	216 MSF
— machine operation during the construction period	130 MSF
Total	1112 MSF

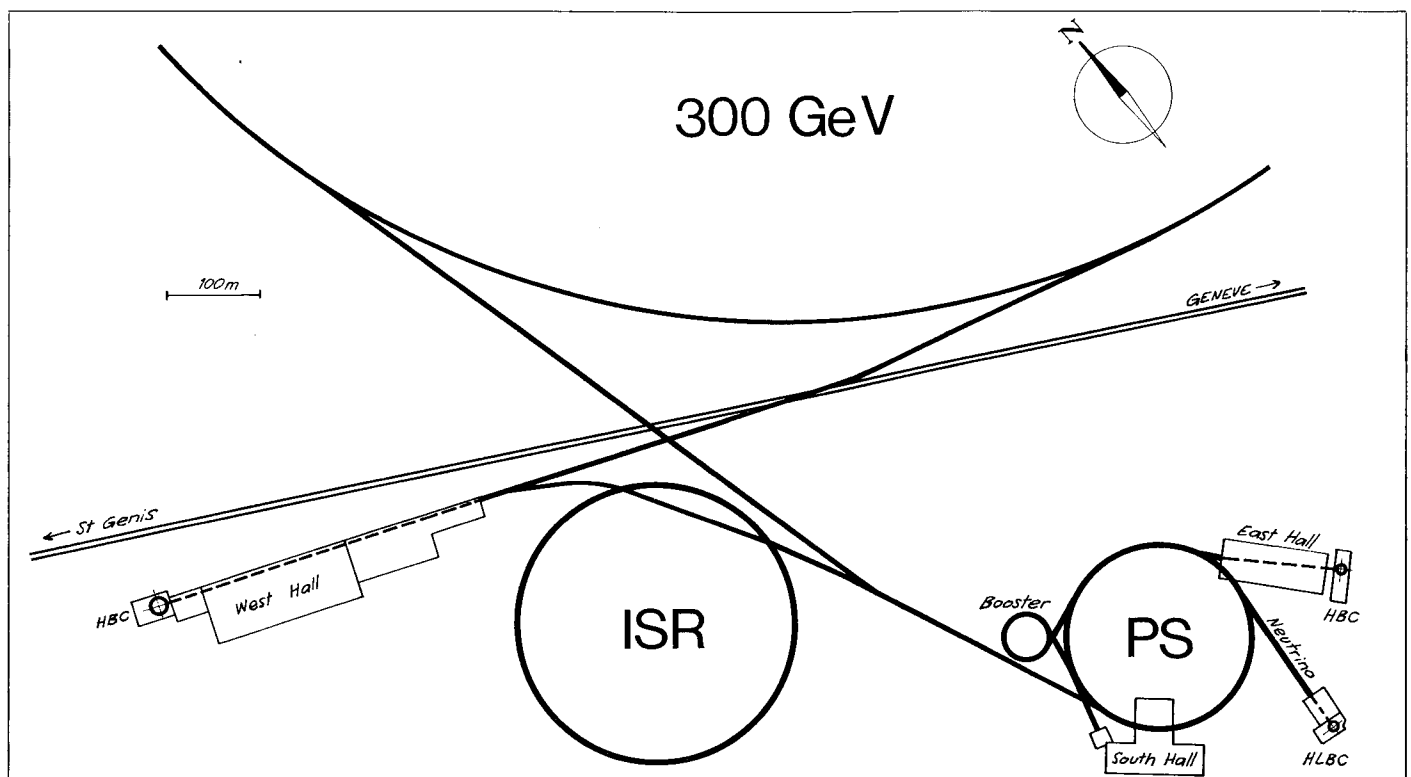
The costs are estimated on the basis of conventional magnets since no reasonably precise figures can be put forward for superconducting magnets at this stage. Note that the total for the whole project of 1112 MSF includes 130 MSF spent to oper-

ate the accelerator for physics in the West Hall while construction of the North Area is being completed. (It is proposed to cover the cost of the research during this period within the budgets foreseen for the existing Laboratory.)

The timescales are then — eight years for the design and construction of the total project ; six years for the completion of a conventional ring to give 300 GeV. This means that, if the project starts at the beginning of 1971, physics at higher energies could begin from the end of 1976. (This is as early a start as was anticipated in the ECFA report of 1967.) If the decision is made to halt at the 150 GeV point, (to bring in superconducting magnets) physics could be started with 150 GeV beams at the end of 1975.

The staff estimates envisage a build up to a total of 980 staff associated with the 300 GeV project by the end of 1978. The staff would in that year be divided into Machine Group (400), Research Group (220) and Services Group (360).

The proposal to construct the new accelerator alongside the existing Labo-



A map of the region around the existing CERN Laboratory showing a possible position of the 300 GeV accelerator and its major ejected beam line feeding the North Experimental Area. The proposed accelerator, built deep underground, would intrude very little on the present use of the region.

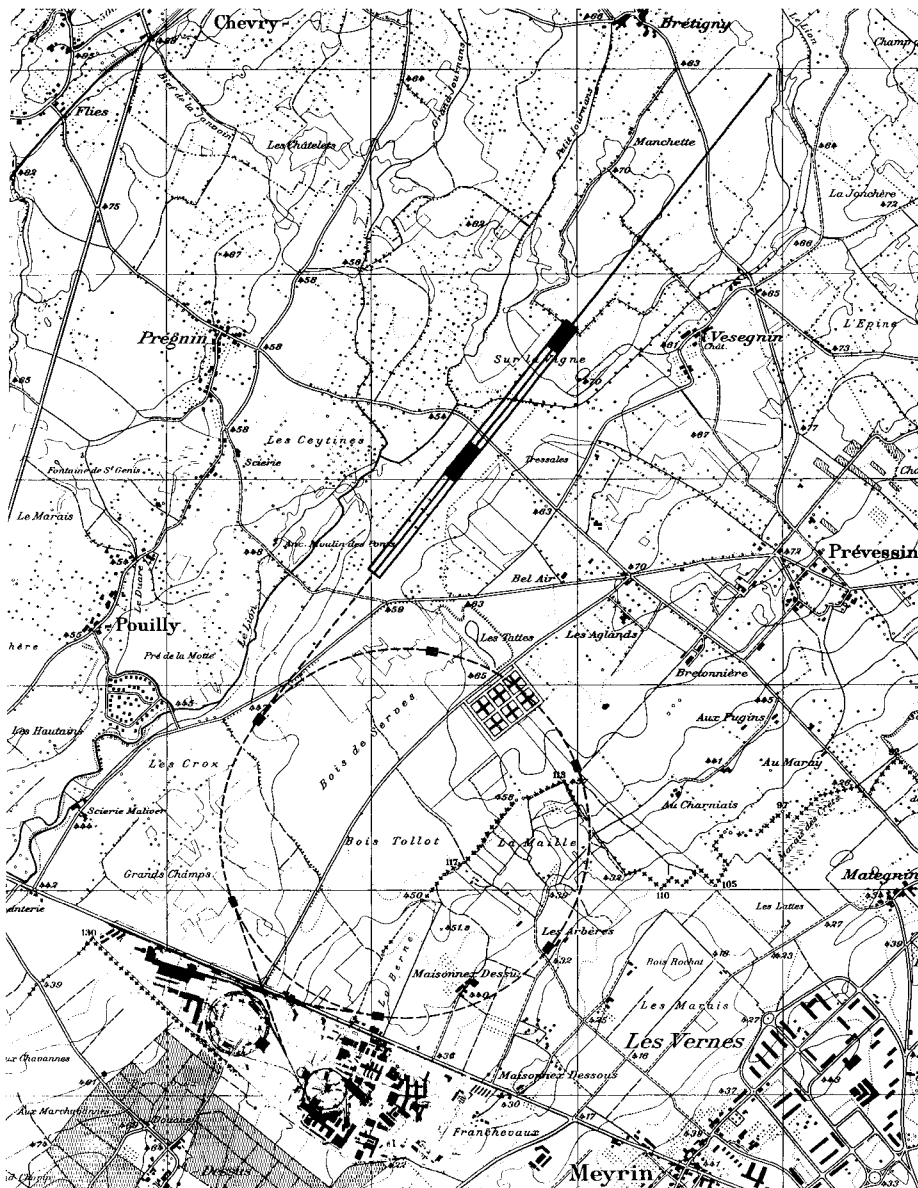
ratory requires a reappraisal of the programme which was foreseen for the existing Laboratory under the assumption that the 300 GeV Laboratory would be built elsewhere. The use of the 28 GeV proton synchrotron as injector and the West Hall as initial experimental area further integrates the programmes and budgets which had previously been discussed separately. The existing Laboratory had been seen as carrying the full research burden for another eight years. If higher energy physics becomes possible from the end of 1975 or 1976 less will be required of the other facilities (there will, in any case, be an automatic transfer of interest to higher energy experiments).

With this new situation in mind, an attempt has been made to organize the budgets in such a way that the 'new money' required for the construction of the 300 GeV accelerator (that is the money over and above that which Member States would anticipate paying for the existing Laboratory) is at a level which enables the project to be realized quickly and which could attract all Member States to participate.

The CERN Scientific Policy Committee recommended that the 'new money' should be set at 900 MSF spread over eight years. Given the total 300 GeV project cost of 1112 MSF, this means that 212 MSF over the same period would have to be found from within the budgets foreseen for the existing Laboratory. Over the past year a 'plateau budget' for the existing Laboratory of 340 MSF has been accepted as reasonable by the Member States. This would be reduced to 310 MSF to find the money (212 MSF) during the construction years of the 300 GeV accelerator.

Budgets (in million Swiss francs) for the eight years would then look as follows:

	Existing Lab.	300 GeV Project	Existing + 300 GeV	'New Money'
1971	330	40	370	30
1972	320	110	430	90
1973	310	160	470	130
1974	310	160	470	130
1975	310	160	470	130
1976	310	160	470	130
1977	310	160	470	130
1978	310	160	470	130
Total	2510	1110	3620	900



The precise detail of how 30 MSF per year could be saved within the programme foreseen for the existing Laboratory has not been finalized but it seems possible to make these savings without eating significantly into the growth of physics research which has been planned with the improved proton synchrotron and the intersecting storage rings. Savings would come about via the transfer of staff (mainly accelerator and services people) though most of the 300 GeV staff would be newly recruited. Other savings could be made by delaying the start of high intensity programmes at the 28 GeV synchrotron and by reducing the exploitation of the West Hall.

To appreciate the attraction of the figures above, we can recall the equivalent figures used in the discussions three years ago. Then the cost of the project with its separate Laboratory was 1902 MSF (now 900 MSF 'new money') with a staff rising to a total of 2970 by the end of construction (now 980) and requiring a

design and construction timescale of ten years before beginning physics at 300 GeV (now six years).

If the new proposals are accepted, Europe will have at the Laboratory near Geneva a most remarkable complex of facilities for high energy physics research — nuclear physics to energies of 600 MeV with the synchro-cyclotron, physics in the tens of GeV range with the improved 28 GeV proton synchrotron, colliding beam physics with the intersecting storage rings, physics in the hundreds of GeV range with the new project. Such a complex would give the flexibility within one Laboratory to swing over a vast range of research following the swings of interest in the physics itself. It would guarantee that Europe would retain its present front-line position in high energy physics research for decades to come.

The first reactions from the Member States can be summarized as follows... All regard the alternative proposals with positive interest. Those countries which

had not declared their intention to participate in the 300 GeV project, as previously drawn up, indicated that the new proposals reopen the possibility of their participation. This opportunity to reunite all twelve Member States in the project is recognized by all countries as one of the great advantages of the new proposals.

The UK delegation stated that the refusal to join the project under the previous conditions no longer stands for the alternative proposals. The Science Research Council, which is responsible for UK expenditure in high energy physics, is unanimously behind the proposals and will advise the government accordingly. Participation would mean diverting a proportion of foreseen budgets from the national effort in high energy physics to the 300 GeV and, to reduce the impact on the national Laboratories, the UK would prefer to see the 'new money' set lower or the construction time extended by a year. Also, the UK considers that thought should be given to having the whole complex of the existing CERN Laboratory plus the 300 GeV under one Director General at least after the construction period. (This position with regards to cost and Laboratory management was also put forward by Sweden.) The UK declaration finished by asserting that we now have a splendid case.

The delegation of the Federal Republic of Germany, while expressing doubts about the desirability of concentrating research in one place in Europe, supported the proposals and insisted that a fast start and fast construction are important. It is necessary therefore to resolve quickly the questions concerning the site and related conditions and to assure that these are as favourable as those offered by Member States proposing sites for a completely new Laboratory. They preferred the 900 MSF figure for the 'new money' to avoid restricting exploitation of the existing research facilities too much. Undue emphasis on economy etc... should not be allowed to prejudice having, overall, a first class programme.

The French delegation recorded the interest of the government and the support of the scientists. There is some disappointment that the ultimate peak energy on a more restricted site would be less

than that possible on other sites but this is seen as more than compensated by the advantage of starting research at higher energies much faster with the alternative proposals. They are concerned also that the facilities built up in the existing Laboratory should be as fully exploited as possible and prefer the 900 MSF 'new money' figure. The conditions with regard to the site remain to be worked out and the government is unable to give any assurances at this stage that the conditions would be the same as those discussed for sites elsewhere.

The Italian delegation said that the alternative proposals were being examined with positive interest but that Italy still prefers the previous proposals. In particular with regard to the site there had been long scientific, technical and financial preparations to arrive at optimum conditions. Similar thorough examination is needed for the new site to ensure that the same guarantees are arrived at. Any differences should be clearly brought out so that the final judgement can be made on the basis of a clear comparison. What is important is to implement a project which is the best possible for the future of European science as a whole.

Some points from the statements of other delegations not mentioned above — Austria: favourable to proposals and urges a fast decision since other research projects are affected by the delays on the 300 GeV. There should be publicity for the new proposals to establish a favourable climate of opinion as quickly as possible. Belgium: favourable to proposals and ready to see the site at Meyrin to further the interests of European science and international collaboration. Netherlands: favourable to proposals but need to find an acceptable compromise regarding exploitation of existing Laboratory. Switzerland: favourable to new proposals. The government and the Canton of Geneva are ready to help solve, together with France and CERN, the site problems as quickly as possible. Norway, Denmark and Greece all recorded a positive attitude.

After the discussion there was unanimous agreement that more detailed

studies should proceed immediately and to this end all delegations supported a budget of 1 MSF for the remainder of this year. The appointment of J.B. Adams to lead these studies was confirmed.

The technical studies will concern continuation of design work on the machine and such things as the layout of the West Hall for higher energy physics, so as to be in a better position to start the project at the end of the year. There will be a series of borings carried out on the proposed site in order to determine the location and quality of the molasse rock.

In readiness for the Council Meeting scheduled for 8, 9 October, several important documents will be prepared — (1) a revised 'programme definition' setting out the framework in which the 300 GeV project will operate and the commitments of participating States; (2) a site document laying down the conditions under which the site is made available for the project; (3) a document detailing the impact on the research programme at the existing Laboratory.

The need for an early start is recognized and it is hoped that, following receipt of these documents in October, governments will be able to arrive at a decision on the project by December.

Collaboration with ESO

The possibility of collaboration between the European Southern Observatory organization and CERN was first brought to the attention of the Council last December. At the June meeting the text of a formal Agreement was presented and Council was unanimously in favour of collaboration. The Director General was authorized to finalize the text together with the Director General of ESO, Professor A. Blaauw. The final text will be sent to delegations for comments before being signed.

ESO are constructing a large (3.6 m) optical telescope to be installed at La Silla in Chile. Under the terms of the Agreement a Division of ESO will come to CERN where the final design, construction and testing of the telescope will be carried out. The Division will comprise

about 50 astronomers, engineers and technicians.

The project involves an expenditure of about 50 MSF and is supported by six European countries — Belgium, Denmark, Federal Republic of Germany, France, Netherlands and Sweden. The Division will be able to draw on the experience at CERN in the engineering and administrative aspects of implementing a large project. The costs, including those in the services used by the Division, will be borne by ESO itself.

This collaboration, which is under the terms of Article 8 of the CERN Convention, is welcomed by the Council and by the Council of ESO.

Appointments

The Council unanimously appointed Professor W.K. Jentschke to succeed the present Director General of CERN, Professor B. Gregory. Professor Jentschke will take office for four years beginning January 1971. His biography appears at the end of this report.

Other appointments were — J. Steinberger to succeed G. Cocconi as Director of the Physics I Department; W. Thirring reappointed as Director of the Theoretical Physics Department; B. Zumino to succeed J. Prentki as Leader of the Theoretical Studies Division; P. Standley reappointed as Leader of the Proton Synchrotron Division; G. Brianti reappointed as Leader of the Synchrotron Injector Division; G. R. Macleod reappointed as Leader of the Data Handling Division; C. Tieche reappointed as Leader of the Finance Division; G. Ullmann reappointed as Leader of the Personnel Division. M. Cresti has been appointed to succeed J. H. Mulvey in October of this year as Chairman of the Track Chamber Committee.

The President of the Council thanked Professors Cocconi, Prentki and Mulvey for the competence and enthusiasm they have brought to their work for CERN during their periods of office.



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Professor Willibald Karl Jentschke, nominated Director General of CERN from January 1971, was born in Vienna, Austria, on 6 December 1911. He obtained a Ph. D. in physics in 1935 and stayed at the University of Vienna until 1946 doing research on nuclear reactions, a precision measurement of the neutron mass, and studies on the fission of heavy elements.

From 1946 he spent a ten year period to the University of Illinois, USA, becoming Professor in 1956. During this time, after some initial work on infra-red spectroscopy, he turned again to nuclear physics working at a low-energy cyclotron. In addition to many measurements of nuclear reactions (checking the validity of different nuclear models), he studied angular correlations between successively emitted gamma rays to determine the magnetic and electric moments of excited nuclei. In 1955, he was involved in a reconstruction of the cyclotron to transform it into a 'spiral-ridge', variable energy accelerator.

Professor Jentschke returned to Europe in 1956 as Professor at the University of Hamburg, Federal Republic of Germany, and undertook the construction of a new Laboratory to house a 7.5 GeV electron synchrotron (DESY: Deutsches Elektronen-Synchrotron). The official foundation of the Laboratory took place in 1959 with Professor Jentschke as Leader of a five-man Directorate.

An intensive research programme with electron and photon beams has been under way at DESY since the synchrotron came into operation in 1964. In 1968 the addition of 3 GeV electron-positron storage rings was authorized and they are now under construction. During his period as Director, DESY has grown from a small University Laboratory to a centre of international repute playing a major role in European particle physics.

Professor Jentschke has been closely involved with CERN for many years. From 1964 to 1967 he was delegate of the Federal Republic of Germany to the CERN Council and a member of the Scientific Policy Committee. In 1968 he spent a year at CERN as Guest Professor and took part in the work of the Directorate. In 1969 he was appointed Chairman of the Intersecting Storage Rings Committee which has been working on the first proposals for experiments with the ISR.

Professor Jentschke will take up his post at a time when the burden of being Director General of the European Organization for Nuclear Research is likely to be as heavy as it has ever been, with, possibly, some completely new problems of policy and of organization to be confronted. We wish him very successful and enjoyable years as Director General of CERN.