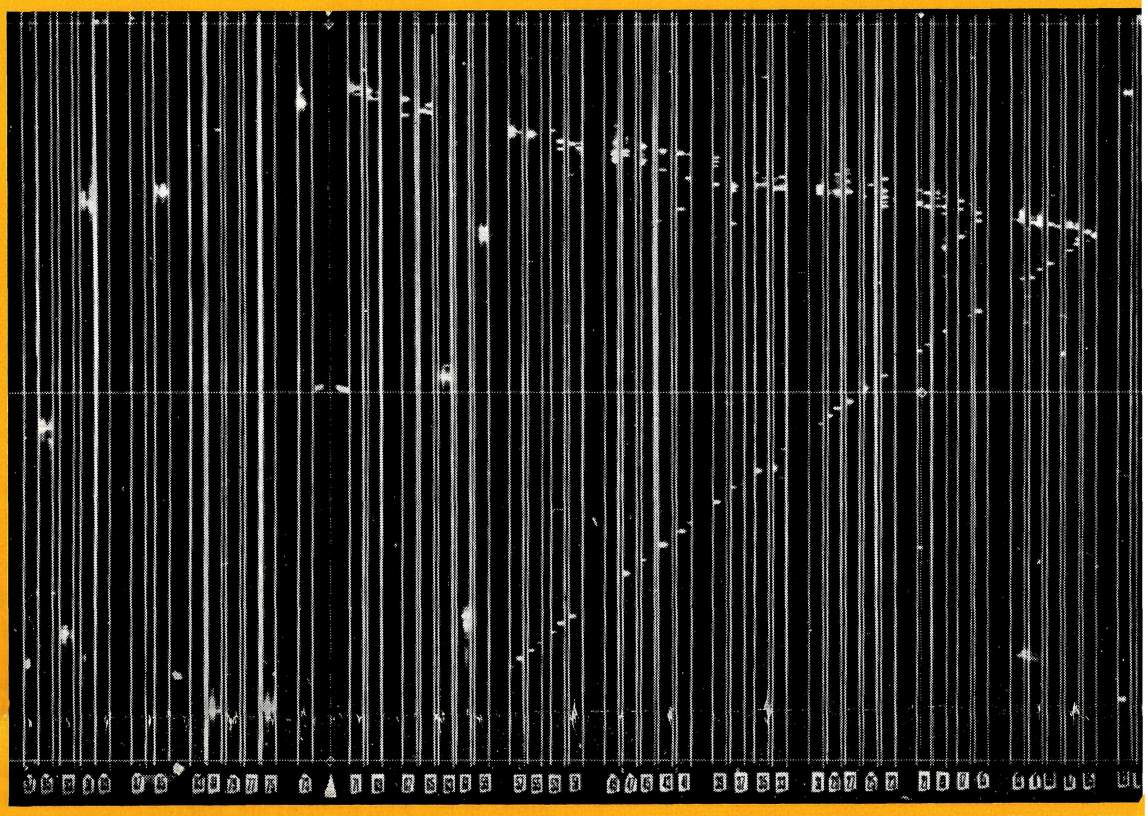
CERN COURIER



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EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

The European Organization for Nuclear Research (CERN) came into being in 1954 as a co-operative enterprise among European governments in order to regain a first-rank position in nuclear science. At present it is supported by 13 Member States, with contributions according to their national revenues : Austria (1.96%), Belgium (3.85), Denmark (2.09), Federal Republic of Germany (22.86), France (18.66), Greece (0.60), Italy (10.83), Netherlands (3.94), Norway (1.48), Spain (1.68), Sweden (4.25), Switzerland (3.20), United Kingdom (24.60).
Contributions for 1964 total 107.2 million Swiss francs.

The character and aims of the Organization are defined in its Convention as follows :

'The Organization shall provide for collaboration among European States in nuclear research of a pure scientific and fundamental character, and in research essentially related thereto. The Organization shall have no concern with work for military requirements and the results of its experimental and theoretical work shall be published or otherwise made generally available.'

Contents

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The cover photograph illustrates the subjects of all three articles in this month's CERN COURIER – the Sienna conference (p. 3), because there the results of the CERN neutrino experiment were first made generally known to European physicists, the December Session of Council (p. 6), as the experiment was especially cited during the review of the Organization's progress, and the Vacation Student programme (p. 8), since the analysis of photos of this particular kind was to a large extent in the hands of such students. The vertical white lines on the picture indicate the upright edges of the plates in the spark chamber used in the neutrino experiment ; the thin white lines are stretched threads providing reference marks for measurement. The long straight track is most probably due to a muon and the other spark pattern has all the characteristics of being caused by an electron shower. Events of this type are most interesting in connexion with the question of the existence of the intermediate boson.

CERN COURIER

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Last month at CERN

A few days before Christmas an important point was reached in the development of the studies using the **electron storage-ring model,** when what could properly be called a circulating beam was obtained for the first time.

The storage-ring model, otherwise known as CESAR (for CERN Electron Storage and Accumulation Ring), has been built and is being operated by a group in the Accelerator Research Division, and is intended to study various basic problems in the design, construction and operation of large proton storage rings such as have been proposed for use with the CERN synchrotron. With this type of storage ring, pulses of particles are injected at a particular energy and each successive pulse is then accelerated to a slightly higher energy, where it is left to circulate on a different orbit. In this way, particles are 'stacked' in the ring and a high circulating current can be obtained, though at the expense of a somewhat higher energy spread than in the initial injected beam. It is mainly to study this stacking process that the electron model has been built.

The ring has a circumference of 24 metres (that is, an average diameter of nearly 8 metres) and the particles are kept on their more or less circular orbits by means of a strong-focusing system comprising 12 bending magnets and 24 quadrupole 'lenses'. To achieve efficient stacking at all, and particularly to investigate the precise way in which it occurs, very high accuracies are required both in the construction of the apparatus and in the power-supply and measurement systems. Thus, for example, the lenses and magnets had to be positioned with an accuracy of 0.1 mm, and the three separate power-supplies for the bending magnets, focusing lenses and defocusing lenses are all stable to better than one part in ten thousand.

Naturally the energy of the injected particles has to be similarly controlled, and much of the group's effort in the first part of 1963 was devoted to commissioning trials and improvement of the double-beam 2-MeV Van de Graaff accelerator which is being used as injector for the initial series of experiments (see *CERN COURIER*, vol. 3, p. 18, February 1963). The first electrons were sent into the ring last August and serious attempts to get them to circulate were begun in September. It was some time before the beam could be persuaded to do one complete turn round the ring, after which systematic measurements on the position of the orbit showed that it did not conform to expectations, probably because of the presence of stray magnetic fields.

The field guiding the particles has to be accurate to about one part in a thousand at all points round the ring, and since about half the circumference is outside the poles of the electromagnets the effect of the earth's magnetic field could be quite large, in spite of the magnetic shielding provided. After putting back-leg correction windings on each of the bending magnets it was possible to guide the beam round the ring on its correct orbit horizontally, to within $\pm$ 0.5 mm. Air-cored electromagnetic coils in all the 12 straight sections between the bending magnets further enabled the deviations in the vertical plane to be corrected, and it was at this stage that continuous circulation was achieved, for times of up to 0.2 second. At first only about 25 μA of beam was captured in this way, but soon after work was resumed in the New Year the current had been increased to about 2 mA, or rather more than two thirds of the injected value.

Contributing to the difficulty of obtaining a stable orbit at injection is the fact that this orbit has to be close to the inner edge of the vacuum chamber (to allow space for the subsequent stacking) and consequently out of the most uniform parts of the magnetic guiding fields. Moreover the clearance here between the beam and various obstructions is

Continued on p. 9

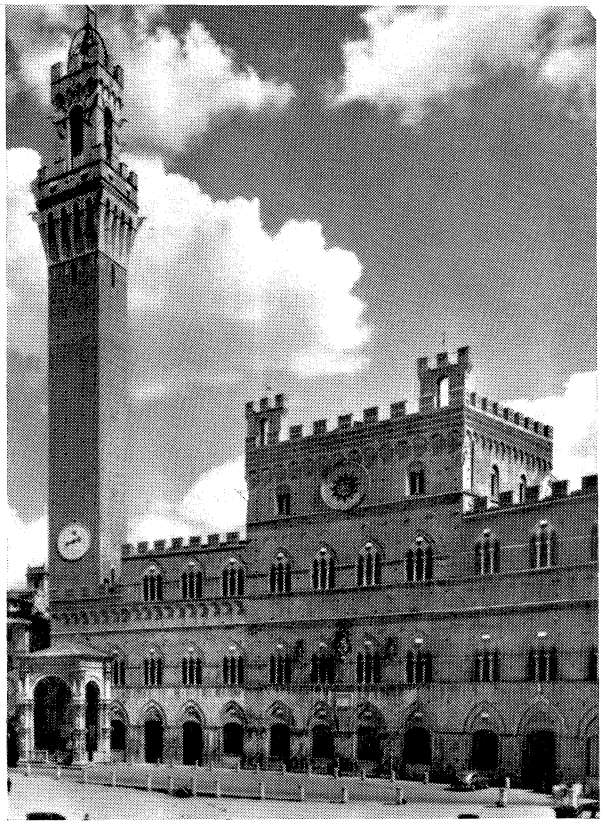

Photo : Omniafoto - Torino

The Palazzo Pubblico, **scene of the conference**

Conferenza Internazionale di Siena sulle Particelle Elementari

30 September - 6 October 1963

Last year the editor of *CERN COURIER* was privileged to be able to attend the Sienna international conference on elementary particles, held in the historic Italian city at the beginning of October. The following article is a personal recollection of the conference activities, both formal and informal, and of the physics that was discussed there.

'Sienna, situated on three hills in the midst of a picturesque countryside, has retained its Gothic aspect, studded with belfries and crenellated towers. Hardly any other town in the world presents such an appearance of refined civilization, where art flourishes at each step, and where modern life, far from destroying past traditions, has succeeded in assimilating them'*. Not exactly the sort of town, most people would imagine, where physicists might gather to talk about the most advanced topics of scientific research. Yet the city's 'programme of events' in 1963 included, as well as the world-famous *Palio,* the 48th Course of Italian language and culture for foreigners and the 20th Sienese Musical Week, an entry for 30 September - 6 October given as 'International Congress of Physics'.

ORIGINS OF THE CONFERENCE

For the explanation, it is necessary to go back to 1961, to Aix-en-Provence, France, and the first conference of a new type on high-energy physics, at which the participants were mostly younger research workers from European universities and CERN. The purpose of this conference, (as described by Prof. Leprince-Ringuet in an article reprinted in *CERN COURIER* in February 1962 (vol. 2, no. 2), was to bring together those who had little chance of attending the major 'Rochester' conferences every other year, and allow them to listen to, meet, and talk with a few of the leaders of international physics. That meeting was so successful that the French and the Italians agreed that it should be repeated every second year, for the benefit of all the young Europeans working and interested in elementary-particle physics. The task of organizing the second conference was taken over by the Italian Physical Society, and an organizing committee was set up under the chairmanship of Prof. Gilberto Bernardini, President of the Society and at that time still Directorate Member for Research at CERN. It was at his suggestion, and admittedly against much advice, that it was decided to hold the conference in Sienna, a city apparently ill equipped for a large scientific conference of this kind.

* Guide to Tuscany of the Italian National Tourist Office.

So it was that on the morning of Monday 30 September, 1963, the *Sala del Mappamondo* of the *Palazzo Pubblico* in Sienna was crowded with physicists, and their wives, for the opening ceremony of the **Sienna international conference on elementary particles.** After a welcome on behalf of the city by the deputy Mayor, Prof. Bernardini made the opening speech — first in Italian, then in English. Referring to the aims of the meeting, he said: 'We may well consider it to be the biennial conference of a new nation, not yet fully shaped, not organized politically, but already firmly established in that it exists in the spirit of some 350 million citizens. This nation is Europe. Naturally, physicists from countries the world over have been invited to come here to share with their European colleagues the responsibility of surveying the principal trends and the main achievements of this physics which demands considerable human and financial efforts from every civilized nation.'

PARALLEL SESSIONS

Lending point to these remarks was the presence at the conference of nearly 500 participants from at least 30 different countries. On the first afternoon and the second day they split into three, loosely defined, groups for 'parallel sessions' in the course of which nearly a hundred speakers reported briefly on their most recent work. Three meetings were held simultaneously and it was up to the participants to choose the one that was of most interest to them. Speakers were generally allowed only five or ten minutes to present their contributions, the rest of the time being given to questions and answers. These sometimes led to quite lively discussions, particularly in the theory sessions. In fact, in spite of the severe limitations on time for each speaker it quickly became obvious that the allowance for discussion had been insufficient. The formal sessions lasted well over the three hours assigned to them, and informal talks continued in small groups everywhere.

Even in these first sessions the participants sensed the meaning of the guide book's words and of Prof. Bernardini's reference to 'a city which is itself a glory

Photo : Foto Grassi - Sier

Prof. Bernardini opening the conference, in the Sala del Mappamondo **before the** Maestà **of Simone Martini.**

and a treasure for all mankind and where the expression of the Arts is dominated by this wonderful Palace'. Two of the sessions were held in rooms of the *Palazzo Pubblico,* which dates from about 1300 and is still partly used as the town hall. Here scientists found themselves discussing weak interactions in the *Sala degli Arazzi,* dominated by 18th-century Gobelin tapestries depicting the allegories of earth, air and fire, with frescoes showing 'heroic scenes taken from Roman and Greek history', painted in about 1530. Speakers in the theoretical physics session, held in the *Sala del Risorgimento* with its 19th-century frescoes on the life of King Victor Emmanuel II, shared the floor with a large statue entitled 'Sorrow'. The surrounding rooms, visited during coffee breaks or when the specialist talks happened to be of little personal interest, held many magnificent treasures, since this part of the building was normally a civic museum.

The third parallel session, like the plenary sessions to follow, was held in the *Teatro dei Rinnovati,* attached to the *Palazzo Pubblico,* resplendent with marble columns, deep-red upholstery and curtains, painted ceiling and ornate chandeliers. The chairman and speakers took the stage with two rather small-looking blackboards and a larger screen for the back-projection of slides (although the proceedings of the conference were in English, '*prossimo per favore*' was an Italian phrase very soon learnt by the speakers). Except when cameramen arrived to shoot some film for television, the performers on the stage were spared the ordeal of spotlights, but on at least one occasion a member of the audience was seen to add an authentic touch by using opera glasses to read the figures on the blackboard.

It was in this setting that most of the conference participants gathered on the second afternoon for the session devoted to neutrinos, undoubtedly the highlight of the meeting. Two years previously, at Aix-en-Provence, the centre of interest had been the relatively new discoveries of resonances and excited states, under the general heading of strong interactions. At Sienna, such is the present pace of advance, this topic no longer held so much excitement for most people, and its place was taken by a development in the study of the weak interactions, namely the neutrino experiment carried out at CERN during the summer of 1963. Since analysis of the results was still in progress, even the conference participants from CERN were anxious to hear the latest news, and the audience filled not only the stalls, but many of the four surrounding tiers of boxes in the theatre. As the afternoon progressed, a steady stream of 'deserters' from the other two sessions added to their numbers.

The session opened with a talk by G. Plass (CERN) describing the high-energy neutrino beam which had made the experiment possible. He was followed by S. van der Meer, who described the focusing behaviour of the magnetic horn (a device which afterwards received high praise from more than one speaker from the U.S.A.) and the neutrino-flux calculations. F. Krienen (CERN) then described the special spark chambers used in the experiment, and detailed the precautions necessary to avoid spurious operation. After this, D. H. Perkins (Bristol) outlined the results that had by then been obtained with the bubble chamber, and F. Ferrero (CERN) did the same for the spark chambers. The last paper was given by J. S. Bell (CERN), who examined the theoretical aspects of the results, and the meeting closed with a lively discussion centred around the possible evidence for the existence of the 'intermediate boson' or 'W-particle'. As reported in the October issue of *CERN COURIER,* the experiment had produced some very interesting results, most of which had given satisfaction to the theoretical physicists, who had generally not been far out in their predictions. It had been hoped that the riddle of the intermediate boson would have been solved in time for the results to be announced at the conference, but, in the words of Prof. Bernardini, who had been largely responsible for initiating experiments of this kind at CERN, Nature again proved to be holding on to her secrets. The CERN spark-chamber group presented some tempting evidence for the particle's existence, but had to insist that it was not conclusive. There remained the possibility of other explanations, and only a more refined treatment of the results or further experimental evidence would enable the right answer to be found.

PLENARY SESSIONS

The remaining three working days of the conference were occupied by 'plenary sessions' at which all the participants could hear and discuss talks summarizing the current position in the various branches of the subject. At the first of these, on 'weak interactions', M. Schwartz (Columbia, U.S.A.) gave a brilliant survey of the experimental work concerning 'non-strange' particles, bringing out the essential points in a way that was a model to all speakers. He was followed by U. Camerini (Wisconsin, U.S.A.), speaking on the experimental aspects of the weak interactions of 'strange' particles, and A. Salam (London), who dealt with the more important theoretical implications of the latest results in both classes. The situation in this branch of high-energy physics seemed brighter than at the last 'Rochester' conference at CERN in 1962. Discrepancies that were apparent then appeared to be well on the way to being solved, and in most cases there was a good deal of agreement between theory and experiment.

Experimental aspects of 'electromagnetic interactions' were dealt with in plenary session by P. Lehmann (Orsay, France), the theoretical position being summarized by R. Gatto (Florence). Here also, it was clear that many careful experiments were being carried out to test the theories in detail and to discover within what limits they were valid. Moreover, it seemed that

real progress was being made towards increased knowledge of the inner structure of the two nuclear particles, the proton and the neutron. A new departure was the observation at CERN, (reported in an earlier parallel session) of the mutual annihilation of a proton and an antiproton to produce only an electron and a positron. Investigation of this process, transforming two 'heavy' particles into two 'light' particles, enabled an entirely new light to be thrown on the proton structure.

One of the sessions under the general heading of 'strong interactions' was devoted to 'particles and isobars', and A. Berthelot (Saclay, France) and R. Armenteros (CERN) reported on the past year's experimental results. These studies are concerned with the 'organization' of the sub-nuclear particles - the number of different ones that exist and how they are related to each other. Extremely unstable kinds are still being discovered and two new examples were reported during the conference, one found at CERN and the other in the U.S.A. The situation reviewed at Sienna was remarkably different from that of two years previously, however. As pointed out by L. Alvarez, chairman of the session, most of the work in the preceding year had been the slow but steady accumulation of data on the various quantum numbers of all the newly discovered particles. Although this was essential, it was not spectacular and, as an experimentalist, he feared that by the time the next conference was held all the interesting papers would be given by theoreticians. The current state of the theory, as reported by R. H. Dalitz (Oxford), was that various semi-empirical approaches had achieved good predictive power, but nothing could yet give a properly satisfactory explanation of all the phenomena found by the experimentalists.

At a second session, A. Wetherell and A. Stanghellini (both CERN) dealt with experimental and theoretical progress in the study of matter at the highest energies now obtainable. Here the situation had become more complicated than was hoped a year before, and the theoretical physicists were faced with a difficult task in explaining all the various experimental results that had come from laboratories in Europe, the U.S.A. and the U.S.S.R.

A particularly lively session was held on the morning of the last day when F. Low (M.I.T., U.S.A.), R. Jost (E.T.H., Zurich), M. Cini (CERN) and T. Regge (Turin) presented successive talks on different 'old and new theoretical ideas'. These showed that, in trying to correlate the different sub-branches of the subject and produce a theory that would explain all the complicated phenomena discovered in recent years, various different and apparently contradictory approaches were being made. Particularly on the great question of which, if any, of the particles are truly 'fundamental' and which are composed of other particles, it seemed that none of the present lines of approach was really satisfactory and there was very much scope for future advances.

On the last afternoon there was a report by E. Amaldi (Rome), on the general accelerator programme for Europe which had been recently recommended by a panel of scientists under his chairmanship. This panel had concerned itself not only with the large machines of international status but also with the lower 'pyramid' of smaller national or regional accelerators needed to support them. Because of the time taken for design and construction, plans have to be made early and the scientists had considered what could and should be done in the next ten years or so. Apart from a new accelerator of ten times the maximum energy now available and a pair of 'storage rings' for use with the large CERN synchrotron, it was proposed that national plans for smaller machines should be co-ordinated. Besides the accelerators already planned, one or more 'meson factories' and a high-energy electron accelerator should be constructed somewhere in Europe.

The conference was sponsored by the Comitato Nazionale per l'Energia Nucleare (CNEN), the Consiglio Nazionale delle Ricerche (CNR) and the Ministero della Istruzione Pubblica (MIP), and organized by the Società Italiana di Fisica. The excellent arrangements and smooth running of the whole conference reflected the invaluable part played by CERN's Scientific Conference Secretariat.

Finally, there was a stimulating talk by M. Gell-Mann (Cal. Tech., U.S.A.), who gave a very clear review of the major problems that needed to be solved and how near the solutions were, based on the papers and discussions of the preceding week. This brought the formal part of the conference to a close.

OTHER ACTIVITIES

Immediately afterwards the participants, and many of their families who had come with them, were transported back several hundreds of years in time by a medieval pageant of a kind that probably only Sienna can now provide. Specially arranged by those concerned to form a fitting end to the final afternoon of the conference, the occasion was the presentation to the representatives of the *Contrada della Torre* * of a silver dish, awarded annually by the civic authorities to the *Contrada* which has achieved most during the year. The brilliant costumes, waving flags, and the insistent drums echoing around the shell-shaped *Piazza del Campo* seemed a long way from the discourse of half an hour before.

This display was only one aspect of the hospitality afforded to those attending the conference by the authorities and inhabitants of the city. On the first

* One of the seventeen districts into which the city is divided, each forming a strictly defined community of its own.

CERN/PI 172A.10.63

One of the informal discussion sessions, outside the Palazzo Pubblico.

evening the cellars of the *Enoteca Italica Permanente* (permanent wine centre) in the 16th-century *Fortezza di Santa Barbara* had been the scene of a reception by the Italian Physical Society. On the Tuesday evening everybody seemed to have accepted the invitation of the Mayor of Sienna and the President of the Chamber Orchestra 'R. Franci' to a concert of music by Vivaldi given by the orchestra in the ideal surroundings of the *Sala del Mappamondo* of the *Palazzo Pubblico*. The following evening, in a totally different setting and with very different music, the participants had been the guests of the *Accademia dei Rozzi* at a ball in the rococo *Sala degli Specchi*. During the week, also, one day had been free of lectures, and many of the visitors had taken advantage of the hospitality offered by the *Ente Provinciale per il Turismo* and the *Azienda Autonoma di Turismo* to go on excursions to neighbouring towns and villages or to take part in conducted tours of Sienna itself.

The opportunity to share in the enjoyment of music, art and history in such surroundings was obviously appreciated by all. Yet these 'extra' activities also contributed greatly to the scientific benefits of the conference, since it was mostly at these gatherings that the participants really had a chance to meet each other and to talk about things of mutual interest.

The last chance for such discussion came on the final evening, when everyone was invited by the President of the *Monte dei Paschi* Bank to a buffet supper in the *Cortile di Podestà*, the courtyard of the *Palazzo Pubblico*.

It was here that the final speech was made by CERN's Director-general, Prof. V. F. Weisskopf. After referring to the unique experience of discussing modern physics in such historic surroundings and to the beginnings of our present cultural era in the city life of the fourteenth century, he spoke for all those who attended the conference by concluding :

'Our friend, the President of the *Società Italiana di Fisica*, expressed his doubt at the beginning of the meeting as to the propriety of the present setting for a physics conference. We can tell him now that we are deeply grateful to him for this choice. It gave us a heightened sense of what we are doing : a sense of participating in a human adventure, which encompasses more than the discovery of natural laws. He gave us a sense of belonging to a unique human development, which started almost a thousand years ago, of which our science is only a part, albeit a most important one. A human adventure which is tragic and full of suffering and cruelty, but also hopeful and full of promise. The cities of the early centuries were ravaged by pestilence and disease — today, these curses have disappeared. Sienna, Florence, Milan and Rome today are one Italy, and no longer fight each other. The countries of Europe are united, at least in the realm of science in our CERN Laboratory, and perhaps such scientific collaboration on an even wider scale might pave the way to a united world.

The confrontation of twentieth-century physics with fourteenth-century art in the frame of the city of Sienna has shown to us that there is sense, and also beauty, in that great human adventure in which we all are taking part.

For this we thank our hosts' ●

26th Session of Council

CERN's Continu

Some important and encouraging decisions were taken at the 26th Session of CERN Council, which was held at CERN on Tuesday 17 December, 1963. As usual, representatives of the thirteen Member states were present, together with observers from Poland, Turkey and Yugoslavia. The chairman was Mr. Jean Willems (Belgium).

Progress Report

In presenting the progress report for the six months May-November 1963, the Director-general, Prof. V. F. Weisskopf, drew particular attention to the neutrino experiment which had been carried out with such success during that period. All the same, he pointed out, this experiment had occupied only 33 per cent. of the time on the proton synchrotron, and other experiments using all three main techniques (bubble chambers, electronic counters and emulsions) had not been neglected. In particular a number of experiments with electronic equipment had investigated very rare phenomena of special interest. The rate and quality of evaluation of bubble-chamber pictures had been greatly improved by a more efficient system of programming and computer use, and the results obtained on 'resonances', in particular, had a significance equal to that of those coming from laboratories in the U.S.A.

Prof. Weisskopf also laid stress on the fact that of the total number of scientists engaged in research at CERN, 70 per cent. were visitors. This illustrated how closely involved CERN was in the scientific life of European universities and research institutions, but it also represented a heavy load on the permanent staff. This, however, seemed inescapable under the present Budget conditions.

Budget for 1964 and Estimates for 1965

The detailed budget prepared for 1964 envisaged a total expenditure of 108.5 million Swiss francs, of which 1.3 million would be provided by miscellaneous receipts and the remainder by contributions from the Member states. This repre-

PARTIC

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* Adviser ** Alternate

ing Progress

sented a net increase of 11 per cent. over the budget voted for 1963, plus additional increases to allow for cost variations. At the Council session, however, two further points were considered. On the hand, the most recent information indicated that the income from miscellaneous receipts would be greater by 600 000 Swiss francs. On the other, recent retrospective increases among the external salaries used as a guide for those in CERN meant that the increase foreseen for 1964 has been underestimated. In approving the budget, the Council also agreed not to reduce contributions by the amount of the extra income ; this would provide some extra money which could be used for a further increase in salaries. The total of contributions would thus remain at 107.2 million Swiss francs for the year.

Later in the meeting, there was some discussion on the budget for 1965, ending in a decision to fix the 'firm estimate' for that year at 116 million Swiss francs. This is the figure within which the Administration will have to work in preparing their final budget for 1965, subject only to adjustments to allow for cost variations. Consideration of the provisional estimates for 1966 and 1967 was deferred until the next Session in June.

Supplementary Programme

Although up to now the design studies for larger accelerators and storage rings for the CERN proton synchrotron have been carried out as part of the normal programme, mainly by the Accelerator Research Division, this work will be financed separately in 1964. It was announced at the Council Session that all of CERN's Member states except Greece and Spain had now agreed to support this 'supplementary programme', which will cost a total of 3.8 million Swiss francs. There was general agreement that adherence to the programme this year does not commit any of the Governments to continued support of the design studies after 1964, or to any subsequent construction programme. At the same time there is no inherent reason why other States should not join in at a later date ●

PANTS

lems (Belgium)

Netherlands
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Vice-chairman of the Scientific Policy Committee
Prof. L. Leprince-Ringuet

Observers
Mr. H. Fahir Alaçam **(Turkey)**
Prof. D. Danysz **(Poland)**
Mr. S. Soc **(Yugoslavia)**

ELECTION OF COUNCIL OFFICERS

At the 26th Session of Council in December the following officers were elected for the coming year :

President — Mr. J. H. BANNIER (Netherlands),
Vice-presidents
— **Sir Harry MELVILLE** (United Kingdom),
— **M. F. de ROSE** (France),
Chairman of the Scientific Policy Committee
— **Prof. L. LEPRINCE-RINGUET** (France),
Chairman of the Finance Committee
— **Dr. G. W. FUNKE** (Sweden).

The former President (Mr. Willems) and Vice-presidents (Mr. Bannier and Prof. Amaldi) were not eligible for re-election to the same office as they had held their posts for three consecutive years.

All the new officers have had long associations with CERN. Mr. Bannier, who studied physics at the University of Utrecht and has been Director of the Netherlands Organization for the Development of Pure Research (ZWO) since 1948, was one of the delegates to the UNESCO meeting in 1951 that led to the setting up of the original 'European Council for Nuclear Research' (from which CERN derives its name). Mr. de Rose, a diplomat who has specialized since the war in nuclear problems, was chairman of that meeting, and he and Mr. Bannier were among the signatories to the Agreement founding the Council in February 1952. Mr. Bannier was President of the preliminary Council in 1952-53 ; Mr. de Rose was President of the CERN Council for the three years 1958-60. Sir Harry Melville is a distinguished chemist who has been Secretary to the Committee of the Privy Council for Scientific and Industrial Research (U.K.) since 1956. He has been associated with CERN from its earliest days and has been among the Delegates to Council since 1958. Prof. Leprince-Ringuet, who has been active in research in fundamental physics since 1929, is a Professor of Physics at the École Polytechnique, Paris, and Professor of Nuclear Physics at the Collège de France. Dr. Funke is also a physicist by profession and is Secretary-general of both the National Council for Scientific Research and the Council for Atomic Research in Sweden.

The grouping of Member states for representation in the **Committee of Council** has been changed slightly, and the new members are, in addition to the officers listed above :

— **Mr. J. WILLEMS** (Belgium),
— **Prof. W. THIRRING** (Austria), for Austria and Switzerland,
— **Prof. E. AMALDI** (Italy),
— **Prof. J. R. BØGGILD** (Denmark), for Denmark, Norway and Sweden.

Two other members, one for Germany and one for Greece and Spain, are still to be named.

The appointments of three new members of the **Scientific Policy Committee** were also announced. They are :

— **Prof. G. BERNARDINI,**
— **Prof. W. JENTSCHKE,**
— **Prof. S. A. WOUTHUYSEN.**

Vacation Students at CERN

Last summer, as a result of the CERN Vacation Student scheme, some 70 university students were able to spend part of their long vacation gaining experience in the Organization's laboratories. The scheme, which has aroused a great deal of interest in the Member states, is briefly described here in an article by R. N. MILLIGAN, *of the Fellows and Visitors Office, Personnel Division.*

Aims of the programme

The CERN Vacation Student programme in its present form began in 1962. In earlier years a number of students had been received on a more or less *ad hoc* basis, but the growing number of applications from students in all subjects and at all levels made it essential to set up a proper procedure for their consideration.

From the start, the aims of the scheme were defined as :

a) to give a widely representative number of European students an idea of CERN and its work, and in this way to spread a wider knowledge of CERN in their home countries ;

b) to consider the students as a potential source of supply of Fellows or possibly of Staff members ;

c) to provide temporary and useful assistance to CERN groups.

This makes it clear that CERN is not seeking a supply of cheap unskilled labour for the summer months. We are, in fact, offering undergraduate and postgraduate students in physics or allied subjects the opportunity to gain some practical experience at a laboratory which is foremost in its field in Europe and among the leaders in the world. It is thus perhaps not surprising that in 1963 there were over five times as many valid applications as there were vacancies.

Selection procedure

In view of the advanced nature of practically all the work at CERN, it is laid down that students must have completed at least two years of study at an institute of university standard before being eligible to participate in the programme. It is significant that the students who took part in 1963 had, on average, completed over four years of university training.

Each year's programme is outlined in a circular, prepared the previous Autumn, which describes the fields in which opportunities are likely to be available. Copies of this circular are sent to all the universities and similar institutes in the thirteen Member states of CERN. Suitable candidates are required to complete a special application form, on which they indicate their field of specialization, the level of their studies, the qualifications for which they are working, and when they expect to achieve them. In addition, each application has to be supported by references from two of the candidate's professors or supervisors.

Further information on the CERN Vacation Student programme, and application forms, may be obtained from the Fellows and Visitors Office, CERN GENÈVE 23, Switzerland.

Applications to take part in the scheme this year must be received by 21 March 1964 ; it will not be possible to consider any forms received after that date.

It has been found best to set the closing date for receipt of the applications relatively early in the year, to allow adequate time for arrangements in the case of successful candidates and to give those candidates who cannot be accepted the chance to apply to other organizations.

After initial screening of the forms for validity in the Fellows and Visitors Office, final selection of the students to fill the various vacancies is made in collaboration with the Division or Group leaders concerned. In contrast to the selection of Staff members, where the question of nationality is completely subordinate to that of qualifications, care is exercised in the selection of students to ensure that all Member states are fairly represented. Moreover, particular emphasis is placed on the representation of the smaller Member states, to help encourage a stronger development of high-energy physics in these countries. Last year the distribution was as follows :

Austria	6	Greece	3	Sweden	2
Belgium	2	Italy	5	Switzerland	5
Denmark	2	Netherlands	3	United Kingdom	16
France	10	Norway	2		
Germany	8	Spain	6	Total	70

The student at CERN

To cover living expenses while they are in Geneva the students are paid a subsistence allowance of 24 Swiss francs per day, and their railway fares to and from Geneva are reimbursed by the Organization.

On arrival at CERN, each student is put in touch with the group to which he has been assigned, and is then required to assist in its day-to-day work. The students' formal experience at CERN is not, however, limited to their immediate laboratory activities and colleagues, for a series of lectures and visits to various sections are arranged to give them an overall picture of what is going on. It is interesting to note, in fact, that in 1963 a number of Staff members were also to be seen at the lectures, finding them an admirable means of learning about activities in Divisions other than their own.

Conclusions

It is too early yet to obtain an accurate assessment of the number of former Vacation Students who later return to work at CERN as Fellows or Staff members, since most of them are still engaged in their studies. We can, however, already count some Staff members who began their association with the laboratory in this way, and it has become a regular feature at meetings of the Fellowship selection committee for a number of former Vacation Students to be considered.

In any event, each year a growing number of students carry back to their university communities throughout Europe a greatly stimulated interest in the work of CERN and an up-to-date impression of the facilities available and the latest developments at the laboratory ●

Last month at CERN (cont.)

only one or two millimetres, so that any betatron oscillations in the beam have to be of quite small amplitude. Up to now, too, the ring has had to be operated with a pressure of about 10^{-8} torr in the vacuum system, although when a previously faulty section has been replaced and the whole chamber baked out, it should be possible to go below 10^{-9} torr. After the successful attainment of the circulating beam, the next step, now in progress, is to accelerate the whole beam into various other orbits in the vacuum chamber (by means of a betatron core) and examine its characteristics in each one, before making the first attempts at stacking using the radiofrequency accelerating system.

On 18 December, Mr. **Robert Hirsch,** Administrator-general and Government Representative of the 'Commissariat à l'Énergie Atomique' of France, visited CERN, in company with Mr. François de Rose (Minister Plenipotentiary and delegate of France to the CERN Council), Mr. Bertrand Goldschmidt (Director of Programmes and External Relations of the C.E.A.), and Prof. Louis Leprince-Ringuet (newly elected chairman of CERN's Scientific Policy Committee).

The following day, the laboratory was visited by Mr. **Wilhelm Billig,** the Polish Government's Commissioner for the Uses of Nuclear Energy, who paid particular attention to the methods used for analysing bubble-chamber photographs. He was accompanied by Prof. Marian Danysz, of Warsaw University, who had been present as Observer for Poland at the Council Session two days previously ●

Staff Vacancies

at CERN in 1964

Applications are invited from citizens of CERN Member States to fill vacancies in various parts of the Organization.

There are vacancies in the three following main groups for :

— **Graduate physicists and engineers** with post-university experience in techniques such as electronics, vacuum, electromagnets, radiofrequency, high voltages, electron optics and pulses.

— **Qualified technicians** to help physicists and engineers in the performance of work in the branches mentioned above.

— **Secretarial staff.** There are excellent career opportunities for younger persons who already possess a good working knowledge of English and French and who have typing and / or general office experience.

CERN offers attractive salaries, generous leave, and substantial special allowances and benefits.

Present staff members are invited to bring this notice to the attention of suitable potential candidates.

Application forms may be obtained from

Personnel Division, CERN, Geneva 23, Switzerland

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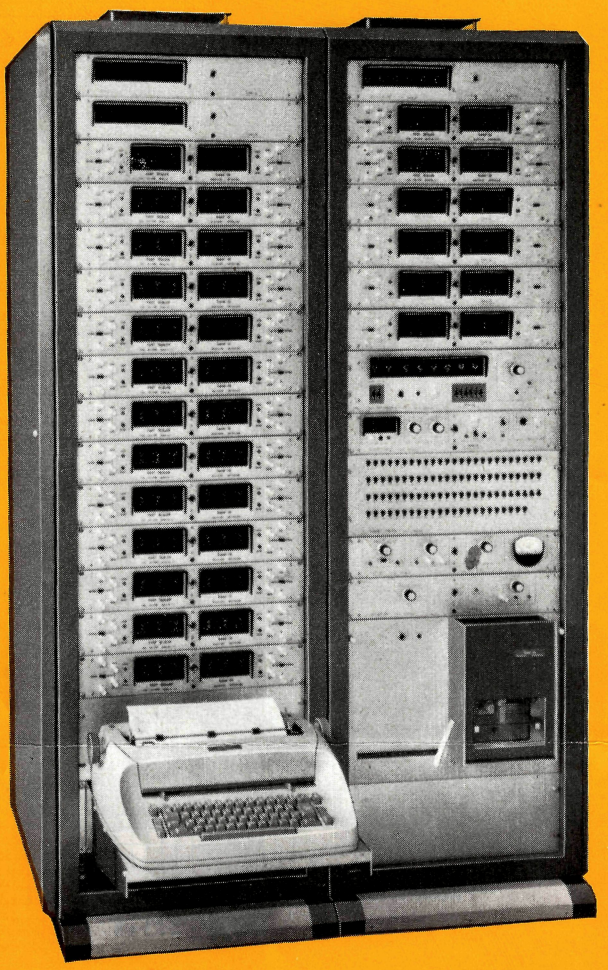

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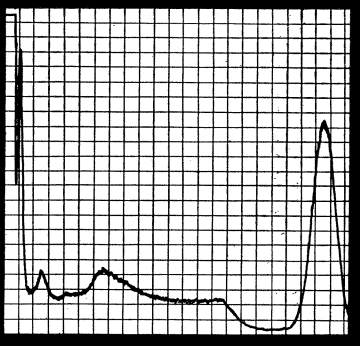
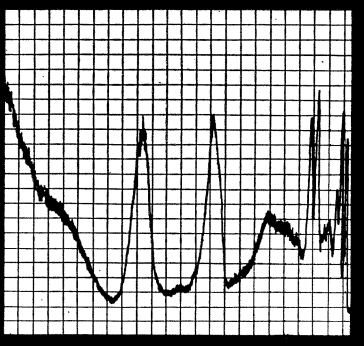
Sliding-channel scanned Cs^{137} spectrum. Note high resolution (half value width of the full energy peak better than 8%)

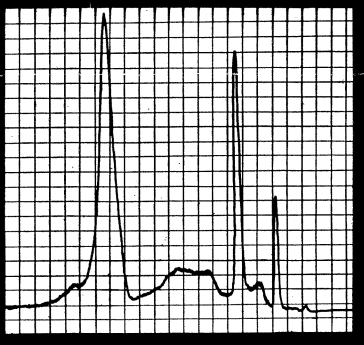


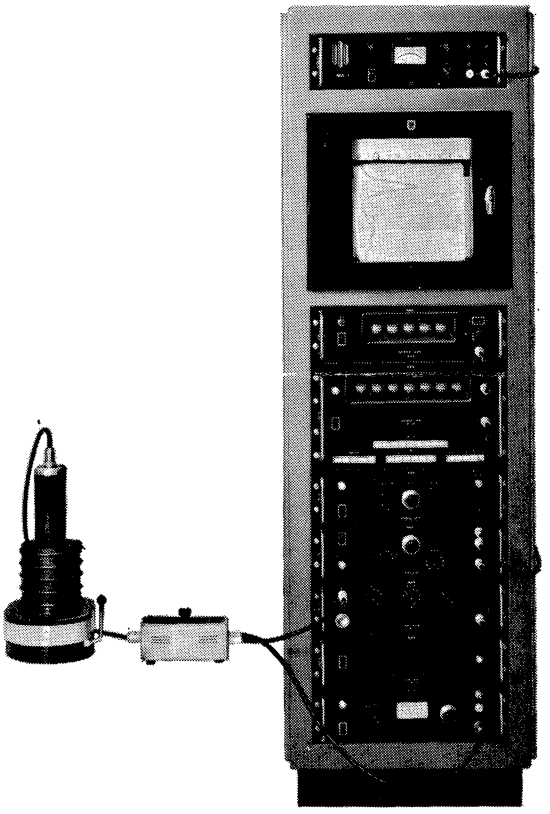


Gain-scanned spectrum of a mixture of Co^{60}, Cd^{109}, Cs^{137} and Bi^{207}. Note the wide energy span covering approx. 3 decades (2 keV - 2 MeV)

Sliding-channel scanned Bi^{207} spectrum compared with . . .

. . . gain-scanned spectrum of Bi^{207}





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