

## Collaboration CERN-JINR (Dubna) and CERN-USSR 1955-1975

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### Introduction

It is just 20 years (August 1955) since J. H. Fremlin (University of Birmingham, UK) gave a talk at CERN entitled «Data on Soviet Accelerators». In this talk he mentioned plans for the building of a high energy accelerator in the Soviet Union, the energy range under consideration being 20 to 30 GeV. The following year CERN organised an International Conference in Geneva on High Energy Accelerators and Pion Physics, which was the first of its kind to be attended by a large number of scientists from both Eastern and Western Europe.

Since then an intensive collaboration has been built up with the Institute of High Energy Physics at Serpukhov (south of Moscow), which has operated a 76 GeV proton accelerator since 1967. Further, good contacts have been established with other Soviet laboratories working in elementary particle physics. However, the first collaboration with physicists from the Soviet Union was with the Joint Institute for Nuclear Research (JINR) at Dubna, some 130 km north-west of Moscow. We will therefore start by describing briefly the origins of JINR and its links with CERN.

### Collaboration with JINR, Dubna

The town of Dubna was originally founded as a scientific centre in 1947, with the construction of a 400 MeV (later 680 MeV) synchrocyclotron and a 10 GeV proton synchrotron, which formed the nucleus of the Nuclear Problems Institute and the Electrophysics Laboratory respectively of the Academy of Sciences of the USSR. These two Institutes were the basis for the Joint Institute for Nuclear Research when it was founded in 1956. The original member countries were

Albania, Bulgaria, the People's Republic of China, Czechoslovakia, the German Democratic Republic, Hungary, the Korean People's Democratic Republic, Mongolia, Poland, Romania and the USSR, while the Democratic Republic of Vietnam joined soon after. (A detailed description of the research facilities at Dubna can be found in *Europhysics News*, January 1969.)

### Exchange of scientists

One of the first two Vice-Directors of JINR was M. Danysz of Poland who visited CERN towards the end of 1957. He suggested to the Director-General C. J. Bakker that it might be useful for CERN and JINR to exchange physicists and accelerator experts for short visits. In July 1960 three Soviet physicists arrived at CERN and seven months later two physicists and one accelerator expert from CERN arrived in Dubna. During the past fifteen years many visits lasting from a few days to one or two years have been exchanged. Since 1963 CERN has also sponsored visits to Dubna of scientists from its Member States under what is known as the Travelling Fellowship scheme.

Since 1965 CERN scientists have been regularly invited to attend specialised seminars and conferences organised at Dubna. The writer made his first visit to Dubna and to the USSR in June 1965 to attend a Seminar on the nuclear emulsion technique; he also took the opportunity to visit Soviet Central Asia and saw CERN emulsions and bubble chamber film being analysed at the Academy of Science Institutes in Alma Ata (Kazakstan) and in Tashkent (Uzbekistan).

### International Conferences and Seminars on future perspectives in High Energy Physics

The International Conferences on High Energy Physics had their origin in 1950 at the University of Rochester, USA and the first seven of the series were held there on a yearly basis. Since 1958 however, they have taken place in rotation in Western Europe, the USSR and the USA, and since 1960 have been held every other year. They have proved extremely useful in terms of promoting contact between scientists from different countries and the number of people attending them is now around 1,000.

The initiative to hold international meetings of a quite different type, namely to discuss «Future Perspectives in High Energy Physics», came from N. N. Bogolubov, Director of JINR, Dubna in 1966. Whilst on a visit to CERN he suggested to B. P. Gregory (then Director-General) that a restricted seminar on this topic be held as an extension of the CERN-JINR collaboration. Gregory agreed, and the Seminar took place in Riga (Latvia) in June 1967. It was attended by 9 laboratory directors and senior

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scientists from CERN and its Member States, 18 from JINR and its Member States and 8 from Soviet institutes. The various laboratory directors gave brief reports on the research programmes of their institutes and outlined their future plans for new facilities. The success of the seminar was such that CERN suggested that a similar meeting should be held in the following year. It was held in September 1968 at Semmering in Austria and was attended by 26 people.

At the third seminar in the series held in Tbilisi, Georgia, in September 1969, the attendance was widened to include scientists from the USA so that the number of participants was about 40. After three Seminars in successive years it was felt that an interval of two or three years between them would be appropriate. The fourth was held in September 1971 at Morges near Lausanne in Switzerland, and the fifth seminar took place in March of this year at New Orleans in the USA and was attended by representatives from CERN, JINR, the USA and the USSR while for the first time two observers from Japan were invited to attend.

#### **Collaboration with the Institute for High Energy Physics (IHEP) Serpukhov**

Construction of a 70 GeV proton accelerator was started near the city of Serpukhov in 1961 under the auspices of the Institute for Theoretical and Experimental Physics (ITEP) in Moscow. In the autumn of 1963 the Institute for High Energy Physics, Serpukhov, was formally set up as an Institute of the State Committee of the USSR for the Utilization of Atomic Energy, and A. A. Logunov, a theoretical physicist from Dubna, was appointed as the first Director. The Institute is located some 15 km west of Serpukhov, near the Protva river (a tributary of the Oka) and the town which has grown there is known as Protvino. Possible collaboration between CERN and IHEP was first discussed in the summer of 1964 by Weisskopf (then Director-General of CERN) and Logunov during a trip on the Volga river at Dubna. R. M. Sulyaev, then a Vice-Director of IHEP, visited CERN in January 1965 and discussed with Weisskopf the possibility of CERN constructing apparatus for a separated particle beam produced from the IHEP accelerator. Following further contacts B. P. Gregory went to Moscow in May 1966 for detailed discussions with the Chairman of the State Committee, A. M. Petrosyants, and his colleagues. Fur-

ther visits followed culminating in the signature of a formal agreement between CERN and the State Committee for Atomic Energy on 4 July 1967. The agreement provided for CERN and the State Committee to carry out a joint scientific and technical programme at the 70 GeV accelerator at IHEP and specifically for CERN to design, construct, test, install and bring into operation :

- i) a fast ejection system
- ii) a radio frequency separator and its auxiliary equipment capable of separating kaons up to 36 GeV/c.

In return CERN was given the opportunity to carry out electronics experiments at the accelerator and to obtain bubble chamber film for analysis, both to be carried out by joint teams of scientists from CERN and its Member States and from the Soviet Union.

The supervision of this programme of work was entrusted to a Joint Scientific Committee consisting of 6 scientists from CERN and 6 from IHEP, responsible to the Director General of CERN and to the Director of IHEP. This Committee meets once or twice a year alternately at CERN and at IHEP; the present co-chairmen are Y. Goldschmidt-Clermont from CERN and V. Yarba from IHEP.

The work on the various components of the separated particle beam, that is, the fast ejection system, the pulsed beam transport system and the radio frequency separators was carried out at CERN during the period 1967-1971 under the responsibility of B. Kuiper, B. Langeseth and H. Lengeler respectively; Soviet engineers and technicians participated in the work at CERN in varying degrees. The transport of the apparatus to Protvino was carried out in several stages during 1970 and 1971, partly by rail but mostly by road. During this time, many of the CERN engineers and technicians involved in the projects moved to Protvino to assist their Soviet colleagues with the installation work at the accelerator. At one stage about 100 people (including wives and children) from CERN were at Protvino.

The installation of the fast ejection system and the associated pulsed beam transport was completed in February 1972 when the first proton beam was focused on to an external target. The first run involving the whole beam, including the radio-frequency separators, was made in May and June 1972. Since then the ejection system has been used to deliver external protons to two different beam channels. The CERN equipment

continues to operate with a very high level of reliability and the experience gained during its construction is of great value for the development of the 400 GeV accelerator programme at CERN.

As already mentioned, the 76 GeV proton synchrotron at IHEP was first brought into operation in October 1967. By coincidence the first meeting of the Joint Scientific Committee took place in Protvino at this time and it was already provisionally agreed that the first joint electronics experiment could be a study of particle production total cross sections in the momentum range 40-60 GeV/c. Equipment for this experiment left CERN in July 1968. The experiment was carried out by a group from CERN led by A. M. Wetherell and a group from IHEP led by Yu. D. Prokoshkin. It lasted about a year and most of the equipment was flown back to CERN in July 1969.

The same aeroplane was used on its return journey to carry equipment for the second joint electronics experiment. This was carried out by scientists from CERN, Geneva University, Munich University, Illinois University (USA) and IHEP Serpukhov. It included a study of the elastic scattering of  $\pi^-$ ,  $K^-$  and anti-protons on protons up to 40 GeV/c, a test of the scaling hypothesis for inclusive reactions and a study of high mass boson resonances. The third and fourth joint experiments followed in the years 1973-1975. They were respectively a study of neutron-proton charge exchange (Karlsruhe, ITEP Moscow collaboration) and studies of  $\pi^- + p \rightarrow \pi^0 + n$  and of neutral boson resonances (Karlsruhe, Pisa, Vienna, IHEP Serpukhov collaboration). A fifth joint experiment to study diffraction dissociation processes is at present being installed and tested at Serpukhov by scientists from Milan, Bologna, JINR Dubna and IHEP.

#### **Collaboration with other Soviet Institutes**

Although the collaboration between CERN and Serpukhov is by far the most extensive one with a Soviet Institute, there are excellent contacts and frequent visits to and from other institutes in the Soviet Union. For example, CERN is now assisting the Institute of Theoretical and Experimental Physics in Moscow to set up a separated particle beam so that a joint experiment by physicists from Padua and ITEP can be carried out using a Xenon bubble chamber. Another collaboration that has been established recently is between groups

in Clermont-Ferrand, Lyon and Uppsala with a group in the Leningrad Nuclear Physics Institute, Gatchina (an Academy of Sciences Institute) with the aim of carrying out a joint experiment at the SPS. CERN has an informal exchange agreement with the Leningrad Nuclear Physics Institute and the Institute of Nuclear Physics in Novosibirsk by which the host laboratory pays the living expenses of scientists who visit them, while the parent laboratory pays their travel expenses.

### Participation in ISR and SPS experiments

The coming into operation of the Intersecting Storage Rings at CERN in 1971 naturally aroused considerable interest amongst physicists all over the world. Subsequently a few Soviet physicists, as well as some from the Member States of JINR, have participated in ISR experiments as individuals, following the normal CERN pattern.

Discussions took place between Petrosyant (Chairman of the USSR State Committee for Atomic Energy) and W. Jentschke (Director-General, CERN Laboratory I) in June 1972 with a view to extending the original 1967 agreement to include joint experiments at the ISR and at the SPS. Somewhat later, similar discussions took place between Bogolubov and K. Lanius of Dubna and Jentschke, as a result of which four JINR scientists came to CERN to participate as individuals in ISR experiments. During their stay some of them joined physicists from CERN, Munich, Rome and Saclay to present a proposal for an SPS experiment on muon scattering which has recently been approved by the appropriate CERN and JINR Committees. In the case of JINR no formal agreement appears to be necessary to allow such joint experiments to be proposed and approved, presumably because both CERN and JINR are considered to be International Organizations.

On the other hand, the Institute for High Energy Physics at Serpukhov comes under the authority of the State Committee for Atomic Energy and it became apparent during 1974 that any joint experiments at the ISR or the SPS involving teams of physicists from Soviet research institutes would require the signature of a new agreement between CERN and the State Committee. To give detailed information to the Soviet scientists about the ISR programme as well as the facilities planned for the 400 GeV



*Signing, on July 10 1975, of the new Protocol between CERN and the State Committee of the USSR for Atomic Energy. (Photo CERN)*

*Left : I.G. Morozov, Deputy chairman of State Committee.  
Right : W. Jentschke, Director-General of CERN.*

SPS (Super Proton Synchrotron) an extended meeting of the CERN-Serpukhov Joint Scientific Committee was held at CERN in June 1974. It was attended by representatives from JINR Dubna and the Academy of Sciences, and from IHEP Serpukhov and the State Committee for Atomic Energy. Subsequently, detailed discussions between CERN and the State Committee have culminated in the signing, on July 10 1975, of a new Protocol between the two Organizations. Its essential features are summarized in article 1. point 1 which states : « The State Committee and CERN shall extend their joint programme of scientific research in high energy and elementary particle physics, using bubble chamber, electronic and other techniques, defined in the Agreement (i.e. the 1967 Agreement) now carried out mostly at IHEP's 70 GeV proton accelerator, by actively promoting :

- a) the carrying out of joint experiments at CERN's 400 GeV proton synchrotron and other CERN installations,
- b) the carrying out of joint experiments both at the Institutes of the State Committee and of the Academy of Sciences. »

Further, Article 3, points 6 and 7 read :

« In so far as experiments at CERN are concerned for the time being only one joint electronics experiment could be carried out at any one time. This shall not preclude, however, some overlap between experiments, particularly during the setting up period » and

« Neither the exchange of individual

scientists, which will continue by virtue of previously established principles nor the distribution of bubble chamber films will be affected by the arrangements set out in this protocol ».

All the activities described above have of course implied a steady exchange of scientists and technicians between CERN and the Soviet Union. During the period 1968-1975 approximately 50 Soviet scientists came to CERN each year, for short and for long visits, while the number of scientists from CERN and its Member States who went to the Soviet Union was on average about 90 per year. Over the years the close contacts established between the administrative departments of CERN, the State Committee and IHEP (and also JINR Dubna) have meant that travel and visa formalities in both directions have become routine and the difficulties reduced to a minimum. Many personal friendships have resulted from working together and add a human dimension to these collaborations which some would rate as high as the scientific achievements which have emerged.

### Acknowledgements

Some of the material in this article has been taken from an unpublished report by Y. Goldschmidt-Clermont, and I am grateful to him for permission to include it here. The Editor of the CERN Courier, Brian Southworth, made many valuable suggestions for the improvement of the manuscript while I. Golutvin and K. Lanius kindly read the first draft.

The European Physical Society has always given a lot of attention to the relations between the scientific community and the human society at large. The Programme of the next EPS General Conference will include an evening open discussion on this general theme, and the Advisory Committee on Physics and Society has prepared a working paper as a general background for the discussion. The working paper, which is published here, is intended as a broad review of the problems which could be discussed in this evening session, but we hope very much that the discussion will focus on specific themes. In this connection we should like to invite the participants to prepare questions, which for preference should be submitted in advance to the chairman of the session, so the discussion can be organized in a useful fashion.

## Energy and Physics

Third General Conference  
of the European Physical Society

Bucharest, Romania  
9-12 September 1975

Although the deadline for registration was 31 July 1975, participants in the Third General EPS Conference may still register. Proper accommodation, however, can no longer be guaranteed.

Participants must be registered before arriving at the campus, otherwise they will not be allowed access to the site.

The registration form should be sent to :

A. Corciovei,  
Institute for Atomic Physics,  
P.O. Box 5206,  
Bucharest, Romania.

Eastern participants can pay the registration fee to :

Banque Nationale de Roumanie,  
Bucharest,  
Account No. 64.41.2.01.43.

Western participants can pay the registration fee to :

Union de Banques Suisses  
CH-1211 Geneva 11  
Account No. 282.079.30 W

OR :

Banque Roumaine  
pour le Commerce Extérieur,  
Bucharest  
Account No. 47.11.032.303-7.

## Norm Aspects of the Science—Technology Spiral

Working paper prepared by the Advisory Committee on Physics and Society (A.C.P.S.) of the E.P.S.

### Purpose of present paper

Whether as research, education or application, physics has a social function and, whatever a physicist's personal attitude may be, interaction between the world of physics and society-at-large is a fact. The A.C.P.S. considers analysis (Trends in Physics, Proceedings E.P.S. Wiesbaden conference 1972, p. 252), communication and discussion concerning that interaction to be extremely important. The Committee recognises the physicists' responsibility for helping the general public to understand the underlying purpose and potential value of their work. They wish to contribute to the E.P.S. General Conference in Bucharest (1975) by elaborating upon discussion of the "Science-Technology Spiral", (H.B.G. Casimir, Trends in Physics, loc. cit. page 125), and particularly by trying to formulate some aspects of the "norm" problem.

### Normative aspects of physics

Physicists seek to resolve problems of either a cognitive or functional character and they pursue their work both under intrinsic and extrinsic scientific motivation and orientation, since these areas do overlap.

*Intrinsically*, physics stems from the imaginative mind striving for deeper insight into nature and seeking to expand the existing body of knowledge, regardless of the possible use of the knowledge acquired. This process may eventually produce its own interactions with society, but there is every reason to proclaim the necessity of freedom for intrinsic research programmes. Such programmes should of course be scientifically and organisationally sound, particularly if they are dependent on the use of public resources, and it should be checked whether, for instance,

- the expenditure and the number of workers involved is a reasonable proportion of the resources available ;
- the proposed programme is likely to lead along a path which will not be considered alien to our society ;
- the proposed programme does not require techniques or processes likely to be damaging to the environment.

Such conditions may pose difficult issues of personal conscience, value judgment, and belief in the need to search for new knowledge. But, as physicists, we can defend "pure" research not merely in satisfying a craving for deeper understanding but as a necessary part of our educational and cultural system. Such research should clearly be very good research.

In the intrinsic area "neutral seekers of truth" may welcome the views of those scholars who can contribute to a deeper philosophical understanding of the normative problems which physicists face in planning or collaborating in specific programmes of intrinsic research.

*Extrinsically*, physics programmes are designed to resolve specific problems defined in industrial, economic, or more general social settings. The objective is again knowledge, but its utility with respect to the achievement of particular functions is the dominant consideration. But who is to define these problems? Who is to set priorities and what is to be the relevant value and norm system?

The path of industrial civilization has hitherto been paved by countless innovators, scientists, entrepreneurs, market-analysts, statesmen and labourers. They have combined to develop technology in response to the needs of man. However, it would seem, further growth and a balanced spread of the industrial civilization over the world require a more sophisticated analysis of human needs. This confronts us with value judgments, having regard to the poverty and starvation in many parts of the world and uncertainties concerning real needs or priorities in developed countries. There is a growing need for changing people's interest from that of an ever-increasing consumer orientation to that of the need to maintain a knowledge-based society, and for an increase of manpower in "services", as distinct from the professional activities of agriculture and manufacturing industry. There is surely a role for physicists to play a part in formulating the requirements to meet these needs.

Technology in its broadest sense has caused such strains in our tra-