9-13 JUNE
1st International Congress on Colour
Stockholm, Sweden
Mr. Tonnquist, FOA 2, S104 50 Stockholm 80

9-19 JUNE
Colloquium on the Spectra of Meteorological Variables
Stockholm, Sweden
F. Eklund, Forsvarets Forskningsanstalt, Avdelung 3, Research Institute of National Defence, Stockholm 80

15-20 JUNE
International Data Processing Conference
Montreal, Canada
Mrs. M. Rafferty, Data Processing Management Association, 505 Busse Highway, Park Bridge, Ill. 60068

16-20 JUNE
Classical and Relativistic Magnetohydrodynamics
Lille, France
Pham Mau Quan, Directeur de l'Institut de Mathématiques de la Faculté des Sciences de Lille, Lille

16-21 JUNE
4th IFAC Congress
Warsaw, Poland
Honorary Secretary, UK Automation Council, IEE, Savoy Place, London WC 2

23-27 JUNE
European Conference on Plasma Physics and Controlled Fusion
Utrecht, Netherlands
FOM-Instituut voor Plasma-Fysica, Rijnhuizen, Postbus 7, Jutphaas

30 JUNE - 1 JULY
Strength and Stability of Inorganic Fibres
University of Sussex, UK
Meetings Officer, IPPS, 47 Belgrave Sq., London SW 1

30 JUNE - 3 JULY
Computer Science and Technology
Manchester, UK
Conference Department, IEE, Savoy Place, London WC 2

7-11 JULY
Structure and Properties of Solid Surfaces
Paris, France
J. Benard, Directeur de l'Ecole Nationale Supérieure de Chimie de Paris, Paris

7-11 JULY
2nd European Symposium and Users' Summer School on Time of Flight Mass Spectrometry
Salford, UK
J.E. Williams, Field Tech. Ltd., Heathrow Airport, Hounslow, Middlesex

8-10 JULY
International Conference on the Three-Body Problem in Nuclear and Particle Physics
Birmingham, UK
Administrative Officer, Department of Physics, P.O. Box 363, University of Birmingham, Birmingham 15

14-19 JULY
Atomic Absorption Spectroscopy
Sheffield, UK
AAS Conference Secretary, Society for Analytical Chemistry, 9-10 Saville Row, London W 1

27 JULY - 1 AUGUST
Quantitative Relation between Properties and Microstructure
Haifa, Israel
Dr. A. Rosen, Department of Materials Engineering, Technion City, Haifa

Dubna

M. Lebedenko

From time to time, Europhysics News will carry information on the organization of National Physical Societies and on the international research centres in Europe. In this first issue we cover the Joint Institute for Nuclear Research at Dubna. The article is based on information supplied by M. Lebedenko (Head of the Publishing Department, JINR).

Twelve years ago the name 'Dubna' began to occur in the scientific press. Dubna is a small town, situated 130 km north-west of Moscow on the river Volga. It first appeared on the map in 1956. From its beginnings, the reputation of this town has grown steadily, being the international scientific centre for the Socialist Republics, the home of the Joint Institute for Nuclear Research (JINR).

The story of the Institute began in Moscow in 1956 when representatives of the following governments met together: Albania, Bulgaria, China, Czechoslovakia, German Democratic Republic, Hungary, Korean Democratic Republic, Mongolia, Poland, Roumania and USSR. On 26 March an agreement was signed which came to be known as the Moscow Agreement for the establishment of the Joint Institute for Nuclear Research. At a later date, the Democratic Republic of Vietnam also joined, thus becoming the twelfth founder member of the Institute.

The Soviet Government handed over to the Organization two laboratories previously belonging to the Academy of Sciences : the Institute of Nuclear Problems and the Electro-Physical Laboratory. These two institutes were situated close to each other near the Volga, where it joins the Moscow canal close to the river Dubna. The existing installations (valued at half a million roubles) and highly qualified staff became the nucleus of the Joint Institute.

From the autumn of 1956, scientists from the Member States began to arrive at Dubna. At that time, the Member States did not possess adequate facilities of their own for large-scale work particularly in high-energy physics which was to be one of the main activities of the Institute.

After a short time the two existing laboratories were joined by a third — the Laboratory of Theoretical Physics. Other laboratories followed, each the equivalent of a modern large-scale institute. There are now six laboratories which, in their over-all scope, cover all the principal lines of modern nuclear physics. The work of the research scientists of Dubna has become internationally known. Preprints prepared at Dubna are distributed, on an exchange basis, to scientists in 42 countries in all 5 continents, and there is no country where the field of nuclear physics is developed that has not seen its senior scientists visiting Dubna, and scientists from Dubna visiting its own centres of research.

The essential aims of the centre are clearly set out in the Moscow Agreement and again in the Constitution of the Institute :

1. To foster collaboration in nuclear research by scientists in the Member States

2. To promote nuclear physics research in the Member States by the exchange of information and results of both theoretical and experimental research

3. To maintain close relations with other national and international scientific research organizations engaged on the development of physics and on the global applications of atomic energy

4. To promote the most effective use of the intellectual effort available in the Member States.

Over the years there have been many changes. The Member States have now their own institutes, laboratories and scientific groups, and schools of scientific workers in the field of nuclear physics. These groups are often led by people who have at some time worked at Dubna or who have worked in close collaboration with the Joint Institute. Generally speaking the equipment that is to be found at Dubna is larger and more highly developed than exists in Member States, but the Member States do now have well-equipped laboratories of their own which makes real collaboration with Dubna possible.

ORGANIZATION

The essential principles involved in the management of the centre were set down in the Convention. Finance is provided by the Member States (according to their financial means), contributions ranging from 0.05 % to near

50 % (the contribution of USSR). In addition the Soviet Union assumes the responsibility for maintaining the town of Dubna itself. A fundamental principle is the equality of each Member State both as regards participation in the work of the Institute and in its management — regardless of the size of contribution. Each Member State has its delegate in the ruling body, which can be translated as the 'Council' of the Organization. This Council meets once a year and takes decisions on all the important questions, such as : budgets, staff, forward projects, longterm development plans etc. The Council elects the Director for three years and two Deputy Directors for a term of two years each.

The present Director of the Institute is N. N. Bogoliubov (USSR) ; the Deputy Directors are K. Khristov (Bulgaria) and N. Sodnom (Mongolia). For the detailed management of the centre, the Director appoints a Director of Administration, currently V. L. Karpovskij. The principal group which determines the scientific policy is the 'Learned Council' comprising leading scientists from the Member States (not more than three from any one State) which meets in Dubna. The chairman of the Learned Council is the Director of the Institute.

The Learned Council receives the reports of the different Laboratories and must approve the forward plans of these Laboratories, awarding premiums for the best research accomplished. It elects the Directors of the individual laboratories and makes recommendations to the main Council on the various subjects within its competence.

In view of the scope and size of Dubna (over 3000 people), other scientific management bodies, composed of representatives from Member States, have been set up. There are three specialized scientific committees: high-energy physics, low-energy physics and theoretical physics, and below these are methods committees and techniques committees. Continuing down the organigram and neglecting the purely administrative and service units, we come to the laboratories.

LABORATORY OF NUCLEAR PROBLEMS

The Laboratory of Nuclear Problems is today twice as old as the Joint Institute. In 1949, its 690 MeV synchro-cyclotron was commissioned, which is still the most important of its type as regards beam intensity, reliability and versatility. This Laboratory was built on the initiative and with the support of I.V. Kurchatov, while its first Director was M. G. Meshcheryakov. Since 1956, the Laboratory has been led by one of its founder members, V. P. Dzhelepov.

Amongst the many experiments which have been carried out in collaboration with laboratories in the Member States just a few can be mentioned :

Identification of the beta decay of the pi-meson for which Yu. D. Prokoshkin was awarded the Kurchatov Medal

Work on nucleon-nucleon interactions and pion production which is now part of the classical literature of high-energy physics. The discovery in 1963 of double-charge exchange of π^- and π^+ mesons.

The Laboratory has made an important contribution to the study of the capture of muons by atomic nuclei, being the first to investigate the capture of muons by Helium 3. Research on muonic matter — where muons replace the orbital electrons is one of the major parts of the current research programme.

Amongst the more notable achievements must also be mentioned the work of B. Pontecorvo on neutrinos, in particular his postulate of two separate kinds — the electron neutrino and the muon neutrino, which has since been confirmed experimentally.

The Laboratory also puts considerable effort into the development of new experimental techniques and first proposed the application of the Cherenkov radiation phenomenon to measuring particle velocity.

New techniques for particle acceleration are also under study. In 1959 the Laboratory commissioned the first space-variation cyclotron, and it was here also that a technique for obtaining very low temperatures by the dilution of Helium 4 with Helium 3 was evolved. The same technique made possible the development of polarized proton and deuteron targets. Other development work includes streamer and other track chambers of novel design as well as advanced electronic equipment.

The synchro-cyclotron has proved an excellent instrument for the production of new isotopes, particularly of the rare earths, and these isotopes are studied not only in the Institute itself but are flown to the laboratories in the Member States such as the German Democratic Republic, Poland, Czechoslovakia, and to Denmark and Sweden.

LABORATORY OF HIGH ENERGY

The Laboratory of High Energy evolved from the Electro-Physical Laboratory of the Academy of Sciences.

1. JINR administration building on the day of the 10th anniversary celebration.

2. Lenin Prize winners for their research on transuranic elements : (left to right) G. N. Flerov, S. M. Polikanov, I. Zvara, V. A. Druin.

3. Polish scientists at work on the Polish-built beta-spectrometer 'Orange'.

4. Symbolizing collaboration with CERN — the Directors of the two centres N. N. Bogoliubov (left) and B. P. Gregory.

(Photos Yu. Tumanov, Dubna)

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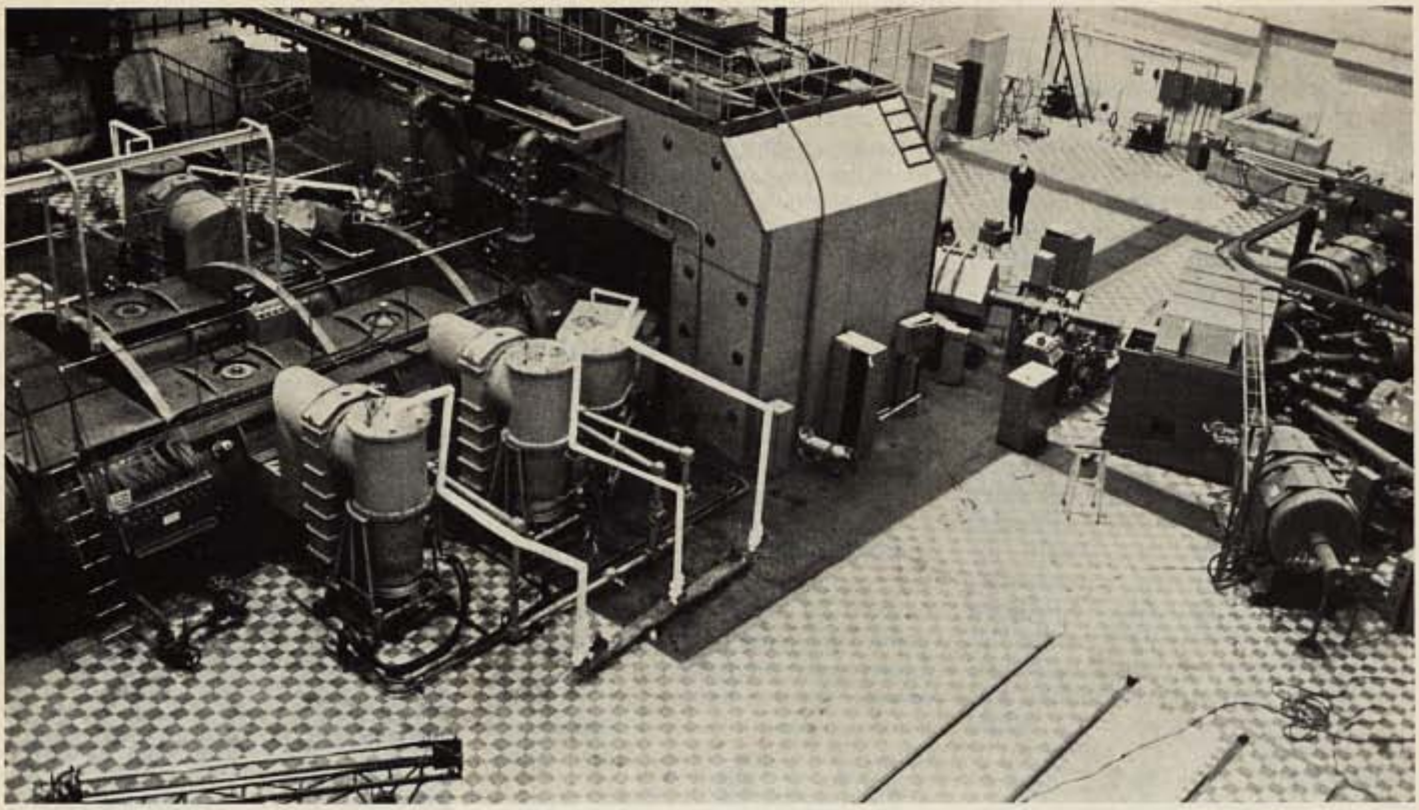

5. The accelerator of multiply-charged ions in the Laboratory of Nuclear Reactions. The accelerator is one of the most powerful and versatile of its type in the world. (Photo Yu. Tumanov, Dubna)

V. I. Veksler was made Director responsible for the design and construction of a 10 GeV synchro-phasotron, at that time the largest accelerator in the world. When Veksler died, he was succeeded by his pupil I. V. Chuvilo, and, in 1968, he in turn by A. M. Baldin.

The laboratory is the most international in the Institute with scientists from all the Member States. One of the first achievements was the discovery of the anti-sigma hyperon, the first of the charged anti-hyperons to be identified. Contributions were made to the discovery of the law of baryon number conservation and other regularities in the production and decay of hyperons and kaons. The Laboratory also carried out the first highly refined experiments on the collisions of mesons with nucleons (scattering at 180°) and was one of the first to investigate the phenomenon of resonances.

A group of scientists from Bulgaria, USSR, Mongolia and Czechoslovakia evolved a new elegant technique for studying scattering at high energies. This revealed the real part of the nucleon scattering amplitude which up to that time had been considered as a sort of phantom or mathematical convenience.

A recent result, which was entitled in the popular press "Discovery of the nuclear properties of light", concerned the major role of vector mesons in the transformation of particles into photons and vice-versa. For this experiment, extremely sensitive detection equipment was built. Further experimental evidence came from research in Novosibirsk, Orsay, DESY and CERN.

The research possibilities have recently been much enlarged by the commissioning of the 76 GeV accelerator at Serpukhov where the Soviet government has invited the Institute to participate in the experimental programme.

Special mention must be made of a new technique of acceleration which was proposed by Veksler. This is the collective ion technique which could bring about a revolution in accelerator design. It could make possible, with a cost saving of an order of magnitude, the acceleration of beams to energies in the region of thousands of GeV. Recently, crucial advances in this technique have been made and, following reports delivered to the Cambridge Accelerator Conference, the principle of the collective ion accelerator has been taken up by the USA and other countries.

LABORATORY OF THEORETICAL PHYSICS

The Laboratory of Theoretical Physics was set up under Bogoliubov almost immediately after the establishment of the Institute. It is one of the largest international theoretical centres with a permanent staff of 100 theoretical physicists coming from the Member States.

When Bogoliubov was made Director of the Institute, the leadership of the laboratory was taken over by D. I. Blokhintsev (the first Director of the Institute), Chairman of the International Union for Pure and Applied Physics (IUPAP). He is also known as the builder of the first nuclear power plant to produce electric current (1954).

Amongst the important achievements of the laboratory is the evolution of the theory of dispersion relations which has become an important technique in the mathematical analysis of subnuclear phenomena. This theory, which was first generally reported at a mathematical congress in Seattle in 1956, has been taken up by many theorists and developed by, for example, D. V. Shirkov and A. A. Logunov.

The Laboratory was also responsible for the quasi-potential method which has opened up a new line of theoretical research and there have been many contributions to particular fields of high energy physics such as neutrino studies.

In the field of low energy studies, Bogoliubov in 1958-59 (simultaneously with US scientists) completed the elaboration of superconductivity theory for which he was awarded the Lenin Prize. From this theory has been developed, by his collaborators, the superfluid theory.

LABORATORY OF NEUTRON PHYSICS

The Laboratory of Neutron Physics was set up under its present director, Nobel Prize winner I. M. Franck. Its main facility is a fast neutron pulse reactor which comprises two cores, a stationary core of plutonium 239 and a uranium 235 core mounted near the periphery of a steel disc. This disc rotates at 5000 rev/min and when the two cores are in coincidence the reactor becomes super-critical returning to the sub-critical state during the rest of the turn. Both the duration of the pulse and the repetition rate can be varied independently. Peak power is of the order of tens of megawatts whilst the average power is in the region of 1 kW. The pulse width has been further shortened by combining the reactor with a powerful microtron accelerator.

One of the main lines of research is measurement of neutron time of flight along a series of vacuum tubes, the longest of which is 1 km, which is provided with measuring stations at different places along its length.

The laboratory was one of the first to establish a centralized system of measurement with refined multi-channel analysers including one of a million channels. Data-links connect the physicists with a central computer.

The laboratory also possesses a 5 MeV electrostatic generator whilst a new technique, evolved at Dubna, for obtaining polarized neutrons and a first effective polarized deuteron target is opening up. The laboratory is also carrying out an extensive programme of fundamental research on problems of atomic structure and nuclear interactions. Increasing effort is being devoted to the investigation of condensed matter, a field in which Polish scientists, especially, have made significant contributions. A recent achievement is the development of techniques for storing and studying ultra-cold neutrons.

LABORATORY OF NUCLEAR REACTIONS

The Laboratory of Nuclear Reactions under G. N. Flerov is equipped with the world's most powerful multi-charged ion cyclotron with a pole face 3 m in diameter. It accelerates ions of boron, carbon, nitrogen, oxygen, neon and argon up to an energy of 8 MeV/nucleon with intensities up to 200 μA.

A number of new transuranic elements have been synthesized, including five isotopes of element 102, the first production of element 104, named Khurchatovium and the first atoms of element 105. It has recently been announced that an intensive search is to be made for the theoretically predicted range of stable elements with atomic numbers between 114 and 126.

To analyze the chemical properties of short-lived isotopes a very fast and sensitive technique based upon gas-chemistry has been involved under the direction of the deputy-leader of the laboratory I. Zvara from Czechoslovakia, a technique which will undoubtedly find a wide field of application in other areas of research.

Flerov, Zvara, S. M. Polikanov and V. A. Druin were awarded the Lenin Prize for their work in the field of transuranic elements, Zvara being the first foreign citizen on whom this Soviet Prize was conferred.

LABORATORY OF COMPUTING TECHNIQUE AND AUTOMATION

This laboratory is the youngest in the Institute, its Director is M. G. Meshcheryakov. A large computing centre has been established consisting of a series of computers integrated into a single system. The most powerful of these is the BESM 6 with a speed of 1 000 000 operations/s. A mathematical section is concerned with programming the computers.

Equally important is the development of modern techniques for the automatic processing of data arising from the experiments including the semi-automatic and automatic scanning of track chamber pictures, on-line systems for spark chambers, etc... and the two-way communication between computers and measuring centres.

INTERNATIONAL RELATIONS

The international spirit of the JINR has developed continuously from its first days. It is evident in the exchange of publications and personnel, and in the colloborative research that is done. Important international conferences have been held in Dubna — on accelerators in 1963, on high energy physics in 1964 and on nuclear structure in 1968. The closest collaboration is obviously with the institutes and laboratories in Member States, in the context of which some 200 joint investigations are carried out each year.

There is also, however, a developing relationship with countries outside the Member States, and, in particular, collaboration with CERN in Geneva has become a tradition. In addition, close relations are enjoyed with the International Centre for Theoretical Physics in Trieste, the Niels Bohr Institute in Copenhagen, the French Nuclear Centres (particularly Saclay and Orsay) the institutes in Yugoslavia, Sweden, USA and other countries.

Fifteen fellowships are awarded annually to young scientists to give them the right to work in Dubna and physicists from Italy, UAR, Pakistan, Yugoslavia, France and other countries have taken advantage of this opening.

Society News

New Member

In addition to the eighteen National Societies and Academies who joined on 26 September 1968, the Türk Fizik Denergi (Turkish Physical Society) has joined the EPS.

Prague Office

On 16 December, steps were taken to establish a Branch Secretariat of the EPS in Prague. F. Janouch is responsible for the Branch Secretariat at the following address :
European Physical Society
c/o Nucleear Research Institute,
Czechoslovak Academy of Sciences,
Rez u Prahy, Czechoslovakia.

Sponsors of the EPS

So far, una tantum contributions sponsoring the creation of the EPS have come from :

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Italian Physical Society
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