A DECADE OF SCIENTIFIC WORK AT THE JOINT INSTITUTE FOR NUCLEAR RESEARCH

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During the post-war years, nuclear and elementary particle physics rapidly became a fundamental and vigorously developing division of science. This was brought about by the importance of its practical application, which led to the creation of atomic industry, and by far-reaching theoretical conclusions which had a profound effect on many branches of science: philosophy, astronomy, astrophysics, etc. However, modern investigations of the nucleus and of elementary particles are associated with the use of huge amounts of energy and with intense particle beams. Further, experimental apparatus has acquired dimensions comparable with those of large industrial equipment, and its operation requires a large staff of highly qualified engineers and technicians with research costs increasing correspondingly.

This fact was one of the reasons for the creation of the Joint Institute for Nuclear Research at Dubna in the spring of 1956, in the confines of which were united the research efforts in nuclear and high energy physics of the scientists of the socialist countries.

Another important reason for the creation of the Joint Institute was the desire of scientists in the socialist countries to use jointly the rich and many-sided experience already acquired by Soviet scientists at that time. As is well known, a 680 MeV synchrocyclotron was put into operation in the Soviet Union back in 1949 which remained the largest in the world for a long time [1]. This accelerator, efficiently used for the last ten years [2], has a record particle beam intensity. Research reactors have been operated successfully in the USSR for many years, including the reactor of the First Atomic Power Station in Obninsk. All this created favorable conditions for the rapid training of highly qualified scientific cadres for those socialist countries where nuclear physics research was only just beginning and for the organization of a broad front of joint research work.

The rules of the Joint Institute of Nuclear Research provide that, regardless of degree of contribution, member-countries are completely equal both in the adoption of common organizational decisions and in participation in research work. There are representatives of all member-countries on the executive committee, on the finance committee, and on the scientific council of the Institute; the posts of Institute director, two vice-directors, and laboratory directors are all elective. There are representatives of both the Soviet Union and of all other member-countries on the scientific councils of the laboratories.

During its ten years of existence, the Joint Institute has significantly expanded its experimental base: a 10-GeV accelerator has become a part of the system of operating equipment at the High-Energy Laboratory [3]; the largest heavy-ion accelerator in the world [4] was put into operation and successfully used in the Nuclear Reactions Laboratory. The unique, pulsed, fast-neutron reactor IBR-1 [5] was constructed in the Neutron Physics Laboratory. A cryogenic laboratory and central experimental shops were also built at the Institute, and a large computing center was constructed.

The work of the scientists at the Joint Institute has made an important contribution to the generally heavy output of theoretical ideas and experimental discoveries in the past decade. In a brief paper, it is not possible to enumerate all the results obtained by the physicists at Dubna; we will discuss only a few of them.

Strong Interaction Studies

At the present time, there still exists no satisfactory theory of strong interactions; it is unclear to many physicists whether the reason for the difficulty lies in an inability to solve the complex operator equations of field theory.

µ-meson channel, Nuclear Problems Laboratory. P. Zoĭnikov photo.

Multiply-charged ion accelerator, Nuclear Reactions Laboratory. Yu. Tumanov photo.