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# The Atom in the Service of Mankind

by Dr. Igor Morokhov,
First Deputy Chairman of the USSR State Committee on the Utilization of Atomic Energy

On 21 June 1973 an agreement was signed between the Soviet Union and the United States of America on scientific and technical co-operation in the peaceful utilization of atomic energy. In the USSR, the executive organization which bears responsibility for the activities of the Soviet-American Commission, carries out general co-ordination in the field of co-operation and controls the implementation of the joint measures, is the State Committee on the Utilization of Atomic Energy.

The APN correspondent, Elena Knorre, talked with the First Deputy Chairman of the State Committee, Dr. Igor Morokhov, on the aims and significance of the agreement.

*QUESTION: What has made a special agreement on co-operation in the peaceful utilization of atomic energy necessary? If I am not mistaken, provision has already been made for dealing with these questions under the general agreement of 1972 on co-operation in the field of science and technology, and in the memorandum of 28 September 1972 on co-operation between the USSR State Committee on the Utilization of Atomic Energy and the United States Atomic Energy Commission.*

ANSWER: It has been made necessary by a global problem of importance to the whole of mankind: technical progress in all the principal areas of science and industry is impossible without the help of atomic energy. We are concerned here not only with a powerful, inexpensive, compact and environmentally safe source of energy (although that in itself is extremely important), but also with a programmed search for new materials possessing properties vital to technology: semiconductors, superconducting alloys, supermagnets, etc. These materials determine scientific and technical progress in electronics, radio and electrical technology, and modern engineering.

Without knowledge of the laws governing the movement and behaviour of microparticles, i.e. without fundamental research on the atom, progress in this context cannot be made.

Nuclear science and technology have crystallized out of the framework of the general agreements into an independent field of co-operation, which enables both countries to avoid duplication of effort and the unnecessary dissipation of human and material resources. All this makes it possible to achieve the goal not only economically, but also quickly. In certain fields, however, time is much more important than cost.

A dynamic combination of the efforts of the USSR and the USA will promote the speedy attainment of the goals that have been set, and will enable all interested countries to enjoy the fruits of science with a minimum expenditure of resources.

*QUESTION: Why do the fields selected for co-operation cover such widely different subjects as fast reactors, thermonuclear research and theoretical physics?*

ANSWER: These are the main trends of today, tomorrow and the day after tomorrow, first and foremost in order to overcome the energy crisis, which is already threatening many countries, and, as I have already said, in order to hasten over-all technical and economic progress.

Fast-breeder reactors are the generally recognized basis for current large-scale nuclear power generation. They are, as it were, intermediate stages between the "ideal", the thermonuclear reactor, which operates with the energy of fused light nuclei, and the existing slow reactors, in which use is made of the decay energy of heavy nuclei. In contrast to the latter, the breeder reactors not only "burn" the commonest naturally occurring nuclear fuel, uranium-238, but also produce an even more valuable fuel, plutonium, and in much greater quantities than are consumed. In this way natural uranium is saved and a fuel source permitting the accelerated construction of new breeder reactors is created. In the USSR much research has been done in this field, and we have great hopes for its outcome.

Research and test reactors (the BR-5 in Obninsk and the BOR-60 in Dmitrovgrad) are in operation; the first nuclear power station in the world with a fast breeder reactor (the BH-350) will produce electricity and desalt water from the Caspian Sea; the third stage of the Beloyarsk nuclear power station in the Urals, the huge BH-600 fast reactor, is nearing completion.

*QUESTION: What about the "ideal"? Why is it so called?*

ANSWER: A thermonuclear reactor is, in schoolboy language, a "sun" which is set alight by man and which obeys him. The processes are certainly the same. The fuel for a reactor of this type consists of light nuclei of a variety of hydrogen called deuterium. It can be obtained from ordinary water without much difficulty. Is it not an ideal arrangement to have water burning, a man-made sun shining, no waste and hence no pollution of the environment, and a fuel supply which is inexhaustible and will provide mankind with energy for all time?

Scientists of many countries are striving to attain this promising goal, without sparing cost or effort. Many avenues of research are being followed. Although a number of them hold promise, there are still substantial difficulties to be overcome, so that the joining of forces will undoubtedly gain time.

The Soviet TOKAMAK devices, which were developed at the Kurchatov Nuclear Energy Institute in Moscow, are generally considered to have got very near to the required level of an industrial thermonuclear reactor. They are currently being constructed in England, France, the Federal Republic of Germany and the United States of America, with Soviet support. Many scientists, including a number from Britain and America, have come to Moscow to carry out joint experiments on a TOKAMAK.

*QUESTION: The question regarding the link with theoretical physics appears to have been answered already; no doubt, however, some special materials, magnetic fields, etc., will be necessary for the reactors of the future?*

ANSWER: The link between theoretical or fundamental scientific research and practical problems is, you know, much more complicated than the formula "I seek - I find".

The discovery of new laws governing the forces of nature cannot by any means be equated with the search for necessary materials and processes. A scientific discovery leads as a

rule to revolutionary changes in production processes, and to the appearance of branches of industry that cannot be predicted. Research in the field of elementary particles (high energies), and nuclear physics (low and medium energies), i.e. investigation of the inner secrets of the structure of matter, is a highly abstract affair. It requires, moreover, an enormous and constantly increasing expenditure. Nevertheless, such research is the corner-stone of all progress. That is why, when the world's largest proton accelerator was commissioned in 1967 at Serpukhov in the USSR, the Soviet Government offered scientists not only from the socialist countries but also from France, the United States and CERN (European Organization for Nuclear Research) the opportunity to work with the accelerator, as the task is one for all mankind.

When the accelerator at Batavia in the United States reached its rated power in 1972, Soviet physicists took part in the first experiments. This privilege was granted to them because with the Serpukhov syncrophasotron, they had developed new methods of proton research without beam extraction, and the experiments could proceed straight away without any additional equipment.

The results obtained at Serpukhov, e.g. with respect to refinement of the theory of elementary particles or the study of antimatter (the production of antihelium and antitritium nuclei), have become the common property of world science. Who knows, perhaps these few antinuclei will one day lead to man's mastery of the fantastic energy of annihilation, the fusion of matter and antimatter!

The Shevchenko Atomic Power Station with its BW-350 reactor . . .
USSR State Committee on the Utilization of Atomic Energy