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ATOMS FOR PEACE AND PLENTY

THE International Conference on the Peaceful Uses of Atomic Energy, which concluded its sessions recently in Geneva, may be said to have fully realised the expectations which it raised. For, apart from its great contribution to the easing of political tensions and paving the way for freeer flow of research information among scientists of all countries, its significance as a scientific conference can hardly be overestimated.

As was pointed out by Dr. H. J. Bhabha, President of the Conference, during its opening session, humanity is in the third great epoch of its history, each of which was marked by a change in the energy pattern of society. It was the unaided human muscle which supplied all the energy for mechanical work during the first epoch, while the second one, which dawned somewhere in the 17th century, ushered in the widespread use of chemical energy in the form of coal and oil. But the energy consumption in the world has gone up in a staggering manner during the three recent centuries, and it is the atom, as the Conference has clearly established, which holds the answer to most of the problems connected with the demand for such supply during the third epoch which we are just entering into.

The present Conference is perhaps the largest ever organised by the United Nations on a subject of universal importance, and was attended by nearly 1,300 scientists, representatives and advisers from 73 countries. Space permits us to make only a brief mention of some of the highlights of the Conference in what follows.

The chief series of discussions in the first few days brought out the economic need for nuclear power in a world in which "conventional" fuel resources are running low, and

foreseeable other resources, such as those of hydro-electric power, are inadequate for the increasing demands of an industrialized world. Nuclear power, it would appear, has come just in time to enable coal and oil to be more widely used in the chemical and allied industries.

The general background to the employment of this new world power source was traced in papers from two of the UN specialised agencies. That submitted by WHO discussed the general problems of protection against radiations from the public health point of view. Potential dangers were considered as coming from two main sources: firstly, in radioactive wastes from reactors, and secondly, on account of the increasing distribution and use of radioisotopes. One point which was brought out was that the long-lived by-products of reactors are likely to be in such demand for many years to come that their disposal is not expected to become a problem for some years to come Above all, it was emphasized, protection must depend on education, not only of the necessary personnel for this new work, but also of the general public.

The second of these general papers dealt with the possible results of the application of atomic energy to increasing production in agriculture, forestry and fisheries. This paper, presented by FAO, reviewed the whole field and stressed the fact that while it would be some time before cheap nuclear power was available in sufficient quantity to make a direct contribution, there was already a vast field in which radiation, and even more, radio-isotopes, were contributing to speed up production through their use as research tools. In fact, it was suggested that the value of nuclear energy in helping to feed, clothe and house the rapidly increasing population of the world might be even greater than its importance as a new source of power

Of the papers in the first of three technical sections of the Conference, those dealing with nuclear physics and with reactors gave a complete survey of the progress made so far in these important fields. In this connection there was a series of announcements from physicists of UK, USA and USSR which showed that in all three countries, almost identical results had been obtained for one of the fundamental measurements in this field, namely, the number of neutrons emitted per fission The greater the accuracy with which this number is known, the more efficiently can nuclear energy be used.

On the reactor side, descriptions were given of many types of reactors already in use, ranging from small research reactors to those so far built for actual power production. Beyond this, detailed plans were disclosed and discussed which show that many of the smaller nations, such as the Netherlands and Norway, are already well advanced and making important original contributions in this field. Though at present research reactors are attracting most attention, they will soon be followed by the design and construction of prototype reactors for power production. But it will be sometime before full-scale nuclear power plants are in operation, except in one or two countries where plans are already very well advanced. A catalogue of reactors so far built was contained in a paper submitted by UNESCO, which summarized the available information to give a complete picture of the situation in this respect.

Another highlight of the Conference was the demonstration of the importance of thorium for the production of atomic energy and the possibility of a positive gain factor in the conversion of fertile to fissile material in the thorium-U233 system which was shown to be superior to the uranium 238-plutonium system in several ways. The breeding of atomic fuel in fast neutron reactors also held out exciting possibilities.

The second technical group of sessions, dealing with chemistry, metallurgy and technology, opened with a general review of the natural occurrence of uranium and thorium, from which emerged the encouraging picture of a plentiful supply of these essential raw materials—a picture which was based on no less than 94 papers submitted to this session. Prospecting problems and techniques were discussed with special reference to aerial survey methods. Less familiar aspects of the chemistry of fission, and problems of handling the highly radioactive materials produced in the fission process were also dealt with in a number of papers.

In the biological and medical sessions, medical applications of radioisotopes, ways and means of handling these materials, clinical and diagnostic work were some of the more important subjects dealt with. Advances in this field were evident in many countries.

Discussions ranged from such public health problems as the study of epidemic communicable diseases to the application of isotopes in studying the biochemistry of muscles. Later, various aspects of radiation injury were dealt

with, during which there was discussion of the possible effects of a general increase in the level of radio-activity in the world as a whole. From these discussions it was evident that the use of radioisotopes in medicine is one of the outstanding contributions which nuclear energy is already making to the welfare of mankind.

On the general side, the feasibility of generating electricity by atomic energy was demonstrated beyond doubt, and the economics of atomic power generation was also greatly clarified. There would appear to be good reasons for expecting that capital costs of atomic power stations would come down during the next decade. Even with present costs, it was shown, atomic power stations would be economically competitive with power stations of a conventional type in many areas of the world where power costs are high.

Certainly the meeting of the world's specialists in the atomic sciences marked a new departure in international co-operation and was not marred by politics. It will go down in history as a major achievement of the United Nations.

PROF. M. S. THACKER

PROF. M. S. THACKER has been appointed Director, Scientific and Industrial Research. He took charge of his office on August 3, 1955.

Prof. Thacker received his early education in Ahmedabad and Bombay, and proceeded to Europe at an early age. He graduated in engineering from the Bristol University and undertook post-graduate research in the Department of Electrical Engineering of the same University. Later, he joined the Bristol Corporation Electricity Department as an engineer. He returned to India in May 1931 and joined the Calcutta Electric Supply Corporation, Calcutta, as a covenanted officer. He continued there till 1947, when he was invited to take up the Professorship of the newly created Department of Power Engineering, Indian Institute of Science, Bangalore. In 1949, he was appointed Director of the Institute.

Prof. Thacker is the author of numerous papers and memoirs in the field of power technology and high voltage engineering. During the past eight years, he has actively participated in a number of international conferences and committees as an expert dielegate from India.

He has also been intimately associated with many scientific and technical organizations in India and assisting several States in the development of power resources and distribution of electricity supplies. His counsel has been much sought by numerous committees and boards concerned with research and technological education and by several Universities in the country and outside. On the last Republic Day the President conferred on Prof. Thacker the award of *Padma Bhushan*.

We wish Prof. Thacker success in his new assignment.

DIRECT CONVERSION OF RADIATION INTO ELECTRICITY

PRODUCTION of electricity by direct conversion of atomic energy should be considered as a possible auxiliary power source, according to Dr. Ernest G. Linder, Paul Rappaport and J. J. Loferski, of the Radio Corporation of America, in a paper presented to the International Conference on Peaceful Uses of Atomic Energy at Geneva.

Discussing various known methods of converting atomic energy directly to electrical energy, Dr. Linder gives particular attention to the semi-conductor type of device employing radioactive material in conjunction with materials such as silicon or germanium—the method used in the experimental atomic battery announced by RCA in early 1954. In this type of conversion unit, high current multiplication is achieved in the semi-conductor material. For example, each beta particle produced by strontium-yttrium-90 radioactive source material produces in turn about 200,000 new electrons as it penetrates a silicon target, increasing output current and reducing internal impedance by a similar factor. However, power sources using radioactive material cannot be considered truly practical until solutions are found to problems of high cost of radioactive material, efficient shielding, radiation damage to target material bombarded by beta particles, and low efficiency.

At the present time, the available isotope nickel-63 meets all of the requirements except that of cost, but it is hoped that attention will be given to this and other materials in the same category.