of the unique ionium-thorium mixture that had been isolated by O. Hönigschmid. Her request met with a generous response and she received half of the mixture. (Note: Ionium is an isotope of thorium)

The friendly relations between Mme. Curie and her Institute on one hand and the Radium Institute in Vienna on the other found expression in the letters of condolence which her daughter, Mme. Irène Joliot-Curie, and her son-in-law, Frédéric Joliot, sent to Vienna on the death of Stefan Meyer. In her letter of 25 January 1950, Mme. Joliot wrote:

> "On returning from a visit to India I learned of Professor Stefan Meyer's death. I was very sorry to receive this news since he was one of the last remaining contempories of my parents, and the Curie Laboratory always enjoyed the most friendly relations with the Institute for Radium Research in Vienna, which he founded".

After a very warm tribute to Stefan Meyer as a person, F. Joliot wrote:

> "I know how strong the bonds of friendship were between Marie Curie and Stefan Meyer"..... "Science has suffered a great loss and we mourn Stefan Meyer with you".

REPORT TO ECOSOC

In the annual report to the Economic and Social Council of the United Nations, presented in July, the Director General, Dr. Sigvard Eklund,selected two main themes. As in previous years, he gave details of one of the ways in which nuclear energy is being applied to a world problem, in this case the scientific study of water. He also summarized the assistance given to developing countries who need technical assistance, fellowships and training, and stressed the need for more ample resources to be made available.

After outlining the upsurge in the use of nuclear power, and the concept that has arisen of energy centres capable of supplying electricity and water, Dr. Eklund said that in previous years he had spoken about Agency work in subjects such as insect control, food conservation, and medicine. This year he

would deal with a less publicized use of nuclear energy in which the IAEA had been involved for many years.

USING NATURE'S GIFTS

The purpose, he said, is to help the development and use of the fresh water supplies that nature has given to the world. The importance of fresh water for agriculture in the arid zones is obvious, but the requirements for industry and domestic purposes are now also causing concern even in certain countries in Western Europe.

Dr. Eklund continued:

Water resources will be the subject of one of the three long-term surveys approved by the Council at its spring session. The importance of the topic was clearly demonstrated at the Water for Peace Conference held last May in Washington DC.

For a rational use of fresh water supplies in the two-thirds of the world that is arid, we must try to have the answer to several questions. The greatest reservoirs are underground, and obviously the first question is how much water they contain.

The second is how long it takes to recharge the reservoir; the third is were the water comes from. Does it, for instance, come from another large underground reservoir, or does it percolate down from the surface? If most of the water in an underground reservoir originates from precipitation in the current year, this supply will obviously be highly vulnerable to droughts.

MOVEMENT IN TIME AND SPACE

Many of these or similar questions must also be answered to make the best use of surface bodies of water like lakes, dams, glaciers and mountain snow cover. Our eventual aim is to obtain an overall picture of the water balance of whole regions and continents, of the movement in time and in space of water from the ocean to atmosphere, atmosphere to ground surface, surface to stream or to underground reservoirs and eventually back to the sea.

Two groups of isotopes enable us to obtain the information needed. The first group comprises certain stable isotopes, chiefly the heavier atoms of oxygen and hydrogen which exist in all forms of water but vary slightly in their ratio to other atoms as a result of the processes of evaporation and concentration. This variation is spatial. It can be detected by sensitive techniques, and the variations enable us to characterize water, study the mixing of different types of water and locate the recharge areas.

The second group consists of certain radioactive isotopes which occur in air and water everywhere, and which, with the passage of time, diminish in proportion to other atoms. The variation is thus temporal and allows us to determine whether a given source of water is receiving some recent recharge such as this year's precipitation, and to study the pattern of the flow of water underground, for instance, in permeable limestone, which is a common geological feature of many arid or semi-arid areas.

The chief radioactive isotopes of use in such measurements are the extra-heavy hydrogen atom—tritium—and radioactive carbon.

One advantage of using these two groups—the stable isotopes and the environmental radioactive isotopes—is that we are looking for indicators which are already present in water or the atmosphere. Thus, we do not artifically introduce radioactive material into the system. Secondly, the variations in these isotopes all over the world enable us to make much larger studies—covering whole regions—than would be possible if we were to inject radioactive tracers.

Taken together, the analyses of stable and radioactive isotopes of water can yield valuable and unique information on the relations between precipitation and run-off, of the relations between ground water and surface water, and of the time of travel of water in the different stages of the hydrological system. This is of particular interest to developing countries faced by rapid growth in water demand, and in most cases a severe deficiency in conventional hydrological data and a shortage of trained technicians.

CONCERTED EFFORTS

This work requires the concerted efforts of meteorologists, hydrologists and nuclear scientists. Since 1960, the IAEA and the World Meteorological Organization have jointly undertaken a continuing world survey of tritium and stable isotopes in precipitation. Data obtained from this survey during the last seven years form the basis for isotope hydrology in the developing countries.

I would like to mention two specific examples of the use of these isotope techniques. In one case the Agency is helping the national atomic energy research institute of Korea to determine whether there is a large fresh water reservoir in an island off the coast of that country. In Southern Spain, isotope techniques are being used to study the ground water resources that feed the upper and lower Guadalquivir river basin. Other countries using these techniques with the Agency's help are Australia, Austria, Brazil, Chile, CSSR, Greece, Hungary, Jamaica, Jordan, Kenya, Niger, Poland, Thailand, Turkey and Uganda.

There is also the use of deliberately injected radioactive tracers. These can only be used for problems of a strictly local nature. The technique is to inject small quantities of artificial radioactive isotopes into a river, spring, bore hole or dam. We can then measure the flow of water in the river, leakage from

the dam or canal and measure the direction and rate of flow of water underground. This technique is also used to measure the dispersion of sewage and industrial waste—a problem that becomes more important each year as the pollution problem increases in our rivers.

I hope it is clear from what I have said that the techniques I have described provide very valuable tools in the systematic study of the hydrology of whole regions and whole river basins as well as of much more limited and local problems. To make the best use of these tools, they must be employed as part of an integrated water study. The Agency has therefore established a group of scientists of various disciplines which is carrying out field studies for the International Hydrological Decade programme under UN Education, Scientific and Cultural Organization auspices and is cooperating with other agencies of the United Nations (UNESCO, World Meteorological Organization, Food and Agricultural Organization, etc.) to apply nuclear techniques to water development.

REQUESTS OUTSTRIPPING RESOURCES

Turning to a different subject, the Director General summarized the steps being taken to improve further the help given to developing countries, adding a plea for more ample resources to be made available to meet requests.

Following a resolution adopted by the Tenth General Conference, the Agency is at present reviewing all its programmes with the extension of such assistance in mind.

"An analysis of our work from 1958 through 1966" he reported "has shown that, of $86 million put at the Agency's disposal, approximately $30 million were used for Technical Assistance or other direct aid for developing countries. A large proportion of the remaining $56 million was spent on work in such countries or of special interest to them".

All Member States, he continued, were asked to comment on this subject and 36 have done so. A special committee of the Board of Governors was also set up to hear Member States' views. The gist of the views expressed by almost all countries was that, while the Agency's work should continue to be of interest to its membership as a whole, there should be a steady movement towards the practical applications of atomic energy in electric power, agriculture, hydrology, raw materials development, etc. This seems to show that nuclear energy and nuclear techniques have now reached the stage where developing countries feel that they can be of direct practical benefit to them—and are no longer a topic only for countries that have reached a high stage of technological evolution. The review also showed, however, that some Governments of developing countries are not yet aware of the economic benefit that nuclear techniques can bring, especially in fields like agriculture and water resources. The Agency's Board of Governors has therefore recommended that steps should be taken by Member States themselves to secure a larger share of UNDP resources for atomic energy development.

The review brought out clearly that the main problem that limits the help the Agency can give to developing countries is lack of resources for assistance projects. There is in this field, as in many others under the authority of the Economic and Social Council, no shortage of technically sound and viable projects but a lack of funds. As I see it, the main, the fundamental problem to be discussed by this session is how to increase the necessary funds. No coordination, no streamlining of procedures can, more than in a superficial way, improve the situation. It seems likely that, in 1968, we in the Agency shall only be able to carry out less than 30% of the requests for technical assistance experts, fellowships and training.

We are constantly reminded of the military applications of nuclear science and technology. The peaceful applications in producing electricity, in hydrology, in desalination, agriculture, medicine and industry, can play an increasingly important role in helping to solve the problems of the developing world.

"It will be unfortunate, to say the least" concluded Dr. Eklund "if the resources so readily available for other uses cannot be put more amply at our disposal in the campaigns to produce and conserve more food, to increase the product of industry, to combat disease and to bring water to the arid areas".

SUCCESSES AGAINST INSECTS AND PARASITES

With more and more answers being found to intricate problems which have entailed years of research in many parts of the world, some successes can now be claimed in the fight to control insect threats to crops, animals and human beings. Nuclear techniques are playing an important part in world efforts, and recent reports show that they have been effective in pioneer work against crop pests as well as in finding an answer to some diseases caused by parasites.

300 000 000 FLIES WITH A PURPOSE

More than three hundred million flies have been bred in laboratories and released in Central America with the paradoxical purpose of reducing the fly-population —and the results at this stage look promising, even allowing for understandable scientific caution.