health and prosperity throughout the world". It will continue to "ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose".

IN HONOUR OF MARIE SKLODOWSKA-CURIE

This year marks the hundredth anniversary of the birth in Poland of Marie Sklodowska-Curie, originator of the word "radioactivity", whose early research in the subject has had far-reaching consequences for the nuclear sciences. The Government of Poland's arrangements for marking the occasion include an international symposium, restoration of her house in Warsaw, publications and films, and the Agency is happy to collaborate. This article from a distinguished Austrian scientist indicates how her work was carried out in an atmosphere of co-operation between scientists of many nations.

By Dr. Berta Karlik

(The author has been since 1945 Director of the Institute for Radium Research and Nuclear Physics, Austrian Academy of Sciences, where she succeeded Professor Stefan Meyer. A graduate of Vienna University and member of a number of learned societies, she has produced many scientific papers, including one published in 1944 dealing with the occurrence in nature of element 85, Astatine. This element was the last in the atomic table to be identified and occurs naturally only in minute quantities. It was first produced artificially by E.C.Segré, D.R.Corson and K.R.MacKenzie in 1940 at the University of California).

The fact that the International Atomic Energy Agency has established its headquarters in Vienna prompts one to consider briefly, on the occasion of the 100th anniversary of Marie Curie's birth, the important part played by

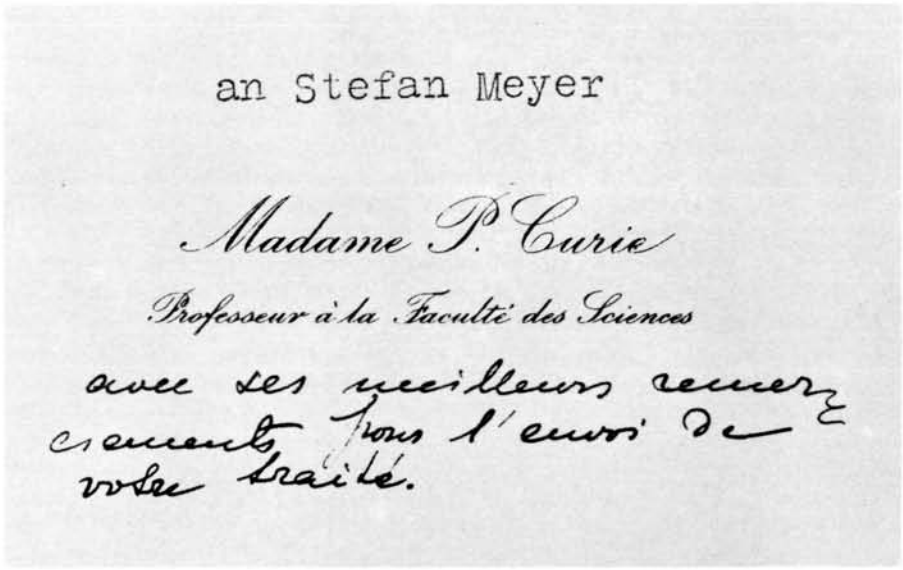
Austria, and particularly by the Academy of Sciences in Vienna, in the discoveries of this great scientist and in the further development of her work.

When Henri Becquerel discovered "uranium rays", at the beginning of 1896, Mme. Curie became interested in this phenomenon. She soon found that chalcolite, a uranium mineral, emitted radiation more strongly in the natural state than when it was synthesized in the laboratory from its known chemical components. On the basis of this observation she put forward the hypothesis that the natural mineral contained, in addition to uranium, a hitherto unknown element which, although present in only a very small amount, was more radioactive than uranium. Mme. Curie set about isolating this element by chemical means and on 18 July 1898 she was able to report to the Academy of Sciences in Paris that she had succeeded in separating a highly radioactive substance which, although related to bismuth, exhibited special characteristics and was therefore to be considered as a separate element, to which she gave the name "polonium". However, these investigations had led her to suspect the presence of yet another radioactive element, about which no detailed information could be presented since larger amounts of raw material were required for its separation than were available to Mme. Curie. Analytical studies indicated that the second element was likely to be present in the residues which remained after the extraction of uranium from pitchblende and which had not hitherto been put to any use. Several wagon-loads of this material were stored in the vicinity of the St. Joachimsthal uranium mine in Bohemia (now Jáchymov in Czechoslovakia), at that time the only known major uranium deposit in the world. In those days Bohemia was part of the Austro-Hungarian empire and the mine was operated by the State. Pierre and Marie Curie had therefore to apply to the Austrian Government in order to obtain a substantial quantity of the pitchblende residues. They presented their request in September 1898 in a letter which was transmitted through the French Embassy and the Austrian Ministry of Foreign Affairs to the Academy of Sciences in Vienna. The President, Eduard Suess, a professor of geology, quickly realized the scientific significance of Mme. Curie's investigations and immediately recommended to the competent ministry that it supply her with 100 kg of residues free of charge. By November 1898 official approval had been granted, to the Curies' great delight. The two scientists immediately set to work and on 26 December they were able to report to the Academy of Sciences in Paris that they had discovered in the material received from the Austrian Government a second radioactive element — radium.

SUPPLYING PRECIOUS MATERIAL

At that time, the Academy of Sciences in Vienna counted among its leading members Ludwig Botzmann, C. Auer v. Welsbach and Franz S. Exner. They now began to follow the work of the Curies with considerable interest and used their influence to ensure the continued supply of Joachimsthal residues. An initial 6000 kg were supplied as a gift — subsequently a small charge was made. By 1906 a total of 23 600 kg of the precious material, containing about 12 g of radium, had been sent to Paris. In letters to the Academy in Vienna, Pierre Curie repeatedly expressed his own and his wife's gratitude for its support and for the generosity of the Austrian ministry concerned.

In Vienna, a number of younger scientists soon became interested in carrying out their own investigations with the newly discovered rays. Pierre and Marie Curie immediately sent as a gift a radium preparation weighing about 1 mg. Stefan Meyer and E. Schweidler were thus able to publish as early as 1899 an account of their experiments on the deflection of the radioactive rays by a magnetic field, thereby demonstrating the corpuscular nature of the rays. Their work was soon followed by other fundamental investigations carried out by Austrian scientists. For example, the Vienna Academy of Sciences itself arranged for the purchase of residues from the Joachimsthal mine and asked C. Auer v. Welsbach to process the material in his laboratories; 4 g of radium chloride were extracted as a result. The Institute for Radium Research was founded in Vienna as early as 1908, Stefan Meyer being appointed Director. When the Sorbonne decided in 1912 to establish a radium institute in Paris, in collaboration with the Institut Pasteur, the Institute in Vienna was in many ways taken as a model.


an Stefan Meyer

Madame P. Curie

Professeur à la Faculté des Sciences

avec ses meilleurs remercîments pour l'envoi de votre traité.

Acknowledgment from Marie Sklodowska-Curie to Stefan Meyer, first Director of the Institute for Radium Research and Nuclear Physics, Austrian Academy of Sciences.

In 1911, Mme. Curie again approached the Austrian Government with a special request. She proposed to carry out an exhaustive study on polonium, for which she required a large amount of the element. She therefore requested that a fraction of "raw polonium" be extracted from the Joachimsthal material by a process indicated by her. Stefan Meyer again used his influence to obtain approval from the ministry concerned and then established contact with the director of the Joachimsthal plant, who carried out Mme. Curie's wishes within a few months. Several letters from Mme. Curie show how grateful she was for this rapid assistance.

FIRST INTERNATIONAL STANDARDS

Mme. Curie's contacts with the Radium Institute in Vienna were particularly active with regard to the preparation of radium standards. At the International Radiology Congress, which was held in Brussels in September 1910, leading scientists in the field of radioactivity considered for the first time, and in lengthy discussions, the question of preparing standard samples for exact comparison of measurements carried out at different laboratories. The International Radium Standard Commission was set up with the following membership: E. Rutherford (Chairman), M. Curie, O. Hahn, F. Soddy, B. Boltwood, A. Debierne, A.S. Eve, H. Geitel, S. Meyer and E. Schweidler. It was decided that two radium samples of maximum possible purity should be weighed with extreme accuracy and the radiation emitted by them compared. One of the samples should be prepared by Mme. Curie in Paris and the other by O. Hönigschmid in Vienna. In March 1912, the members of the Commission again met in Paris and compared the two samples. It was found that the radiation intensity per mg was the same for the two samples, which were therefore of equal purity. Mme. Curie's sample was declared to be the primary international radium standard and it was agreed that it should become the property of the Commission. The sample prepared at the Institute in Vienna was declared to be the secondary international standard. Since the Paris sample was Mme. Curie's property, an equivalent sample was prepared by O. Hönigschmid in Vienna (the cost of the radium being borne by F. Soddy's father-in-law) and Mme. Curie received this as a substitute for her own sample.

Many countries were now interested in obtaining a "national radium standard", i.e. a standard sample based on the international standard, in the same way as the weights kept at national offices of weights and measures are based on the international prototype kilogram. Accordingly, O. Hönigschmid prepared a considerable number of radium chloride samples, carefully sealed in glass tubes. When required, these were accurately compared with the secondary international standard at the Radium Institute in Vienna and subsequently with the primary international standard in Paris. The measurements, between which very good agreement was consistently obtained, were always carried out by Stefan Meyer and Mme. Curie personally, the certificate being signed by both of them and issued by E. Rutherford as Chairman of the Commission. In this way, the following countries acquired internationally recognized standard radium samples: Austrialia, Belgium, Canada, Czechoslovakia, Denmark, Germany (Physikalisch-Technische Reichsanstalt), Hungary, Japan, Portugal, the Soviet Union (Leningrad), Sweden, the United Kingdom (National Physical Laboratory, Teddington) and the United States of America (National Bureau of Standards, Washington). A number of countries even acquired several standards of different sizes.

CONTINUED COLLABORATION

There were repeated opportunities for collaboration between the Radium Institutes in Vienna and Paris. When, for example, Mme. Curie wished to prepare a standard ionium sample in 1925, she asked Stefan Meyer to send her some

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