

MEASUREMENT OF RADIOACTIVITY

More than 100 scientists from 27 countries and several intergovernmental organizations took part in a symposium on the metrology of radionuclides held by IAEA in Vienna last October. A radionuclide is a radioactive isotope and the aim of radionuclide metrology is to develop methods for the precise measurement of the activity of various radioisotopes with a view to their standardization. The Vienna symposium was the first scientific meeting on the subject to be held at a truly international level.

In almost all applications of radioisotopes, it is important to know the precise quantity of the radioactive substance employed. And to know this, it is essential to determine the activity of the substance, because at any given moment the activity is proportional to the radioactive atoms present. As is well-known, the atoms of all radioactive isotopes disintegrate with the emission of nuclear radiations in such a manner that half the atoms of any given amount of the substance disintegrate in a particular period of time which is immutably fixed for every radioisotope but varies from one isotope to another. In other words, for every radioisotope there is a time - known as its half-life - during which half the atoms in any given amount of the substance disintegrate, the remaining radioactive atoms being reduced by half in exactly the same time, and so on.

The number of disintegrations per unit of time is thus a measure of the quantity of the active substance present in a nuclear radiation source. But any determination of quantity on this basis presupposes precise knowledge of the half-life of the radioisotope involved and often of its scheme of disintegration, the latter being sometimes quite complex. The metrology of radionuclides thus gives rise to many complicated problems, and measurement methods are often beset with uncertainties.

Intensive research has been going on in many countries to remove these uncertainties and to develop and perfect the methods of measuring the absolute value of the activity of a radionuclide. The importance of this research would be obvious in the context of the rapidly growing use of radioisotopes all over the world. As Mr. Hubert de Laboulaye, Deputy Director General of IAEA, observed in his inaugural address at the symposium, the use of radionuclides had increased not only in regard to the variety of applications but also in respect of the quantities involved. Moreover, until recently these uses had been confined to a few scientifically advanced countries but now they were spreading to more and more countries of the world. Development in this direction, Mr. de Laboulaye pointed out,



Experts on the metrology of radionuclides at the Vienna symposium

was bound to continue, and this increased the importance of improving the methods of measuring, as precisely as possible, the absolute values of the activity of various radionuclides. The Scientific Advisory Committee of IAEA had expressed the view that it was important to attempt a synthesis of the experience in this field gained in different countries. The Vienna symposium was meant to serve that purpose.

The symposium lasted three days, during which 36 papers were presented and discussed. On the first day, scientists from a number of countries reported on the routine methods of standardizing radionuclides. New developments in this field or suggestions for the refinement of measuring techniques were discussed on the second and third days.

Various types of equipment are available for measuring or "counting" the activity of radioactive substances, and several experts discussed possible improvements in these counters. The theoretical aspects of the counting methods were also taken into account. The subject was divided into a number of categories according to the type of radiation emitted by a radionuclide. The application of absolute measurement methods to various problems were discussed in detail.

It was felt that the data presented and the suggestions made at the symposium would go a long way towards establishing and improving universally acceptable methods for measuring accurately the activity of radionuclides which are finding increasingly wide applications in industry, agriculture and medicine.