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Nobel Prize in Chemistry 1911

Marie Curie, née Sklodowska

The Nobel Prize in Chemistry 1911 was awarded to Marie Curie *"in recognition of her services to the advancement of chemistry by the discovery of the elements radium and polonium, by the isolation of radium and the study of the nature and compounds of this remarkable element"*.

RESEARCH INFORMATION:

The aim of the scientist is, or should be, to extend the limits of human knowledge. However, the roads open to him The Royal Academy of Sciences, at the session on the 7th of November of this year, decided to award the Nobel Prize for Chemistry for 1911 to Madame Marie Sklodowska Curie, Professor at the Faculty of Sciences of Paris, "in recognition of the part she has played in the development of chemistry: by the discovery of the chemical elements *radium* and *polonium*;
by the determination of the properties of radium and by the isolation of radium in its pure metallic state; and finally,by her research into the compounds of this remarkable element."

In 1896, Becquerel observed that the compounds of the element uranium gave off rays which had the property of acting on photographic plates and of making air conduct

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electricity. This phenomenon is known by the name of radioactivity, and substances causing it are said to be radioactive.

A little later, it was noticed that the compounds of another element, thorium, already discovered by Berzelius, possess similar properties.

For the discovery and investigation of this radiation, called uranic or Becquerel rays, the Academy of Sciences awarded the Nobel Prize for *Physics* in 1903 to Henri Becquerel and Pierre and Marie Curie jointly.

During her research into the radioactivity of a great many compounds of uranium and thorium, Mme. Curie realized that the strength of the radioactivity was directly related to the proportion of these elements in the compound. However, certain naturally occurring minerals provided a striking exception to this rule, for example pitchblende, whose radioactivity was well above the value calculated from its uranium content, in fact even greater than that of the element uranium itself.

The logical conclusion was that these minerals must contain a hitherto unknown element, which was extremely radioactive; and, in fact, by the systematic use of chemical procedures, which were long and arduous, and required several tons of pitchblende, Marie and Pierre Curie finally succeeded in extracting - admittedly in minute quantities - the salts of two new highly radioactive elements, which they named *polonium* and *radium*.

Radium, the only one of these two elements which it has been possible to isolate in the pure state so far, resembles the metal barium in its chemical properties, and is distinguished by a very characteristic spectrum. Its atomic weight was determined by Mme. Curie to be 226.45. It was only last year (1910) that Mme. Curie, with the help of a co-worker, succeeded in producing radium in the pure state, i.e. as a metal, thus establishing its status once and for all as an element, in spite of various hypotheses to the contrary.

Radium is a silvery-white, shiny metal, which decomposes water violently and chars organic matter, such as paper, with which it comes into contact. It melts at 700°C and is more volatile than barium.

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From the chemist's point of view the most remarkable property of radium and its derivatives is that, without being affected by environmental conditions, they continually give off an *emanation*, a radioactive, gaseous substance which condenses into a liquid at low temperatures. This emanation, for which the name *niton* has been proposed, seems to have the characteristics of an element, and chemically is most like the so-called noble gases, whose discovery was rewarded at the time with the Nobel Prize for Chemistry. This is not all. The emanation, in turn, undergoes spontaneous break-down, and among the products of this break-down, Sir William Ramsay, the Nobel Prize winner, and other leading scientists after him have established the presence of the gaseous element *helium*. This had already been observed in the solar spectrum and even found in small quantities on earth.

This fact has established for the first time in the history of chemistry that one element can really be transmuted into another; and it is this above all which gives to the discovery of radium an importance which can be said to revolutionize chemistry and mark a new epoch.

The theory of the absolute immutability of chemical elements no longer holds good, now that science has succeeded in penetrating some of the mystery which has until now shrouded the evolution of the elements.

The theory of transmutation, dear to the alchemists, has been unexpectedly restored to life, this time in an exact form, deprived of any mystical element; and the philosopher's stone with the property of inducing such transmutations is no longer a mysterious, elusive elixir but is something which modern science calls energy.

The system of particles from which, it must be assumed, the atoms of radium are composed is charged with the most extraordinary quantities of energy. When the atom breaks down, these reveal themselves in the spontaneous development of light and heat which is characteristic of radium.

Furthermore, we are no longer dealing here with a phenomenon which is unique or even unusual. The discovery of radium and polonium, an even more radioactive element, has brought in its train the discovery of a great many other radioactive elements with

longer or shorter life-spans, by which our field of knowledge in chemistry and our understanding concerning the nature of matter have been considerably extended.

Indeed, research on radium has led during recent years to the birth of a new branch of science, *radiology*, which already commands institutes and journals of its own in the great scientific countries.

This science, important in itself, has acquired an added importance by virtue of its numerous points of contact with many other natural sciences, such as physics, meteorology, geology and physiology. We know that radium, because of its physiological effects, has found a use in medicine and to judge by a good many experiments, radiotherapy claims its most promising results especially in the treatment of cancerous growths and of lupus.

In view of the enormous significance that the discovery of radium has had first for chemistry, then for many other branches of human knowledge and activities, the Royal Academy of Sciences considers itself well justified in awarding the Nobel Prize for Chemistry to the sole survivor of the two scientists to whom we owe this discovery, to Mme. Marie Sklodowska Curie.

Madam. In 1903, the Swedish Academy of Sciences had the honour of conferring upon you the Nobel Prize for *Physics* for the part which you, together with your late husband, took in the momentous discovery of spontaneous radioactivity.

This year, the Academy has decided to award you the prize for *Chemistry* in recognition of the eminent services you have rendered to this science by your discovery of radium and polonium, by your description of the characteristics of radium and its isolation in the metallic state, and by your research into the compounds of this remarkable element.

During the eleven years in which Nobel Prizes have been awarded, this is the first time that the distinction has been conferred upon a previous prizewinner. I beg you, Madam, to see in this circumstance a proof of the importance which our Academy attaches to your most recent discoveries, and I invite you, Madam, to receive the prize from His Majesty the King, who has graciously consented to present it to you.

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