The following is a reprint of an article contributed to the *Sydney Morning Herald* by Professor O. U. Vonwiller:—

SIR ERNEST RUTHERFORD.

Both to workers in Physics and to the many others interested in the recent remarkable developments in this science the news that Sir Ernest Rutherford is to lecture here soon will be welcome because it gives a rare opportunity of seeing and hearing one of the greatest living physicists and of learning at first hand, in his accounts of his own marvellous discoveries, of the latest researches on the structure of the atom.

Sir Ernest is a native of New Zealand; in 1894, after graduating at Canterbury College, in the University of New Zealand, he went to England as 1851 Science Research Scholar and there for four years worked under Professor J. J. Thomson at the Cavendish Laboratory in the University of Cambridge, then, as now, the greatest centre of research in Physics. He was in England at a notable time in the history of Physics, the beginning of the present period of marked activity and progress which has resulted in such extraordinary advance in our knowledge of matter. During these years were commenced by physicists at Cambridge and elsewhere researches in connection with the conduction of electricity in gases which established the existence of electrons, giving full information of their properties, demonstrating their presence in matter of all kinds, confirming Crookes's view that cathode rays consist of negatively charged sub-atomic particles and supplying the foundation of our present day knowledge of atomic structure. Two notable discoveries which have had a profound influence on this development and on the later advances were announced at this time, that of X rays by Röntgen in 1895 and that of radio-activity by Becquerel in the following year. The growth of the "new physics" thus started at the same time as Rutherford's career in research and in a very few years he became recognised as a leader in the new developments. In particular his name is very closely associated with the growth of our knowledge of radio-activity; in fact while recognising the fundamental importance of the great discoveries of Becquerel, the Curies, Crookes and others one feels justified in saying that from the time of his active interest in the subject the history of radio-activity is essentially the story of Rutherford's successive researches.

Among his early important contributions in this connection may be mentioned his discovery, in 1899, of radiations from uranium of two kinds, distinguished first by marked difference in penetrating power, the α and the β rays; for our knowledge of the properties of the former, that they consist of particles, positively charged, of about four times the mass of a hydrogen atom, projected with enormous velocities and eventually, after their speed has fallen, becoming recognised as atoms of helium, we are mainly indebted to Rutherford's experiments. In 1900 he discovered the first known of the radio-active emanations, that of thorium, and later showed the production of active deposits from this gas upon surfaces of solids in contact with it. Prolonged and exhaustive investigations of the changes in activity of this gas and of the constituents of the active deposit enabled him, with Soddy, who collaborated in this work, to conclude that in radio-active processes we are concerned with changes in the atoms themselves—with a true transmutation of the elements. Their theory of successive transformations was truly revolutionary, more so than we can realise to-day, but as all know it is fully confirmed by subsequent work.

These researches, which make clear what radio-activity is, were carried out in Montreal where Rutherford was Macdonald Professor of Physics in McGill University from 1898 to 1907. During this period his work was recognised by the conferring of numerous distinctions from British and foreign scientific bodies; he was elected a Fellow of the Royal Society in 1903, and further honoured by that body in his appointment as Bakerian Lecturer in 1904 and by the award of the Rumford Medal in 1905.

In 1907 he was appointed Langworthy Professor of Physics in the University of Manchester which position he occupied until 1919 when he succeeded Sir J. J. Thomson as Cavendish Professor of Experimental Physics at Cambridge.

Shortly after his return to England he achieved a striking experimental triumph in detecting the effect of a single alpha particle enabling him to count directly the number of particles emitted from a known amount of a radio-active material in a given time and leading at once to fuller and more accurate knowledge of radio-active and atomic constants. It was after this in 1908 that he was awarded the Nobel prize. His knighthood was conferred six years later.

Rutherford's later work has been concerned almost wholly with the phenomena accompanying the passage of α rays through matter and by these investigations he has made most valuable contributions to our knowledge of atomic structure. First by observations on the scattering produced in narrow beams of these particles when sent through thin sheets of solid materials he was able to decide among various atomic hypotheses in favour of the nuclear theory by showing that in the atom there is a minute central portion or nucleus, positively charged, containing practically the whole mass, round which at comparatively great distances revolve electrons. Thanks to subsequent work by Rutherford and other physicists, many of whom were at one time research students under him, we now have a fairly detailed knowledge of the outer part of the atom, of the arrangement and behaviour of the electrons in this part, but comparatively little is yet known of the structure of the nucleus. Here too, however, work on alpha rays is helping us; one of the most important and spectacular achievements in recent years, from the physicist's point of view, is Rutherford's success in breaking up nuclei of atoms of certain elements by bombardment with alpha particles. He showed that from atoms of nitrogen, aluminium and several other substances occasionally a particle identified with the nucleus of a hydrogen atom was detached, the remaining part of the atom presumably forming some other element. These are the first experiments in which by artificial means there is produced a transmutation of the elements.

Of his later experiments in this field, of other experiments concerned with a detailed investigation of the behaviour of α particles during their passage through matter and of his interpretation of the observations he will no doubt speak at length in his lectures.

There can be no doubt that Rutherford will always be recognised as one of the great scientists. His experimental work is brilliant alike in conception and in execution. He possesses the wisdom and just the right imagination to enable him to make correct interpretation of his observations. While he has advanced bold and startling hypotheses these have always been reasonable deductions from the experiments and it is noteworthy that opinions and theories published by him have never proved to be incorrect in any essential particular.

LECTURES BY SIR ERNEST RUTHERFORD.

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