

this. Whence therefore, has the radium come? It is found that radium occurs in minerals containing uranium, itself a radio-active substance. It has now been proved by Soddy that a uranium preparation entirely free from radium, subsequently produces radium. The radio-active substances can be arranged in a set of family trees. Uranium gives rise to ionium, ionium to radium, radium to radium emanation, and this in all probability to the common metal lead. This transformation of the elements one into another, is not a thing that we can make to occur at will. All we can do is to observe the changes. The conversion of one element into another, the old dream of the alchemists has thus, through the wonderful skill for investigation displayed by our modern wizards, become a matter of observation; but we cannot control the changes, we cannot hasten them or retard them. Perhaps some day we shall learn how at will we may transmute one element into another, but that end does not at present appear to be in sight.

One of the most extraordinary consequences of the discovery that the atom contains electrons and of the fact of radio-activity, is that our eyes have been opened for the first time to the existence of a vast store of unsuspected energy—energy stored up in the atom which had been, until recently, entirely overlooked. Helium has been discovered in the sun by means of the spectroscope, and there seems every reason to believe that its parent radium is there too, i.e., that there are radio-active substances in the sun. For long it was believed that the sun's heat was only kept up by the shrinkage of its materials into smaller volume. But even shrinkage could not keep the sun's temperature constant for very long. Now geologists believe that the sun's heat has remained about the same for at least one hundred million years, and possibly much longer, and also that the earth's surface has remained in its present condition for this vast period.

According to modern views the maintenance of the sun's heat is due to radio-active substances which it contains. Atoms of different kinds in the sun are constantly undergoing spontaneous disintegration with the result that vast stores of energy are being liberated. It is this energy—energy of atomic source—which