"The West Australian 25th July 1907

pause.) While one expressed one's thanks to Mr. Soddy for work of that nature, one must not overlook the University Extension Committee—(applause)—who were responsible for Mr. Soddy's visit, and who had been spending the small sums entrusted to their hands with the utmost good sense and the utmost discretion. (Applause.) When Mr. Cooke came to him a week or ten days ago and gave him the opportunity of meeting Mr. Soddy, and they had a discussion about the future University, he was quite surprised when Mr. Cooke told him that Parliament gave him only £100 to carry on the work of which this was a portion. He promised Mr. Cooke, with the full certainty that it was bound to be endorsed, whoever his successor might be, that that sum would be increased to £300 next year. (Applause.) This was a practical way in which they could show their thanks to the committee. They could not say to Mr. Soddy, "We hope you will come back to us." They knew what Mr. Soddy's ambition was. His aspiration was to carve out a name and reputation for himself in the old country. (Applause.) Might they express the confident hope that the future would amply justify Mr. Soddy's anticipations, and that he would thoroughly realise his ambition? (Applause.) When Mr. Soddy became, as they hoped he would become, world famous, and if he in his busy days had six months to spare, might they hope that the recollections of his trip to Western Australia would be so bright as to induce him to spend those six months in Western Australia, to come and see their University established, and an educational system justifying the boast he made now that they intended it should be second to none in the Commonwealth. (Loud applause.)

Three cheers were then, on the call of the Premier, given for Mr. Soddy.

Mr. Soddy, in reply, said that no words of his could properly express his appreciation of the way in which they had welcomed him in Western Australia and of the vote of thanks they had passed to him. It would always be a happy memory with him that this trip had been so successful and that they had shown so much interest in these subjects he had been able to speak to them about. He thought that the words which had fallen from Mr. James in regard to a University were not likely to lack fulfilment in the future, from what he could see of the future of Western Australia. He was sure they would carry out the scheme, which he hoped would be put before them without loss of time, in the same way they had carried out other great undertakings. He would be very pleased if his visit should in any way have borne fruit of a lasting character and have done anything to popularise the idea of a University and University education. In his work here, coming as he had a long way he had been able to do things he should otherwise have been unable to do, mainly through the large amount of help he had received from people he had met here. He desired that they should also express their thanks to Mr. Cooke, the secretary of the University Extension Committee, and the officials of the Observatory, and to Mr. Hancock, the Government Electrician, for the material help they had given him in his lectures. (Applause.)

The audience then dispersed.

THE LESSON OF RADIUM.

MR. SODDY'S CONCLUDING LECTURE.

SOME INTERESTING THEORIES.

In Queen's Hall on Saturday night Mr. Frederick Soddy (Lecturer in Physical Chemistry and Radio-activity at Glasgow University) delivered the last of his series of University Extension lectures on "Radium and Modern Views on Electricity and Matter." There was again a large attendance. His Excellency the Governor and Lady Bedford were present.

Mr. Soddy said that the explanation they had arrived at at the previous lecture to explain the behaviour of radium must have an important bearing on other departments of science. Radium was slowly undergoing a change. This was similar to the change they knew of in coal when it burned and gave energy in the form of light or heat, and the change of dynamite when it exploded. It was at the same time different because it involved a far more fundamental change than any investigated in science before. If they had a body giving out energy of any sort that body must be undergoing a change unless, indeed, it had stored up this energy beforehand from some previous source. There was no evidence that radium stored up any energy during the time they had known it, and they were forced to the conclusion that radium must be undergoing a change, and this change was different from any that had been known before on account of the very intensity of the phenomena that were manifested. The science of chemistry began really with the efforts of the alchemists, a class of people who held that they could transmute elements. It was perfectly well known then that elements were fundamental things, but the alchemists said that in certain secret nostrums and methods they had the secret of transmutation. The two centuries which followed absolutely disproved all these pretensions. The idea of the elements being something fundamental gradually grew up among scientific people, and about the middle of last century Professor Clerk-Maxwell, one of the leading scientists, described an atom or unit as the foundation stone of the material of the universe. The idea arose that these elements were intransmutable. They omitted to mention, however, their personal inability to decompose these elements. The awakening in the scientific world following upon the

Discovery of Radium

showed that although they personally could not do it the process was going on in Nature under their eyes. They now realised their limits better than they did five years ago. He had shown them at his previous lecture the emanation of radium, and he described it as the transition or intermediate form in the break up of the heavy element into lighter elements. Just follow for a moment the history of the gaseous emanation they drew from a given quantity of radium. It was an absolutely infinitesimal quantity, and in order that they might detect it it had to be breaking up rapidly. If they left the emanation for a few days its energy decayed, and in three weeks it was gone. It was analogous to an ordinary community. The population was regulated by the birth rate and the death rate. They had this emanation produced at a given rate just as they had children born at a given rate. The emanation had a definite period of life, averaging about 5.3 days, and it thereafter disappeared at a definite rate corresponding to the death rate of the community. These two factors were fixed. There was a steady balance between the rate of production and the rate of decay. The energy of radium was always being produced and was always dying down. Everything they had to guide them proved that the actual change in any given quantity of radium must be very small. Madame Curie found that her radium did not measurably decrease in activity and power after several years, so far as she could tell. From the first it appeared hopeless to find out very much about this change. The question of

What Radium Changed Into

looked at first sight a rather difficult one to answer. In pitchblende, the mineral in which they found radium, these processes of change must have been going on steadily, and the change from the radium steadily accumulating century after century. It was, therefore, only reasonable to suppose that these products would have accumulated in the pitchblende to a sufficient degree to be easily detected. Unfortunately, pitchblende contained about 40 other elements besides radium. By a fortunate chance the

Problem was Soluble.

It was found on the discovery of the rare element helium that it was only got in elements which contained thorium and uranium. They ventured the prediction that the helium present in the pitchblende was the product of a slow change from radium through long decades of time, and that helium was one of the elements into which radium changed. They had been able to establish the rate of change that radium was undergoing. About a thousandth part of radium underwent a change every year. The question arose of how it was there was any radium left considering the age of the earth. This raised one of the points which had not yet been decided, but he thought there was little doubt that radium had grown, and was growing all the time, from other bodies in exactly the same way as helium was growing from radium. They could imagine how the discovery of this steady change which was going on had opened up a big field in practically all departments of science. One factor left out of their calculations was time. Rocks did not undergo any appreciable change, so far as they could see, and they came to the conclusion, therefore, that these rocks consisted of inanimate matter. If, however, they might live for a million years they would find that slow changes were really going on around them the whole time in all forms of matter. They might, therefore, look upon the elements as undergoing a

Steady Process of Evolution

in the same way as it was now customary to regard animal types produced from one another by the steady action of the process of evolution. They could say that they knew more about radium than any other element. If radium was breaking down at this rate, it was absolutely impossible that any large quantity would ever be found. They would never discover an ore which contained more radium than pitchblende — 1-10th of a pennyweight to the ton. During his visit to the goldfields he was interested by an idea held by some prospectors that gold in some way grew in the veins of quartz. Until a few years ago such an idea would have been regarded as absolutely absurd, but at present it was by no means absurd. There might be some scientific law governing the occurrence of gold in rocks, or the occurrence of minerals in rocks, on exactly the same lines as the transmutation of matter in radium. At present there was not much chance of this source of energy being utilised in any useful way. It was impossible to control the forces which were producing the change. Until they could control them radium would not affect any great change in the methods of obtaining energy on a commercial scale. If they could extract the energy from radium quickly, he calculated that about seven ounces would

Drive a Mail Steamer

from London to Sydney and back again. There were other elements, uranium and thorium, which contained no less energy than radium, but it was given off at a slower rate. If they could utilise radium in this way they could also utilise these two other elements. At present the most interesting problems which were affected by this new knowledge the scientific world now possessed were those connected with astronomy, or, rather, cosmology. A controversy took place during the last half of the last century as to how long the globe had been habitable. The geologists argued that with the same forces at work as at present existed, it would, to produce the results they knew, take several hundred million years. The physicist said it was absolutely impossible for the sun to have given out heat for more than ten million years at the outside. The physicist was to be considered as being absolutely wrong in his former estimate as to the possibility of the maintenance of life on the globe. This was the result of the discovery of radium. It was possible that a minute quantity of radium in the earth would account for the increase which took place in the temperature when they got beneath the surface. The slow charge of this radium dissipated throughout the mass of the earth might be supposed to be giving out rays of sufficient energy to cause the

Internal Heat of the Globe.

The heat of the earth was one of the arguments which was used by Lord Kelvin to show that the earth was once red hot. It was to be supposed that the uranium and thorium were sufficient to produce results of this order when they considered the enormous mass of the earth. They could imagine the same thing in regard to the sun. If they had a quantity of matter in the sun undergoing these changes like radium, this would account for the production of light and heat for long ages, for a hundred million years. This was a question for experts. It had always been the only explanation to suppose the earth started red hot, because they could not imagine any other process. Now, with these curious processes of transmutation they could imagine bodies to be giving out heat spontaneously, and it was almost as logical to suppose that at one time the