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his career. It was a momentous time in the history of science, for in that year the X-ray was discovered by Professor Rontgen, followed by the discovery of radio activity. A year or two later electrons were duly placed. These discoveries had been responsible for the great advance of physical science in the last few years. "We live in an heroic age of physics," he added, "and we have accomplished much more than a great many of us considered possible."

Sir Ernest traced the amazing present-day achievements of wireless, resulting from the knowledge of the independent existence of the electrons. The discoveries were made by men who were merely dabbling in experiments and proving scientific theories. He referred to the facilities for research afforded by the universities, and said opportunity should be given to students to prove themselves when they showed talent. Sir Ernest evidently appreciates the fact that science and humor are not necessarily dissociated, and his remarks were freely punctuated with bright phrases. His audience perceptibly warmed to the human touch. People, he said, had but the vaguest notion what an atom was—they tried to visualise it, some as an infinitesimal football, and others as a marble of microscopic proportions. The human mind could not grasp its inconceivable smallness. It could not be measured. More than one hundred millions could be contained in a thousandth part of a millimetre. In fact, even the professional experts of a few years ago regarded it as futile to define an atom. It was a bold man to-day who would deny the atomic theory.

Some of the diagrams illustrating the lecture were fearsomely prolific in algebraical symbols and references, and such phrases as "kinetic energy," "Wein contrast of structural radiation," "grating spacing in calcite," and so forth. The animated pictures were truly startling. Taken with a special instrument fitted with an ultra-microscopic lens of very high magnification, they clearly showed the movement of atoms in a mass of liquid. One could even trace the movements of a separate atomic liquid. The "mass" was but one thirty-five-thousandth of a millimetre in diameter, but there could clearly be seen thousands of atoms chasing first this way and then back again in accordance with the dictates of applied radio energy. It was uncanny, and one could only stand in reverential awe of the master mind which devised instruments of such rare delicacy.

The lecturer explained the rate of progress of particles from a grain of radium. It took 10,000,000,000,000,000,000, or, as he put it, one and nineteen noughts, to make one cubic centimetre of helium. "But," he concluded amidst laughter, "the Americans are filling balloons with it."

Sir Ernest Rutherford will deliver another lecture at the Brookman Hall tonight.

News. 3.9.25

League of Nations' Union

"Executive Official of the Drivers' Union," Adelaide:—The address of Mr. Birrell to the League of Nations' Union was interesting, coming from a Labor leader. But he did not make it clear how the League is to maintain peace and establish social justice.

Mr. Birrell is surely not unaware that three great nations—United States of America, Germany, and Russia—are outside the league. In effect it is only a League of Victors and not a League of Nations.

Professor J. R. Wilton, addressing the same body at a luncheon a week previously, referred to the horrors of Bolshevism and the pitiable plight of the peasants who go to make up the great majority of the nation's population under the present misrule.

What many workers want to know is how it is that a Labor leader is identified with and a member of an institution that launches an attack upon the only workers' republic of Labor in the world, and which leads in wireless invention and is broadcasting news to which people in Australia sitting by their firesides can listen.

Adv. 4.9.25

ELDER CONSERVATORIUM.

On Monday week in the Elder Hall, in the presence of his Excellency the Administrator and Mrs. Poole, the University choral class conducted by Mr. Frederick Bevan, will give its annual concert. The works to be performed are Handel's serenata, "Acis and Galatea," and Mendelssohn's "Athalie." For the former the soloists will be Misses Thelma Martin and Elsie Cook, and Messrs. Walter Wood, John Ardill and Arnold Matters, and for the latter, Professor Darnley Naylor will act as reader, and the Misses Sylvia Thomas, Alice Morgan, Jean Sinclair, and Mabel Siegele will take the solo parts. Plan to-morrow at S. Marshall & Sons, Gawler-place.

Reg. 4.9.25

A FAMOUS SCIENTIST.

Arrival of Sir Ernest Rutherford.

Welcome at the Town Hall.

The famous scientist, Sir Ernest Rutherford, who was accompanied by his wife, disembarked at the Outer Harbour on Thursday from the Ascanius. He was met there and in Adelaide by many friends and the leading scientists of the State.

In the Town Hall at noon the Lord Mayor of Adelaide (Mr. C. R. J. Glover) and Mrs. Glover tendered him a reception. Those present included Sir Douglas Mawson, Dr. H. Basedow, the Surveyor-General (M. T. E. Day), Mr. A. A. Simpson, Professors Mitchell, Chapman, Howchin, Kerr Grant, Darnley Naylor, T. Harvey Johnston, Mr. C. T. Madigan, the Director of the Adelaide Botanic Garden (Mr. J. F. Bailey), the Government Astronomer (Mr. G. F. Dodwell), and Dr. R. H. Pulleine.

The Lord Mayor stated that it was a privilege to welcome Sir Ernest Rutherford to Adelaide. He was not altogether a stranger, for he had come to Adelaide with the British Association for the Advancement of Science in 1914. He had won a world-wide reputation in science, and they as Australians were glad to be able to lay some sort of claim to nationhood with him, because he was born in New Zealand. He trusted that the stay of the distinguished visitor in Adelaide would be pleasurable.

The Vice-Chancellor of the University (Professor Mitchell) said it was a great honour to be able to welcome a man like Sir Ernest Rutherford to Australia. Six months ago the scientists of Australia thought they had failed to induce him to visit the Southern Hemisphere, but Professor McCallum had succeeded in getting him to change his mind. It was impossible to speak too highly of Sir Ernest Rutherford and the work he had done. After having received the Nobel prize he had done still more distinguished work, and had written his name for ever on the atom.

Sir Douglas Mawson supported the welcome. He stated that nobody could be more distinguished in the realm of science than the guest of honour. His work had been so fundamental, and so complete, that it would stand for all time. In Adelaide they appreciated his visit greatly, especially because of his nearness of kin to them. His work was valuable not only in pure science, physics, and chemistry, but even the geologists had benefited by it. His studies in disintegration, which were really the outcome of his work more than any one else's, had given a chance of placing a definite figure on geological time.

Sir Ernest Rutherford, in response, thanked those present for their welcome to "a comparatively insignificant atom in the universe." He stated that he had noticed the pride of Australia in its weather, for when 2,000 miles away the steamer on which he travelled had entered a fine zone and the Australians on board claimed that that particular weather and calm seas were a natural attribute of their continent. It was a great pleasure for him to visit Australasia. One of his most cherished memories was a visit to Adelaide when a youngster. On that occasion he had met Professor Bragg at the University and had seen the work he was doing. Not altogether by accident, he had been more closely associated with him in England, and with his distinguished son, who was born in Adelaide, and now occupied a chair at the Manchester University. No one appreciated Professor Bragg's work more, or the name he had made in science, than he did. Reference had been made to the difficulty he had experienced in making a trip to Australia. That had not been due to unwillingness on his part, but to the exacting nature of his work. With regard to his work in the Cavendish laboratory at Cambridge he had been most fortunate in the way it had ended. He always had at the back of his mind a possibility that some one would come along to show that things were not what they had seemed to him, but there was no sign of that at the moment. His work was largely connected with experiments to try to find the constitution of the outside of the atom. His studies of the inside seemed to indicate that it really controlled the outside. The atom was associated with a mysterious and intricate world. They had found some methods of attacking but it would be a long time before they could hope to know much about it. The layman might ask why all that fuss was made about such a minute thing as an atom. In reality the world was one mass of atoms and man another, so it seemed reasonable to know as much as possible about the

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things which formed them and their structure. The whole of chemistry, physics, and most other applied sciences were dealing with the atom or its combinations, so that they could say that it was a fundamental mass. The real interest of the subject lay in the philosophical question of its fundamental nature. During the past 25 years they had made substantial progress, and now appreciated the fact that they were dealing with some simpler phenomena; but they would find it more complex as they proceeded. The most startling discovery was the extraordinary simplicity of the relations which lay at the root of physics. They had become able to discuss combinations of elements and the atoms themselves in numerical and arithmetical terms. There was no end to the thing, and that was a misfortune, for no leader of research could hope to do more than deal with one branch of it. That was the effect of the rapid accumulation of knowledge. He regretted his inability to stay long in Australasia, but it was necessary to get back to his laboratory to supervise the work of the men engaged in research, and see that they kept at it.

AN INTERVIEW.

The Study of the Invisible.

When Sir Ernest Rutherford landed in South Australia from the steamer Ascanius on Thursday he found a busy time ahead of him. He was tendered a reception by the Lord Mayor of Adelaide (Mr. C. R. J. Glover) at noon, and spent the afternoon with Professor Kerr Grant at East Adelaide.

There he had plenty to do answering the telephone. Lady Rutherford went on to Sydney by the express during the afternoon, en route to New Zealand. Sir Ernest will leave on Saturday night. He stated during an interview that he had a pleasant voyage to Australia, and after a holiday in New Zealand he would return to England by way of the Panama Canal.

Sir Ernest stated that scientific research was flourishing in Great Britain. Its value was realized by the public, and that had enabled the Government to form a Department of Scientific and Industrial Research, with a big grant to conduct its operations. That department had done its work wisely, and had been of great assistance to research in general. It not only financed technical research in industry, but it also provided special grants for young investigators of promise. It gave money to help with special research in university laboratories and certain experiments in the generation of electric power at tremendous energy were being financed by it. The general idea was to work as fully as possible in conjunction with the universities, because they had the men to investigate the various problems and to help in training young men of science to take a part in the research of the future. The great general value of the department to the community could scarcely be understood, and there was no doubt that it had been thoroughly successful in the attainment of its ideals. Great importance was placed on training students so that they should take up work in the university and should concentrate on fundamental research. It was not desired to set them to research of a technical character. It was felt quite rightly that investigations of the principles which caused certain phenomena were a better training ground than a direct attack on some definite technical problem. Australia would be interested to know that the head of that department (Sir Frank Heath) was to visit the country shortly to discuss matters of organization with the Commonwealth Government.

Playing with the Infinitesimal.

His work at the Cavendish laboratory, Cambridge, was discussed by Sir Ernest. He stated that it dealt to a considerable extent with the subjects of radio activity and the disintergration of the atom. Disintegration might be studied in its natural phase, as seen in the slow destruction of radium, or could be produced artificially by a bombardment of atoms with the swiftly moving particles of matter emitted from radium. There were two general methods of attacking those questions, one of which was known as scintillation, because, under it, atoms of matter produced weak points of light on certain phosphorescent materials like zinc sulphide. That effect could be observed with a miscoscope after the eye had been thoroughly rested in a darkened room. The other method was to photograph the track of an alpha particle by means of a beautiful system discovered by Professor C. T. R. Wilson. In that case they were able occasionally to observe a collision between an alpha particle and the nucleus or centre of an atom of matter. Thus they could observe the effects of an extraordinarily powerful collision. In that way some information could be obtained about the effect produced by those violent encounters. If the nitrogen of the air were bombarded evidence had been found that from its atom one of hydrogen was liberated at high speed. In such a case the alpha particle was captured by the nitrogen atom. With those methods scientists had found that a number of the lighter elements could be liberated by intense collisions, but the effects were on a minute scale, for the nucleus of an atom was so small that only one alpha particle in about one hundred thousand could get close enough to affect it.

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Electricity in Excelsis.

Many experiments were being conducted in the Cavendish Laboratory with money provided by the Department of Scientific and Industrial Research. Some on a large scale were in progress with the idea of producing a much more powerful magnetic field than any known hitherto, or possible, with the present electro magnets. The fields of magnetism obtained now were measured in units of about 50,000, whereas the new method, it was hoped, would give them of the order of one million units. Those experiments, which were being conducted by Dr. Kapitza in the laboratory, depended on making a short circuit in a specially designed dynamo of large power. It would give from the minute interval of one hundredth part of a second the extraordinarily intense current of the order of 50,000 amperes. That momentary current was used to produce a powerful field in a suitably wound coil. A large quantity of apparatus was required and the operations would be started soon. Their object was to study the effects on matter of currents with such immense power, which hitherto had not been available. It was believd that the result would be to alter the motion of the particles and the construction of an atom. If that were the case they might hope to produce effects on a much larger scale than previously.

STRUCTURE OF ATOMS.

Sir Ernest's First Lecture.

In the Brookman Hall of the School of Mines on Thursday evening, Sir Ernest Rutherford delivered the first of a series of lectures on the structure of the atom. There was a large attendance, which listened intently, and was most appreciative. To explain various phenomena lantern slides and some cinematograph views were shown. The latter illustrated the movements of atoms in various substances and their different movements in positive and negative magnetic fields. Among the lantern slides there were illustrations of the effect of alpha particles on moisture-saturated air, and the way they acted in certain substances.

Advance in 25 Years.

After having outlined the history of physical research, Sir Ernest stated that it had been discovered that X-rays were akin to light. That led to new problems which were brilliantly solved by Maxwell and Hertz, with their theories of the electro-magnetic properties of light and the effect of ethereal vibrations. Sir William Bragg immediately followed up their discoveries and ascertained the architecture of crystals and the distribution of atoms is space. Already the chemist and metallurgist were applying the theories of Bragg and his son to their sciences, and great advances had been made as a result. Though the electro-magnetic theory of light was only 25 years old, its outcome had been the use of wireless communication and the invention of powerful oscillators and valves of previously unheard-of strength. Now it was possible to communicate with the whole world with currents of low power. That had resulted from the development of fundamental principles discovered by men working merely for the advance of knowledge, and without an idea of the commercial value of their discoveries. It was their duty to foster any talent which might be in their midst, with the intention of keeping it concentrated on fundamental problems. The university should be their home, and it was the duty of the State to see that the university was adequately supported so that any talent could show itself. That was more particularly the case in a young country than an older one, because in the former a young man might have few opportunities for advancement in science.

Search for Facts.

From a scientific point of view, the history of the atomic theory began with Dalton, of Manchester. He had endeavoured to show the effects of chemical combination, and estimated that there must be a number of elementary substances. The labours of Mendeleef in the last century were directed to the discovery of those substances and their relations with each other. The atomic theory, after all, was simply a definite way of explaining facts. It did not worry the investigators what the size of an atom might be provided it was fairly small. Probably most of them thought of it as round, something in the nature of a miniature ball; and only a few years ago most scientific men had similar ideas. To them it was useless to speculate about whether an atom had an inside, because it was so minute. From the beginning, however, there were philosophic men who admitted that the theory was correct, but said that they must be able to form some idea of the starting of an atom. Young was the foremost of them, and he showed on the most simple hypothesis that the atom must have a dimension of about a millionth of a centimetre. Kelvin was the most accurate of the investigators, and he used the surface tension of water to discover the size of atoms and the number of them in any substance. Nowadays they did not merely estimate the number of atoms in a substance, but knew it with considerable certainty. Though they could not assign a size in definite terms to it, they knew its mass, the charge of electricity it carried, and the number in any given quantity of material.

Effects of Bombardment.

As a result of the discovery of the ultra microscope by the botanist Brown 100 years ago a means had been devised of seeing the movements of atoms, and so