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RADIO-ACTIVITY.

LECTURE BY PROFESSOR BRAGG.

The great interest taken by South Australians in the discovery of the wonderful radium, added to by the recent finds at Olary, was shown by the large attendance on Monday evening, when Professor Bragg delivered the first of his two lectures on radio-activity during the present session of the University extension addresses. The lecturer said the study of radio-activity was exciting immense interest in all parts of the world. This arose partly from the fact that the new science revealed wonders hitherto unsurpassed, and also because it dealt with a series of phenomena not previously touched by scientific discovery. It was important to understand that point. In the nineteenth century the discoveries of Dalton and the work of all the great chemists and physicists who had followed him had treated in the main with the interactions of atoms and molecules on one another. The very word atom implied that the study of its properties was carried on in relation to it as a whole, and not to its parts. The new science was distinguished from the old in that it dealt with the processes occurring within the atom itself. One illustration of this would serve. In the laboratory of the chemist the thermometer was an all-important instrument; in fact, all chemical processes were largely affected by the temperature at which they were carried on. Temperature implied the existence of heat, which consisted in the energy of the motion of the molecules and atoms among themselves. In the new science of radio-activity temperature was of very small importance, for the motions and properties dealt with were those that occurred within the atoms themselves, and had no relations to their motions among other bodies or to other atoms and molecules round about them. Whether as many great results would flow from the study of radio-activity as proceeded from the study of the atom and the molecules, as exemplified in chemistry and physics, remained to be seen, but there was no doubt that the study was enormously interesting, and gave every promise of leading to knowledge of service to man.

Professor Bragg sketched the principal points in the theory of radio-activity for the benefit of those who had not studied the subject. He recapitulated the description of some discoveries made in the University of Adelaide, an outline of which he gave last year, and mentioned that when he delivered his last lecture on the subject he was not in a position to say much about the impression the Adelaide discoveries had made in the scientific world, but in the year that had elapsed many discoveries in various parts of the world had verified his experiments, so that he might say that the Adelaide University had made material contribution to the world's knowledge of radio-activity. Much new and important work had been done in the past year, and this he proceeded to describe. In the first place Professor Rutherford, who had been working in Montreal, in Canada, had shown that the alpha particle, when it ceased to give evidence of its motion through the air, was still moving at a speed of something like 6,000 miles a second. The range of the alpha particle in the air was the distance it went before its speed fell to the velocity named. The discovery that the remaining velocity of the particle was so great was certainly surprising. What became of it afterwards was a matter of wonderment. Professor Rutherford had written to him that he was at present engaged trying to discover the remaining history of the particle. Professor Rutherford had also carried out a series of experiments, testing and confirming the Adelaide results. That had been done mainly because certain experiments performed by M. Becquerel in Paris had seemed to run counter to them. M. Becquerel had argued from his work that the particle did not gradually lose its speed as it went through matter, as had been supposed by Professor Bragg, and he published his experiments in some of the Continental papers. Professor Rutherford's experiments showed easily the point at which M. Becquerel had erred, and his results were also published in various scientific papers in the early part of the year. The lecturer mentioned that his own replies to M. Becquerel appeared later, as the letters had to travel round the world. Almost immediately after the publication of his first results M. Becquerel himself found out his mistake, and had in his turn also described experiments in which he showed his agreement with the Adelaide results. Professor Rutherford's experiments had also brought out the singular fact that when the alpha particle fell to the velocity named not only did it cease to have electrical effects as Professor Bragg had shown, but it also ceased to be able to affect a photographic plate, or to cause minerals to phosphoresce. A piece of research work had been carried out during the year which dovetailed beautifully with those new results. It had been shown by Sir James Dewar that a photographic plate could be acted upon by light, even at a temperature of 400 Fahr. below zero. All chemical actions had practically ceased at so low a temperature as that, and it was clear therefore that photography was not primarily a chemical effect at all. It was probably electrical. There were certain substances which responded electrically to the stimulus of light. For instance, a large number of bodies discharged negative electricity when ultra-violet light fell upon them. The point was of considerable importance in physiography, for it was generally supposed that mountain tops discharged negative electricity into the air under the effect of brilliant sunshine. These so-called photo-electric effects had also been found by Joly to be in existence at extremely low temperatures, and it was therefore to be inferred that the photographic action was probably one of those photo-electric effects, and not a chemical one at

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all. This had formed the subject of Joly's address to the Photographic Convention of the United Kingdom last year. Professor Rutherford's discovery that the property of the alpha particle, in that it lost this power to affect the photographic plate at the same moment it lost its electrical power, was in every way consonant with the theory of photography. Probably therefore the photographic effect upon a plate exposed in a camera consisted of the unseating of electrons from their proper place, the displacement being capable of being carried on at any temperature. Materials so modified would afterwards respond to the chemical action of the developer at ordinary temperatures.

Professor Bragg then showed some interesting photographs which had been sent to him by Professor Rutherford. These illustrated the radiating power of radium. Metal rods had been exposed to the emanations from radium, and had become radioactive themselves. When placed upon a photographic plate curious patterns were formed, depending upon the shape of the rods themselves. The unravelling of these patterns, he declared, was easily effected by the new theory of the alpha rays, and was a pleasing confirmation of the correctness of the theory. An ordinary incandescent body of the same size would have given no pattern at all on the plate. (Applause.)

The W.A. Morning Herald 7th June 1906.

UNIVERSITY EXTENSION COMMITTEE

ANNUAL REPORT.

The report of the local University Extension Committee for 1906 is as follows:—

Our work has shown a steady increase in every direction. During the year 1905 entries were received from 62 schools, and examinations were held in 10 centres. The total number of passes has risen steadily year by year as follows:—1896, 18; 1897, 27; 1898, 47; 1899, 84; 1900, 143; 1901, 201; 1902, 218; 1903, 299; 1904, 396; 1905, 485.

There was an increase above all previous years in each of the general public examinations, the number of passes being:—Primary, 162; junior, 80; senior, 25; higher pub., 22. In the degree examinations, however, only three candidates came forward, each of whom succeeded in passing in one or more subjects. This small number of entries is probably due to the new regulations, which place West Australian students at a great disadvantage. The principal objections to these are—(a) Students can now obtain exemption from attendance at lectures in one subject only per year. (b) They are compelled to pay half lecture fees, though unable to attend. We have been notified that at the end of 1906 the co-operation of the Associated Board with the University in conducting the music examinations will cease, so that in all probability we shall be relieved of this portion of the work after the next series of examinations. Coming to details, we have both cause for congratulation and the reverse. In the junior examination the West Australian boys obtained first and second prizes, and in the senior first and third. This was against the competition of the entire youth of South and Western Australia. West Australian candidates obtained first place in the honors' list in the following subjects:—Junior—Geography, Greek, Latin, French, arithmetic, algebra, geometry. Senior—History, Greek, Latin, French, arithmetic, algebra, geometry, trigometry. Higher Pub.—History, Greek.

The accompanying schedule has been prepared in order to obtain some idea of the state of education here compared with South Australia. It gives the percentages of entries and passes of West Australian students in relation to the total for both States. A careful examination of the figures will reveal many interesting and useful facts, amongst which are the following:—Compared with South Australia, the greatest number of relative entries occurs in the primary, then in succession the higher public, junior, and senior. In the primary and junior our candidates were slightly more successful than those of South Australia, and the reverse in the senior and higher public, but, on the whole, the successes were very nearly equal.

By far the most striking feature, and one which cannot be too strongly emphasised, is the apparent neglect of scientific subjects in our schools. Thus, in the junior examinations, our candidates secured only three out of 41 passes in physics, four out of 99 in chemistry, five out of 45 in physiology, and 20 out of 91 in botany. In the senior it was worse—only one out of 75 in physics, one out of 43 in chemistry, one out of 32 in physiology, and two out of 42 in botany. By the time the students are ready for the higher public, science of all sorts has apparently been quite eliminated from their curriculum, for we find that out of 107 West Australian entries there was only one for physics, one for chemistry, one for physical geography, and none for biology and physiology. Even in applied mathematics there were only two entries, against 26 from South Australia. Another subject which seems to meet with disfavor in our schools is German. In the primary, we entered one out of 43 (for both States); in the junior, two out of 85; in the senior, three out of 62; and in the higher public, one out of 31. In most of the other subjects, as will be seen from the percentage list, our candidates are, on the whole, about on an equality with those in the sister State. We desire to call special attention to the deplorable neglect of all scientific subjects. The following shows the percentage of the entries and passes of West Australian students compared with the total number from the two States (Western Australia and South Australia):—

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	Entries. Per cent.	Passes. Per cent.
Primary.		
English	34	35
Arithmetic	34	32
Geography	40	44
History	35	38
Greek	73	88
Latin	16	14
French	45	41
German	2	3
Algebra	34	36
Geometry	38	41
Drawing	31	0
Total entries	34	35
Junior.		
English literature	29	29
English history	32	33
Geography	31	41
Greek	32	31
Latin	23	29
French	39	41
German	2	1
Arithmetic	26	30
Algebra	28	25
Geometry	27	26
Physics	14	7
Inorganic chemistry	16	4
Physiology	20	11
Botany	21	22
Total entries	27	28
Senior.		
English literature	19	15
History	21	25
Greek	36	38
Latin	23	27
French	31	32
German	5	6
Arithmetic and algebra	18	18
Geometry	20	20
Trig.	26	22
Physics	7	12
Chemistry	26	2
Physiology	15	3
Botany	7	5
Physical geography and geology	24	24
Total entries	21	19
Higher Public.		
English literature	49	27
History	41	41
Greek	55	46
Latin	32	32
French	54	57
German	3	3
Pure mathematics	22	23
Applied Mathematics	7	10
Physics	3	4
Chemistry	5	8
Physical geography and geology	10	0
Total entries	28	24

Professor Bottomley gave a series of six lectures in the Queen's Hall, Perth, three at Fremantle, and one at Kalgoorlie, Coolgardie, York, Northam, and Bunbury. His subject, bacteria, is now generally acknowledged to be of great practical interest and importance, but this was not fully realised by the public at the time, and attendances, though good, were not sufficient to make the venture a financial success. We received from the Government a grant of £100, and the Gilchrist trustees generously donated another £100. The lecturer's fee was £300, and the local expenses amounted to £125 3s. 6d. The receipt from the sale of tickets was £141 5s. 6d., therefore we were compelled to make good the amount of £83 18s. 6d. from our general funds.

The Government has increased our grant for lecture purposes to £200 for the current year, but the Gilchrist trustees have signified their unwillingness to assist any more, and therefore it is at present rather doubtful whether we shall be able to give a course of lectures next winter. Negotiations are, however, in progress, and we may rely upon Dr. Roberts, who has so kindly assisted us in the past, to do the best he can to meet our offer and desires.

Owing to the general public wish for an office in the centre of Perth, where they can obtain information with respect to lectures or examinations, pay fees, etc., the committee has secured an office in Forrest-chambers, and has appointed a secretary. At first there was a little confusion on account of the change of address, but most of those interested are acquiring the habit of applying direct to Forrest-chambers, instead of to the Observatory as heretofore.