about 4460 metres, and above this the mountain rose to 4750 metres. A former extension of glaciation in this part of the range down to the altitude of about 4000 metres was shown by striæ on the rock surfaces and the presence of a small, typical glacier lake, though no glaciers are existing in this part of the range now. The expedition encountered many difficulties in the journey from the coast to the mountain ranges in the interior, but, taught by the experiences of the first expedition, special arrangements were made to push up the North river so far and so rapidly as possible to avoid the delays and sickness incidental to a prolonged stay in the low and marshy region.

Besides the geographical information obtained, much work was also done in zoology and botany. A thousand birds' skins and ten thousand insects collected during the expedition are now being studied at Leyden, and numerous new species have been obtained; the Australian character of the fauna is well marked, and especially so among the fishes captured in the North river.

The botanical collection, ranging from the tropical to the Alpine flora, shows a majority of plants having a Malayan character, but there are so large a number of endemic forms that New Guinea and the adjacent islands seem to be separable as a botanical region from the Soenda Islands. Savannas, consisting largely of intruding species from North Australia, occur; but the Alpine flora, on the other hand, is said to be of a northern character, resembling that of the mountains of Java, Sumatra, and the Himalayas.

The Wilhelmina Peak is stated to consist of Alveolina limestone, and generally the geological age of the formations traversed was of comparatively recent date; eruptive rocks were only met with near Geelvink Bay. A very interesting collection of ethnological objects was obtained, and many observations were made concerning the Papuans living in the plains and those of the mountains.

The results of this expedition, together with those of the British expedition now in New Guinea, should greatly extend our knowledge of this region.

RADIO-ACTIVITY AS A KINETIC THEORY OF A FOURTH STATE OF MATTER.[1]

THERE are many points of resemblance between the movements of the molecules of a gas and the movements of those corpuscular radiations with which we have become acquainted in following up the discovery of radio-activity. In both cases we find that things of extremely minute dimensions are darting to and fro with great velocity, and in both cases the path of any one individual is made up of straight portions of various lengths, along which it is moving uniformly and free from external influence, and of encounters of short duration with other individuals, when energy is exchanged and directions of motion are altered. There is even a resemblance in the universality of each movement. The motion of molecules is a fundamental fact throughout the whole of our atmosphere, and, indeed, in all material bodies; the motion of the radiant particles emitted by radio-active substances is also widely distributed, and of great importance. Taking Eve's estimate of the usual ionisation of the air, we can calculate that in this room, in every second, some thousands of α and β particles enter into existence, complete their paths through all the atoms they meet, and sink into obscurity; some of them, viz. the α particles, as atoms of helium. These last move through definite and well-known distances in the air. For example, a third of those which are due to radium products move through a range of just above 4 cm., an equal number have a range of just below 5 cm., and again an equal number move through 7 cm., and the speed is so great that the life of each α particle as such is completed in about a thousandth-millionth of a second. They leave their mark behind them in the ionisation of the air through which they have passed, and in the heat into which their energy has been commuted. The former effect is easily detected by the sensitive measuring instruments which we now possess; the latter is too small to measure, and must be greatly increased by the aid of radium itself before it can be investigated. But on a large scale, which takes into account the distribution of radio-active material through the earth, the sea, and the air, the effects are of first-rate importance to the physical conditions of our earth.

If we compare the movements a little more closely, we find differences as interesting as the resemblances. The motions which the kinetic theory of gases considers are those of the molecules of which gases consist; in the case of radio-activity, the things which move are quite different. They are sometimes electrons, which have come to be called β rays when their speed is great, and kathode rays when it is somewhat less; or they are γ or X-rays, which are new things to us; or if as α particles they are helium atoms, such as we have known before, they move with excessive speeds which give them quite new properties. In general, the radiant particles move hundreds of thousands of times as fast as the gas molecules do, and it is, no doubt, on account of this fact, as well as through their usually extreme minuteness, that their power of penetrating matter is so great. When two molecules of a gas collide, they approach within a fairly definite distance, which we call the sum of the radii of the molecules, and the approach is followed by a recession and new conditions of motion. Each molecule has, as it were, a domain into which no other molecule can penetrate. But the defences which guard the domain are of no account to the vigorous movements which we are considering now. The radiant particles pass freely through the atoms, and their encounters are rather with one or other of a number of circumscribed and powerful centres of force which exist within the atomic domain, and act with great power when, and only when, approached within distances which are small in comparison with the atomic radius. It is on this account that the new theory opens out to us such possibilities of discovering the arrangement of the interior of the atom. Never before have we been able to pass anything *through* an atom; our spies have always been turned back from the frontier. Now we can at pleasure cause to pass through any atom an α particle, which is an atom of helium, or a β particle, which is an electron, or a γ or X-ray, and see what has happened to the particle when it emerges again, and from the treatment which it seems to have received we must try to find out what it met with inside.

The newer movement exists superimposed upon the other. Its velocities are so great that the gas (or liquid or solid) molecules are, in comparison, perfectly still. There is, as it were, a kinetic theory within a kinetic theory; there is a grosser movement of gas molecules which has long been studied, and in the same place and at the same time there is a far subtler and far more lively movement which is practically independent of the other. Your vice-president, Sir William Crookes, was the first to find any trace of it. The behaviour of the kathode rays in the vacuum tubes which he had made showed him that he was dealing with things in no ordinary condition. Whatever was in motion was neither gas, nor solid, nor liquid, as ordinarily known, and he supposed it must be possible for matter to exist in a fourth state. We have gone far since Sir William's first experiments. The X-ray tube and radium have widely increased our knowledge of phenomena parallel to those of the Crookes tube. But I think we may still be glad to use Sir William's definition.

There is another very striking characteristic of the newer kinetic theory which differentiates it sharply from the older. The experiences of any one of the radiant particles in an atom which it crosses are quite unaffected by any chemical combination of that atom with others; that is to say, by any molecular associations it may have. Naturally, this simplifies investigation. We may, no doubt, ascribe this state of things to the fact that a radiant particle is concerned rather with the interior of the atom than with the exterior, and that it is the latter which is of importance in chemical action.

Let us take notice of one more important difference. The molecules of a gas move with velocities which vary at every collision, yet vary about a certain mean. But the peculiar motion of the radiant particle is only tem-

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[1] Discourse delivered at the Royal Institution on Friday, January 27, by Prof. William H. Bragg, F.R.S.

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porary. For only a very short time can any ray be described as matter in a fourth state; at the end of it the extraordinary condition has terminated, the particle has lost its tremendous speed or suffered some other change, and the ray ceases to exist. Speaking technically, we are dealing with initial, not permanent, conditions.

Let us now come back to resemblances between the two kinds of motion, for there is one point of similarity which is not quite so obvious as others I have mentioned, and is, I think, of the greatest importance; in fact, it is largely on account of this similarity that I have ventured to put the two theories together for comparison.

When the first experimenters in radio-activity allowed their streams of rays to fall upon materials of various kinds, they found that the irradiated surfaces were the sources of fresh streams of radiation. The secondary rays were sometimes of the same nature and quality as the primary, sometimes not. Further, they found that the secondaries, on striking material substances, could produce tertiaries, and so on. The examination of all the variations of this problem—the investigation of the consequences of changing the primary, of changing the substance, and last, but not least, of changing the form of the experimental arrangements—has been the cause of an enormous amount of work. There is a large literature dealing with secondary radiations of all kinds which, I imagine, but few have read with any completeness, and the subject has become, on the surface at least, complicated and difficult. Now I believe that it is possible to clear away the greater portion of this complexity at a stroke by the adoption of an idea which makes it possible to describe and discuss the whole of these phenomena in a very simple way. When an encounter takes place between two gas molecules, we suppose that the sum of the energies of the two is the same after the collision as before, and, further, that there are just two things to consider—two molecules—after as well as before. I think that we may carry this idea over almost bodily to the newer theory. A radiant particle encounters an atom. The particle is a definite thing; it contains a definite amount of energy, and whether it is an α, or β, or γ, or X-ray, its energy is to be found almost entirely inside a very minute volume. The encounter takes place. When it is over there are still two things, an atom and a radiant particle, going away from it. The sum of the energies of the two is still the same, which means that we deny a possibility much considered at one time, viz. that in the encounter the atom could be made radio-active, and could unlock a store of energy usually unavailable. We suppose there is no energy to be considered except the original energy of the radiant particle, and we suppose that there are not now two or more radiant particles in place of the original one, which also is a limitation on previous ideas. It is a theory which ascribes a corpuscular form to all the radiations. Each particle, α, β, γ, or X, is to be followed from its origin to its disappearance, and we have nothing to think of but the one particle threading its way through the atoms. It loses energy as it goes, though little at any one collision, and it passes out of our reckoning when it has lost it all. There are no secondary radiations other than radiant particles moving in directions which are different from those in which they moved at first. Even when a kathode ray excites an X-ray in the ordinary Röntgen tube, or the X-ray excites a kathode ray in a manner almost as well known, it is hardly an exception to this rule. The kathode ray has an encounter with an atom and disappears; simultaneously the X-ray comes out of the atom, a circumscribed corpuscle carrying on the energy of the kathode ray. There is a change, but it extends only to the external characteristics of the carrier of energy. The X-ray passes through the glass wall of the X-ray bulb, or at least it does so sometimes; it may pass through other matter as well, but sooner or later it has a fatal encounter with an atom, and the reverse change takes place. In all cases, in that of the undeviating α ray, or the β ray which suffers so many deflections, or the γ or X-rays, it is a matter of tracing the movements of individual minute quantities of energy until they finally melt away.

Let us consider one or two simple experimental results from this point of view in order that we may illustrate this corpuscular theory, and at the same time may learn something of the properties of the corpuscles and of the arrangements of the atoms through which they pass.

We take first one of the simpler cases, the movement of an α particle through a gas. The relatively large mass of the particle gives it an effectiveness which the other radiations do not possess. It moves straight through every atom it meets, and ionises most of them. Very rarely does it suffer any deflection from its course until its velocity is nearly run down. Then, indeed, it does appear to depart considerably from the straight path, and it may be that it is much knocked about by collisions before it finally comes to comparative rest. In this way we may explain the distribution of the ionisation along its path, which increases slowly at first and rapidly afterwards, until the α particle has nearly finished its journey; it then falls off rapidly. Considering that the ionisation increases as the particle slows down and spends more time in each atom, and considering the more broken nature of the path near its end, the reason of these peculiarities is clear enough. Apart from its comparative simplicity, there are some other very interesting features of the particle's motion. It is found, for example, that the loss of energy which the particle incurs in crossing an atom is proportional to the square root of the atomic weight very nearly, and there is no certain explanation as yet of this curious law. And again, Geiger has examined the small scattering that does occur, and found that α particles when moving quickly may be swung round completely even by the thinnest films of gold leaf, though the number is so small that the effect would have remained undetected had it not been for the scintillation method which he and Rutherford have perfected. He has found that about one particle in 8000 is returned in this way from a gold plate, which need consist only of a few thicknesses of gold leaf in order to give the maximum effect.

Now let us take an example from the behaviour of the β rays. The β particle is so light that it is easily deflected, even though it moves several times as fast as the heavier α particle. Because it therefore possesses little energy its effects are much smaller, and no one has yet succeeded in handling a single β particle in the same way as Rutherford and Geiger have handled the other. We are obliged to content ourselves with observations of the effects of a crowd of β particles, since the combined action of many is necessary to give us an observable result; and at the same time that the β particle gives much less effect than the α, it has a much more irregular course, so that the problem is doubly difficult. We are, in fact, only just beginning to understand it. There is a compensation in the fact that its very liability to deflection makes it all the more interesting an object. It is possible—and this is the particular β-ray problem I wish to consider now—to examine the deflection of a single β particle by a single atom; the parallel result in the kinetic theory of gases has never, of course, been achieved.

Suppose that we project a stream of β rays against a thin plate and measure the relative number sent back, which we do by measuring the ionisations caused by the incident and returned rays respectively. We do this for varying thicknesses of the plate, and plot the results, as, for example, Madsen has done. His plate was made of gold leaves, which could be had of extreme fineness. From the relation thus obtained, it is possible to obtain with confidence the amount of β radiation that would be returned by the thinnest plate that could be imagined, only one molecule thick. In such case the particles turned back could have had but one collision, and we have achieved our purpose. Madsen's figures show that a plate weighing 4 milligrams to the square centimetre turned back a tenth of the β particles that fell upon it, and, so far as can be judged, the ratio of the proportion turned back to the weight of the plate would be almost doubled for very thin plates. We could go more into detail, and find the distribution of those that are returned; we should then have data from which we might determine in some measure the distribution of the centres of force inside the atom. We cannot follow this up now, but I would like to direct your attention to a curious indication which we obtain when we compare the results for gold with those which Madsen found for aluminium. They show that the lighter metal turns back fewer β particles, and that its power of absorbing a stream of rays is rather an absolute

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abstraction of energy. There is clearly an actual absorption effect, which is to be distinguished from the scattering effect. Indeed, the two effects are obviously of different importance in the two cases. When a β ray strikes a gold atom it must be much more liable to deflection than when it strikes the lighter atom of aluminium. On the other hand, I think it can be shown clearly that in ploughing through aluminium atoms there is a relatively quicker absorption of energy. We may illustrate this by a rough model. Let us stand an electromagnet upright on the table, and let us suspend another magnet so that it can swing over the fixed one and just clear it. If we draw back the swinging magnet and let it go towards the fixed one, the currents running so that the two repel, then as the moving magnet tries to go by there will be a deflection depending on the relative speed, the closeness of approach, and the strength of the poles. This may represent the turning aside of an electron by a centre of force inside an atom. Now let the magnet at the table be supported by a spiral spring so as to be still upright, but have some freedom of motion; then, when the experiment is repeated, the swinging magnet pushes the other more or less to one side; it is less deflected, but it has to give up some of its energy. This is exactly what happens in the case of the β particle. The centre of force in the gold atom behaves like the stiffer electromagnet on the table; it deflects the electron more, but robs it of less energy in doing so. It will not do to suppose the gold atom to differ from the aluminium atom simply in the number of centres of force, such as electrons, which it contains if it is supposed that they all act independently. There is some other fundamental difference, equivalent to a difference in the stiffness with which the electrons are set in their places. There are two things to be expressed in the behaviour of the atom towards the β particle, as has been pointed out several times. H. W. Schmidt has actually calculated them from experiments which gave them indirectly and somewhat approximately. The method I have just outlined gives one of them directly, viz. that which is called the scattering coefficient, and I think the other can also be found directly by a method which will serve as an illustration of the behaviour of γ rays.

We must first, however, consider the part which γ and X-rays play generally in this theory. Workers are by no means agreed as to the proper way in which to regard them, but there is no need to enter at once on a discussion as to their nature. It is well known that they have the most extraordinary powers of penetration, and are unaffected by electric or magnetic fields. They have one property which alone, as I think, brings them within our experience; that is to say, the power of exciting β rays from the atoms over which they pass. Were it not for this they would still be unknown. When we examine this production of β rays, we find that in the first place their speed depends on the quality of the γ rays which cause them, and not on the nature of the atoms in which they arise; in the second, that the β rays to a large degree continue the line of motion of the γ rays, as if the latter pushed them out of the atoms; and, lastly, that the number of the β rays depends on the intensity of the γ rays. It is these facts which suggest the simple theory I have already described. The γ ray is some minute thing which moves along in a straight line without change of form or nature, which penetrates atoms with far greater ease than the α or β particle, which is not electrified, and which sooner or later disappears inside an atom, handing on a large share of its energy to a β particle which takes its place. The absorption of γ rays is simply the measure of their disappearance in giving rise to β rays, one γ ray producing one β ray, and no more.

We find the same sort of scattering in the case of γ rays as in that of β rays. Of a stream of rays directed against a plate which it can penetrate easily, we find that a few are turned completely back, a very much larger number are only slightly turned out of their path, and the rest go on. The scattered rays are very similar to the original rays; there is no need to suppose that the original ray disappears, to be replaced by a secondary, any more than there is to suppose that α and β rays disappear and are replaced by others in similar cases. When, therefore, a γ ray enters an atom, three possibilities await it. The first is a negative one; it may go through the atom untouched, and this must happen in the majority of cases; the second chance is that of deflection, and the third that of conversion into a β ray, using the word conversion in a general sense, without going into details as to the nature of the process.

Now we may consider our γ-ray problem. Suppose a stream of these rays passing over a block of any substance, such as aluminium, or zinc, or lead. When they are really penetrating rays they are equally absorbed by equal weights of these materials, which means that in equal weights equal numbers of β rays spring into existence. If these β rays were able to move through equal weights of the metals, we should find in each metal the same "density" of β rays; and the important point is that this is independent of whether the rays are straight or crooked in their paths. If ten lines of given length were begun in every square centimetre of a sheet of paper, the ink used in drawing them would be independent of the straightness of the lines, but proportional to their length. Now if we make a cavity in each metal the β rays will cross it in their movements to and fro, and if a little air is introduced into the cavity, the ionisation produced in it will be a measure of the density of the β rays, and therefore the average distance each moves in the metal. Experiment shows that we get twice as much ionisation in a cavity in the lead as in a similar cavity in the aluminium, and we conclude that the β particle really has a longer track in the heavier metal. This experiment gives us the second constant of β-ray absorption, that is to say, the rate at which its energy is taken away from it; the other experiment gave the chance of deflection only. We see that the path of a β ray in aluminium is more direct, but of less length, than in lead; in the latter metal it has really a longer path, but it does not get so far away from its starting point because it suffers so many more deflections.

Finally, let us take a problem from the X-rays. Let us see how we may test the idea that X and γ rays do not ionise themselves, but leave all the work to be done by the β rays which they produce. Suppose a pencil of X-rays to pass across a vessel and to produce ionisation therein. It is convenient to use, not the original X-rays, which are heterogeneous, but the rays which are scattered by a plate of tin on which the primary rays fall. Such "tin rays," as we often call them briefly, are fairly homogeneous, and give kathode rays of convenient penetration. In some experiments of mine the rays crossed a layer of oxygen 3·45 cm. wide, having a density 0·00137, and the ionisation produced was 227 on an arbitrary scale. The result may be put in the following way. Suppose, provisionally, that all this ionisation is done indirectly; the oxygen has converted so much X-ray energy into kathode-ray energy, and these kathode rays penetrating their one or two millimetres of oxygen, which is all they can do, have ionised the gas. Then we may say that, in crossing a layer of oxygen weighing $3{\cdot}45 \times 0{\cdot}00137$, or 0·00473 gr. per sq. cm., enough kathode rays have been produced to cause an ionisation of 227 units, and therefore that a layer weighing one milligram per sq. cm. would produce 48 units in the same way. We now proceed to compare this production in oxygen with the similar effect in a metal such as silver. Stretching a silver foil across the chamber in the path of the rays, we find that under the same intensity of rays the ionisation is largely increased, and the change is due to kathode rays which the X-rays have generated in the silver. Not all these rays get out of the silver, but we can overcome this difficulty by taking silver foils of different thickness, drawing a curve connecting the effect of the foils with their thicknesses, taking the curve back to the origin, and so finding what would be the effect of a foil so thin that all the kathode rays did get out. In my case I found that a milligram of silver produced enough kathode rays to give an ionisation 1580. This is thirty-three times as much as the oxygen could do. Now, according to our theory, this should be because silver absorbs tin rays thirty-three times more than oxygen does, and experiment showed this to be very nearly the case. In finding the absorbing power of oxygen, I measured first those of carbon and oxalic acid, and then proceeded by calculation, for the absorption in a gas is difficult to determine.

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Two interesting points appeared in this experiment. In the first place, the ratio between the two quantities of kathode rays, which appear on the two sides of a silver leaf through which the "tin rays" pass, is nearly constant for different thicknesses of leaf. With the thinnest leaf obtainable each quantity was about half its full value. It would have been desirable to have had still thinner leaves; but it is fairly clear that the ratio would be nearly the same for extreme thinness. The kathode radiation, which appears on the side of the leaf whence the X-rays emerge, is 1·30 times that which appears on the other, and we may take it that this would be the case even if the leaf were but one atom thick. Thus when an X-ray plunges into an atom in which its energy is converted into that of a kathode ray, the kathode ray may emerge at any point, but there is a 30 per cent. greater chance that it will more or less continue the line of motion of the X-ray than that it will not. In previous work on the conversion of γ-ray into β-ray energy, I have found that the β ray may practically be supposed to continue the line of motion of the γ ray, so that there is a great difference in behaviour of the two classes of ray in this respect. It is remarkable that the scattering of the γ rays shows also a much greater dissymmetry than is found in the case of the X-rays. It looks as if the β rays that appear when γ or X-rays impinge on atoms are related rather to the scattered than to the unscattered primary rays. Putting it somewhat crudely, no doubt, it might be said that when a γ or X-ray is deflected in passing through an atom, it runs a risk of being converted into a β ray in the process, so that β rays are found distributed about the atom in rough proportions to the secondary γ or X-rays. In the case of γ rays this practically amounts to their all going straight on at first; in the case of X-rays the distribution is more uniform.

Another interesting point arises in this way. When the X-rays from tin are allowed to pass into the ionisation chamber through increasing thicknesses of silver foil, the kathode rays grow at a rate which is not represented by the exponential curve usually assumed. The amount is for some time more nearly proportional to the thickness of the foil. A second foil adds its own effect without destroying much of the one on which it is laid. This may easily be ascribed to the relation of the ionisation due to the β particle to the energy it has to spend. The ionisation is nearly all at the end of the path, and the second layer does not absorb the rays made in the first because they are still at the beginning of their career.

These few experiments which I have described may serve to illustrate both the justice and the convenience of placing all these rays, α, β, γ, and X, in one class. We are tempted to consider them all as corpuscular radiations of some sort, and we then look upon our researches into their behaviour as attempts to understand the collisions of the various new corpuscles with the constituent centres of force in the atoms. But if we ascribe corpuscular properties to the γ and X-rays, we are led far away from the original speculations as to their nature. Stokes supposed them to be spreading æther pulses, but in his theory the energy of the pulse spreads on ever-widening surfaces as the time passes, and is utterly insufficient to provide the energy of the β rays which the γ or X-rays excite. Some sort of mechanism has to be devised by which the energy of the γ ray moves on without spreading, so that at the fateful moment it may be all handed over to the β ray, which carries it on. I had the hardihood myself to propose a theory of this kind. My idea was that the γ or X-ray might be considered as an electron which had assumed a cloak of darkness in the form of sufficient positive electricity to neutralise its charge. Nor do I see any reason for abandoning this idea, for it is at least a good working hypothesis. It means, of course, that not only does the energy of the β ray come from the γ ray, but the β ray itself.

Many insist that my neutral corpuscle is too material, and that something more ethereal is wanted, for it appears that ultra-violet light possesses many of the properties of X and γ rays. It can excite electrons to motion, and sometimes the speed of the electron depends on the quality of the light, and not on the nature of the material from which it springs. They propose, therefore, a quasi-corpuscular theory of light, γ and X-rays being included. The immediate objection to this proposal is that it seems to throw away at once all the marvellous explanations of interference and diffraction which Young and Fresnel founded on a theory of spreading waves, and I do not think anyone has yet made good this defect. The light corpuscle which is proposed is a perfectly new postulate. It is to move with the velocity of light, keeping a circumscribed and invariable form, to have energy and momentum, and to be capable of replacing and being replaced by an electron which possesses the same energy but moves at a slower rate, and, of course, it has to do all that the old light-waves did. The whole situation is most remarkable and puzzling. We are working and waiting for some solution which, perhaps, will come in a moment unexpectedly. Meanwhile, we must just try to verify and extend our facts, and be content to piece together parts of the puzzle, since we cannot, as yet, manage the whole. My object to-night has been to show you how we may conveniently bind together a large number of the phenomena of radio-activity into an easily grasped bundle, using a kinetic theory which has many points of resemblance to the older kinetic theory of gases.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—It is proposed to confer the degree of Master of Arts, *honoris causa*, upon Mr. K. J. J. Mackenzie, university lecturer in agriculture.

On Thursday next, February 16, a Grace will be offered to the Senate recommending that a site on the Downing Ground be assigned for a building for the department of physiology, to the east of the School of Agriculture. At the same Congregation a further Grace will also be brought forward recommending that a space to the south of, and adjoining, the proposed building for the department of physiology, be assigned as a site for a laboratory of experimental psychology.

OXFORD.—On February 4 Prof. T. W. Edgeworth David, C.M.G., F.R.S., delivered a public lecture before the University, in which he described the part he had taken in Sir Ernest Shackleton's Antarctic Expedition of 1907–9, including the ascent of Mount Erebus and the reaching of the South Magnetic Pole. On February 7 the honorary degree of D.Sc. was conferred on Prof. David.

The report of the committee for anthropology for the year 1910, just presented to Convocation, contains a record of continuous and healthy development of the study in Oxford. The salary of the curator of the Pitt-Rivers Museum has been raised from 200*l.* to 500*l.* per annum, and a readership has been founded in social anthropology, to which the secretary to the committee, Mr. R. R. Marett, Fellow of Exeter College, has been appointed. A large number of lectures have been delivered in the course of the year under the general heads of physical anthropology, psychology, geographical distribution, prehistoric archæology, technology, social anthropology, and philology, besides special lectures for Sudan probationers, and addresses on the art of prehistoric man in France, by M. Emile Cartailhac.

The consideration of the proposed amendments to the statute on faculties and boards of faculties has been resumed by Congregation.

IT is announced in the *Revue scientifique* that Prof. Hans Meyer has presented 150,000 marks to the University of Leipzig for the inauguration of an institute of experimental psychology.

WE have received from the honorary secretary of the Association of Teachers in Technical Institutions a copy of a letter sent by the association to the principal of the University of London directing attention "to the marked inequality of the requirements of the examiners for a 'pass' in the respective subjects" for the intermediate and final B.Sc. external examinations. Tabulated statistics, drawn up by the association from the University Calendar, show that in 1909 the following percentages of candidates, entering for the various subjects of science in the intermediate external examination, failed:—chemistry, 46·9; physics, 30·7; pure mathematics, 25·3; applied

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