for the M.Sc. degree after a course of two years' research work in the University.

The new laboratory was opened on November 13 by Sir Sydney Olivier, the Permanent Secretary of the Board of Agriculture and Fisheries, in the absence of Mr. Walter Runciman, the President of the Board, who was detained in London by a meeting of the Cabinet Council. At the opening ceremony, Dr. Imms gave a short sketch of the aims and scope of agricultural entomology, and Sir Sydney Olivier, in declaring the laboratory open, explained the policy of the Board as regards the endowment of the universities and agricultural institutions for research work in agricultural science.

At the conclusion of the ceremony a number of exhibits of the research work done in the department and of the apparatus used in entomological investigations was shown to the visitors in the zoological laboratories and museum.

S. J. HICKSON.

THE PASSIVITY OF METALS.

A GROUP of eight papers brought together with the view of setting forth every aspect of "passivity" as it presents itself to those now actively engaged in working out a satisfactory explanation of this most difficult and elusive subject, was discussed at the meeting of the Faraday Society on November 12.

The theoretical importance of passivity lies in the fact that it is in all probability so closely bound up with the fundamental mechanism of electrolytic action that a proper understanding of its cause will go far towards clearing away many of the difficulties which still surround the simple processes of anodic solution and cathodic deposition. It has further an important practical bearing on corrosion, for if this be an electrolytic action, a non-corrodible metal and a passive metal are, anyhow within certain limits, synonymous terms. The very idea of the connection suggests a line of research on non-corrodible alloys that may lead to most fruitful results. But if the subject is important, it is no less perplexing. At present two theories, in many respects diametrically opposed to one another, would appear to hold the field, one of which, broadly speaking, ascribes passivity to the presence of oxygen in some form or another, and the other to hydrogen. It may be added that the advocates of each theory point to an *experimentum crucis* claimed to prove the impossibility of its rival as a satisfactory explanation of all the phenomena which have been observed.

While attention was concentrated on the original observation made in 1790 by Keir, that iron became "passive" or indissoluble after plunging into strong nitric acid, the simple mechanical explanation that the change of state was due to a close film of protective oxide no doubt seemed all-sufficient. It was only when passivity was studied as an electrolytic phenomenon, as an example of anodic polarisation by which the passive metal rises higher in the electrolytic scale towards the "noble" metals than it was in its active state, that a broader interpretation was called for, and hence was put forward Le Blanc's fruitful conception that the retarded anodic action was chemical and not mechanical in its origin, and that it must be explained as arising from the diminished reaction-velocity of some chemical process taking place at the anode. This conception is now universally adopted in the consideration of passivity phenomena; the only question arising is, What is the reaction the velocity of which is diminished when metals become passive?

To this question the following answers were given in the papers presented for discussion.

NO. 2299, VOL. 92]

(1) Adopting the current view of Nernst that electrode potential is a result of the formation of metallic ions when the electrode is placed into an electrolyte, Dr. G. Grube supposes this action to be retarded under conditions known as passive by the formation of an alloy of anode surface and oxygen, which has a lower solution pressure than the pure metal. Such retardation of anodic action is known to take place when a platinum anode is used in the electrolysis of halogen salts, and for the self-same reason, and analogous cathodic retardation was likewise shown to exist by Dr. Grube; for example, when zinc and hydrogen are deposited simultaneously with iron. Much the same theory was developed by Dr. D. Reichinstein direct from the Nernst formula, and experimental support was given to the theory by Dr. H. S. Allen, who showed that the photo-electric behaviour of iron—its property of losing negative electricity under the action of light—which from considerations of "fatigue" is believed also to be due to the state of the gaseous film on the metal, increases or diminishes in intensity according as the iron is in the active or passive state.

(2) In order to take into consideration the specific properties of the electrolyte anion some investigators are now reverting to the old Grotthus view of electrolysis that the primary action at the anode is not the formation of metallic ions, but a discharge of negative ions (anions). Prof. Leblanc, however, further supposes that the anion is hydrated, and that passivity is merely the retardation of the reversible reaction, $\text{ion} + \text{hydrate} \rightleftharpoons \text{ion} + \text{water}$. Prof. E. Schoch also adopts the theory of primary anion discharge, but impressed by Dr. Günther Schulze's experiments on the structure of aluminium anode-films, he considers that under certain conditions of current density, temperature, &c., there will be a diminished rate of reaction between anions and electrode owing to the formation on the latter of a film of oxide or oxygen. Neither of these theories, which seem to make gratuitous and unnecessary assumptions, were received with much favour.

(3) More attractive is the hydrogen theory stated in the paper presented by Prof. G. Schmidt, and supported by some ingenious and striking experiments. This supposes that the passive condition is normal, and that metals like iron and chromium are only rendered active by the diffusion through them of hydrogen, which acts as a catalyst and sets up local action. Possibly this is often the case, but it is doubtful whether the "hydrogen-activation" theory will explain all cases of passivity. In the end it may be found, as Dr. G. Senter said in the course of the discussion, that no one theory will cover every case of passivity, but the sense of the meeting was certainly in favour of either an oxygen-film or an oxygen surface alloy as offering in most cases a satisfactory working hypothesis of the passive state.

UNIVERSITY EDUCATION IN LONDON

THE President of the Board of Education has sent to the Vice-Chancellor of London University an important letter in which he announces that the Government accepts in general the recommendations of the Royal Commission on University Education in London, and is prepared to act upon them. The letter is as follows:—

Board of Education, Whitehall, S.W.,
Nov. 12, 1913.

DEAR MR. HERRINGHAM,—I am very anxious that the position of the Government in regard to the proposed reconstitution of the University should be generally realised, and that discussion should not be

obscured by any misunderstanding on the subject. I am, therefore, venturing to set out in the form of a letter to yourself as Vice-Chancellor of the University the substance of what I said at the Mansion House the other day.

2. As you are aware, I have appointed a Departmental Committee to consult the bodies and persons concerned and to recommend the special arrangements and provisions which may be immediately adopted for the purpose of giving effect to the scheme of the report and as the basis of the necessary legislation. The committee will not attempt to go again over the ground covered by the Royal Commission. The Government, after careful consideration, have decided that the scheme of the report is calculated to produce a University of London worthy of the name. Starting from this point it will be the business of the Departmental Committee to discover how far the numerous bodies and persons concerned are prepared to cooperate on the basis of the principles underlying the scheme.

3. Those principles are in themselves simple. They may be shortly stated as follows:—

(1) That the Government of the University, and particularly its financial administration, shall be entrusted to a small Senate predominantly lay in its composition and not representative of special interests; and

(2) That on the other hand the control of the teaching and the examinations of students in colleges of the University shall be in the hands of the teachers;

(3) That the educational and financial control of the constituent colleges shall be vested in the University; and

(4) That as much of the University work as possible, together with the University administration, should be concentrated in a central University quarter. (The question of the particular site to be selected is one on which the Departmental Committee will be able to advise the Government after they have considered the various alternatives that have been proposed);

(5) The scheme of reconstruction should provide effectively for continuance of access to University examinations by external students—i.e., by those who are not attached to any college or school of the University.

4. As regards the future of the Imperial College, I may say that it has never been proposed that the college should be moved from its present site. It is, however, an essential part of the scheme that it should become a constituent college of the new University under "the educational and financial control" of the Senate. I ought to explain that the word "incorporation," which is sometimes used as a convenient term to describe the position of a constituent college under such control, does not imply any such vesting of the property of the constituent college in the University as would preclude the earmarking of capital or income by donors and benefactors for particular institutions or specific purposes. This applies to past no less than to future gifts. Such a restriction is not contemplated by the Government, and, speaking for myself, it would be contrary to the views which I have more than once expressed as to the value of local and private munificence in maintaining the highest standard of educational development.

5. On the conclusion of the necessary negotiations the Government hope to introduce legislation in due course to give effect to these principles, and I see no reason why sufficient agreement should not be

arrived at to secure the acceptance of the Bill in Parliament as a non-contentious measure.

6. I trust that this statement, which I have already made in public, will be of assistance to all who are from whatever point of view interested in the work of reconstruction by defining the area within which amendments and modifications of the scheme of the committee are admissible. Particularly would I ask of them that they should not reject the scheme because in this point or in that it may fall short of their ideals or is even contrary to what they think best. Some acquiescence or even sacrifice on individual points will be necessary for all concerned if a scheme worth having is to be carried out. It must be remembered that the scheme of the Royal Commission is the only one in the field and that if it fails of accomplishment all chance of reform and progressive development may be gone for many years. In these circumstances and with a definite statement of principles before them I trust that they will not hesitate to make some mutual surrender of views and opinions which perhaps owe their origin in large measure to the uncertainty which has so long prevailed even as to the main lines of reconstruction.

7. The Government will be prepared, in the event of the scheme taking shape in legislation, to make substantial new contributions to the resources of the University, and they are confident that the establishment of a University worthy of the capital of the Empire will be regarded by the citizens, Livery Companies, and corporate bodies of London equally with the Government as an object deserving of their interest and support.

8. I am sending a copy of this letter to the Press.

Yours faithfully,

JOSEPH A. PEASE.

W. P. Herringham, Esq., M.D., &c.

THE PREPARATION OF EYE-PRESERVING GLASS FOR SPECTACLES.¹

Since March, 1909—in connection with the Glass Workers' Cataract Committee of the Royal Society—I have been experimenting on the effect of adding various metallic oxides to the constituents of glass in order to cut off the invisible rays at the infra-red end of the spectrum, and thus to prepare a glass which will cut off those rays from highly heated molten glass which damage the eyes of workmen, without obscuring too much light or materially affecting the colours of objects seen through the glass when fashioned into spectacles.

Single metals were at first tried in varying quantities to see if from the colour and properties communicated to the glass they were worth further examination. Each specimen is cut and polished into a plate 2 mm. thick. The plate so prepared is first put into the radiometer balance to find the percentage of heat cut off. It is then tested in the spectrum apparatus to ascertain the upper limit of transmission of the ultra-violet rays; next it is tested in Chapman Jones's opacity meter to estimate the percentage of luminous rays transmitted, and finally the colour is registered in a Lovibond's tintometer.

The following elements were selected as likely to be worthy of further experimentation by combining the metals, two, three, or four at a time in one glass so as to enable the advantages of one to make up for the shortcomings of another:—Cerium, chromium, cobalt, copper, iron, lead, manganese, neodymium, nickel, praseodymium, and uranium.

Whilst bearing in mind that the chief object of

¹ Summary of a paper read before the Royal Society on November 13 by Sir William Crookes, O.M., F.R.S.