

of the Directory to organise such schools throughout their county, to receive and supplement the grants made by the Board of Education, and to supply and pay qualified teachers. The instruction should be in such subjects as natural history, botany, and other sciences bearing upon agriculture and horticulture, bee and poultry keeping, land measuring, farm accounts, &c., rather than in such subjects as typewriting, commercial arithmetic and shorthand. Between these classes and the highest agricultural colleges, schools should be established in every county, where lads from the age of thirteen to eighteen might obtain two years' thorough theoretical and practical training. Each of these schools should be developed by its managers upon the lines most suitable to the agriculture of the district. Thus it may be possible to organise a satisfactory system of agricultural education, but, as was well observed by M. Tisserand, Director of Agriculture in France in 1896, in his memorandum for the Recess Committee: "the agriculturists must be made to understand that the improvement they desire depends as much upon themselves as upon the Ministry, if not more so; that the latter must be powerless without their help; that they will receive succour from the State in proportion as they themselves put forth energy and labour; and that it is only by the united effort of all concerned that progress can be brought about."

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The practical teaching of physical chemistry is being introduced this term at the Daubeny (Magdalen College) Laboratory. The course of instruction will be given by Mr. Duncan Wilson, who was recently appointed Lecturer in Chemistry to the College, and has studied with Prof. Ostwald.

CAMBRIDGE.—The Allen Scholarship for research, worth 250*l.* for one year, will this term be given for work in medicine, mathematics, physics and chemistry, biology and geology, or moral science. Candidates are to be graduates of the University of not more than twenty-eight years of age. Applications should be sent to the Vice-Chancellor by February 20.

The Faculty of Medicine of the University College of South Wales and Monmouthshire has been recognised for the purpose of medical study outside the University.

Plans and estimates for the new botanical laboratory have been submitted to the Senate. The cost will be over 22,000*l.*

The Mathematical Board have amended in a few details their previous report on the Mathematical Tripos. They now propose that each class in Part I. shall be arranged in two divisions, the names in each being in alphabetical order. They think it important that these divisions should, so far as may be practicable, indicate a uniform standard from year to year. The voting will take place on February 15, at 2 p.m.

Dr. Jackson was on January 26 unanimously elected a member of the Council in the room of Mr. Dale, now Principal of University College, Liverpool.

The present state of war has affected the University in a remarkable manner. Not only have a considerable number of graduates and undergraduates volunteered for active service, but the Vice-Chancellor has summoned a meeting with a view to applying to the Government for an increase of the establishment of the University Rifle Corps. The present strength is 600; it is proposed to increase this to 800, and the recruits are ready. Moreover, it is proposed to place the Senate House at the disposal of the corps for a drill hall, at times when it is not required for University purposes. Colonel Dyke is giving a course of lectures on tactics thrice weekly.

Lord Lister has been appointed an Elector to the Chair of Pathology in the place of the late Sir James Paget.

The State Medicine Syndicate have made a grant of 50*l.* in aid of a course in bacteriology, provided for candidates desiring to obtain the Diploma in Public Health.

THE London County Council have agreed to retain a site in Clare Market, Strand, valued at 14,770*l.*, for the establishment of a school for higher commercial education in connection with the new University of London.

THE Queen's Speech, read at the new session of Parliament, which opened on Tuesday, announced that a measure would be introduced in regard to education in Scotland, and that pro-

posals would be made for better enabling local authorities to aid secondary and technical education in England and Wales.

THE following officers were elected at the annual meeting of the Association of Technical Institutions, held in the Mercers' Hall, London, on Wednesday, January 24:—President, Sir Swire Smith; vice-presidents, Lord Spencer, Sir Bernard Samuelson, Bart., Mr. H. Hobhouse, M.P., Mr. W. Mather; treasurer, Mr. R. F. Martineau (Birmingham); honorary secretary, Prof. J. Wertheimer (Bristol).

In order to meet increasing demands for space, and to keep pace with modern requirements, the Council of King's College have been obliged to undertake very extensive additions to and improvements in the departments of physiology, bacteriology, anatomy, botany, geology, public health, architecture, and applied mechanics. For these purposes, and for the resulting equipments and adaptations, an expenditure of not less than 18,000*l.* has to be met immediately. The object in view is specially commended to friends of the college and of science by Lord Salisbury and by Lord Lister. Mr. Balfour, M.P., will preside at a special festival dinner in aid of the fund, to be held at the Hall of Lincoln's Inn on Wednesday, February 14. All contributions promised before or at the dinner will be placed on the chairman's list and announced at the festival. Contributions may be sent to the Hon. W. F. D. Smith, M.P., treasurer, at King's College.

MR. W. P. HARTLEY, of Aintree, Liverpool, has added to his many donations to University College, Liverpool, the magnificent gift of a completely furnished Botanical Institute. The building, which has been carefully designed to meet all the requirements of modern teaching and research, will be built of Ruabon brick with sandstone dressings, on land specially purchased for it by Mr. Hartley, and situated close to the new chemical laboratories. The building, the architect of which is Mr. F. W. Dixon, of Manchester, will consist of three main floors containing the Museum, Lecture Theatre and Junior Laboratory. Two mezzanines and top floor will provide space for senior and research laboratories, library, experimental physiology laboratory, herbarium and private rooms. The basement will contain store-rooms, heating chambers, lavatories, &c. It is expected that the new laboratories will be ready for occupation early in 1901.

THE first report of the Liverpool School of Tropical Diseases has been issued. The school was formally opened last April, with Major Ross as the lecturer in tropical diseases, and though much time has had to be devoted to organising courses of study, and arranging the material available for research, an abundance of other work has been done. The most important result, however, achieved by the school, was the despatch of an expedition to West Africa to investigate the prevalence there of tropical malaria and other diseases. The expedition, which started at the end of July and returned in October, chose Sierra Leone as the field of their labours, owing to its proximity to Liverpool, the time at their disposal being short. The results of the expedition have been in the highest degree satisfactory, and a report on its labours is now in course of preparation, and will shortly be issued. The expedition brought back a considerable amount of very valuable material for teaching purposes, more especially a unique collection of malaria infected mosquitoes, which have proved exceedingly useful for demonstration purposes. Full recognition by the Government has not yet been extended to the school, and until that recognition is given, the class of students most desired, namely, medical officers about to enter into the service of the Government in tropical colonies, will not be attracted. It is confidently expected, however, that full recognition will shortly be given, and that the medical officers in question will be allowed the option of undergoing their course of instruction in tropical medicine at Liverpool.

A DEPUTATION of the Agricultural Education Committee waited upon the Duke of Devonshire at the Education Department on Friday last, to urge the adoption of certain educational reforms on the lines of a series of resolutions which were adopted a short time ago by the executive of the Committee. Among other reforms, the resolutions suggested that in view of the importance of concentrating the control of agricultural and rural education in the hands of one Government department, the educational work of the Board of Agriculture should be transferred to the new Board of Education; that the staff of the new board should include an adequate number of inspectors well

acquainted with the needs of the agricultural classes and the conditions of country life, and that the inspectors should be instructed to see that the curricula of rural schools are differentiated from those of urban schools. It was also recommended that in rural elementary schools there should be a continuous course of rural instruction, beginning in the lower standards with object lessons and continued in the upper standards with lessons in natural history and elementary science bearing on agriculture and rural life. With regard to training, it was suggested that provision should be made at certain of the teachers' training colleges for giving practical as well as theoretical instruction in agriculture and horticulture to those students who desired it. With regard to higher agricultural instruction and evening continuation schools it was recommended that the Board of Education should encourage those county authorities which have not yet done so to provide or to contribute to school and experimental farms and should inspect and report annually on such farms; that in rural evening schools instruction should be given in such subjects as natural history, botany, and other sciences bearing on agriculture, horticulture, bee and poultry keeping, land measuring, farm accounts, and so on, rather than in such subjects as typewriting, commercial arithmetic, and shorthand. The Duke of Devonshire expressed himself in sympathy with the desire of the Committee to give a more useful and practical character to elementary education in rural districts, and mentioned certain steps which the Education Department has taken in furtherance of this object. Full consideration was promised to the various suggestions put forward by the Agricultural Education Committee. The subject is dealt with in an article on p. 332.

#### SOCIETIES AND ACADEMIES.

LONDON.

**Physical Society**, January 26.—Prof. Lodge, F.R.S., President, in the chair.—A paper by Prof. Ayrton and Mr. Mather, on some developments in the use of Price's guard wire in insulator tests, was read by Prof. Ayrton. For insulation tests made by the direct deflection method the guard wire properly applied affords complete protection against surface leakage when the ends of the cable tested are near the galvanometer, so that it is possible to have the wire connecting the conductor of the cable with the galvanometer terminal "air insulated." A difficulty, however, arises when the ends of the cable are at a considerable distance from the testing instrument; this may render air insulation impossible. The authors have overcome this difficulty by applying a guard wire along the entire length of the lead. This is done by using a concentric wire to connect the cable and galvanometer, the inner of the concentric being used as the lead and the outer as the guard wire. The principle can also be applied to determine whether a defective piece of cable is bad throughout or bad owing to one or more isolated faults. In this case the cable is placed in two water tanks, one of which is earthed, and the other fairly well insulated. By a suitable arrangement of the guard wire it is then easy to determine the resistance of the wire in the earthed tank, so that by altering the length of this wire the character of the insulation can be determined throughout the whole length of the cable. In referring to some of the earliest experiments with the guard wire made by Mr. Appleyard in 1895, Prof. Ayrton pointed out that the principle had not been applied completely, and that at one point there was a chance of leakage. Mr. Campbell said that the necessity of having a concentric could be obviated by simply hanging the lead from the guard wire by short lengths of material of fair insulation. Mr. Appleyard said that he quite agreed with Prof. Ayrton that the guard wire ought in general to be applied at both ends of all leads, provided that both ends could be got at. The reason it was used at one end only in the experiments on dielectrics made in 1895 was that the far end of the lead was carried into the condenser box, which was submerged in water in the temperature tank. Special precautions were taken to ensure good insulation of the submerged end of the lead, and tests showed that the leakage there was nil. As the end of the wire could not be got at, no guard wire could be applied. Mr. Appleyard congratulated the authors upon the use of a concentric cable for a lead, and pointed out that such a lead was sufficient for all the routine tests on core; the inner and outer conductors could be used for the purpose of taking the "copper" resistance. Mr. Price expressed his interest in the develop-

ments of his principle which had been made by the authors.—Mr. Appleyard then read a paper on a fault-test for braided and other cable-core. This method enables the fault to be found without the removal of braiding or tape. The core is wound on two insulated drums or tanks, the intermediate piece of cable being about ten feet long. One end of the core is left free, the other is connected to earth through a galvanometer and a battery. A guard wire is connected from some point between the galvanometer and the battery to some point of the braiding on the wire between the drums. A wet cloth, connected to an earth wire, is laid on one or other of the drums, over the braiding. The galvanometer deflection is noted. The earth-wire is then changed over to the second drum, and the corresponding deflection is observed. A comparison of these deflections at once indicates upon which drum the fault lies. With the galvanometer still deflected, the core may be run through a suitable contact brush or sponge attached to the guard wire. The instant the fault passes under the guard wire contact, the deflection falls and the fault is located. The paper gives the theory of the method, and indicates how to apply it (1) to localising "distributed" faults; (2) to several faults in a single cable; and (3) to the case of a single fault. One advantage of the method is that at the critical moment, when the fault passes under the guard wire, the galvanometer is short circuited through the fault, and thus completely protected.—A paper on reflection and transmission of electric waves along wires, by Dr. E. Barton and Mr. L. Lownds, was read by Dr. Barton. The waves used were produced by means of an induction coil and an oscillator, and travelled along wires 15 cm. diameter, 8 cms. apart, and 166 metres long. The ends of the wires were connected by graphite markings on ground glass, so that any wave trains which reached the ends were at once absorbed. Three circular parallel-plate condensers were used, of 15, 9 and 5 cms. radius respectively. The plates were in all cases separated by air, and were placed 1 cm. apart. The needle of the electrometer connecting the wires was uncharged, so that it was always attracted by the charged plates. The positions of the condenser and electrometer could be varied so as to study either the reflected or the transmitted waves. The electrometer produced a negligible disturbance, as it reflected only 0.04 per cent. of the energy incident upon it. The authors have attacked the problem mathematically, using the relations of Heaviside, and have obtained expressions for the reflected and transmitted systems. These expressions consist of two terms, one of which is comparatively unimportant. From the other term certain values have been calculated. A superior limit has then been given to the other term, and the values already obtained have been subjected to a correction on this account. By a suitable arrangement of the condenser and electrometer these calculated values have been experimentally determined, and are in close agreement with the theoretical numbers, falling in many cases between the results derived from the approximate and the corrected theories. The authors have also investigated the stationary wave system produced by interference when the electrometer is placed close to the condenser, and between the condenser and the oscillator. The chairman said that the experiments afforded a satisfactory verification of Heaviside's theory.—A paper on the frequency of transverse vibrations of a stretched india-rubber cord, by Mr. T. J. Baker, was taken as read. In this paper Mr. Baker has investigated the frequency of the note given out by an india-rubber cord of square section when subjected to different tensions. The relation between length and tension is linear over a considerable range. The curve connecting length with frequency shows that while the cord was doubling its length the pitch was rising rapidly, but that further extension was practically without effect. Since the relation between length and tension is linear, while the sectional area is decreasing, it follows that the value of Young's modulus must be changing. The author has shown that the value of Young's modulus is proportional to the square of the stretched length of the cord. Using this fact, the frequency of the note given out by a stretched india-rubber cord is shown to be proportional to a quantity which varies very slightly with increase in length of the cord, and hence the variation in elasticity is given as the cause of the constancy of the note.—Mr. Appleyard exhibited some mirrors produced inside incandescent lamps by the application of voltages much above those for which the lamps were designed, and the consequent deflagration of the filaments.—The meeting then adjourned until February 9.