affording to its students the opportunities which they now lack for post-graduate study and original research.

At any rate, we may take it that the Imperial Technical College will become the technical university for London—whether as a part of London University or as a new university working alongside it does not for our present purpose matter—concerned chiefly with honours students entering with high qualifications for a three or four years' course, including post-graduate study and research.

While referring to research, let me say I do not think you can successfully command a college, either by Act of Parliament or by Royal Charter, to become the home of original research. You can foster the endeavour by your regulations and the proper provision of funds, but success depends mainly on the men who guide the students and direct their energies. It was Liebig who made Giessen; the physical laboratory of Berlin became famous because Helmholtz worked there; it was not the cellar in the old university buildings, or the funds available for inquiry, which drew students from all over the world to Kelvin's laboratory at Glasgow. Rowland and his staff are the real founders of the Johns Hopkins University; to-day it is Thomson who fills the Cavendish Laboratory and Ramsay who attracts our ablest chemists to a somewhat second-rate laboratory in Gower Street. To expect a distinguished body of post-graduate students to flock at once to a newly opened college is a vain hope; but this is a digression. The Imperial Technical College will in time become the technical university of London. To achieve all that is aimed at, time and a more generous support on the part of those who have interests of education at heart alone are needed.

To this university there must be many avenues of approach; it must spread its roots afield; among its students some—by no means all—will pass through the polytechnics, for it appears to me the primary work of the polytechnics is not to prepare undergraduates for degrees in science and engineering, but rather, in the first instance, to supply needful knowledge to the worker.

No doubt it is necessary that, in view of the size of London, there should be centres of university work in various parts; it is desirable that some of the polytechnics should organise themselves so as to meet this demand; but is it necessary for all to do so? I do not wish to express an opinion so much as to raise a question.

I think I realise in part the feelings of the teachers; their university students are, I take it, among their best; the chance of doing research work turns largely on having one or two such students, and research work must be done if your teaching is to be kept alive and your courses, at any rate to advanced students, made fruitful; but is the highest work, or even work up to degree standard in many subjects, to be attempted in every polytechnic? The expense of such a plan must be very heavy, the strain on the teachers enormous. Suppose that, instead of endeavouring to cover all the instruction required for the B.Sc. degree, each institution made a serious effort to specialise only in one or two of the required subjects, leaving the others to other polytechnics, would not this relieve the pressure? In this chosen subject the principal would draw round him a large and able staff who would attract students from a wide area, and his college might in time become a specialised school of technical research. The teachers in this subject would find in their work ample opportunities for investigations of real importance; in the other branches of science the work would be avowedly more elementary, and the teachers probably less competent to research: but if the classes were mainly evening, such of the staff as wished might carry on investigation in the central laboratories of the university, or possibly at some other polytechnic where the subject of the research was made a special object of study.

One point more. Among your many students are some of very marked ability, perhaps of genius. Ease their paths by all methods within your power. Let me urge on the governors of your various institutions, and on those who hold the purse, if there are any such who can hear me, that expenditure on scholarships or bursaries for such, on material and apparatus for their researches, will soon repay itself in the effect their work will have in applying science to industry and trade, in discovering new means whereby the forces of nature may be harnessed to do the work required by man.

To conclude; my dream would picture a central technical university for London, a place where students only of proved capacity were admitted, where the staff were free to conduct original investigations and through these to teach their students, where scholars and prizemen from the various technical institutions of the district were collected, and where the teachers in the polytechnics and other colleges were freely welcomed to carry out researches.

In close connection with this there would be a number of colleges, day colleges chiefly, organised so as to provide the teaching required for the less advanced stages of the university. The suitable centres for this work would, of course, need to be selected with due regard to geographical conditions. Beyond these, again, would come the polytechnics, engaged chiefly in evening classes for the worker, but each with its one or more departments organised so as to provide teaching and means for research of the highest character, with its teachers recognised by the university, having a common interest in promoting the welfare of the central body and looking to the professors as their leaders in the search for truth.

Whether this dream comes true or not, I am clear that a scheme for technical education in London must aim at coordinating existing effort round a central institution, and in this endeavour must recognise the self-sacrificing labours of those who, in the past ten years, have done so much to forward the great movement—the governors and the staff of the institutions represented on this association.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The general board of studies will shortly proceed to the appointment of a Stokes lecturer in mathematics, in succession to Prof. Hobson. The appointment will be from June 24, 1910, to September 29, 1913. The annual stipend is 200*l*. Candidates are requested to send their applications, with a statement as to the branches of mathematics on which they are prepared to lecture, and with testimonials if they think fit, to the Vice-Chancellor on or before April 25.

The Allen scholarship has been awarded to Mr. R. Whiddington, of St. John's College. Mr. Whiddington took a first class in physics in part ii. of the natural sciences tripos in 1908.

SIR ALFRED KEOGH, K.C.B., formerly Director-General of the Army Medical Service, has accepted the rectorship of the Imperial College of Science and Technology, and will take up his work at an early date.

A REUTER message from Bombay announces that Sir Carrimbhoy Ebrahim has given to the Bombay Government a sum of 30,000*l*. for the improvement of scientific training, the encouragement of research, and the provision of scholarships to science students of the Mussulman faith.

A MEETING of the London branch of the Mathematical Association will be held at the L.C.C. Training College, Southampton Row, W.C., on Saturday, March 19, at 2.30 p.m. Papers will be read on the teaching of graphs, by Dr. T. Percy Nunn and Mr. P. Abbott. A discussion will follow, which will be initiated by Mr. D. Mair. All who are interested in the work of the association are invited to attend.

THE Fresenius Chemical Laboratory, Wiesbaden, offers opportunities for the pursuit of study and research in chemical science in an attractive part of Germany. The directors of the institution are Prof. H. Fresenius, Prof. W. Fresenius, and Prof. E. Hintz, and there is a large staff of lecturers and assistants. The summer term will begin on April 25, and among the subjects of lectures announced are chemical technology, stöchiometry, microscopy and chemistry, and analysis of foods. Copies of the regulations and the syllabus of lectures may be obtained upon application to one of the directors of the laboratory.

THE Old Students' Association of the Royal College of Science, London, has commenced the publication of a *Record*, which is to be issued at irregular intervals as

occasion may demand, containing information in regard to the work of the association and other matters of interest to old students. The association has accomplished some useful work during the first year of its existence. A register containing particulars of 729 old students has been published, steps are being taken with a view to secure academic costume for associates of the college, and inquiries are being made with the intention of offering evidence before the Royal Commission on University Education in London. We notice that Sir Thomas Holland, K.C.I.E., F.R.S., is the president of the association for the current year.

MR. F. M. DENTON, of the Carnegie Technical Schools, Pittsburgh, has been appointed to the post of associate-head of the electrical engineering and applied physics department of the Northampton Polytechnic Institute, Clerkenwell, London, E.C., rendered vacant by the resignation of Dr. C. V. Drysdale. Mr. Denton received his technical training at the Central Technical College of the City and Guilds of London Institute, and for a time he occupied a position on the staff of the electrical engineering department of the college. He left to join the staff of the General Electric Company in various departments at Pittsfield, Mass., and at Schenectady. After occupying these positions for one year he was, two and a half years ago, appointed lecturer in electrical engineering at the new Carnegie Technical Schools at Pittsburgh, a position which he still occupies and is resigning to take up his London appointment.

THE Department of Agriculture and Technical Instruction in Ireland has distributed a circular (Form S 41) giving full particulars of its summer courses of instruction for teachers, to be held, for the most part, in Dublin during July and August next. In July, courses will be conducted by the Department in, among other subjects, experimental science, laboratory arts, and drawing and modelling for teachers in day secondary schools, and in day and evening science and art classes; in domestic economy and woodwork for teachers in day secondary schools; and in hygiene and sick nursing and in housewifery for domestic economy instructresses. For August, four courses have been arranged, as follows:—in metal-work, practical mathematics and mechanics, and in hand-railing, for teachers of wood-working; in industrial chemistry for teachers of chemistry in technical schools; in rural economy for teachers of experimental science in technical schools and teachers in national schools; and in school gardening for teachers in schools with gardens. The syllabuses of work contained in the circular show that great pains have been taken to provide practical courses dealing with subjects which will be directly useful to teachers in their work, and they should also serve the purpose of adding new life to their lessons when the teachers return to their schools.

ON Friday, March 11, Sir William H. White, K.C.B., F.R.S., distributed the certificates and prizes at the South-western Polytechnic Institute, Chelsea. Mr. W. Hayes Fisher, M.P., occupied the chair. After the principal had read the report for he session 1908–9, and the certificates had been distributed, Sir William said that in education he has three articles of faith, namely:—(1) every child should have an opportunity for education; (2) all who give proof of capacity of profiting by higher training must be allowed to go on; (3) in getting the best educational results the natural process of gradual selection must be adopted and allowed to operate. This leads to apparent wastage; but there is no real wastage. It is necessary to have educated men of all grades in all works, and this has specially to be brought home to the English manufacturer, who does not yet realise the importance of higher education. Sir William said that in Chelsea he felt at home, for when he came from Devonshire, before he joined the Admiralty in 1867, he studied at the School of Practical Shipbuilding at South Kensington, and lodged on King's Parade, Chelsea, almost within a stone's throw of the polytechnic. He was very pleased with his inspection of the polytechnic last week, and specially congratulated the governors on the large amount of their day work. From his experience of the technical colleges and institutes in London he had come to the conclusion that the polytechnics must be encouraged to carry on and extend day courses—their work in the evening was without parallel in the educational world. Various subjects must not be concentrated in special buildings, but each institute should make its courses as wide and as general as possible. London was so extensive, and its population was so large, that there was an ample field.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 10.—Sir Archiba'd Geikie, K.C.B., president, in the chair.—C. Gordon **Douglas** and Dr. J. S. **Haldane**: The causes of the absorption of oxygen by the lungs (preliminary). A short preliminary account is given of experiments affording clear evidence of a secretory activity of the lungs in the absorption of oxygen.—V. H. **Veley** and A. D. **Waller**: The action of nicotine and other pyridine bases upon muscle, and on the antagonism of nicotine by curarine. Nicotine (mol. wt. = 162) as such, or in the form of salt as nicotine tartrate, produces a very characteristic effect upon the contraction of isolated muscle. Its toxic power upon muscle, as compared with that of other substances that the authors have dealt with, is of the following order, *i.e.* approximately one-third that of quinine and considerably greater than that of curarine:—

Aconitine	10,000
Quinine	100
Nicotine	33
Strychnine	12
Curarine	5

The effect on muscle, characteristic of nicotine, is not produced by its parent base pyridine, nor by picoline, nor by piperidine. The order of toxicity upon muscle of these substances as compared with that of nicotine is as follows:—

Nicotine	100
Piperidine	50
Pyridine	10
Picoline	10

As has been indicated by Langley, there is an antagonism between nicotine and curare. Using a solution of pure curarine iodide prepared by Prof. Boehm, we find that the characteristic effect of nicotine upon muscle is abolished when the proportion of curarine to nicotine, reckoned by molecules, is 2 to 1, 30 to 1, and 160 to 1. With this last proportion a trace of nicotine effect can still be detected. In the case of other poisons, viz. strychnine, quinine, and aconitine, of which the effect *per se* upon muscle considerably exceeds that of curarine, there is, in a sense, an antagonism, as shown by abolition of the characteristic nicotine effect, but the abolition requires a greater mass of these more powerful poisons than is sufficient in the case of the less powerful poison—curarine. Thus, approximately, whereas 1 mol. of curarine can overpower upwards of 100 mols. of nicotine, it requires 1 mol. of strychnine or of quinine to overpower 1 mol. of nicotine, and 1 mol. of aconitine can overpower at most 10 mols. of nicotine. But in these cases the result appears to the authors to be intelligible as an effect of subdivision of muscle stuff between two poisons similar to the case of the subdivision of an acid between two bases; but this explanation is hardly applicable to the case of the antagonism of the strong poison nicotine by the weak poison curarine.—Prof. H. E. **Armstrong** and E. H. **Horton**: Studies on enzyme action, xiii., enzymes of the emulsin type.—Miss M. P. **FitzGerald**: Preliminary note on the origin of the hydrochloric acid in the gastric tubules.—C. J. T. **Sewell**: The extinction of sound in a viscous atmosphere by small obstacles of cylindrical and spherical form. The results obtained in this paper are only valid when the dimensions of the obstacles are small compared with the wave-length of the incident sound. For cylinders and spheres the radius of which is not less than 10^{-3} cm. it is found that the ratio of the lost energy to that incident upon the obstacle is at most of order 10^{-2}; this is a very much larger proportion than is obtained in the case of a non-viscous air. The results obtained for a single obstacle are extended without difficulty to the case of a large number