specific chemical messenger, which travelled by the blood, and not by the stimulation of nerve-endings and the passage of impulses through nerves and the central nervous system. They showed that this secretin was but a type of a whole group of substances which they designated hormones. The discovery of these hormones, and the precise definition of their nature and of the conditions of their activity, mark an important epoch in the development of our knowledge of the organs of the animal body. Prof. Bayliss's researches on the mode of action of enzymes and on the closely related questions with regard to the nature of colloidal solutions have obtained universal recognition. The war led to Prof. Bayliss making a great advance in practical medicine. He studied the condition known as shock, which follows great loss of blood. The condition had previously been treated by the injection of saline solution, but the effect produced was characteristically transitory, and sometimes no benefit accrued at all. Prof. Bayliss, amongst other things, proved that per-fused fluid to be effective must contain colloidal matter sufficient to give the osmotic pressure of the normal colloids of the blood.

A ROYAL MEDAL is awarded to PROF. JOHN BRET-LAND FARMER for his researches in botany, especially in the cytology and anatomy of plants.

Prof. Farmer's work is characterised by the fundamental importance of the problems worked upon; thus his memoirs on the meiotic phase (reduction division) in animals and plants are of as great value to zoologists as to botanists, and his conclusions and interpretations of the complex nuclear changes which precede the differentiation of the sexual cells have stood the test of criticism, and remain the clearest and most logical account of these very important phenomena. His papers, in collaboration with his pupil, Miss Digby, on the cytology of those ferns in which the normal alternation of generations is departed from has thrown new light on problems of the greatest biological interest, and especially on the nature of sexuality. In his cytological work on cancerous growths Prof. Farmer has established the close similarity between the cells of malignant growths and those of normal reproductive tissue.

A ROYAL MEDAL is awarded to MR. JAMES HAYWOOD JEANS.

Mr. Jeans has successfully attacked some of the most difficult problems in mathematical physics and astronomy. In the kinetic theory of gases he has improved the theory of viscosity, and, using generalised co-ordinates, has given the best proof yet devised of the equipartition of energy and of Maxwell's law of the distribution of molecular velocities, assuming the validity of the laws of Newtonian dynamics. In dynamical astronomy he took up the difficult problem of the stability of the pear-shaped form of rotating, incompressible, gravitating fluid at a point where Darwin, Poincaré, and Liapounoff had left it, and obtained discordant results. By proceeding to a third order of approximation, for which very great mathematical skill was required, he showed that this form was unstable. He followed this up by the discussion of the similar problem when the fluid is compressible, and concluded that for a density greater than a critical value of about one-quarter that of water the behaviour is generally similar to that of an incompressible fluid. For lower densities the behaviour resembles that of a perfectly compressible fluid, and with increasing rotation matter will take a lenticular shape and later be ejected from the edge.

THE DAVY MEDAL is awarded to PROF. PERCY FARADAY FRANKLAND for his investigations in three sections of chemical science.

Prof. Frankland's early work on the illuminating power of burning hydrocarbons was considerable in

amount, and had the further merit of inspiring others in the study of combustion. He was one of the first after Pasteur to study seriously the chemical reactions which occur during the vital processes of numerous lower organisms, and to apply such reactions to the preparation of pure products. During the last twenty years he has devoted himself to the elucidation of the relationship existing between the chemical constitution and the rotatory power of optically active substances.

THE SYLVESTER MEDAL is awarded to MAJOR PERCY ALEXANDER MACMAHON.

Major MacMahon's researches on the combinatory analysis and on subjects allied to the partition of numbers are of the highest value, and display great originality and invention. He has shown equal power in the discovery and treatment of the wonderful ranges of partition theorems which are derivable from the theory of elliptic functions, and of the similar theorems to be obtained by the application of analysis to purely arithmetical principles.

THE HUGHES MEDAL is awarded to DR. CHARLES CHREE.

Dr. Chree has for many years devoted himself to the intimate study of the phenomena of terrestrial magnetism, notably those which are recorded by self-registering instruments. He has investigated the differences which occur in the diurnal variation on quiet or moderately disturbed days, studied the initial stages of magnetic storms, and investigated various problems connected with the relation of solar phenomena and manifestations of terrestrial magnetism. Perhaps the most notable result obtained is that called by Dr. Chree the "acyclic change." This manifests itself on taking the averages of quiet days, when it appears that the mean value of the magnetic force is not the same at the end as it was at the beginning of the 24-hourly period, but shows a difference which is always in the same direction.

THE HYDRO-ELECTRIC SURVEY OF INDIA.¹

AT a time when so much enterprise and energy are being displayed in collecting facts and data concerning the world's water-power resources, the issue of a preliminary report on the water-power resources of India is an incident of considerable interest and importance. The investigation was commenced in 1918 under instructions from the Indian Government by the late Mr. G. T. Barlow, C.I.E., who was placed in charge of the survey, with Mr. J. W. Meares as his assistant. The untimely and deplorably sudden death of Mr. Barlow in April, 1919, towards the close of the tour of inspection, left the compilation of the report in the hands of Mr. Meares, who was appointed as his successor in the post of Chief Engineer. Mr. Meares has discharged his exacting task in a very able manner. The removal of Mr. Barlow's collaboration was, of course, a serious deprivation, as a number of places were visited by him unaccompanied; and, although he compiled his notes with every care, his unrecorded impressions would have been of great value. Notwithstanding this the report is excellently put together, and full of useful information.

The earliest water-power installation in India was the electric lighting plant of the town of Darjeeling, carried out by Mr. Meares himself in 1897. Five years later considerable power for industrial purposes was developed in Mysore from the River Cauvery. Then nothing of importance happened until the initia-

¹ "Hydro-electric Survey of India." Preliminary Report on the Water-power Resources of India. Ascertained during the Season 1918-19 by the late G. T. Barlow, assisted by J. W. Meares. Compiled by J. W. Meares. Pp. vii+108+iii plates. (Calcutta: Superintendent Government Printing, India.) Price Rs. 3.2 or 4s. 9d.

tion of the great Tata hydro-electric power project at Bombay, which has recently been completed. The country is known to abound in hydraulic possibilities, but, owing to the paucity of important manufacturing industries, no serious attempt has been made to exploit these possibilities, except in a few rare instances.

The difficulty in regard to the promotion of power-development schemes is the erratic incidence of the rainfall. India differs very greatly in this respect from other countries. The rainfall is seasonal, often tremendously heavy, followed by protracted spells of drought. In amount it ranges from 500 to a few inches.

Apart from canals, the mountainous regions, where the rainfall is a maximum, are the natural sources of water-power, but here there is a certain disability in that they lie largely in unsettled districts in the north inhabited by uncivilised tribes. "Except in localities where storage on a large scale is possible, such as the Western Ghats and possibly the uplands of the Central Provinces, the greater part of the monsoon rainfall of India must necessarily pass to the great rivers and canals undeveloped for power purposes." The Jaldaka River in the Bengal Duars is instanced as a case in point. The catchment area is 250 square miles, and the annual rainfall not less than 150 in.—probably 200 in. as an average. In the seven months from April to October the total fall amounts to some 75,000,000,000 cubic ft., giving an average flow of nearly 4000 cubic ft. per second, yet the flow gauged in April this year was only 170 cubic ft. per second. Add to this that a single day's rainfall may reach, and even exceed, 10 in., and the difficulty of controlling such extremes becomes at once apparent.

In consequence of the prevalence of conditions such as these, many Indian rivers during the dry season sink to insignificant streamlets. Storage, therefore, during the monsoon period is the only possible means of obtaining continuous supplies of water. But in most localities this is not economically possible. Certain seasonal industries, such as tea-drying and kindred processes, might be served by intermittent supplies, but the cost would be relatively higher than by a continuous supply.

As indicating the backward state of electrical development in India, the following figures are interesting. The number of watts installed per head of population in Canada is 148, in Australasia 62, in South Africa 57, in the British Isles 33, and in India less than 1.

The total brake-horse-power of all kinds is set down approximately as follows:—

Assam	22,550
Bengal... ..	201,518
Bihar	2,325 (apart from collieries)
Bombay	782,872
Burma	17,750 (exclusive of rice mills, etc.)
Central Provinces	32,773
Madras	39,568
Punjab... ..	15,734 (steam only)
United Provinces	38,548

Grand Total ... 1,153,638

No estimate of the total water-power available for development is given or attempted. Mr. Meares states that it would take several years to ascertain it, even approximately. A statement is set out of existing hydro-electric plants and a number of possible sites for developing water-power are discussed. The report concludes with a series of practical notes and suggestions on methods of collecting and tabulating the necessary data, with a view to the future work of the survey.

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UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—A further benefaction of 1000*l.* has been received by Prof. Nuttall on behalf of the institute for parasitology from the executors of the late Lord Strathcona and Mount Royal, in fulfilment of a promise made in 1910 to contribute that sum when the sum of 6000*l.* had been collected from other sources.

Dr. F. H. A. Marshall, fellow of Christ's College, has been appointed reader in agricultural physiology.

Mr. P. Lake, of St. John's College, has been appointed reader in geography.

Mr. W. B. R. King, of Jesus College, has been appointed assistant to the professor of geology, and Mr. T. C. Nicholas, fellow of Trinity College, to be demonstrator in geology.

OXFORD.—On November 2 an amendment to the Responsions statute was moved in Congregation by Prof. Gilbert Murray. This, if carried, would have had the effect of restricting the exemption from compulsory Greek to candidates in the pass schools and in the honour schools of natural science and mathematics. The amendment was lost on a division by 104 votes to 123. This decision will, no doubt, lead to a reopening of the question of exemption before Congregation, with a possible appeal to Convocation before a final settlement can be reached.

ON Friday, December 5, the Marquess of Northampton will distribute prizes and certificates at the Northampton Polytechnic Institute, Clerkenwell, E.C.1.

OWING to the lack of fuel for heating purposes, the University of Budapest has been unable to resume its activities this session. It is not anticipated that the resumption of work will be possible until next spring.

THE RIGHT HON. VISCOUNT HALDANE OF CLOAN, president of Birkbeck College, will receive the college graduates and deliver an address on "What is Truth?" at the celebration of the ninety-sixth anniversary of founder's day of the college on Friday, December 12. The chair will be taken at 8 p.m.

THE Dean of the faculty of medicine of the University of Paris has directed our attention to the re-organisation of the courses of instruction and the re-opening of the laboratories and clinics in this faculty. A booklet has been published by Messrs. Masson (price 1 franc) giving a valuable and interesting historical account of the school, together with complete information with respect to the various courses. The booklet is admirably produced, and illustrated with twenty-one well-executed photographic plates. It should be in the hands of all those who wish to make use of the great resources now open to them. There should be many of these. Some of the clinical courses are given in vacation time—a fact which makes them available to those who might otherwise find it impossible to make a visit to Paris.

THE Prime Minister has appointed a Committee "to inquire into the position to be assigned to the classics (*i.e.* to the language, literature, and history of ancient Greece and Rome) in the educational system of the United Kingdom, and to advise as to the means by which the proper study of these subjects may be maintained and improved." The constitution of the Committee is as follows:—The Marquess of Crewe (chairman), Sir George Adam Smith, the Rev. C. A. Alington, Mr. S. O. Andrew, Miss M. D. Brock, Prof. H. J. Browne, Prof. I. Burnet, Mr. T. R. Glover, Sir Henry Hadow, Miss K. Jex-Blake, Prof. W. P. Ker,