THURSDAY DECEMBER 5, 1895.

THE ORGANISATION OF SCIENCE.

AS we are accustomed in this country to look on the *Times* as a political barometer, the appearance in it of the very admirable article to which we drew attention last week must be regarded as proof that the exigency of the situation in which the nation is placed is likely soon to attract some share of the attention it imperatively demands. And the question arises how we may best secure that "scientific organisation in the field, in the workshop, in the laboratory, and in the conduct of national policy" which the *Times* so fully and justly recognises to be essential to our national safety.

It is just twenty years since the Royal Commission on Scientific Instruction and the Advancement of Science, presided over by the Duke of Devonshire—father of the present Duke—issued their final report in which they emphatically recommended the appointment of a Ministry and Council of Science. The report is full of evidence of a most convincing character, given by witnesses of the greatest eminence and wide experience; and when we recollect that it was signed by such men as the late Duke of Devonshire, Lord Lansdowne, Huxley, Sharpey, Henry Smith, Stokes, Bernhard Samuelson and Lubbock, it is more than surprising that its provisions should have been so completely neglected. In point of fact, and most unfortunately, nothing has yet been done to bring the State thoroughly into touch with science, and to lead it to regularly avail itself on all possible occasions of the services of qualified scientific advisers.

Had such a Council been called into existence, it would undoubtedly have operated in two ways. In the first place, its members would inevitably have had their attention drawn to public affairs, and the narrowness of purview which too often characterises the work and thoughts of men devoted to science, as well as of business men, would have given place to broad conceptions of civil duty, so that an ever-widening influence would have been secured to them. On the other hand, by gradually bringing about the introduction of scientific methods of regarding and treating State problems, they would have conferred inestimable service on the nation, and the growth of a system of rational statesmanship would have been encouraged. We are indeed able to form an effective estimate of what might have been the result of their labours—for, having commenced to organise our public service at about the same time, and pursued similar methods, we should not improbably have attained to a position comparable with that in which the Japanese appear now to be placed.

It would certainly have been impossible for the minister at the head of our educational affairs to gravely argue in 1895 in favour of granting to a small group of irresponsible individuals a post-card veto on the finding of a Statutory Commission, which his Government are begged to appoint to finally adjust the claims of the various parties concerned in the foundation of a University in London. Nay more, our minister would have been in a position to say that sheer force of circumstances compelled him to recognise that it was of the utmost national importance to immediately secure the effective organisation of all the higher educational interests of the capital of the empire—indeed, our Government would long since, at the instigation of its scientific council, have taken the matter into its own hands, and have brought about such organisation, instead of requiring to be positively compelled to act.

The existence of such a national council of scientific advisers—the words are used intentionally, as we are thinking of a council of men scientifically trained and of proved ability and originality—would infallibly have exercised a most potent influence on public opinion: in forming it and educating it. It would have spread abroad the spirit of inquiry by making it operative in every branch of the public service. The manufacture of red-tape would have fallen into oblivion instead of that of aniline dyes; agriculture would have been cared for, as it would have been foreseen that the lowering of freights, consequent on improvements in shipbuilding and the introduction of steam, made it necessary to relinquish wheat-growing into the hands of those who can command cheap labour and constant sunshine; and probably we should have learnt to make butter and grow onions at home.

Each of our public departments would have had a scientific staff, charged not merely with the duty of carrying out its routine work, but also expected to contribute to the growth of scientific knowledge, in order both to maintain touch with the outside world, and preserve and extend their interest in the subjects with which they were concerned. Only those can institute progress who themselves progress, and it is clear that this was fully recognised to be the case by the Duke of Devonshire's Commission, as it is stated in so many words in the report, that there was a general concurrence of opinion that, even in the interests of the Government Departments themselves, more ought to be done by the Government in the way of investigation.

The condition of our public service in these respects is nothing less than deplorable, and yet, when the example set by Kew—which, during many years past, has always been in the hands of highly-qualified scientific administrators—is taken into account, the advantages to be derived are so obvious. Where are the scientific men connected with our great departments of national defence in evidence? Most important researches on explosives have issued from Woolwich in days gone by; and Froude's great work under the Admiralty was epoch-making. What is being done at the schools where naval and military officers are being trained to make an atmosphere of research not only possible but essential? And when we pass to our colossal Indian empire, what is being done there to encourage the growth of the scientific spirit among those concerned in the administration of its affairs? We believe that at the present moment there is but a single agricultural expert available for the whole of India, and yet agriculture is the one industry on which the country is practically dependent. Why is engineering considered to be the only branch of science worthy of introduction into the public service?

As the present President of the British Association

said in his evidence to the Duke of Devonshire's Commission, "Our statesmen do not appreciate properly the value of scientific advice or scientific inquiry, and they are very much fonder of experiments made upon a large scale with no defined system, than they are of experiments which have been brought out as the result of a carefully studied previous inquiry." This is as true now as it was twenty years ago, and probably many hundreds of millions which might have been gained have been sacrificed in consequence.

The *Times* pointed out last week that, on his first appearance as Member for Foreign Affairs, M. Berthelot asked for money for the establishment of six new consulates in China. M. Berthelot may be properly described as the most original living chemist; he is certainly also the most prolific in ideas. As his Government will probably soon be thrown out in the natural course of affairs French, it might be well for us to consider whether a man who is capable of conceiving so daring an idea immediately on entering into political office might not—although a member of a class considered incapable of governing in this country—be invited over here to leaven our public service.

Reflections such as these should, however, give food for thought, not only to men of affairs, but also to those who are engaged in scientific work, and should lead the latter to ask themselves whether they are doing their duty in all respects—and this is especially the case at a time when we are seeking to appraise the value of Huxley's labours. Important as was his scientific work, and much as we are disposed to agree with Mr. Balfour as to the inestimable public service he rendered in making the doctrine of evolution plain and popular, the work he did in displaying the meaning of scientific method to people generally was, if possible, of even greater value. Yet how few follow his example—how few are prepared to be unselfish and to withdraw themselves from the fascination of their private investigations to labour in the cause which Huxley and also Kingsley made holy. If more had followed their example, we should now have far less cause to deplore the failure to apply scientific method in the public service which has led to the present break-down.

THE GROWTH OF THE BRAIN.

The Growth of the Brain. A Study of the Nervous System in Relation to Education. By H. H. Donaldson, Professor of Neurology in the University of Chicago. "Contemporary Science Series." (London: Walter Scott, 1895.)

THE "populariser" of science (who differs widely in kind from a Helmholtz or a Tyndall—the writers of popular science) labours under great disadvantages. He is compelled to give a scissors-and-paste account of the work done by other people in different departments, and to summarise a number of perfectly distinct monographs, omitting all the experimental evidence which alone gives value to the conclusions. He must not express any original criticism, and he usually has to bring in a moral. To say the best of it, he writes about science with an object, whereas science must be trodden for itself, like a Swiss mountain. It is a little sad to think that neurology is going to have an object—judging from the essay before us. It will become the lumber-room for histological details, weight statistics, architectural dimensions, a little physiology—very little—and some educational cobwebs to weave them all together. But such a collection should at least be up to date at the time it is offered to the public. An account of "localisation of cerebral function," with no reference to Munk and Goltz, no suggestion that opinions differ as to the extent of localisation, or that the expression "sensory *vs* motor" (tracts), has previously been termed "misleading," no hint that in the absence of the higher centres, function may be taken on by the lower, in any less long-suffering animal than the "brainless frog," does not lead one to anticipate much neurological pabulum.

The account of nutrition, again, is very inadequate; cell diffusion is referred to in almost purely mechanical terms, with little reference to the physiological activity of the epithelium. "Thyroid feeding," too, is casually introduced in a foot-note, with a couple of references to medical journals. Yet Brown-Séquard's name is not unknown, and we have lately heard a good deal about "internal secretion." Nor is the account of metabolism in the nerve-fibre very satisfactory. We are told that "it is possible to assume that there are metabolic changes which have not yet been detected, *or* that the nerve impulse is not accompanied by such changes." And again: "Physiologists have been busy at the same time seeking to determine how far the passage of a nerve impulse along a fibre causes fatigue-changes in it"; (no conclusion given).

Another loose statement is to the effect that the beat of the heart is an example of the automaticity of the nervous system. How then does it come about that rhythmic contractility appears in the embryonic heart before the nervous system has been developed?

Weismann has been assimilated, and is written out large for the "growth period of races and nations": so that, as Prof. Donaldson says, "the germ-plasm wears the appearance of immortality."

But we look in vain for any reference to recent French studies in experimental psychology, in which there is a fund of suggestion for "the parent, the teacher, and the physician," who are to "seek light" from the "facts within these covers." The question of types of perception—and of memory—is one of the most interesting in modern educational psychology. Instances are being classified every day of the visual, or auditive, or motor temperament; and surely we all know which is the particular language of our own translation of experience? Yet Prof. Donaldson can only suggest that "it is now recognised that thought can be carried on in terms of the several senses. In this connection Fraser (*Am. J. of Psychol.*, 1892) has made an examination of certain philosophic writers, which indicate that particular writers, or schools, prefer sense-images of one mode in their speculative thought, and he suggests that much of the failure to be mutually comprehensible depends on the fact that tactual and visual images, for example, are by no means capable of being manipulated in the same manner, and hence that relations conceivable in the terms of one are often not so in those of the other. With the employment of one sort of mental image comes precision; but it is precision gained at the price of limitations Fortunately

the law of the diffusion of incoming impulses works against a too great specialisation in this direction. Yet in the highly defective this specialisation must be carried very far, and in those whose endowments are distinctly unusual the dominance of one sense in controlling the reactions of the central system may rise to *the dignity of a deformity*." The last words should bring comfort to any poor victim of a temperament, but are a cheap substitute for the clear thought and scientific terminology of M. Binet or M. Ribot.

The account of consciousness and the relations between stimulation and sensation is also very defective. "Granting," we are told, "that the central system responds throughout a large extent to all the impulses acting upon it, and that by virtue of these responses the background varies; it remains to be determined how far the law and order in these changes can be formulated. . . . The reactions obtainable by the application of a given stimulus depend on the other stimuli with which the new one is competing. Cold water does not feel cold after ice; a black line on a grey surface has a value different from the same line on a white one, and so on throughout all contrasts. This relation between the stimulus and the sensation is expressed in the psycho-physic law by the formula that sensation increases in intensity according to the logarithm of the stimulus. The limits within which this law is applicable do not immediately concern us, its use here being purely to express the fact that at any moment the activities of the nervous system under the influence of existing stimuli *form a background against which a new stimulus, according to its intensity and character, may or may not be recognised*." (The italics are ours, here and elsewhere.)

The poverty of this conception of consciousness is typical of the whole book, which reads like a "background"—a dull record of facts with no living factors playing in and out of them, and making the physiological and psychological aspects into a conscious unity. It seems to have missed its mark, inasmuch as it is neither a scientific text-book nor a social philosophy.

F. A. WELBY.

THE VALLEY OF KASHMIR.

The Valley of Kashmir. By W. R. Lawrence, C.I.E. (Oxford: Frowde, 1895.)

UP till now the standard authority on Kashmir was Drew's well-known book. It contained a good deal of information about routes and passes, and concerned itself not so much with Kashmir proper as with the outlying and dependent territories. The present work has a more restricted aim, and deals more thoroughly with its subject. The reader must distinguish between Kashmir the kingdom and Kashmir the vale. The former is a large territory containing enormous mountain areas, chiefly uninhabited and stretching, in theory at any rate, from Tibet to Chitral and from the Pamirs to the border of the great Indian plain. But Kashmir proper is a level valley, apparently an old lake basin, included between a fork of the Himalayas. On the map it resembles, as Mr. Lawrence well remarks, a white foot-print set in a mass of black mountains. The level of the valley floor is about 6000 feet above the sea, and it is approximately 84 miles in length and 20 to 25 miles in width. Numerous trade-routes debouch upon this valley and concentrate upon its populous capital, Srinagar on the Jhelum. To Kashmir proper may also be reckoned the fertile lower portions of a number of tributary side-valleys, for the most part exceedingly beautiful, and well marked with wood, water, and meadow. This beautiful area—the garden of India—is shut off from the rest of the world by bare and, in many places, snowy mountain ranges, or by a gorge which has only a few years ago been trained to admit a cart road. It is inhabited by an interesting race, speaking a language and having a literature, a written history, and an art of their own. Thus Kashmir is marked out by nature, history, and circumstance as a geographical unit suited for separate treatment and study.

The Government of the Happy Valley was up till recently, in some respects, one of the worst in Asia. There, was no security of property, and personal liberty hardly existed for the peasantry, who were liable to forced labour at any time of the year, however ruinous to their industry, and had to pay taxes to swindling publicans, equally disloyal to the tax-payer and to the State. To put an end to this state of things became a crying necessity. A survey and land-settlement was decreed, and entrusted to officials under British direction. The bulk of the work was done by Mr. Lawrence, who has been for some years the Maharaja's Settlement Commissioner, and by whom the whole transaction has been concluded. In his daily labour he has been brought in contact with all classes of the community, and especially with the peasants. He has been obliged to make himself familiar with the nature of soils, the systems of irrigation and agriculture, the character of the crops, the resources of the country generally, the system of taxation, the character of the official class concerned, and to deal with its collection, and all manner of similar and connected questions. In course of his work he has been forced to accumulate a large body of notes on these matters, and he was thus designated by circumstances as the man best suited to report on the condition and prospects of the country generally. I gather that the volume under consideration is practically the report, or the major portion of the report, drawn up by Mr. Lawrence for the Indian Government which placed his services at the disposal of the Kashmir Durbar.

The scheme of the report is drawn on large lines. There are chapters descriptive and historical. Others deal with the geology, physical history, flora, and fauna of the valley and its surrounding slopes. There is a chapter on archæology, another on statistics, whilst the remainder deal with the people, their races, languages, religions, manners and customs, industries, and trade, and with the old Administration and the new Settlement. Some of these chapters are admittedly compilations. That on geology is little more than a reprint of passages from Lyddeker's memoir. Less satisfactory is the archæological chapter, which chiefly consists of quotations from Sir Alexander Cunningham's reports—excellent at the time they were written, but now superseded by the work of excavation and research which is being done for the Indian Government by Dr. Stein. The chapter on the flora makes no profession of completeness, but, being contributed by experts, is authoritative as far as it goes. It is chiefly confined to "plants and trees possess-

ing some well-known economical value for the people." The fauna chapter is remarkable chiefly for its full list of the birds of Kashmir—a region very rich in birds—and here the author is able to introduce a number of original observations.

In the remainder of the book he writes as an authority of the first rank, and conveys a mass of new and admirably digested information. His contact with the people was evidently of a sympathetic character. The Kashmiri is usually not beloved by the European. His effeminate dress is against him, to start with. His moral and physical cowardice seem superlative. He appears to be fundamentally a liar and a cheat. Such, indeed, are too often the characteristics of the boatmen class with whom the traveller comes most in contact. But the Kashmiri *shikari* is of a finer sort, and many of them are well beheld by their employers. Mr. Lawrence explains that the truly typical Kashmiri peasant is really more of the latter type. He has vices, patent enough ; but they are rather to be ascribed to the misgovernment, of which he has been victim for centuries, than to any original sin. The people are conscious of their degradation, and explain that it is the result of a curse from heaven, against which it is idle to protest. That curse Mr. Lawrence has done much to remove. In his quiet methodical fashion he has gone through the country with open eyes and healing hands. It is to be assumed that he went there to do a piece of work, and did it to the best of his ability, with no flaming ideals and high-sounding intentions. As a result, he has accomplished an amelioration in the lot of some hundreds of thousands of his fellow-creatures, great enough to warrant a less efficient founder of a new religion being raised to a pinnacle of eternal sanctity.

It is impossible within the limits of a brief review to give any idea of the volume and extent of work involved in the Settlement, and now actually accomplished. I was myself witness of some of its smaller fragments and effects. Still less can any idea be given of the value of the author's contributions to anthropology contained in this volume. He has entered into the life of the village and the cottage, and returned with note-books full of accurate and first-hand information. The greatest of his literary successes lies in the fact that he makes plain what a rich mine still remains to be worked. Here is folk-lore to be written down that would keep several men busy for years. Here is an important language to be studied. Here are customs of high antiquity yet remaining to be recorded and classified. It is to be hoped that Mr. Lawrence's book, besides bringing to him the high honour that is his due, and embodying a mass of most valuable facts and observations, will have a yet higher efficiency, in that it will get others to work along the lines, here laid down, to results yet more important and complete.

W. MARTIN CONWAY.

METALLURGICAL PROCESSES.

Metallurgy. An Elementary Text-book. By E. L. Rhead. (London : Longmans, Green, and Co., 1895.)

THE author's aim has been to present, within narrow limits, a clear and concise account of metallurgical processes, and he has done his work conscientiously, for much information has been included in the 271 pages of the volume, which also claims to be a "small handy book of reference." This claim can, however, hardly be sustained, though the publication of the work is amply justified, mainly for the following reason. It is difficult to make the ordinary student of chemistry understand that metallurgical processes differ essentially from those he is taught in a chemical laboratory, for as regards "wet" processes the reactions which occur in large volumes of dilute liquids, held in tanks, are often more complicated than the chemical changes which may be studied with the aid of test-tubes or beakers. In dry processes also the student has to deal with problems which involve a knowledge of the influence exerted by mass and high temperatures, and his laboratory experience is often at fault. The sooner, therefore, that students are taught the need for special instruction in metallurgy the better, and a little volume like this one under review is to be welcomed, more especially as the author is careful to point out "that the equations given for reactions occurring at elevated temperatures only partially express the truth." He says that "details are only given when necessary for the sake of clearness"; and this reveals the weak point of his scheme. It is impossible to give details as to the extraction of individual metals from their ores in a book of this size, and it would have been better to have limited the range of the little volume to a consideration of the principles on which metallurgy is based.

There are several things which present themselves, even to a rapid glance through the pages, as needing change or modification. For instance, it is stated in the introduction that "a gold structure of the same strength as an iron one would be nearly nine times as heavy"; an illustration which is not very apt, as mere weight is not the only thing which prevents gold being used for constructive purposes. Standard gold would make a very fair gun, but it would be a costly form of armament. On p. 3, it is stated that "all metals, with the exception of chromium, have been reduced to a fluid condition by heat"; but chromium is no exception, as it is not difficult to fuse even the carbon free metal in the electric arc. Moissan has, in fact, shown that titanium is the least fusible metal known, though he succeeded in melting it. There is another use of the words "cold-short" than the one given on p. 4, for "cold-shorts"; and the student should be warned of this, as it is a point upon which an examiner would expect rigid accuracy. Turning through the pages, on p. 224 it is stated that during the roasting of certain silver ores the gold "is chlorinated, and thus dissolved out." This is practically not the case, though the mistake is not an unnatural one. The brief description, given on pp.231–232, of hydraulic mining is very defective ; the head is said to be "sometimes 200 feet," it really sometimes is as much as 500 feet. Somewhat ancient practice is described in relation to the stamp battery for crushing quartz. In describing the cyanide process for extracting gold, the author thinks that it would "displace the chlorination process if a cheaper method of making cyanide can be found"; but the progress of the very important McArthur-Forrest process has not, really, been in the least impeded by the cost of the cyanide. The reviewer has, however, been over-captious. He has persistently advocated teaching the methods of conducting

metallurgical processes by diagrammatic schemes such as the author has adopted; see p. 198, for instance. The one given for the blast furnace (p. 110) is certainly instructive.

The illustrations, of which there are nearly one hundred, are clear, but some of them are very old friends, while others are perspective drawings; and for a book like this, the reviewer would have preferred to see suggestive outlines and sketches, which the student could have transferred to his note-book with a few strokes of the pencil. W. R.-A.

OUR BOOK SHELF.

Milk, its Nature and Composition; a Handbook on the Chemistry and Bacteriology of Milk, Butter, and Cheese. By C. M. Aikman, M.A., D.Sc. Crown 8vo. Pp. 173. (London: Adam and Charles Black, 1895.)

THE design of this little work is to give a short, popular statement of the more important facts concerning the chemistry and bacteriology of milk; and Dr. Aikman has succeeded admirably. A great deal of most valuable information is conveyed in a simple and eminently readable form, and it is a volume which is not only suitable for students in our recently started dairy-schools, but might well find a place in the library of any country-house. The general public is only very slowly awakening to the dangers which surround the consumption of dairy produce, and it requires the pressure of enlightened public opinion to produce the requisite reforms in the hygienic management of dairies. Dr. Aikman's volume, together with Dr. Freudenreich's "Bacteria in their relation to the Dairy," recently reviewed in these columns, should help a great deal in bringing about such reforms, which are not only of hygienic but of commercial importance to this country. In the section on the pasteurisation of milk, Dr. Aikman has overlooked an important fact, upon which the subsequent keeping power of such milk so largely depends, *i.e.* the *immediate* chilling of the milk after pasteurisation to a temperature below the point most favourable for germination. We think, in view of the recent valuable experiments, made in America and elsewhere, on the production of pasteurised milk on a commercial scale, and the importance of our adoption of a practice which has already gained considerable ground on the continent, Dr. Aikman might with advantage have entered more fully into this branch of the subject. Doubtless in a second edition Dr. Aikman will also expand somewhat the part devoted to cheese, and include some of the important and interesting results obtained by Bondzynski on the chemical composition of some varieties of cheese, published in the *Landw. Jahrbuch der Schweiz* last year. The illustrations accompanying the text are carefully chosen and well executed.

Elementary Physics. By John Henderson, B.Sc. (Edin.). Pp. 128. (London: Longmans, Green, and Co., 1895.)

IT may be well to remark at once that this is not a text-book of physics, but the first volume of a series of manuals designed solely for use in physical and electrical engineering laboratories. The present book is a general introduction to practical work in physics, and future volumes will be devoted to more advanced experiments. Altogether, eighty experiments are described, and are arranged in sections having the following succession: general physics, magnetism, electricity, heat, light, and sound. No serious attempt seems to have been made to connect the experiments in any particular order, so that, with few exceptions, they are independent of one another. A slight knowledge of physics is necessary before the student can understand and carry out the course of work described. This information may, however, be obtained from lectures given concurrently with the laboratory work, though the order of the practical course is not what most teachers follow in their lectures.

The experiments can be performed without any very elaborate apparatus, and we have no hesitation in saying that the student who works through them will by so doing obtain a sound knowledge of many important physical laws. The knowledge thus gained by direct observation is far and away better and deeper than that obtained by reading text-books.

Practical Trigonometry. By H. Adams, M.I.M.E. (London: Whittaker and Co., 1896.)

THE author of this small book is careful to point out that it is not a text-book; but it will be found useful to practical men, in enabling them to undertake the perusal of other than elementary works where a knowledge of trigonometry is essential.

The book is so arranged as to gradually disperse the difficulties to beginners in trigonometry, and it cannot but prove an incentive to further study. As an *aide-mémoire*, however, the absence of proofs, to secure brevity, will diminish its value for examinations where trigonometry is a special subject. W. S.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Remarkable Sounds.

WITH reference to Mr. McKenny Hughes' letter on this subject, which appears in your issue of the 14th ult., and to his suggestion that it "would be of great help if we would get some exact data as to the distance at which the sounds of great guns, of blasting, or of waves, can be proved to have been heard," I would ask permission to be allowed to cite my experience on the north coast of Spain at the fishing village of Comillas, about twenty-four miles west of Santander. The bay which gives rise to the port is relatively small, and of inconsiderable depth inland; the south-east part of it is limited shoreways by cliffs of limestone, which rise to a height of about 120 feet, and somewhat overhanging the base or water-line. When the ground-swell—so characteristic of the Bay of Biscay—comes in to this bay, the breakers are very remarkable, and dangerous for small fishing-boats, being relatively high, and succeeding one another with great regularity. They break against the cliff mentioned with a thundering noise, and such that I have frequently heard them at eight miles' distance inland, although high and uneven ground lay between me and the coast, and the weather was relatively calm, so that the sound could hardly be favoured in its transmission by the wind. In stormy weather, and when the weather has been bad seaward, then the waves are even more terrible, and the sound heard still farther away.

Dublin, November 27. J. P. O'REILLY.

IT is a pleasure to me to see Prof. Darwin's note on curious sounds, in NATURE for October 31, since I have often been puzzled by what is obviously precisely the same phenomenon along the Bay of Fundy coast of New Brunswick, particularly about Passamaquoddy Bay, where I have been a great deal in the summer. Locally it is explained as the reports of the guns of Indians shooting porpoises off the islands of Campobello and Grand Manan; but, for several reasons, I never believed this: in fact, I have always been sure it must be due to some other cause, though I could think of no explanation. It is heard most often in summer, in rather still and warm weather, on those days when the heat-haze hovers upon the ocean, and appears to come from seaward. W. F. GANONG.

Smith College, Northampton, Mass., U.S.A.

THE "humming in the air," to which Mr. Tomlinson calls attention in your last number, is noticed in White's "Selborne."

"There is a natural occurrence to be met with upon the

highest part of our downs in hot summer days, which always amuses me much, without giving me any satisfaction with respect to the cause of it; and that is a loud audible humming as of bees in the air, though not one insect is to be seen. This sound is to be heard distinctly the whole common through, from the Moneydells to my avenue gate." (Vol. ii. p. 94, Macmillan's edition.) W. TUCKNELL.

November 30.

Fireball of November 22.

ON November 22, at about 6h. 51m. I observed, in a sky quite overcast, a brilliant prolonged flash quite different to lightning. The whole firmament was illuminated for more than a second with an intensity greater than that which the full moon could have occasioned, and the glow seemed strongest in the south-east. Not a star was visible, but though the origin of the outburst could not be observed, no doubt existed that a fireball of the most brilliant type had fallen.

Mr. R. Sheward's letter from Eastbourne (NATURE, November 28, p. 78) affirms this conclusion, and it would be well if he or others who witnessed this striking object would give particulars as to the path it traversed. Appearing, as it did, at a convenient time in the evening, it must have had many observers, though unfortunately in the west of England the sky was veiled in cloud. For purposes of calculation it is not sufficient to have descriptions which merely indicate the general direction of the meteor's flight, as, for example, from east-north-east to west-south-west. We require to know the altitudes as well as the azimuths of the initial and terminal points, or the co-ordinates read from a celestial globe or star chart. A particular account of the path relatively to the stars near would be equally useful.

It is to be hoped that such information will be forthcoming in regard to this splendid meteor, which, from the manner in which it illuminated the clouded sky, must have been a very exceptional object of its class.

At this period in November many large fireballs are directed from the region of Taurus; but it is impossible to say, in the absence of necessary details, whether or not the fine meteor of November 22 last belonged to the Taurid stream.

Bristol, November 29. W. F. DENNING.

IN reference to the letter of Mr. Sheward in last week's NATURE, it may be of interest to mention that whilst talking to a friend in a dark road in this locality on the evening of November 22, the sky at the time being entirely overcast, we were startled by the sudden illumination of the clouds as if by the outburst of a bright light above them. The effect was similar to that which might have been produced by the explosion of a large magnesium shell sufficiently brilliant to illuminate the entire sky. The light appeared suddenly, but faded out gradually, its estimated duration being three seconds. It appeared to me to emanate from a point in the north-east, at an altitude of about 60°. My friend, whose face was turned in the opposite direction, could not localise the outburst, though he remarked that the light suffused the clouds almost equally in the west and south-west. I noted the time as 6 48 p.m., which so nearly coincides with that mentioned by Mr. Sheward, that although so far apart it seems probable that we were witnesses of the same phenomenon. R. T. LEWIS.

Ealing, W., December 2.

A Joint Meeting of Associations for the Advancement of Science.

MY suggestion for a joint meeting of the British, Australasian, and American Associations for the Advancement of Science at San Francisco in 1897, at some time conveniently near to that of the Toronto meeting of the British Association, published in your issue of October 24, meets favourable reception in the United States and Canada. I have recently received a letter from Sir Wm. C. Van Horne, President of the Canadian Pacific Railroad, and a member of the British Association, in which he says that he will instruct his superintendent to reopen negotiations with other transcontinental roads to secure favourable rates of transportation. Prof. Joseph Le Conte, who has for years given earnest effort to secure a meeting of the Association on the Pacific coast, writes from Berkeley, California: "I will certainly interest myself in your scheme . . . I am glad you are moving the affair so early, and thank you for drawing my attention to it."

The following is a copy of a letter just received from the Mayor of San Francisco:—

MY DEAR SIR,—

Your communication of October 9, 1895, was received and thereafter forwarded to the Board of Supervisors.

That body, on October 28, 1895, passed a resolution, and it is herein inserted in print.

"*Resolution No.* 13, 120 (*Third Series*).

"Resolved—That his Honour the Mayor be, and is hereby empowered and requested to invite the American and Australian Associations for the Advancement of Science to meet in this city in 1897; also, to invite the British Association of the same character to meet said Associations in this city as invited guests, and to that end to take such action as may be proper to arrange for their comfort and accommodation on that occasion.

"And the clerk is hereby directed to advertise this resolution as required by law.

"Board of Supervisors, San Francisco, October 28, 1895."

Pursuant thereto, an invitation is thereby sent to your Society—the American Association for the Advancement of Science.

It is my sincere hope that San Francisco may have the good and rare fortune to receive the visit of all three of these distinguished bodies.

The gathering of the world's chosen scientists is at once recognised as of high importance to our Municipality.

Its citizens will feel honoured in extending a generous welcome to men eminent in the cause of truth, and representing the three great branches of the Anglo-Saxon races.

Should this invitation be accepted, an early notification thereof is requested.

Invitations have been sent to the British and Australian Associations. (L. S.) ADOLPH SUTRO.

Application will be made to Congress at its session, which begins on the first week of December, for an appropriation to assist the American Association for the Advancement of Science towards defraying the necessary expenses of holding a meeting so distant from the homes of most of our members. It is, of course, impossible to foretell what Congress may be willing to do in the matter; but as it has never before been asked to subsidise the Association, we may hope that some appropriation may be secured. WM. H. HALE.

Brooklyn, November 18.

The Metric System of Weights and Measures.

THE adoption of the metric system in this country can be best effected by first familiarising the people with it for some years. I would suggest that the following would form a good beginning:—

(1) Its adoption by the Post Office. At present the weight of a foreign letter that will go at the minimum rate, must not exceed ½ oz. if posted in England, while 15 grammes are allowed on the continent, which is rather more. The 15 grammes limit should be adopted in England for foreign postage, and 30 grammes for inland postage. Parcels and newspapers should also be charged according to the metric system.

(2) The metric system should be employed by the Meteorological Society and Meteorological Office. At present our weather statistics cannot be compared directly with those published on the continent. The same course should be also followed by other sciences (*e.g.* geology, astronomy, &c.) that still use miles, yards, feet, &c.

(3) Government topographical and geological maps should all bear a scale of metres and kilometres.

There are, of course, many other ways in which the metric system could be brought before the public.

December 2. JOHN W. EVANS.

"Dendrexetastes capitoides."

DR. FORBES has been kind enough to send me for examination the typical specimen of *Dendrexetastes capitoides* of Eyton, now in the Derby Museum, Liverpool, to which he has called attention in a letter in NATURE of October 24 last (NATURE, vol. lii. p. 619). I have compared it with specimen *a* of *Dendrexetastes temmincki* in the British Museum, and do not hesitate for a moment to say that they are referable to the same species. Both are from Cayenne, and of the ordinary unmistakable "Cayenne make." But it is quite true that, as pointed out by Dr. Forbes, the cross-bands on the belly, which

are very visible in the British Museum specimen, are quite non-apparent in the Derby Museum specimen. These cross-bands are, in all probability, remnants of the immature plumage, the British Museum specimen being not quite adult. I was, therefore, wrong in using this character ("Cat. Bds.," xv. p. 140) to separate *Dendrexetastes temmincki* from *D. devillii*, which, however, are quite different species, easily distinguishable by other characters. But *D. capitoides* = *D. temmincki* in my decided opinion, as has been stated in the "Catalogue."

P. L. SCLATER.

"The Zoological Record."

IN reference to the note in NATURE of November 21, about the *Zoological Record* for 1894, I must ask to be allowed to say that it is stated in the preface that Prof. Hickson could not undertake a record of Cœlenterata. Consequently there has been no failure of contract on his part. Prof. Hickson has been a valued contributor to the *Record* for several years, and his work was always ready at the time agreed on.

Cambridge, November 23. D. SHARP,
Editor of the *Zoological Record*.

THE LONDON UNIVERSITY.

FORTUNE so far has not been too kind towards the efforts made for adding teaching functions to the existing University of London. As already chronicled in NATURE, the answer of the late Government to the request of the deputation to Lord Rosebery from institutions mentioned in the Report of Lord Cowper's Commission was the introduction of Lord Playfair's "University of London Act, 1895," enacting the appointment of a Statutory Commission to give effect to the recommendations of the Royal Commission. Before it had been read a second time, the Government went out of office and the Bill was dropped. From reports which have lately appeared in the press, it would seem that on June 13 a deputation from the members of Convocation hostile to the scheme waited on the Duke of Devonshire and Lord Salisbury, then in Opposition, and were led to believe that these statesmen were not unwilling to support an amending clause to Lord Playfair's Bill, which would entail the scheme, when arranged by the Statutory Commission, being submitted to Convocation for approval in the manner prescribed for a senatorial election, *i.e.* by voting-papers. And by July 1, Sir John Lubbock, in seeking re-election for the University, had pledged himself to oppose the Statutory Commission Bill unless such a clause were inserted, and comes into line with those against whom he voted in the Senate a year previously. Following this, came the Duke of Devonshire's reference on August 15 to the "strong opposition taken by a large and not unimportant section of Convocation" to the scheme of Lord Cowper's Commission, coupled with the announcement that legislation on the subject would not be undertaken in the short session then commencing.

Judged from such incidents, the outlook could not be regarded as reassuring, and with the return of Ministers to town, steps have been taken to bring to the notice of the Government the urgent necessity of dealing with the burning question of a Teaching University for London. On November 21 the delegates represented on the deputation to Lord Rosebery, met at the University of London, and unanimously passed the following resolution:—

"That the Government be requested to introduce, at an early date, a Bill, similar to Lord Playfair's London University Commission Bill, 1895, appointing a Statutory Commission to carry out the recommendations of Lord Cowper's Commission, but with an added clause giving [in accordance with precedent Acts of similar tenor [1]] to all Institutions or persons directly affected by any Statute or Ordinance proposed by the Statutory Commission, a right of appeal to the Privy Council for the disallowance or alteration thereof, previous to such Ordinance being laid before Parliament for confirmation."

The Duke of Devonshire, on Thursday last, received a deputation in support of this resolution, the delegates present representing not only the institutions named in the Report of Lord Cowper's Commission, but also the members of that and of the earlier (Lord Selborne's) Commission on a Teaching University for London, as well as members of the recent Bryce Commission on Secondary Education. The deputation was introduced by Lord Kelvin, and its views were enforced by Prof. Rücker on behalf of the Senate of the University of London: Dr. Allchin for the Royal College of Physicians, Mr. Heath for the Royal College of Surgeons, Sir George Young (University College), Principal Wace (King's College), Dr. Frederick Taylor (Medical Schools), Principal Whitehouse (Nonconformist Theological Colleges), Sir Henry Roscoe (Association for promoting a Professorial University for London), Prof. Silvanus Thompson (Annual Committee of Convocation), and Mr. Anstie (Committee of Graduates).

In the presence of so emphatic an expression of the unanimity not only as to the need for but also the method of the reorganisation of the present University existing among the many institutions and persons interested in the settlement of this grave question, a sympathetic reply might surely have been expected from the official head of the Education Department. This, however, was not to be the case. The Duke, after conceding the representative character of the deputation, made no further reference to the manifold interests represented by the delegates; no reference to the needs of higher education in London; no reference to the widespread recognition of the necessity for a Teaching University without which, in view of the conflicting nature of the interests concerned, little approach towards a united appeal for a Commission with executive and judicial powers for their settlement could have been gained. On the contrary, his reply dwelt on the difficulty of securing the present status of the external students under the scheme of Lord Cowper's Commission, while admitting that the scheme and deputation were at one in insisting that this should be maintained unimpaired; on his desire to obtain, if possible, an expression of opinion on the subject from the external students, and on the differences in opinion which had arisen in Convocation about the scheme. In Convocation the Duke of Devonshire recognised three sections—those who accept the scheme with such modifications as may be made by the Statutory Commission, those who are irreconcilable, since they express the view that if a Teaching University for London is needed it should be founded apart from the existing University, and those who are of opinion that it would not be enough for the amendments they desired introduced in the scheme to go merely as recommendations to the Commissioners when appointed, whence their claim for a veto on the scheme when arranged, to which we may add a fourth, viz. the large proportion, nearly one half of the members, who, so far, have not been beguiled by the foregoing three to express any opinion at all. And recognising only these three, he dwelt on the expediency of everything possible being done to conciliate the opposition, if only on the ground that it is extremely desirable that the Bill, if it comes before Parliament, should come before it in a shape which should excite as little opposition as possible.

It is not too much to say that, in tendering this advice, the Duke showed that he had not had time to balance the relative importance of the views laid before him by the deputation from some members of Convocation in the summer, and those which had been so strongly urged by the delegates whom he was addressing. Had it been otherwise, the disparity between the interests involved is

[1] Oxford and Cambridge Act, 1877, sec 46.
Scottish University Act, 1889, sec. 20 (*a*).

so evident that advice to treat, apparently on a footing of equality, with a section of Convocation would never have been given to the deputation before him—a section of Convocation, be it remembered, which has rejected the conciliatory overtures of the Annual Committee of Convocation,[1] and has made common cause with the irreconcilables in promoting opposition to the scheme.

The Duke's reply has at least made one point clear. We now know that between the institutions concerned with higher education in London, and the realisation of their wishes, there only stands the opposition of a section of the graduates of the present University. Thus no alternative is left but to deal with the question again from this point of view. It must not be forgotten that Convocation, in the manner prescribed by the charter, has twice declared in favour of the scheme of Lord Cowper's Commission. But even were the members of Convocation as unanimous in opposition to the scheme as they are divided in opinion as to what measure of support should be accorded it, is it right or just that the organisation of London's unrivalled facilities for higher education should be delayed at the instance of a body of graduates of a State institution? The precedents are all the other way, as in the case of the Queen's University for Ireland, where the hostile vote of its Convocation was set aside by Lord Beaconsfield's Government, and the University reorganised as the Royal University for Ireland. For what is the position? The University of London, according to the clearly implied opinion, both of Lord Selborne's and Lord Cowper's Commissions, and to the widely-expressed opinion of those outside the University most competent to judge on educational matters, does not perform the duties now required of it. Lord Cowper's Commission, in its Report laid down the lines on which the University may be reorganised, so that it can become a Teaching University for London without interference with its present work. The principles of the proposed reconstruction have been accepted by all concerned, as well as by outside opinion, with a degree of approval no less remarkable for its wide extent than for the contrast it affords with the reception accorded to all previous schemes. But this approval is wholly conditional on the reorganisation being effected by legislative authority as recommended in the Report, a requirement so displeasing to a section of Convocation that to secure its assent to this procedure nothing less is demanded than a right to veto the scheme when arranged by the Statutory Commission, should the "opinion of Convocation as a whole," ascertained by voting-papers, be unfavourable to it. Is it not a truly Gilbertian idea that the graduates of a State-created, State-maintained Examining Board should be put in a position to veto the action of the State itself? The War Office clerks might with about as much reason have insisted that the scheme for the reorganisation of the War Office should be submitted to a *plébiscite* of their body for approval before it appeared in the Orders in Council.

The misconception which gives the name of University to the examining body at Burlington Gardens extends, perhaps not unnaturally, to the Convocation of its graduates, and mischievous expressions such as the "opinion of Convocation as a whole" find a too ready currency. Convocation, if it means anything, means an assemblage for the discussion of matters affecting itself or the body it represents, and, save in the case of the election of members of the Senate, where no useful purpose would be served by the public discussion of the merits of the candidates, decisions arrived at in its meetings are the decisions of the Convocation of the University. Whatever the opinions of members absent from the meetings of the Convocation, they have as much weight, or as little as those of members of Parliament absent from a division, and as the result of the division on Mr. Brodrick's famous motion showed, it is the opinion of the members present, and not that of the House of Commons "as a whole," which determines the fate not only of measures but ministries.

The necessity for a Teaching University has now become a "London question" of the first importance, and is becoming recognised as such by the metropolitan press. Matters obviously cannot be allowed to remain in their present position, and in the fact that he has still to be convinced an incentive will no doubt be found by those in charge of this matter to see that the misconceptions under which the Lord President labours are as far as possible removed. That the true inwardness of the proposal to make Convocation the arbiter in this great question is gaining public recognition cannot be doubted when "the small group whose views are represented by Sir John Lubbock, Dr. Collins, and Dr. Napier" is plainly told by the *Morning Leader* that its attitude is that of Demetrius the silversmith, and by the *Star* that "no Statutory Commission could for a moment accept such a position" as that proposed for it under the postal veto scheme. The following paragraph from *The Times* is so much to the point that we gladly give it further publicity:—

"We are sorry to see that the Duke of Devonshire speaks almost with bated breath of the reference of the question to a Statutory Commission. It would be 'a somewhat strong proceeding,' he says, to interfere in this way with the rights conferred on the Convocation of the University of London by the charter now in force. We cannot help feeling that this is a rather strange objection in the mouth of a statesman who has taken a leading part in the Liberal legislation of the past quarter of a century. Was it not by Statutory Commissions that sweeping reforms were introduced in the educational system and even the proprietary rights of the Universities of Oxford and Cambridge and their constituent colleges? Does the Duke of Devonshire imagine that those reforms would ever have been carried through if it had been left to the Convocation of Oxford or to the Convocation of Cambridge to give or withhold its sanction? On what ground, rational or sentimental, is an immunity from the reforming hand of Parliament claimed for the University of London which was denied to the historic and national foundations of Oxford and Cambridge? Indeed, the Convocation of the University of London has itself accepted in general terms the principle of the plan embodied in the Report of the Cowper Commission; but the Duke of Devonshire is probably right in refusing to take this as an absolutely final expression of opinion. The Duke, however, goes further than this. He appears to insist that some additional means should be devised for ascertaining the views of those whom he calls the 'external students.' If unanimity, or anything approaching to it, is to be sought for as the result of this inquiry before the reforms unanimously demanded by the friends of higher education in London are initiated, the establishment of a Teaching University here, for which educational reformers have been struggling for years, will be substantially relegated to the next generation. This is a lame and impotent conclusion from which we should have thought the practical and positive temper of the Duke of Devonshire would recoil. The Parliamentary difficulties in the way of passing a Bill that meets with any strenuous resistance need not be insisted upon. The present Government, supported by an immense majority, and including so many distinguished statesmen, will find it no hopeless task to overcome such difficulties, especially as the Opposition are committed by Lord Playfair's Bill

[1] *Vide* Report of the Annual Committee presented to Convocation at its meeting on January 22, 1895.

to this very settlement of the question. But the problem will never be solved if the party of resistance are encouraged by being told that the acquiescence of the country graduates is indispensable, and that a measure brought in by the strongest Administration of the century cannot be passed if a handful of malcontents oppose it."

With such expressions of opinion as these before us we cannot doubt but that London will yet be roused to a sense of what it will lose if advantage is not taken of the present golden opportunity.

HENRY SEEBOHM.

THE death of Henry Seebohm was announced in one of the "leading dailies" last week, as that of a member of an eminent firm of steel-manufacturers. Steel-manufacturer Seebohm was, no doubt, and his steel was good; but his name will be remembered as that of an acute and hard-working naturalist long after the quality of his steel is forgotten.

Henry Seebohm was one of a family of Quakers of Scandinavian origin, as the name shows, but settled for several generations in England. He was born in 1832, at Bradford in Yorkshire, and educated at the Quakers' school in York. His father, who was a practical man and thought everybody should begin at the beginning, started him in life as a grocer's shop-boy, in order that he might be taught to tie up paper-parcels properly. After many vicissitudes in business, Seebohm settled down as a maker of pot-steel at Rotherham, and in due time achieved a handsome competence. From his earliest days devoted to natural history and especially to ornithology, Seebohm spent all his leisure in the study of birds, and made short excursions into different parts of Europe in order to obtain personal acquaintance with some of the rarer species. It was not, however, until about twenty years ago that his business pursuits permitted him to devote much time to scientific work. In 1875, in company with his friend Mr. J. Harvie Brown, he made his first great excursion to the valley of the Lower Petchora in North-east Russia. Of the remarkable ornithological discoveries effected on this occasion an account was first published in *The Ibis* for 1876. But a complete and most attractive narrative of the whole journey was subsequently prepared by Seebohm, and issued in 1880 under the title of "Siberia in Europe." In 1877 a longer and more adventurous journey was carried out into the Far East. On this occasion Seebohm visited the valley of the Yenesay, and in 1882 published his "Siberia in Asia" as a pendant to his former volume.

After this Seebohm commenced to put together the facts that he had accumulated, and the conclusions that he had arrived at on his much-loved subject of British birds. The first volume of his "History of British Birds and their Eggs" was issued in 1882. In 1885 the subject was concluded by the issue of the third and fourth volumes. It may be truly said that no other book of the sort has been prepared on the base of such wide and varied experiences. Having acquired from a brother ornithologist a special collection of wading-birds, Seebohm next turned his attention to this branch of ornithology, which had also particular attractions for him in connection with the migrant habits of this order, and in 1888 issued a beautifully illustrated quarto work "On the Geographical Distribution of Plovers, Sandpipers, and Snipes," which was, in fact, a complete "Monograph" of the birds of the order Limicolæ. He also wrote two treatises on the "Classification of Birds," the last of which was only published in the present year.

Seebohm was a most liberal contributor to the bird-collections of the British Museum, and from time to time made many very handsome contributions to them. He would purchase and present without the slightest hesitation any specimens that came into the market, if he thought there would be a difficulty in their acquirement by the Museum. He gave to the Museum the whole of his unrivalled series of eggs, and had it arranged along with the rest of the collection of these objects under his own personal supervision. He was also the compiler of the fifth volume of the great catalogue of birds published by the Trustees, which was issued in 1881. This related principally to the thrushes—a group with which Seebohm was specially familiar. In fact, he has long had in preparation a complete monograph of this group of birds, with coloured illustrations of every species, but has unfortunately left it unfinished at his decease.

Seebohm was elected a Fellow of the Zoological Society and of the British Ornithologists' Union in 1873, and from that date onwards was a leading spirit in the conduct of both these Societies, and a constant contributor to their publications. He was never elected a Fellow of the Royal Society, though put up as a candidate, and very strongly supported. Unfortunately occult influences interfered with his attainment of this honour. Seebohm, though one of the kindest natures possible, was occasionally a severe critic, and gave offence to sensitive individuals by stating the truth too plainly. The loss of an only son some years ago was a sad blow to Henry Seebohm; but he recovered this shock to a great degree, and returned to his usual pursuits. His last and fatal illness was consequent, as he believed, on an attack of influenza, which took place last spring. He died on the 26th ult., at his residence in South Kensington, where he had got together a splendid ornithological library and an almost unrivalled collection of British birds, leaving a vacuum in the ranks of living naturalists which it will be very difficult to fill.

NOTES.

THE first meeting of the General Committee formed for the purpose of establishing a memorial to the late Prof. Huxley was held on Wednesday, November 27, when it was resolved—"That the memorial do take the form of a statue to be placed in the Museum of Natural History, and a medal in connection with the Royal College of Science; and that the surplus be devoted to the furtherance of biological science, in some manner to be hereafter determined by the Committee, dependent upon the amount collected."

IT will be remembered by our mathematical readers that a Committee, including the names of many eminent mathematicians in both hemispheres, was formed in 1893 to obtain funds for a memorial to the renowned master of geometry—Lobatchefsky. The report of the Committee on what has been done in the matter has just been issued. The total sum received up to May last was 9071 roubles (£1417), and when all expenses had been paid the amount available for the memorial was 8840 roubles (£1381). This sum enables the Committee to carry out the double intention of founding an international prize for geometrical works, especially for those belonging to non-Euclidean geometry, and also to erect a bust of Lobatchefsky. Six thousand roubles have been put by to found the prize, which will consist of 500 roubles (nearly £80), to be given every third year for the best geometrical works or memoirs. The memoirs may be written in Russian, French, German, English, Italian, or Latin, and must be sent to the Physico-Mathematical Society at Kazan, at least a year before the adjudication of the prize. The first prize will be awarded on October 22 (November 3, new style), 1897. The sum remaining over and

above that devoted to found the prize will go towards erecting two busts of Lobatchefsky—one outside the University of Kazan, and the other in the interior of the University Buildings. The former bust, with its pedestal, will cost three thousand roubles, of which two thousand will come from the Lobatchefsky fund, and one thousand from the Municipal Council of Kazan. In the case of the second bust, which will be placed in the meeting-room of the University, two hundred roubles will be given from the fund; and the remainder of the cost will be defrayed by the Professors. All memoirs referring to Lobatchefsky and his geometry, together with the printed papers and manuscripts of the great geometer himself, are to be arranged in a separate collection, and named the "Bibliotheca Lobatcheoskiana."

MR. JOHN D. ROCKEFELLER'S recent gift of an additional million dollars (£200,000) to his munificent donations to the University of Chicago, and his promise of a similar contribution of two million dollars, were noted at the beginning of last month. Our readers will be interested to read Mr. Rockefeller's letter to the Trustees of the University, printed in *Science* of November 15:—"October 30, 1895. To the Trustees of the University of Chicago, T. W. Godspeed, D.D., Secretary. Gentlemen: I will contribute to the University of Chicago $1,000,000 for endowment, payable January 1, 1896, in cash, or at my option, in approved interest-bearing securities at their fair market value. I will contribute in addition, $2,000,000 for endowment or otherwise, as I may designate, payable in cash, or, at my option, in approved interest-bearing securities at their fair market value, but only in amounts equal to the contributions of others, in cash or its equivalent not hitherto promised, as the same shall be received by the University. This pledge shall be void as to any portion of the sum herein promised, which shall prove not to be payable on the above terms, on or before January 1, 1900. Yours very truly (signed), JOHN D. ROCKEFELLER." These gifts, remarks our contemporary, make the entire amount of Mr. Rockefeller's donations to the University of Chicago about 7,600,000 dollars, probably the largest gift ever made by an individual for educational or public purposes."

A QUARTER of a million dollars (£50,000) was, we understand from *Science*, granted by the last U.S. Legislature to the Regents of the University of California for the erection of a suitable building for the departments situated in San Francisco, the Colleges of Law, Medicine, Dentistry, Pharmacy, and Veterinary Surgery. Mr. Adolph Sutro, Mayor of San Francisco, has given a tract of thirteen acres as a site for the building. On the adjoining thirteen acres Mr. Sutro proposes to erect a building for his magnificent library of about two hundred and fifty thousand volumes.

IT is announced that at the instance of the Bureau des Longitudes, the French Minister of Marine has provided ships, men, and instruments for some seven expeditions, which are to make accurate (and as far as possible simultaneous) observations in different parts of the globe. One of the chief defects of the present state of knowledge of this important branch of terrestrial physics arises from the fact that past observations have been made in various ways, under very various conditions, and that a great part of it depends upon the scarcely scientific records of ordinary seamen. The French expeditions are to observe strict uniformity in their method of observation, and cannot fail to enhance the value of the work which England and America have begun in this direction.

AT the recent annual meeting of the Royal Society of Edinburgh, the following officers and members of Council were elected for the ensuing session:—President: The Right Hon. Lord Kelvin, F.R.S. Vice-Presidents: Prof. Copeland, Prof. James Geikie, F.R.S., the Hon. Lord Maclaren, the Rev. Prof. Flint, Prof. J. G. McKendrick, F.R.S., and Prof. Chrystal. General Secretary: Prof. P. G. Tait. Secretaries to Ordinary Meetings: Prof. Crum Brown, F.R.S., and Dr. John Murray. Treasurer: Mr. Philip R. D. Maclagan. Curator of Library and Museum: Dr. Alexander Buchan. Councillors: Dr. Alexander Bruce, Prof. Frederick O. Bower, F.R.S., Mr. A. Beatson Bell, Sir Arthur Mitchell, K.C.B., Prof. T. R. Fraser, Mr. Robert Munro, Dr. M. D. Noel Paton, Mr. C. G. Knatt, Sir W. Turner, F.R.S., Sir Stair Agnew, K.C.B., James Burgess, and Dr. John S. Mackay.

AS one of the results of the late Medical Congress, the *Pharmaceutical Journal* states that the Government of India have decided to institute an inquiry into the subject of the desirability of a more extended use of indigenous drugs. The Committee to which the Indian Government has decided to refer the whole question consists of Dr. George Watt, C.I.E., Surgeon Lieut.-Colonel C. J. H. Warden; and Brigade-Surgeon Lieut.-Colonel George King, F.R.S., C.I.E., Surgeon Lieut.-Colonel J. F. P. McConnell, and Rai Bahadur Kanny Loll Dey, C.I.E. The points to which the Government of India has particularly invited the attention of the Committee, with a view to their careful consideration, are the practicability as well as the utility of (*a*) encouraging the systematic cultivation of medicinal plants indigenous to India; (*b*) encouraging the increased use in medical depôts of drugs of known therapeutic value; and (*c*) sanctioning the manufacture of stable preparations of certain drugs at the depôts. With regard to these points, the Government of India desires that the members of the Committee shall consider, and report their opinion, as to the action which would be best calculated to give the suggested encouragement. The Committee will further consider, from a practical point of view, the question of initiating, as a Government measure, experiments to test the reputed therapeutic value of indigenous drugs.

THE next session of Parliament will, the *British Medical Journal* remarks, have before it a scheme for providing a supply of sea water for London and certain places on the route. The intention is to take in the water from the sea opposite Lancing, in Sussex, where all the pumping machinery will be situated. It will be pumped thence to a large reservoir in an elevated position at Steyning, whence it will flow by gravitation to another reservoir at Epsom. From this reservoir it will be distributed over London, the parts to be first supplied being the West-end and central portions. It is stated that local authorities will be supplied with sea water for flushing sewers, watering streets, and other public uses, such as swimming baths, and that sea water baths will be supplied to hotels, hospitals, schools, &c. As to any relief to present sources of water supply by using sea water for public purposes, it should be mentioned that the quantity proposed to be provided is stated to be only 10,000,000 gallons per day, while the average daily supply of water to London amounted in 1893 to over 190,000,000 gallons. If the scheme is carried into effect, it will have an important bearing upon the health of London.

ON Friday last, the new Museum of Natural History which has been erected at Perth by the Perthshire Society of Natural Science, at a cost of about £4000, was formally declared open by Sir William Flower, in the presence of a large and representative gathering. Mr. Henry Coates, the President of the Society, occupied the chair, and, in introducing Sir William Flower, he remarked that the idea of forming a Museum had been kept before their Society from its commencement, twenty-eight years ago. The first attempt to form a collection dated from 1869. In 1877 the late Sir Thomas Moncreiffe brought

forward a comprehensive scheme, which ultimately resulted in the erection of the Moncreiffe Memorial Museum. The available space was rapidly filled up, and in 1885 Dr. Buchanan White suggested a scheme for the enlargement of the premises. The scheme was embarked upon in 1892, and by the generous support of friends, and in particular the donation of Sir Robert Pullar, it had now reached its present successful completion. Sir William Flower, in declaring the Museum open, said he thought that this epoch in the history of the institution might mark a distinct advance in the educational history of the country. The foundation of such societies as the Perthshire Natural Science Society in all the principal centres of population was a proof that they fulfilled a natural want in the human mind in its present stage of development. Of the general value of museums, using the word in its widest sense, as collections of works of art and of nature, in the intellectual advance of mankind, there could be no question. How could science be studied without ready access to the materials upon which knowledge is built up? In many branches of science, especially those commonly called natural history, the progress was mainly commensurate with the abundance and accessibility of such materials. All would recognise the gradual development of the conception that the museum of the future was to have for its complete ideal not only the simple preservation of the objects contained in it, but also their arrangement in such a manner as to provide for the instruction of those who visited it. The value of a museum would be tested not only by its contents, but by the treatment of those contents as a means of advancing knowledge. What a museum really depended upon for its success and usefulness was not its building, not its cases, not even its specimens, but its curator. They might as well build a church and expect it to perform the duties required of it without a minister, or a school without a schoolmaster, or a garden without a gardener, as to build a museum and not provide a competent staff to take care of it. Complimenting the directors on the objects they had sought after in the arrangement of their museum, which was to provide a good local collection of natural products, as well as the formation of a type collection, Sir William Flower said every specimen should have its definite purpose, and he quoted the saying of Dr. Brown Goode that an efficient museum might be described as a collection of instructive labels, each illustrated by a well-selected specimen. Advocating the appointment of a paid curator, he said the great principle of expending public money upon purposes of education, though a comparatively new one, was now conceded upon all sides. The cost of supporting a few really efficient museums would be a mere trifle compared with the hundreds of thousands spent upon far less efficient modes of educating and elevating the people. He commended to the consideration of those who controlled the pecuniary funds of the city the great benefits they might confer on education by assisting to guarantee the stability of the Institution, which noble voluntary efforts had brought into the condition which enabled him to declare it open.

THE Gesellschaft für Erdkunde of Berlin has elected Mr. Scott Keltie, Dr. H. R. Mill, and Mr. E. G. Ravenstein, Corresponding Members, as a recognition of their work at the late International Geographical Congress.

THE Paris Academy of Sciences have elected M. Lannelongue Member of the Section of Medicine and Surgery, in the place of the late Prof. Verneuil. M. Charles Monod has been elected to succeed Prof. Verneuil as a Member of the Paris Academy of Medicine.

DR. G. LAGERHEIM (Trömso) has been appointed Professor of Botany and Director of the Botanical Institute to the University of Stockholm.

THE second series of lectures arranged by the Sunday Lecture Society begins on Sunday afternoon, December 8, in St. George's Hall, Langham Place, at 4 p.m., with a lecture by Sir Benjamin Ward Richardson, F.R.S. Lectures will subsequently be given by Mr. J. Churton Collins, Prof. Arthur Smithells, Prof. Vivian Lewes, Prof. Percy Frankland, F.R.S., Dr. Karl Leutzner, and Dr. Andrew Wilson.

A CORRESPONDENT in the United States writes:—"At the elections this month several very important matters not of a political nature were decided. In the State of New York, the measure to expend $9,000,000 on the State canals was approved by a large majority. The Erie Canal will be made nine feet deep, and somewhat widened, and improved locks will be built. Similar improvements will be made on the Oswego and Champlain Canals. The work will be pushed on rapidly, and facilities provided for the use of electric-motive power, to be furnished by the Falls of Niagara."

IN June 1894, Dr. A. Donaldson Smith, a young American physician, left England for an expedition across Somaliland to Lake Rudolf. He was accompanied by Mr. Gillett, who was recalled to England a few months later, and by Mr. Dodson, who acted as collector and taxidermist. The attempt to march straight from Milmill to Lake Abbai was frustrated by the Abyssinians, and Dr. Smith returned to the Webi Shebeyli. He left there in February last in order to try to reach Lake Rudolf by another route, and as he was not heard of till he arrived at Lamir in November, some anxiety was felt as to his safety. He has, however, brilliantly carried out the whole of his plans, and achieved the march from the coast of Somaliland to that of British East Africa, which has been attempted repeatedly since it was first projected by Burton. Dr. Smith has explored the country to the north of Lakes Rudolf and Stephani and Abbai, connecting the route of Teleki with that of the Abyssinian travellers. He also reports (*Times*, 2nd inst.) a race of dwarfs in this region. These must be the Doko, first reported by Harris in 1844 from information supplied by a native of Shoa, and whose existence has been repeatedly reaffirmed. Lake Rudolf has only previously been reached by Teleki and Höhnet; at the time of their visit the lake was brackish, but it is now fresh. Dr. Smith has brought back large collections, including fish from Rudolf, Stephani, and Abbai. He does not seem to have seen the snow-clad Wosho, reported by Abbadie; Mount Wosho will probably therefore have to be wiped off the map. Dr. Smith is expected to read his paper at the Geographical Society in January, when important additions to our knowledge of this part of Africa may be expected.

FURTHER interesting additions to our knowledge of the African fish-fauna may be hoped from the collection of Miss Kingsley, who returned on Saturday, 30th ult., from a courageous journey on the West Coast. Miss Kingsley ascended the Ogowe River to the French station at Njole, and thence journeyed northward to the Rembwe, a tributary of the Gaboon. She visited the Crystal Mountains. Subsequently she ascended the Cameroons, and climbed the highest peak, the summit of which was first reached by Burton and Mann in 1862. Miss Kingsley's field of exploration is sufficiently well known to preclude important geographical results, but many valuable ethnographical observations have been made and zoological specimens collected.

A CURIOUS method of silvering mirrors has recently been patented by M. Hans Boas, of Kiel (says *Engineering*). It is based upon the fact that, when one of the heavy metals forms the cathode of a vacuum tube, containing a trace of hydrogen, the metal is volatilised by the current, and is deposited as a firmly adherent and highly polished layer on the walls of the tube. The mirror thus produced is said to be of much greater brilliancy than can be obtained by ordinary methods.

THE *Times of Ceylon* learns that it is in contemplation to introduce the electric light into the Sivan Hindu Temple at Kochicadde, on the main road to Mutwal, Ceylon. The premises of this Hindu place of worship are at present lighted by gas, and the trustees propose to substitute the electric light for gas; but whether they will introduce it into the interior of the building, is a matter which is now under their consideration. It is said that, if the Sivan Hindu Temple introduce the innovation, the trustees of equally wealthy temples are sure to follow the example set by their brethren.

IN reference to his letter on the "Jelly-fish of Lake Urumiah" (NATURE, 1892, p. 294), Mr. Sclater informs us that he has lately received a letter from Mr. F. F. Irving, of the English Mission at Urmi, in Persia, stating that Mr. Irving has lately visited the lake, and has found, as has been described by Mr. Curzon, numerous specimens of the supposed jelly-fish in its waters. Mr. Irving says that it resembles a tiny shrimp when swimming, but that as soon as it is brought out it succumbs into a sort of gelatine mass without shape. Measures are being taken to secure the transmission home of specimens of this interesting organism.

AN instance of concerted harmony and measured time-keeping on the part of certain insects, described by Dr. G. M. Gould, of North Carolina, in a recent number of *Science*, has drawn several letters from entomologists on the subject. Probably most people would hardly recognise music in the stridulous noise made by members of the group Crytophyllus, or "Katydids," and would express surprise at the suggestion that there is any rhythm or unison in the sound. Dr. Gould, however, states that there is no doubt whatever that katydids keep time in their stridulations. So soon as the sun has set in North Carolina an orchestra of katydids begins to tune up. After a few preliminary raspings, the members of the orchestra begin to make their noises together; another orchestra at once answers them, and so they go on swing-swong, one set answering the other the whole night long. Mr. A. P. Bostwick adds his testimony to that of Dr. Gould as to the antiphonal rhythm of two orchestras of katydids. He has remarked that the antiphony is often very regular for several minutes, sometimes stopping short, and again becoming broken into irregular individual stridulation at the end. The exact unison of movement can hardly be purely mechanical, for the katydids often start their noises all at once. A difference of pitch between the notes of two orchestras was suspected by Dr. Gould; but Mr. Scudder, who has given much attention to the sounds made by locustarians, thinks this may have been only apparent, and due to difference in distance from the observer.

THAT real images of objects are formed upon the human retina seems to be supported by a series of experiments carried out by Mr. W. Ingles Rogers, and described by him in the *Amateur Photographer* for November 22. Mr. Rogers took a shilling and looked at it intently in ordinary daylight for a full minute, with the idea of fixing the image of it distinctly upon the retina. He then drew a yellow screen over the window of the room in which he sat, so as to exclude all actinic light, and, placing a photographic plate in a certain position, fixed his eyes upon the centre of the plate, at the same time allowing nothing but the image of the shilling to occupy his mind. He remained looking at the plate for forty-three minutes, and afterwards developed it, with the result that an outline of the coin was clearly shown upon it. The "psychogram," as the resulting picture is called, was sufficient to show that better results might confidently be expected. Accordingly, Mr. Rogers continued his experiments, and, in order that there should be no doubt about the *bonâ-fide* nature of the result, he produced a psychogram in the presence of three trustworthy witnesses, whose testimonies as to the genuineness of the photographs accompany Mr. Rogers's communication. On this occasion a postage-stamp was used instead of the coin. The stamp was looked at in a strong light for one minute. It was then removed, a plate was put in its place, and the plate was looked at for twenty minutes. The resulting psychogram is reproduced in our contemporary, and although there is an absence of detail, sufficient is seen to prove beyond doubt that a picture of an object, impressed upon the retina, can send out vibrations which will result in the production of an image upon a sensitive plate. The result is of such great interest not only to photographers, but to students of physiological optics, that we hope the experiments will be continued.

AT a recent meeting of the Paris Academy of Sciences, M. Mascart presented an interesting note on the rainfall at Athens, by M. D. Eginitis, based on observations made at the Observatory during 1878–94. The average yearly rainfall for this period was 16 inches, and the number of wet days 97·8. This amount is not very small; the reputed dryness of Athens is due to three other causes: (1) the considerable variation in the annual fall; thus in 1883 it amounted to 33·3 inches, while in 1891 it was only 8·1 inches, or half the normal value. The dry and wet years follow with some regularity; a very wet period occurs generally about every seventh year. (2) The annual range of the rainfall, which presents great irregularity. The wettest month, November, has an average fall of 3·1 inches; and the dryest, July, only 0·3 inch. From June to July the rainfall is very insignificant; at times there is none for three months. (3) The intensity; the falls being heavy, but of short duration. It rarely rains for a whole day, generally speaking, after a few hours of rainy weather the sky becomes quite clear. From observations taken at 8 a.m., 2 and 9 p.m., it is found that the amount of rainfall during the day is double what it is during the night; the maximum occurs during the afternoon, owing to the greater frequency of thunderstorms at that time. The great variation in the yearly rainfall is said to be due to the different amount of humidity brought by the equatorial air-current, according to the course it has taken in arriving at Athens.

A VALUABLE catalogue (No. 155) of choice and rare books, including selections from the libraries of the late Dr. Reginald S. Poole, and Prof. de Lacouperie, has been compiled and issued by Mr. Bernard Quaritch, 15 Piccadilly.

AT the recent meeting of the National Academy of Sciences' held at Philadelphia, the following papers were presented:—"On the Palæozoic Reptilian Order of the Cotylosauria," by Prof. E. D. Cope; "On a New Variable of Peculiar Character," by Dr. S. C. Chandler (see "Our Astronomical Column," p. 109); "On a Bone Cave at Port Kennedy, Pa," by Prof. E. D. Cope; "On Borings through the Coral Reef in Florida," by Prof. A. Agassiz; "On the Alkali Uranates," by Prof. Wolcott Gibbs; "The Olindiadæ" and "New Campanulurian Medusæ," by Prof. W. K. Brooks; "The Filar Anemometer" and "The Counter-twisted Curl Aneroid," by Prof. Carl Barus; "On the Broadening of Spectral Lines by Temperature and Pressure," by Prof. A. A. Michelson; "On the Asteroids," by Prof. A. Hall; and "The Early Segregation of Fresh-water Types," by Dr. Theo. Gill.

THE fourth volume of *Transac ions* of the Rochdale Literary and Scientific Society, covering the period 1893–1895, has reached us. Included in it are papers on "The Birds in Piethorn Valley," by Mr. W. Watts; "The Rainfall in Rochdale and the Neighbourhood," by Mr. J. R. Ashworth; "The Cold Weather at Facit, during the Winter of 1894-95," with instructive diagrams, by Mr. T. S. Smithson; and Recent Discoveries in the Manufacture of Indigo," by

Mr. W. H. Pennington. The volume represents a large amount of industry and research on the part of associates of the Society, and it will give a stimulus to the study of science in Lancashire. Another volume just published by a provincial Society is the Annual Report and *Transactions* (vol. xxix.) of the Naturalists' Field Club and Archæological Society of North Staffordshire. This volume is, as a whole, more scientific in character than that of the Rochdale Society. Reports are given of the work of the various sections of the Society concerned with observations in different branches of science, and we notice, among the other contents, an address by Dr. W. Hind; a paper on glacial theories, past and present, and their application to Staffordshire, by Mr. C. E. De Rance, and one on the occurrence of marine fossils in the coal-measures of North Staffordshire, by Mr. John Ward. Both volumes are very creditable records of the work of provincial scientific Societies.

WE have on our table several new editions of books previously reviewed in NATURE. Among these volumes is a second edition of "Modern Microscopy" (Baillière, Tindall, and Cox), a handbook for beginners, comprising a section on the microscope, and instructions for its use, by Mr. M. I. Cross; and on the preparation and mounting of microscopic objects, by Mr. Martin J. Cole. We welcome a second edition of "A Manual of Physics" by Dr. W. Peddie, bearing the same publishers' names. The work is an admirable text-book, which students of physics would do well to obtain. Messrs. Longmans, Green, and Co. have published an eighth edition of Mr. John Thornton's "Elementary Physiography"; and Messrs. Blackie and Son, the ninth edition of "Earth-Knowledge," by Mr. W. Jerome Harrison and H. Rowland Wakefield; both these books being intended for students in the physiography classes of the Department of Science and Art. Messrs. Blackie have issued also a fourth revised and enlarged edition of "Elementary Inorganic Chemistry," by Prof. A. Humboldt Sexton.

THE additions to the Zoological Society's Gardens during the past week include a White-backed Piping Crow (*Gymnorhina leuconota*) from Australia, presented by Mr. Percy A. Gore; a White-headed Sea-Eagle (*Haliætus leucocephalus*) from Newfoundland, presented by Mr. Leicester Curzon Howe; a Chough (*Pyrhocorax graculus*), British, presented by Mr. Gerald Strickland: two Blood-breasted Pigeons (*Phlogœnas cruentata*) from the Philippine Islands, presented by Captain Harvey; two Greater Sulphur-crested Cockatoos (*Cacatua galerita*), a Crimson-winged Parrakeet (*Aprosmictus erythropterus*) from Australia, presented by Mrs. Morgan; two Barbary Wild Sheep (*Ovis tragelaphus*, ♂ ♂) from North Africa, deposited; a Great Northern Diver (*Colymbus glacialis*), twelve Snow Buntings (*Plectrophanes nivalis*), four Dunlins (*Tringa alpina*), a Golden Plover *Charadrius pluvialis*), a Grey Plover (*Squatareola helvetica*), British, a Bahama Duck (*Dafila bahamensis*) from South America, four Green-winged Doves (*Chalcophaps indica*) from India, two Bearded Vultures (*Gypætus barbatus*), European, purchased.

OUR ASTRONOMICAL COLUMN.

POSITIONS OF THE NEW COMETS.—As we go to press, the following calculated positions for the two new comets have been received from Kiel. The places are for Berlin midnight.

Perrine's Comet.

Date.	R.A.	Decl.
	h. m. s.	° ′
Dec. 7 ...	14 52 37 ...	−13 37·2

Brooks's Comet.

Date.	R.A.	Decl.
	h. m. s.	° ′
Dec 8 ...	8 11 2 ...	+44 28·2
10 ...	7 45 57 ...	+51 36·7
12 ...	7 16 42 ...	+57 23·5

SWIFT'S COMET, 1895 II.—Another comet has put in a claim to be considered the long-lost comet of Lexell; and the claim is perhaps based on a better foundation than any of the other competitors can show. Le Verrier has supported the comets of Faye and De Vico; more recently Brooks' comet of 1889 found a supporter in Dr. Chandler, but the claim was routed by the calculations of Mr. Lane Poor. M. Schulhof looked favourably for a while on the merits of Finlay, but finally inclined to the belief that the two comets had a common origin rather than absolute identity. The new comet Swift has much to recommend it to the consideration of astronomers (*Astr. Nach.*, No. 3318). In the first place, Tisserand's criterion is fairly well satisfied; next, the closest approach to the orbit of Jupiter, in the case of both comets, falls very nearly in the same longitude; further, of the various orbits along which Le Verrier showed Lexell might move, after the heavy perturbations of 1779, one can be selected which agrees very closely with the orbit of Swift. Moreover, this particular selection of the various orbits suggested by Le Verrier is supported by Clausens's work on the same comet. Here is the comparison:—

	Selected orbit of Lexell.	Orbit of Swift (Schulhof).
Long. of perihelion ...	330°·0 ...	338°·1
Long. of node	169°·9 ...	170°·3
Inclination	6°·0 ...	3°·0
Excentricity	0·6317 ...	0·6515
Semi-axis major	4·224 ...	3·724
"Tisserand's criterion" ...	0·480 ...	0·493
Long. of approach to ♃ ...	184° ...	179°·5

It is a question if the agreement is not too good, for the comet of Swift made a close approach to Jupiter in 1886, and underwent heavy perturbations. M. Schulhof is at present considering these; but till their character and amount is known, it is premature to decide this vexed question of identity. It is possible the question will not be set at rest till 1931, for the returns previous to that date are not very favourable for observation, and the comet may pass unnoticed. But in any case observations in large telescopes should be prosecuted as long as possible, in order to determine the mean motion with accuracy, with the view of assisting the re-discovery.

A PECULIAR VARIABLE STAR.—A variable star recently discovered by Mr. Chandler presents some very remarkable features (*Astronomical Journal*, No. 358). In the singularly short period of 5h. 31·15m., the magnitude of the star varies between 8·9 and 9·7, so that three or four of the principal phases may be observed in a single night. The variations are distinctly not of the Algol type, but maxima and minima are equally and sharply marked. The light-curve is also unlike those of the other class of short-period variables, such as δ Cephei and η Aquilæ, inasmuch as the rise to maximum and fall to minimum take place in equal periods.

The newly-discovered variable is designated U Pegasi, and its position for 1900 is R.A. 23h. 52m. 53s., Decl. 15° 23′·9; the elements of the variability are as follows:—

	G.M.T. d. h. m.	
Minimum, 1894 Sept. ...	22 14 56·0	+5h. 31m. 9·0s. E.
Maximum ...	22 17 41·6	

The probable error of the period is believed to be only a moderate fraction of a second.

It appears that Dr. Chandler discovered the variability of the star more than a year ago, but erroneously inferred that it was of the Algol type with a period of 2·06 days. Mr. Yendell confirmed the variability, and concluded that the period was 0·69d., or one-third of that assigned by Dr. Chandler; but it was still supposed to be of the Algol type. A more recent discussion of the observations, however, has established that this period must again be divided by three, and that the light-curve has the character to which reference is made above.

SATURN'S RINGS.—Some remarkable observations of the rings of Saturn are reported by A. Mascari, of the Catania Observatory (*Ast. Nach.*, 3318). Observing from July 25 to August 6 of the present year, he noticed certain dark spots on the crape ring, as well as bright ones on the brighter rings. Perhaps the most curious feature of these spots is their apparent permanence of form; for this is not easy to explain if the idea that the rings are composed of separate particles be accepted, as in that case

adjacent parts of the rings would have different angular velocities. It was found, also, that the external boundary of the outer ring apparently joined the inner bright ring at a point on its northern edge, while the crape ring was almost twice as wide in the northern as in the southern part. This imperfect symmetry of the outer ring and crape ring with the inner bright ring, suggests that they do not all rotate in one plane. The different divisions of the ring would thus cast shadows upon each other, the amount of shadow depending upon the inclination.

The colour of the crape ring is described as bluish, and the shadow of the globe on the rings was curved, with the convexity towards the planet. Encke's division was very feeble and uncertain during the observations. It is pointed out that future observations of the spots may throw further light upon the rotation and constitution of the rings.

THE ANNIVERSARY MEETING OF THE ROYAL SOCIETY.

LAST Saturday being St. Andrew's Day, the Anniversary Meeting of the Royal Society was held in their apartments at Burlington House. The auditors of the Treasurer's accounts having read their report, the Secretary read the list of Fellows elected and deceased since the last Anniversary.

The qualifications of the new Fellows were given in NATURE of May 9 (vol. 52, p. 31). Since the last Anniversary Meeting, the Society has lost nineteen Fellows and seven Foreign Members, viz. :—

Bisset Hawkins, December 7, 1894, aged 98.
Pafnutij Tchebitchef, December 8, 1894, aged 73.
Arthur Cayley, January 26, 1895, aged 73.
Sir James Cockle, January 27, 1895, aged 76.
Rev. Thomas Penyngton Kirkman, February, 1895, aged 88.
John Whitaker Hulke, February 19, 1895, aged 64.
Henry Austin Bruce, Lord Aberdare, February 25, 1895, aged 80.
Sir William Scovell Savory, March 4, 1895, aged 69.
Sir Henry Creswicke Rawlinson, March 5, 1895, aged 84.
Albert William Beetham, March 11, 1895, aged 95.
James Dwight Dana, April 15, 1895, aged 82.
Carl Ludwig, April 24, 1895, aged 78.
Roundell Palmer, Earl of Selborne, May 4, 1895, aged 83.
Henry John Carter, May 4, 1895, aged 82.
Sir George Buchanan, May 5, 1895, aged 64.
Franz Ernst Neumann, May 23, 1895, aged 97.
Valentine Ball, June 15, 1895, aged 52.
William Crawford Williamson, June 23, 1895, aged 78.
Right Hon. Thomas Henry Huxley, June 29, 1895, aged 70.
Henri Ernest Baillon, July 19, 1895, aged 67.
Charles Cardale Babington, July 22, 1895, aged 86.
Sir John Tomes, July 29, 1895, aged 80.
John Syer Bristowe, August 20, 1895, aged 68.
Sven Ludwig Lovén, September 3, 1895, aged 86.
Louis Pasteur, September 28, 1895, aged 73.
George Edward Dobson, November 26, 1895, aged 47.

Lord Kelvin, the President, then delivered the Anniversary Address as follows :—

In Cayley we have lost one of the makers of mathematics, a poet in the true sense of the word, who made real for the world the ideas which his ever fertile imagination created for himself. He was the Senior Wrangler of my freshman's year at Cambridge, and I well remember to this day the admiration and awe with which, before the end of my first term just fifty-four years ago, I had learned to regard his mathematical powers. When a little later I attained to the honour of knowing him personally, the awe was evaporated by the sunshine of his genial kindness; the admiration has remained unabated to this day, and his friendship has been one of the valued possessions of my life. While we mourn his departure from among us we know with gratitude that he has left an imperishable monument of his life's work in the grand edition of his mathematical writings which the University Press of Cambridge gives to the world. The interesting and genuinely appreciative obituary notice of Arthur Cayley, contributed by our colleague, Prof. Forsyth, to the *Proceedings* of the Royal Society for the present year, has been reprinted as a preface to the eighth volume of his "Collected Mathematical Papers," which was published last August, rather more than half of it having been passed through the press by the author with notes and references, and the remainder simply reprinted from the original publications. Matter for two more such volumes remains to be reprinted.

At the good old age of ninety-seven the veteran Franz Ernst Neumann has left us. He has been one of the most profound and fertile of all the workers in mathematical physics of the nineteenth century. I remember with gratitude the admirable and suggestive theorem[1] on electromagnetic induction which I learned in 1848, from a first paper on the subject which he had communicated to the Berlin Academy of Sciences, and which, translated into French, was published in the April number of that year of Liouville's *Journal des Mathématiques*. That first paper and others which followed it on the same subject, and his papers on the physical theory of light and on elasticity, are grand and permanently valuable contributions to science.

The death of Huxley, one of my predecessors in the Presidential chair of the Royal Society, takes from us a man who can ill be spared. During the fifty years since he sailed from England, as assistant-surgeon on board H.M.S. *Rattlesnake*, bound for a surveying expedition in the southern seas, he had been a resolute and untiring searcher after truth, and an enthusiastically devoted teacher of what he learned from others and what he discovered by his own work in biological science. His first contribution to science was a short note communicated, while he was still a student in the Charing Cross Hospital, to the *Medical Times and Gazette*, describing a structure in the root-sheath of hair, which has since borne the name of Huxley's layer. It was followed by papers on the blood corpuscles of the *Amphioxus lanceolatus* and on the anatomy and affinities of the family of *Medusæ*, for the British Association and the Royal Society; and several other articles on various biological subjects, all describing some of the work of the leisure left him by his medical duties during his four years' cruise on board the *Rattlesnake*, which were sent home by him to England, and published during his absence. It is to be hoped that the long series, thus so well begun, of papers describing skilful and laborious research by which knowledge was increased in every department of biology, will be given to the world in collected form as soon as possible. Even those purely scientific papers contain ample evidence that Huxley's mind did not rest with the mere recording of results discovered by observation and experiment: in them, and in the nine volumes of collected essays which he has left us, we find everywhere traces of acute and profound philosophic thought. When he introduced the word agnostic to describe his own feeling with reference to the origin and continuance of life, he confessed himself to be in the presence of mysteries on which science had not been strong enough to enlighten us; and he chose the word wisely and well. It is a word which, even though negative in character, may be helpful to all philosophers and theologians. If religion means strenuousness in doing right and trying to do right, who has earned the title of a religious man better than Huxley?

Another name literally of world-wide fame, Louis Pasteur, stands next to the end of our list of losses. Before he entered on his grand biological work, Pasteur made a discovery of first-rate importance in physics and chemistry—the formation of crystals, visibly right-handed and left-handed, from a solution of racemate of soda and ammonia; and the extraction of ordinary tartaric acid and of a kind of tartaric acid not previously known, from solutions obtained by picking out the crystals separately and redissolving: the new kind of tartaric acid having the property of producing the opposite rotatory effect on the plane of polarisation of light to that produced by ordinary tartaric acid. From 1848 to 1857 he was chiefly occupied with researches related to the subject of that great discovery, as may be seen from the titles of the first twenty-two of his papers in the Royal Society Catalogue. His work of those nine years led up from Biot's fundamental discovery of the dioptric heliçoidal property of liquids and vapours, to the enrichment of chemistry by the annexation of a new province called stereochemistry, splendidly and fruitfully developed twenty years later by Le Bel and Van 't Hoff. Near the end of 1857 his twenty-third paper appeared, three pages, in the *Comptes rendus*, "Sur la Fermentation appelée lactique." It shows that he had then entered on the

[1] Quoted in "Mathematical and Physical Papers" (Sir William Thomson), p. 92, vol. i.

line of research to which he devoted the rest of his life, and by which he conferred untold benefits on humanity and the lower animals. As I had occasion to remark in my Presidential Address of last year, Helmholtz had in his earliest work proved almost to a certainty "that the actual presence of a living creature—vibrio, as he called it, bacterium as we more commonly call it now—is necessary for either fermentation or putrefaction." Pasteur gave complete demonstration of that conclusion, and early expanded it to vast and previously undreamt of extensions of its application. The first great practical application of his views was made by Lister about 1863-65, then my colleague in the University of Glasgow, now recommended by your Council as my successor to the Presidency of the Royal Society. From Pasteur's discoveries he was led to work out the principles of his antiseptic surgery, the practice of which he commenced in the Glasgow Royal Infirmary in the summer of 1865.

Having been led to trace microbes as the origin not only of fermentation and putrefaction, but of a vast array of destructive blights happening to plants and animals—vines, silkworms, birds, cattle, and mankind—Pasteur was forced to take up the question, as of supreme practical importance, "Whence came these microbes, and what are their antecedents?" From warmth and moisture, as we see by turning up a stone in a field, I was told forty years ago by an Arran farmer well versed in the popular literature of the day. We are sometimes told the same thing in scientific journals of 1895 under the more learned disguise perhaps of abiogenesis, or the fortuitous concourse of atoms, not tested by the calculus of probabilities. Without wasting words to prove theoretically that, while stones falling together may, as we all believe they have actually done, make a solar system with a habitable planet or planets, they cannot make a man, or a microbe, or an organic cell with its property of heredity, Pasteur set about practically to trace the antecedents of every microbe he met with, and he found for it in every case a living thing, whether in the air, or in water, or in earth. During nearly all the latter part of his life and to the end Pasteur devoted himself to biological research, and to vigorous practical realisation of its benefits for the world.

Turning now to the business of the Royal Society since our last Anniversary Meeting, I am glad to be able to report that excellent progress has been made with the "Catalogue of Scientific Papers." Vol. xi. of the Catalogue, under authors' names, completing the alphabet, is on the eve of issue, and the supplementary volume is far advanced.

The movement which led to the inception of the Catalogue dates back forty years—to the first meeting of the British Association in Glasgow, when Prof. Henry, of Washington, communicated a proposal for the publication of a catalogue of philosophical memoirs scattered throughout the Transactions of Societies in Europe and America, with the offer of co-operation on the part of the Smithsonian Institution.

The proposal was referred to a committee consisting of Mr. Cayley, Mr. Grant, and Mr. Gabriel Stokes. The year after, at the Cheltenham meeting, this committee propounded a scheme for a Catalogue, embracing the mathematical and physical sciences, to include both authors' names and subjects. Besides, Transactions and Proceedings of Societies, journals, ephemerides, volumes of observations, and other collections not coming under these heads were to be indexed.

This scheme came before the Royal Society in March 1857, in consequence of a request made by General Sabine at the instance of the British Association. Considerable discussion took place, and eventually it was decided to prepare a *manuscript* Catalogue of periodical works in the Royal Society's library, to include all the sciences, the question of printing being deferred; and to do the work at the Society's sole charge. Subsequently it was resolved to extend the Catalogue to works in other libraries not included in that of the Royal Society.

In 1864 it was decided to offer the Catalogue to Government for publication, and in 1866 the printing of the first series of the Catalogue, covering the period from 1800 to 1863, was commenced by the Stationery Office. The sixth and last volume of the series was published in 1872. Two additional volumes, covering the period 1863-1873, were published in 1879. The Treasury then declined to continue the publication of the Catalogue, which, however, was undertaken by the Society, assisted by a sum of £1000 voted by Parliament towards the charges of publication of the decade 1873-1883. The unexpended portion of this grant was invested in a policy, under which £1000 will become available for the purposes of the Catalogue in October, 1899.

So far back as June, 1864, it was resolved by the Council that the Catalogue according to authors should be followed by the immediate publication of an Index according to subjects. Such an Index Rerum was constantly under consideration, and many plans for its preparation have been discussed. The work at last took practical shape in 1893, when our Fellow Mr. Ludwig Mond most generously presented a sum of £2000 to the Society, in aid of the work of preparing the Catalogue and the Subject Index. Out of this liberal donation there remains unexpended a sum of £1500. A special staff was organised, by whom more than 140,000 slips have now been mounted and arranged in boxes, and of these over 46,000 have already been provisionally prepared for press. Since the last Anniversary, the department has to some extent been reorganised by the Committee, women being now employed in the Index Rerum Department, and Miss Chambers having been entrusted with full control over the whole. The total number of women employed in the two departments including junior copyists is now twelve.

It has, however, long been felt that the continuation of such a work was almost beyond the resources of the Royal Society, and therefore about two years ago a committee was appointed to take into consideration a suggestion that the preparation of complete indexes to scientific publications should be effected by international co-operation.

This very important subject has continued to engage the attention of the Council during the past year; and the suggestion of international co-operation having been recommended to Her Majesty's Government for favourable consideration, official invitations have been issued to an International Conference to be held in London in July next.

Meanwhile others have been equally aware of the great importance attaching to the indexing of literature, and only in September last an International Institute of Bibliography was established by Royal Decree in Brussels.

Two gentlemen in that city, MM. Otlet and La Fontaine, have, during the past half dozen years, devoted themselves to the study of modern methods of bibliographic classification, specially with reference to sociology, and their work has been supported by the Belgian Government. They were led to adopt the decimal system devised by Melvil Dewey, which is popular with American librarians, and having made a careful study of its application, have become so impressed with its value that they have developed an extraordinarily comprehensive scheme applicable to literature generally.

An invitation to attend a conference in Brussels at the beginning of September last was received by the Royal Society early in August, too late unfortunately to permit of a representative being present.

At the conference held there on September 2 to 4, a number of resolutions to establish an International Institute of Bibliography as a development of the work begun by the above-mentioned gentlemen, were arrived at, and by a Royal Decree of September 12, 1895, such an office was established.

Your senior Secretary had an opportunity, when in Brussels recently, of visiting the office which has been established, and of seeing the skill and zeal with which the preliminary preparations have been made to carry the work into execution.

All must admire the energy and enterprise which has thus been displayed in Belgium. At the same time, the magnitude of the work and the importance of the interests involved are such that it appears most desirable that the action which the Royal Society has already taken for an International Conference should be persevered in, so that decisions may be arrived at which may ensure, if possible, complete success. The enterprise is one in which we, in consequence of our long connection with such work, are most deeply interested; it is also one which may well become of exceeding value to science generally. But it is impossible to overrate the difficulties connected with it; and to avoid unnecessary complications in the future it is essential that very many questions—especially the division of the subject matter in the various branches of science and the nomenclature to be used—be taken into consideration by competent bodies and settled by general agreement.

In my last Anniversary Address I mentioned that the Library Committee, in view of the great accumulation of the stock of *Philosophical Transactions*, were taking measures to make the memoirs composing the volumes separately available to the public, which, while facilitating the sale, would increase their

utility. I have now the pleasure to announce that arrangements have been made with Messrs. Dulau and Co. to carry out this suggestion, and that Messrs. Dulau have, at their own expense, issued a very useful alphabetical list of all the papers in the *Philosophical Transactions*, from the year 1800 to the present time, any of which may now be separately purchased by the public.

The great and increasing success of our annual soirées has led the House and Soirée Committee to recommend to the Council that in addition to the two conversaziones held in May and June, some informal receptions for the Fellows should also be occasionally held. This suggestion was readily adopted by the Council, and the first of these receptions was held last month.

The Water Research Committee have continued the labours which they commenced in conjunction with the London County Council four years ago, and although the County Council no longer contributes to the expenses, the Committee have been able to carry on the researches, partly by means of an assignment from the Government grant, and partly by a grant from the fund established in 1891, by his Excellency Dr. Gunning. A Report, of 200 pages, by Prof. Marshall Ward, forming the Fourth Report to the Committee, was presented to the Council of the Royal Society last March, and has been published in the *Proceedings*. This Report treats on the biology of *Bacillus ramosus* (Fraenkel), a schizomycete of the River Thames.

With respect to the Gunning Fund which I have just now mentioned, the Committee appointed by the Council to consider and report upon the best terms for carrying out the trust, made the following recommendations, which, with Dr. Gunning's approval, were adopted by the Council :—

"(1) That the Fund should not be applied in the form of a prize, medal, or reward, but should be devoted to the furtherance of knowledge in some special direction.

"(2) That, by preference, the interest accruing from the Fund during every three years be applied for the promotion of Physical Science and of Biology alternately.

"(3) That aid should, by preference, thus be given in Physical Science and Biology respectively, either to investigations or operations which require to be repeated from time to time, or to the development of some specified continued line of research."

The Council, while adhering to the policy of retrenchment touched upon in my last address, have had to recognise the fact that the Society was, at that time, already committed to a large amount of publication, a great bulk of printed matter being almost ready for issue. This accumulation has been rapidly worked off during the past session, with the result that the Council, notwithstanding that every effort has been made to limit the amount of fresh publication, have issued in the mathematical and physical section of the *Philosophical Transactions* no less than thirty-one papers, and in the biological section twenty-one. The two sections together contain in all 2259 pages of letterpress and sixty-one plates. Of the *Proceedings*, fourteen numbers have been issued, containing 1356 pages.

While determined not to depart from the policy of avoiding all unnecessary expenditure on publication, the Council felt that with only the funds hitherto at its disposal it could not effect the requisite diminution of expenditure without diminishing the efficiency of the Royal Society in promoting the augmentation of natural knowledge, which is the reason for its existence. An application to the Treasury for additional funds was therefore made by a resolution of Council adopted at its meeting of June 20 last. I am happy to say that a favourable answer has been received, and a grant of £1000 a year has been given by the Treasury to the Royal Society on the purpose of aiding in the adequate publication of scientific matter, whether in the *Transactions* or *Proceedings* of the Society or through other channels and in other ways.

At a meeting of the Council on October 17 it was resolved to send to the Institute of France the following address on the occasion of the centenary of its foundation; and it was agreed to authorise the President and Treasurer to represent the Royal Society at the commemoration to be held in Paris from October 23 to 26 :—

"The President and Council of the Royal Society of London offer to the Institut de France their most cordial congratulations on the auspicious occasion of the centenary of its existence, which it is now about to celebrate.

"The President and Council are well aware that various ancient Academies flourished in France long before the official foundation of the Institut as a means of recording discoveries and promoting arts and sciences, and that much of that great advance in human knowledge which took place during the 17th and 18th centuries was due to the labours of members of the French Academy of Science.

"The foundation of the Institut, however, comprising as it does five Academies, each with its own special sphere of action, but all united as one harmonious whole, constantly investigating the laws of nature and the developments of art, constitutes an era in the history of civilisation.

"It would be an endless task to attempt to enumerate the branches of human knowledge which during the past century have benefited by the labours of the Institut. It is a body of which not only France but the whole of the civilised world may be justly proud.

"It is sad to think, that just at the moment of a commemoration which would otherwise have been celebrated with unalloyed pleasure, Science has to mourn the loss of one of her most distinguished votaries. The single-minded and devoted labours of Pasteur, and their beneficial results to man and the domestic animals, are recognised throughout the whole world with the highest gratitude and admiration. The Royal Society assures the members of the Institut of its hearty sympathy in the sad loss that they and humanity at large have sustained.

"That the Institut may long continue to exist and prosper, and that each succeeding century may witness an ample harvest from its labours, is the heartfelt wish of the President and Council of the Royal Society.

(Signed) "KELVIN,
"*Pres. R.S.*"

I had the honour of presenting this address to the President of the Institute of France in person. For myself and other Fellows of the Royal Society who were present along with me I may be allowed to say that we were much gratified with the friendly and fraternal reception accorded to us, as colleagues and fellow labourers in the work of the Institute.

I am sorry to say that we are now losing the service, as Assistant-Secretary, of Mr. Herbert Rix, who, after seventeen years of faithful work for the Royal Society, retires from this post, as he finds the necessarily increased anxiety and burden of the office to be too great a strain upon his health. We all feel grateful to him for the manner in which he has discharged his duties from the time he first entered the service of the Royal Society; and I am sure the Fellows generally will agree with the Council in being pleased that we have been able to arrange to still have Mr. Rix to help us in our work, in the less arduous post of Secretary to the Government Grant Committee.

A very important scientific event of the past year, resulting from work initiated by the Royal Society a quarter of a century ago, is the completion of the "Report of the *Challenger* Expedition," in fifty large royal quarto volumes containing 29,500 pages, and illustrated by over 3000 lithographic plates, copper-plates, charts, maps, and diagrams. I may remind you that H.M.S. *Challenger* was fitted out by the Government in 1872, on the recommendation of the Royal Society, and was absent for nearly four years on an exploration of the Great Ocean Basins. The publication of the numerous observations, which have enriched almost every branch of science, was at first carried on under the direction of Sir C. Wyville Thomson, and subsequently by Mr. John Murray.

I have been myself much struck with the extreme beauty of many of the plates contained in these volumes; and, though no expert in the subject, I may be allowed to say that I believe nothing more admirable has been hitherto given to the world in the way of illustration and representation of biological subjects. Of the maps, I may confidently say that they are models of careful, accurate, and elaborate work. Two volumes of the Report deal with the narrative of the voyage, three volumes with the physics and chemistry of the ocean, one volume with deep-sea deposits and geology, two volumes with botany, forty volumes with marine zoology, and two volumes are devoted to a summary of the scientific results.

How highly the work of the *Challenger* expedition is appreciated by those best qualified to judge of the merits of its results is illustrated by the following words, spoken by Milne-Edwards at a meeting of the International Congress of Zoology, held last September in Leiden :—L'expédition du *Challenger* a porté des fruits merveilleux. Ceux qui l'ont organisé, ceux qui y ont pris part, et dont quelques-uns ne sont plus ici pour

recueillir le prix de leurs efforts, ceux qui en ont étudié les résultats, ont rendu des services dont nous leur sommes profondément reconnaissants. Le monument scientifique ainsi élevé par les savants anglais constitue un titre de gloire dont une nation a le droit d'être fière."

The contributors to this gigantic Report are, for the most part, natives of the United Kingdom and the British Colonies, but the scientific men of nearly every civilised State are represented among the authors. The British and foreign contributors are seventy-six in number, and many scientific men whose names do not appear on the title-pages of the special memoirs have taken part in the physical and chemical researches performed in connection with the work of the expedition. Among the contributors we find the names of Alexander Agassiz, Ernst Haeckel, P. G. Tait, G. O. Sars, F. E. Schulze, T. H. Huxley, Rudolph Bergh, A. v. Kölliker, A. Renard, W. K. Brooks, N. N. Polejeff, Th. Studer, A. A. W. Hubrecht, W. Dittmar, Sir William Turner, A. Günther. Before the end of the present meeting I shall have the pleasure of presenting to Mr. Murray one of the Royal medals, which has been awarded to him by the Council of the Royal Society, to mark their appreciation of his editorship of this great work, and of his own scientific contributions to it.

In my Presidential Address of last year I took occasion to refer to Lord Rayleigh's discovery that the gas which remains when oxygen, vapour of water, and carbonic acid are removed from common air, is denser than nitrogen extracted from chemical compounds; and I was then able to tell you of the consequent discovery that our atmosphere contains a fifth constituent which is denser than nitrogen. This discovery had been thoroughly established by Rayleigh, in association with Ramsay, who had joined him in the work; but no details had then been published. They had succeeded in isolating the new constituent by extracting all the four previously known constituents (oxygen, nitrogen, aqueous vapour, carbonic acid) from air, and they were energetically at work with a view to discovering its properties. I concluded my last year's Address by expressing the hope that their work would give us, "before the next Anniversary Meeting of the Royal Society, much knowledge of the properties, both physical and chemical, of the hitherto unknown and still anonymous fifth constituent of our atmosphere." That hope, as you all know, has been splendidly fulfilled. They early discovered a name for it, Argon, because exhaustive chemical investigation gave them no evidence of its chemical combination with any other known element. They found its density to be very high, 20 (that of oxygen being called 16), and the ratio of its specific heats $1\frac{2}{3}$. Olzewski, experimenting on a specimen sent to him by Ramsay, succeeded in liquefying it, and found its critical pressure to be 50·6 atmospheres, and its critical temperature $-121°$. These results were communicated in a joint paper by Rayleigh and Ramsay to the Royal Society at a memorable meeting, held in the theatre of the University of London, because our ordinary meeting-room was not large enough to contain all who wished to hear it. It will be gratifying to Fellows of the Royal Society to know that the Smithsonian Institution of Washington gave to Lord Rayleigh and Prof. William Ramsay the first Hodgkins' prize for their "Memoir on Argon: a New Constituent of the Atmosphere." This memoir had been communicated to Washington before the end of December 1894.

Since the dates of those first communications much work has been done by various observers on the spectrum analysis of argon. In a communication by Rayleigh to the recent meeting of the British Association, we find a very accurate determination of its refractive index and its viscosity. Ramsay, in trying for clues to compounds of argon, had his attention called by Mr. Miers (of the British Museum) to a paper by Hillebrande, telling that cleveite (a rare Norwegian mineral which consists chiefly of uranate of lead) gives out 2 per cent. of gas, supposed to be nitrogen, when warmed with weak sulphuric acid. Ramsay, thinking the so-called nitrogen might turn out to be argon, experimented on the mineral. He found that the gas evolved, by heating it in sulphuric acid, contained a trace of nitrogen, which he removed by the Cavendish process of sparking with oxygen in presence of alkaline liquor. The residue was proved by the spectrum test to contain argon, but to contain also another gas, not argon, showing itself by a brilliant yellow line. This line was identified by Crookes as the "helium line," discovered thirty years ago by Lockyer, who, finding it to have been not discovered in the spectrum of any terrestrial substance spectroscopically examined up to that time, attributed it to a substance in the sun's atmosphere, which he called helium. Thus, a substance, discovered thirty years ago in the sun's atmosphere, and accordingly named from the sun, has been found in a terrestrial mineral by Ramsay, in his quest after argon. Having got helium into his laboratory, he found its density to be less than 3·9 (ultimately reduced to 2), and, therefore, less than one-fifth (about one-tenth) of that of argon. He sent a specimen to Olzewski, who found (NATURE, October 3, 1895) that the treatment by which he had succeeded in liquefying hydrogen—namely, compressing with a pressure of 140 atmospheres, cooling to the temperature of liquid air boiling at low pressure, and then expanding suddenly, showed no signs of liquefying helium.

Considering the uncertainty as to the density of the gas in which helium was identified, and the multiplicity of spectrums found for it by various experimenters, Lockyer, who experimented on some eighty minerals, and found the yellow line of helium in sixteen of them, thinks it most probable that it is not a single gas that is extracted either from cleveite or the other minerals, but a mixture of gases of which helium is one; and this view was supported by Runge and Paschen in their admirable spectroscopic analysis of argon and helium, communicated to the British Association ("British Association Report," Section A, September 18, 1895) at its recent meeting at Ipswich. It seems too early to feel sure that the helium found by Ramsay in the gas from cleveite, if perfectly purified of nitrogen and other known gases, is a single gas, or is a mixture or combination of several. Before another Anniversary Meeting of the Royal Society, it is probable that we shall have certain knowledge, without any doubt, as to this question. Meantime, at our present Anniversary, we may be satisfied to feel that if there are several new gases, of which one, at least, has density less than a quarter of that of oxygen, the discovery will be several times as interesting as if the helium now discovered proves to be only one gas.

COPLEY MEDAL.

Dr. Karl Weierstrass, For. Mem. R.S.

Dr. Karl Weierstrass is distinguished for his investigations in pure mathematics, extending over a period of fifty years. He is one of the great pure mathematicians of the century.

Among his researches, dealing with many branches of the science in which his work is of significant effect, may be specially mentioned:—

(i.) His investigations in pure algebra, particularly in relation to functions of real variables, to the considerations of convergence and divergence of series and products, and to the theory of bilinear and quadratic forms.

(ii.) His contributions to the general theory of functions of complex variables. This subject he has developed from its foundations, and has re-established it on a new basis, so that much of it is his creation. The extensions which he has made to this theory have of themselves proved sufficient to secure for him the distinction of an acknowledged master.

(iii.) His work in the theory of periodic functions. In particular, the advances made by him in the theory of Abelian transcendents, mark the chief algebraical development since the time of Abel and Jacobi, and they have stimulated others to further developments. Also the valuable advances made by him in the theory of elliptic functions have been fruitful and suggestive as the starting-points for researches by a number of distinguished mathematicians.

(iv.) His work in the calculus of variations, the best known published part of which relates to the theory of minimal surfaces.

Not least remarkable among his claims to originality is the method of proof which he has introduced in his investigations; he has associated a vigour and a strictness with the minutest details of his proofs that have not merely led to the sound establishment of propositions, but have indicated limitations and have suggested new ideas.

ROYAL MEDAL.

Dr. John Murray.

To Dr. John Murray one of the Royal Medals is awarded for his energetic and successful editorship of the Report of the *Challenger* Expedition, and for his own large contributions to the work of the expedition and to the scientific papers embodied in the Report. In this matter Dr. Murray's labours are recognised universally as having been of extreme value to zoological science. His own contributions to the elucidation of the material brought home by the *Challenger* have been of great

importance and originality. His researches on the deep sea deposits, and his general discussion of the oceanographic results of the expedition, are recognised as being of first-rate quality.

Dr. John Murray has already received the "Prix Cuvier" of the French Académie des Sciences, and it is right that the corresponding body in this country should take the first opportunity available to it, after the completion of the *Challenger* Reports, to express its appreciation of their value.

ROYAL MEDAL.

Prof. James Alfred Ewing, F.R.S.

A Royal Medal is conferred on Prof. J. A. Ewing for his investigations on magnetic induction in iron and other metals.

The magnetic properties of iron and steel when subjected to magnetising forces of different intensities, under various conditions of temperature and mechanical stress, have been studied by many physicists both in this country and abroad. In a series of papers which have appeared at intervals during the last fourteen years, Prof. Ewing has put on record a remarkable collection of experimental facts connected with these complicated subjects. In some of his results and methods he was anticipated by others, but apart from the wide extent of his investigations, he has displayed great sagacity and originality both in his more fundamental researches, and in the directions in which he has developed his work.

Having studied the behaviour of iron when subject to magnetic forces which vary in a cycle, he applied the same process to nickel, proving that, as in the case of iron, the susceptibility is constant for small forces, but that the range of force over which this law holds good is much larger for nickel than for iron.

Prof. Ewing has also investigated the behaviour of iron and steel of various qualities, of manganese steel, of cobalt and nickel, when placed in very strong magnetic fields, the intensity of which was raised to the splendid magnitude of 46,000 C.G.S. units in the air around the metal bar under observation. He thus showed experimentally, in corroboration and extension of Joule's primary discovery, that the intensity of magnetisation approaches asymptotically towards a limiting value, which it very nearly reaches before the magnetising force attains a comparatively small magnitude, and at which it remains constant while the magnetising force is increased without limit.

Not content with investigations such as these, Prof. Ewing has made an important advance in our knowledge of the probable constitution of magnetic substances. He constructed a model of such bodies by placing a number of small magnets near to each other so that each is free to rotate in a horizontal plane. These magnets, when disturbed, settled down into groups of more or less stable equilibrium, which are gradually broken up under the influence of increasing magnetic forces. This model suggests the novel and most important conclusion that the act of magnetisation is accompanied by the re-arrangement of similar groups of magnetic molecules. So closely does it reproduce the behaviour of iron, that it is possible not only to imitate the more prominent phenomena, to copy the curve of magnetisation, and the loops produced by cyclic forces, but also to detect minor details which were for long overlooked in iron itself.

Throughout these theoretical researches Prof. Ewing has paid attention to their practical applications. The well-known phenomenon which he has named "hysteresis" plays an important part in the action of transformers. He has, on this account, invented two instruments by which the magnetic properties of samples of iron can be readily tested.

Prof. Ewing's researches on magnetic induction are described in a series of memoirs published in the *Transactions* of the Royal Society, and in a number of shorter papers which appeared chiefly in the *Roy. Soc. Proc.* and the "Reports of the British Association." He ranks as one of the principal authorities on a subject of great theoretical and practical importance. He has thrown light upon the theory, and has facilitated its application to industry.

DAVY MEDAL.

Prof. William Ramsay, F.R.S.

Prof. Ramsay's earlier researches were in the department of organic chemistry. Nearly twenty years ago he was carrying on researches on picoline and its derivatives, which were published in the *Phil. Mag.* for 1887 and 1888, and on quinine and its decomposition products, the results of which were published in the *Chem. Soc. Trans.* for 1878 and 1879.

Prof. Ramsay's later researches have been more devoted to subjects in the borderland dividing chemistry and physics. In 1879 and 1881, he published in the *Chem. Soc. Trans.* four papers on molecular volumes, and between the years 1880 and 1892 he communicated to the Royal Society eight papers on the critical state and properties of liquids, two being published in the *Proceedings*, and six in the *Phil. Trans.* In 1893 he published the results of researches on molecular surface energy in the *Phil. Mag.*, the *Chem. Soc. Trans.*, and the *Proc. Roy. Soc.* In 1893 he communicated to the *Phil. Mag.* a very important paper on the expansion of rarefied gases.

But the researches on which the award of the Davy Medal to Prof. Ramsay is chiefly founded are, firstly, those which he has carried on, in conjunction with Lord Rayleigh, in the investigation of the properties of argon, and in the discovery of improved and rapid methods of getting it from the atmosphere; and, secondly, his discovery in certain rare minerals of a new elementary gas which appears to be identical with the hitherto hypothetical solar element, to which Mr. Lockyer many years ago gave the name of "helium." The spectrum of this terrestrial gas was seen at first as an extremely narrow and sharp line of a brilliant yellow colour, close to, and slightly more refrangible than, the sodium lines D_1 and D_2, and having a wave-length near to 5876, this, according to recent determinations, being the wave-length of the solar line of helium, or, as it is usually designated, D_3. Shortly after its discovery, Prof. Runge, of Hanover, announced that the yellow line of Ramsay's gas was double, consisting of a strong component having a wave-length of 5875·88, and a faint component having a wave-length of 5876·21. As no observer had seen the solar line, D_3, double doubt was thrown on the first assumption that Prof. Ramsay had actually isolated a solar element hitherto unknown on the earth. Within the last few weeks, however, Dr. Huggins, in England, and Prof. Hale, in America, have detected the presence of a faint luminous companion of D_3 in the spectrum of the chromosphere, and as these solar lines have the same wave-lengths as those of the corresponding terrestrial lines, the doubts at first raised have been set at rest. The body giving rise to the solar line D_3, and Prof. Ramsay's new gas from cleveite, uraninite, bröggerite, monazite, and many other rare minerals, is now admitted by chemists, physicists, and astronomers to be the same substance—helium.

The conferring of the Davy Medal on Prof. Ramsay is a crowning act of recognition of his work on argon and helium, which has already been recognised as worthy of honour by scientific societies in other countries. For his discoveries on these gases he has already been awarded the Foreign Membership of the Société Philosophique de Genève, and of the Leyden Philosophical Society. He has had the Barnard Medal of the Columbia College awarded to him by the American Academy of Sciences, and within the last few weeks he has been elected a Foreign Correspondent of the French Académie des Sciences.

Five years have now passed since you elected me to be your President. Living at a distance of 400 miles from London, I felt that it could not be possible for me to accept the honour when the possibility of its being offered to me was first suggested. I accepted, with much misgiving as to my ability to perform the duty which would fall upon me; and now, after having been re-elected four times, I feel that if the interests of the Society have not suffered under my Presidency, it is chiefly because they have been so faithfully and unintermittently cared for and worked for by the other officers, the Treasurer and the Secretaries, who have left nothing undone that could be done to promote the welfare of the Royal Society. For their unfailing kindness to myself I can only offer my heartfelt thanks. I soon found that what I looked forward to with apprehension—the Council meetings, and as many of the ordinary meetings as I could attend, during my University session in Glasgow—were the reverse of fatiguing; and I am only sorry that I have been so many times obliged to forego the pleasure of performing that part of my Presidential duty. I look back otherwise with unmixed pleasure to all the meetings at which I have presided, and my sole regret now is—I cannot disguise it, and it is a very keen regret—that these five years are passed, and that to-day I cease to be your President. I thank you all, my colleagues of the Royal Society, for electing me five times to be your President, for

forgiving me all my short-comings, and for the inestimable benefit which you have conferred on me by giving me your friendship.

In the evening a large number of the Fellows and their guests dined together at the Hôtel Métropole. Among those present being M. Marey, who attended officially as President of the Paris Academy of Sciences.

DR. DUBOIS' "MISSING LINK."

THE opening scientific meeting of the session of the Royal Dublin Society, on November 20, was of especial interest, owing to the presence of Dr. Eugene Dubois, who exhibited the famous remains which he discovered in Java. The chair was taken by Prof. W. J. Sollas, F.R.S. Dr. Dubois read a paper "On *Pithecanthropus erectus:* a transitional form between Man and the Apes," which will very shortly be published by the Society, and which was illustrated by a number of lantern slides made in Dublin for this lecture. He said that when he was invited by Prof. Cunningham to read a paper before the Royal Dublin Society, he did not for a moment hesitate to comply, as he was anxious to get as much criticism as possible. By order of the Dutch Indian Government he conducted, from 1890 to 1895, explorations of a fossil vertebrate fauna, of which some remains had been discovered many years ago by Junghuhn and others. These vertebrate remains, which were found abundantly at Trinil on the southern slope of the low Kendeng Hills, were obtained from beds of cemented volcanic tuff, consisting of clay, sand and consolidated lapilli, which were rearranged by fluviatile action. The whole formation attains a maximum thickness of over 350 metres. In these strata the Bengawan River has cut its channel 12 to 15 metres in depth. These beds lie unconformably upon beds of marine marl, sand and limestone, which have recently been determined by Prof. Martin to be of Pliocene age. In August 1891, Dr. Dubois came upon a very rich layer of fossil bones, in which the remains in question were found; this occurred in the lapilli deposit, or fine gravel, about five inches above a bed of coarse gravel, which rests on a black clay. The layer of bones lies a little below the dry-season level of the river. The river-bank was excavated with such care that the position of each specimen was accurately known. In September a wisdom tooth was discovered, and a month later the skull-cap was found about one metre distant, and at precisely the same level. The work was interrupted by the rainy season, but was renewed in May 1892; the left femur was found in August, at distance of about 15 metres from the calvaria, and in October a second molar, at a distance of 3 metres from where the skull-cap was found, and in a direction towards the place where the femur had been dug out. Among the associated animals may be mentioned large numbers of Stegodon, specimens of hippopotamus (Hexaprotodon), hyæna, several species of deer, Bubulus, a gigantic pangolin three times as large as the existing Javan form, &c. The four remains were all in the same state of fossilisation as the animal remains, the weight of the femur being nearly three times that of a recent femur. Doubt had been expressed whether the four remains belonged to the same individual; Dr. Dubois himself had no doubt on this point, as he had often found bones from the self-same skeleton, and even fragments of a single bone, at similar distances apart; never had he found a complete skeleton. He had good reasons for believing that the animals perished in volcanic catastrophes, and their corpses were brought down a large Pliocene river, so that before the bones were finally deposited and buried they must have been separated by the rotting of the flesh; and there are evidences of crocodiles having preyed upon the carcases.

The femur is so human-like that nearly all anatomists did not hesitate to declare it to be human; but up to the present no human remains had been found in the Lower Pleistocene, the oldest only reach down to about the middle of that period. Nobody had the slightest doubt that the bone must have belonged to a form with an erect posture. Only Virchow repeatedly maintained, even after seeing it, that it belonged to an ape, probably Hylobates, because it has, in his opinion, a straight, shaft such as never occurs in man; but the audience could easily see that the shaft of the fossil was by no means straight, and Dr. Dubois demonstrated some features which he had never seen in human femora, but which he believed to be simian characters.

For normal human proportions the capacity of the cranium was too small for the femur; but microcephalic skulls of the class which may be regarded as atavistic can be even relatively smaller, while the height of the body is more than that of Pithecanthropus, as computed from the length of the femur. Such was the case of the microcephalic idiot, Joe, described by Prof. Cunningham. The length of the Java cranium is 185 mm., its breadth 130 mm. The same dimensions in an average female chimpanzee's skull are 132 and 91, and those of a Hylobates 95 and 69. The internal capacity he estimated at 1000 cubic centimetres. The largest skulls of the anthropoid apes average about 500 c.c. Normal human skulls are known of an equal or even less size than the Java cranium; but these small skulls are always associated with a small body. The chances are enormously against this being the skull of an idiot, and no microcephalic skull shows such a flattening of the parietal region. The orbital part of the skull is quite different from that of man, but the inclination of the nuchal plane is far more human than simian. From the genus Hylobates he could only find a difference in size and in the downward slope of the occiput; the resemblance between the two was most striking if the former was enlarged two diameters.

A divergence of opinion also prevailed as to whether the teeth were human or simian; they were larger than human teeth, and the cusps showed a relative development which was characteristically simian.

From the whole geological and anatomical investigation it followed that in each of the four specimens they had evidence of a form intermediate and transitional between man and anthropoid apes. The problem was as to the exact position of this creature in the tree of genealogical descent.

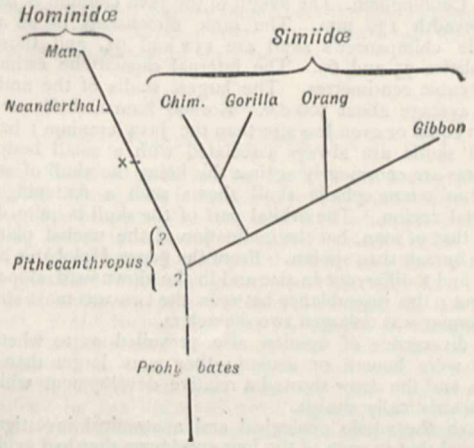
Dr. D. J. Cunningham, Hon. Secretary of the Society, believed the specimens to be of supreme importance. Discussing Dr. Dubois' memoir at a previous meeting of the Royal Dublin Society, he had expressed the view that the cranium was distinctly human, and he still held that an unbiassed study of the published description and figures could lead to no other conclusion. Now, however, when he was brought face to face with the actual specimen, he failed to see in it any decided and leading human feature, except its capacity of 1000 c.c. He agreed with Dr. Dubois in considering that it most resembled the cranium of Hylobates, although he was of opinion that Dr. Dubois slightly exaggerated the relative height and quality of the cranial arch in Hylobates. In this respect he considered that, if fairly tested, the fossil cranium would be found to be superior to any known ape. Certainly the cranial arch was vastly superior to that of a gorilla, chimpanzee, or orang, and he believed also that it was relatively fuller and loftier than the most highly-arched Hylobates cranium. Dr. Dubois placed some stress upon the inclination of the nuchal area of the occipital bone, and thought that in this there was a human characteristic; but he (Dr. Cunningham) thought that this region of the cranium was extremely ape-like, and, further, he did not altogether consider that the means which Dr. Dubois had taken to determine the degree of this inclination were calculated to yield absolutely trustworthy results.

With regard to the femur, he had nothing to add to what he had previously said on this subject. It was a human bone, and while he fully appreciated the distinctive points alluded to by Dr. Dubois, he thought that Dr. Dubois had not made sufficient allowance for the variation to which this bone was liable. It was, to say the least of it, strange that a thigh-bone of such undoubted antiquity should exhibit none of those characteristics which we were in the habit of associating with prehistoric femora, as well as with the femora of rude and savage races of the present day. It showed no signs which would indicate that the individual to whom it belonged was in the habit of assuming the squatting attitude.

In so far as the two molar teeth were concerned, he still held that the features which they exhibited were more human than simian, although it could not be denied that they also exhibited some very decided ape-like characters.

The question as to the place which should be assigned to the fossil form on the genealogical tree was a most interesting one. On this point he differed entirely from Dr. Dubois. Dr. Dubois placed Pithecanthropus below the point of devarication of the anthropoid apes from the human line. Dr. Cunningham, on the other hand, placed it on the human line, a short distance above the point at which the anthropoid branch is given off. In urging this view, he stated that he could not believe that an ape-form with a cranial capacity of 1000 could be the progenitor of the man-like apes, the largest of which had a capacity of only 500.

Such a supposition would necessarily involve the assumption that the anthropoid apes were a degenerated branch from the common stem. This view he explained by means of the accompanying diagram.



Prof. Haddon said: Ever since the evolution hypothesis had shed such an illumination upon nature, biologists had believed in the previous existence of forms intermediate between man and the lower animals; and it was with a fearful joy that they heard of Dr. Dubois' discovery, and then they subjected the remains to a searching criticism, with the result that all agreed that the individual to whom the cranium belonged was transitional in character between the apes and man—some thinking him more ape-like, and others more human; balancing the one set of opinions against the other, they could only come to the opinion that it was an intercalated type. Whilst agreeing with Dr. Dubois in all his statements of fact, he concurred with Prof. Cunningham in thinking that the size of the cranium was an insuperable difficulty in the way of placing the individual to which it belonged below the point in the genealogical tree where the anthropoids branched off. Palæontological evidence points to the fact that in the evolution of any series of mammals the brain tends to increase in size; at all events, there is no known case of a brain decreasing to less than half its original dimensions. Nor did it appear to him to meet the case to suppose that by doubling the body of a gibbon the brain would be equally doubled in size; there was no such proportion between body growth and brain growth.

Dr. Pearsall, a leading dental surgeon in Dublin, made some remarks about the teeth, and said that the human characters of the teeth were very striking.

Prof. Sollas agreed with the preceding speakers as to the invaluable evidence afforded by these fossil remains. They indicated an organism which was either a pithecoid man or a remarkably human ape; which of these alternatives might prove to be true was a matter of secondary importance, the fact remained that we had before us traces of the most simian ancestor of the human race yet known.

The materials for determining its geological age were abundant, but not yet fully worked out. Dr. Dubois, however, stated that the associated mammalian fauna stood in close relation to that of the Nerbadá beds and the Upper Siwaliks of India; and so far as it might be possible to correlate the Javan deposits with those of Europe, they would appear to be older than our river-drifts, and possibly on the same horizon as the forest-bed of Norfolk. In this case the intervals in time, and the differences of structure which separate the Javan fossils from the race of Spy, and this from existing man would be, so to speak, proportional.

In the Miocene times we first meet with a few modern genera struggling to the front from a crowd of competitors; and in the Pliocene a few modern species emerge, and thus, in the case of the human race, we might expect to find the existing species *Homo sapiens* replaced by some earlier representative, say *Homo innocens* in the Pliocene, and the genus *Homo* by allied though different genera of the family *Hominidæ* in the Miocene. While, however, *Hominidæ* are not yet known from the Miocene, remains of anthropoid apes, (*Dryopithecus*) are, and thus what palæontological evidence exists lends no favour to the view that the anthropoids are degenerate descendants from the human stem. Thus Prof. Sollas was less inclined to agree with Dr. Dubois than with Prof. Cunningham in estimating the human characters of the Javan fossils.

Dr. Dubois thanked the Society for the honour they had done him and for their kindness. He explained why he placed Pithecanthropus in a different position in the genealogical tree from that assigned to him by Prof. Cunningham. They knew very little about the laws of evolution, which in some cases proceeded slowly and in others quickly.

The proceedings then terminated.

SCIENCE IN THE MAGAZINES.

SEVERAL articles on more and less scientific topics appear in the *Contemporary*. Mr. Herbert Spencer contributes the seventh of his series of articles on the development of professional institutions, the subject this month being the teacher. It is shown that the primitive conception of the teacher is the conception of one who gives instruction in sacred matters, so that the priest and teacher were identical. The priesthood is, for a long time, the sole source of knowledge, but in the course of evolution the teaching functions of the priest are shared by a non-priestly class, and thus the secular educator comes into existence. Mr. Spencer quotes, in support of this theory of development, extracts from the records of peoples, past and present, in various parts of the world. The evidence adduced goes to show "how teaching was in the beginning exclusively concerned with religious doctrines and rites, and how there eventually began to rise a teaching which, in some measure detached from the religious institutions, at the same time entered upon other subjects than the religious." In some cases, the normal genesis of teachers from priests was interfered with, but that does not alter the general fact of such development. The differentiation of the teaching class from the priestly class is even now incomplete, for a large number of the private schools in our own kingdom are carried on by clergymen. Finally, as in other professions, segregation and consolidation into unions and associations have followed upon differentiation.

M. Berthelot, the renowned chemist, lately appointed French Minister for Foreign Affairs, was a close friend of Renan. A few incidents referring to that friendship, and what Renan might have thought of the appointment, are given in the *Contemporary* by Mr. Albert D. Vandam. The same review contains the first instalment of an article on "Physics and Sociology," by Mr. W. H. Mallock. The character of the article is sufficiently indicated by the following headings of the sections. (1) On the application to social phenomena of the methods and principles derived from physical science; (2) on the crucial difference between the subject-matter of physical science and that of social science, which render the method of study proper to the first inadequate when applied to the second; (3) on the deliberate rejection by contemporary sociologists of the methods by which, in social science, the methods of physical science must be supplemented; (4) on the nearness with which contemporary sociologists have approached the methods of study, which they have nevertheless missed or rejected. The *Contemporary* also contains articles on the Secondary Education Report, by Prof. J. Massie; Mr. Balfour's philosophic writings, by Mr. Norman Hapgood; and a reply, by Prof. A. A. Bevan, to an article in which Prof. Sayce dealt with Biblical criticism from an archæological point of view.

The first number of the English series of the *Popular Science Monthly* contains a large amount of readable matter on scientific topics. Accompanying a description, by Mr. H. P. Fitzgerald Marriott, of the Palæolithic skeletons discovered near Mentone in 1892 and 1894, are three good illustrations reproduced from photographs of the remains. Prof. Sully contributes an interesting paper entitled "Studies of Childhood," and there are also popular articles on consumption, the saltness of the sea, and other subjects. We notice a letter entitled "Are Animals Left-handed?" by Mr. D. S. Jordan. Several observers have stated that parrots grasp and hold food with the left claw, but Mr. Jordan concludes from his observations that "the appearance of left-footedness is due entirely to the fact that those who offer the finger or food to parrots do so as a rule with the right hand. Repetition of this process makes the parrot more or less left-footed in time."

Lieut. B. Baden Powell describes his "Air-Car, or Man-

lifting Kite" in the *National*, and expatiates upon its superiorities over the balloon. The machine consists of a varying number (usually four or five) of sails of a flattened hexagonal shape. These are connected, one behind the other, to the ground-line, from which latter is suspended a basket-car, which has a parachute spread out above it in case of accident. The number of kites required to lift the car depends upon the wind. Lieut. Powell has tried his kites on several occasions, once during the meeting of the British Association at Ipswich, and though the result has in a few cases been disappointing, yet on the whole they have been very successful. To sum up, he remarks: "We have here a machine capable of lifting a man safely to a height, which has many advantages over a balloon. It is infinitely more portable; it is infinitely less costly. It requires no reserve supplies, and is not precluded from ascending by too much wind. It is practically invulnerable, and it promises to be of use in many circumstances rendering a balloon impracticable." What Lieut. Baden Powell specially wants is that the War Department, or the Treasury, should thoroughly investigate his invention and completely put it to the test. Our present Army Balloon establishment costs £3000 a year, and Lieut. Powell thinks most of this would be saved if the air-car were used, and with no loss of efficiency.

In a long paper contributed to the same *Review*, Mr. Mortimer Granville gives to the world "A New Theory of Gout." It is for students of chemical physiology and pathology to estimate the value of the evidence brought forward; all we need do is to indicate the kind of conclusions arrived at, viz.: (1) That gout is not a malady having for its cause an over-production of uric acid. (2) Gout is a malady which has for its cause the presence in the organism of an undue proportion of leucocytes, not necessarily in the blood, but in the organs and tissues generally. (3) If this view of gout be the true one, the treatment of the malady must be the treatment of leuchæmia or anæmia. In other words, efforts should be made, by means of a meat diet, to multiply the red corpuscles in the blood, and so assist in bringing about a reduction of the white corpuscles—uric acid makers—within normal limits.

In *Scribner's Magazine*, under the title "Wild Beasts as they Live," Captain C. J. Melliss, a well-known authority on lion and tiger hunting, describes those animals from a sportsman's point of view, his article being illustrated by reproductions from a remarkable series of etchings of wild animals, by Evert van Muyden. Among the articles in *Knowledge*, we notice "The Filtration of Water," by Dr. S. Rideal; "Whip Scorpions and their Ways," by Mr. R. I. Pocock; and "New Stars," by Dr. A. Brester.

A passing reference must suffice for the remaining articles on scientific subjects in the magazines received by us. A paper on "The Limits of Natural Selection," contributed to the *Humanitarian* by Prof. C. Lloyd Morgan, is accompanied by a portrait of the author. A description of the arrangements made for the International Exhibition of 1900, with a plan showing where the exhibition will be placed, how the grounds will be divided, and what will be the names of the principal buildings, is given in the *Century*. Mrs. Lecky has in *Longman's* a very interesting account of the Institute of France, and the recent centenary celebrations. Among the subjects of popular articles in *Chambers's Journal*, we notice "The Metal Platinum," "Living Barometers," "Ivory," "Our Simian Cousins," "The Ancient Incas of Peru."

In addition to the magazines mentioned in the foregoing, we have received the *Fortnightly Review*, *Strand Magazine*, *Good Words*, and the *Sunday Magazine*, but no articles in them call for comment here.

SCIENTIFIC INVESTIGATIONS OF THE FISHERY BOARD FOR SCOTLAND.

THE part of the thirteenth annual report of the Fishery Board for Scotland, dealing with the principal scientific investigations carried on in 1894, in connection with the sea fisheries under the charge of the Board, has recently been issued. An idea of the scope and value of the work done may be obtained from the following summary:—

In the course of the year, the investigations, which were carried out under the supervision of Dr. T. Wemyss Fulton, were prosecuted on the same general lines as in previous years, and have resulted in further extensions of knowledge respecting the life-histories and habits of the fishes which form the basis of the fishing industry, and of the operation of certain methods of fishing in relation to the food supply. Besides such inquiries, which are necessary for the proper conservation and regulation of sea fisheries, the operations in the hatching and artificial propagation of some of the more important food fishes have been continued at Dunbar Marine Hatchery, which was completed last year, and which have resulted in the addition of over forty-five millions of the fry of plaice, turbot and cod to the fishing-grounds along the neighbouring coast. Similar establishments are now in operation in the United States, Canada, Newfoundland and Norway, and others are in process of being formed in France and in Lancashire.

As in previous years a large part of the scientific inquiries, both biological and physical, have been carried on or rendered possible by means of the *Garland*, the small steamer obtained by the Board for this work; but, as has been mentioned in previous reports, her small size has curtailed the extent and usefulness of the investigations.

Part of the scientific work was also carried on at the marine laboratories at St. Andrews and Dunbar.

The Hatching and Rearing of Food Fishes.

In last year's report the reasons which induced the Board to establish a hatchery for sea-fishes at Dunbar were given, together with a detailed description and plans of the building, and an account of the work during the first season it was in operation. The present report contains an account by Mr. Harald Dannevig, who is in charge of the hatching work, of what has been accomplished during the current season, and of the work now in progress. It is satisfactory to be able to note that the various pumping and incubating apparatus have continued to work well and without any hitch, and that the number of fry of the food fishes which have been successfully dealt with this season considerably exceeds the number turned out last year.

The great majority of the young food fishes which have been propagated have consisted of plaice, of which 44,085,000 eggs were obtained from the spawning pond, yielding 38,615,000 fry. The number of cod hatched numbered 2,760,000, and the number of turbot 3,800,000. This seems to be the first time that the eggs of the turbot have been hatched at any hatchery, and the success in this respect has enabled the development of this important fish to be studied and described by Prof. M'Intosh.

In regard to the practical results of marine pisciculture in adding to the fish supply, it may be stated that in the United States, Newfoundland and Norway—where cod alone has been propagated on a large scale—according to the official reports published in these countries the abundance of young cod has been materially increased. In the neighbourhood of the hatchery on Dildo Island, Newfoundland, the shoals of this fish were so numerous during the past season that they were described as a "solid thick mass covering the bottom for long distances on both sides of the island," and it is stated that fishermen from other parts, on hearing of the abundance of cod, came to Dildo to fish. Sufficient time has not, of course, elapsed since active operations were begun at Dunbar to afford any indication as to the influence of the work in increasing the fish supply, but there are some points of importance that may be considered in connection with the subject. There can be no doubt that the great majority of the fry distributed on the fishing grounds are destroyed from natural causes; but if only a fraction of one per cent. survive, the resulting benefit would far exceed the expenditure upon the work. If one in a hundred of the fry distributed from the hatchery survived, and if the price of the marketable fish be placed at sixpence, the resulting value to the fisheries would be about £18,000. It would require the survival of only one in a thousand, and the marketable fish to be sold at only one penny each, to cover the expenses of the work.

The Influence of Marine Currents in Transporting Floating Eggs and Larvæ from Offshore Spawning Areas.

Previous investigations have shown that the inshore waters are destitute of spawning grounds for the great majority of the food fishes, and that they receive their supplies from the spawning areas situated at some distance from shore. In the present report a preliminary account is given, by Dr. T. Wemyss Fulton, of experiments which have been made to determine the influence of marine currents in transporting the floating eggs and young fishes to various parts of the coast. It is shown that they may be carried in the course of their development long distances in a

definite direction, to other parts of the coast, and that the fish supply of a given area of the territorial waters on the east coast may be derived, not from the spawning areas *ex adverso*, but from those situated further north.

THE LIFE-HISTORIES AND DEVELOPMENT OF THE FOOD FISHES.

The report contains an important paper by Prof. M'Intosh, giving the results of his continued investigations on the eggs, young, and development of several of the food fishes, the work having been carried on, as in previous years, at St. Andrews Marine Laboratory. The principal investigation relates to the development of the turbot, which has now for the first time been elucidated, fertilised eggs having been procured from the hatchery. The ripe egg of the turbot has an average diameter of 1·0287 mm., and is perfectly buoyant, floating at the surface of still water or suspended midway, and it possesses a prominent oil-globule. The embryonic fish, which is of a reddish colour, emerges from the egg about the sixth or seventh day, so that the period is short before hatching occurs. The larvæ in a few days become active and dart rapidly through the water, and they are hardy; the yolk-sac becomes absorbed about the seventh day, and thereafter they feed for themselves, being extremely quick in noticing the movements of the minute crustaceous and other forms in the water around them. Prof. M'Intosh states that no form hitherto observed at St. Andrews appeared to be more hardy, or to undergo the vicissitudes of temperature and manipulation with greater impunity than the young turbot; there are grounds, therefore, for expressing the hope that they may yet be reared in great numbers from the post-larval to the adolescent and adult condition in suitable enclosures. The various stages in the development of this valuable form are described and figured. Another species whose development is described is the long rough dab, the pelagic eggs of which are found in considerable abundance in March and April.

Mr. H. Charles Williamson contributes an elaborate paper on the reproduction of the common eel, which has been, and still is, in many respects, involved in considerable obscurity. He gives a very full account of the reproductive organs, both as described by other naturalists, and as observed by himself in a number of specimens examined at St. Andrews; and the paper includes a description of the migrations of the eel, and all that has been ascertained about its spawning. It is a remarkable fact that the ripe egg of the eel has never yet been discovered.

Mr. Williamson also gives a detailed account of the distribution of the pelagic eggs and larvæ of various species of food fishes, obtained in tow-nets, including those of the plaice, haddock, cod, whiting, saithe, sprat, dab, turbot, gurnard, long rough dab, flounder, &c. In another paper he describes the variation in the size of the eggs of a number of the food fishes. Dr. Fullarton has also furnished an elaborate description of the larval and post-larval development of the brain in the lesser sand-eel (*Ammodytes tobianus*), accompanied by illustrations. The important subject of the rate of growth of fishes is at present receiving considerable attention in connection with fishing questions. In the present report Mr. Arthur T. Masterman gives the result of his researches on the subject at St. Andrews, dealing especially with the rate of growth of the plaice.

Mr. Harald Dannevig also furnishes an account of the experiments he has made in regard to the influence of variations of temperature in accelerating or retarding the development of the eggs of fishes. The species dealt with were the plaice, cod, haddock, whiting and flounder.

Finally, the report contains a paper, by Mr. Thomas Scott, on the fauna of the Firth of Forth area and of inland waters; Mr. A. J. Herbertson contributes an elaborate paper, accompanied by numerous tables, dealing with the physical observations on the temperature and density of the sea; and Dr. Wemyss Fulton gives an account of the scientific fishery work and the condition and regulation of the sea fisheries in other countries possessing them, and of the principal methods employed to protect and develop them.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Dr. A. R. Forsyth, F.R.S., Sadlerian Professor of Pure Mathematics, has been appointed by the Council of the Senate a member of the Governing Body of Eton College, in the room of Dr. Ferrers, F.R.S., resigned.

An Isaac Newton Studentship in Astronomy and Physical Optics will be vacant in the ensuing Lent term. The studentship is of £200 per annum for three years. Candidates must be at least B.A.s of the University, and under the age of twenty-five on January 1, 1896. Their names should be sent to the Vice-Chancellor between January 14 and 24 next, together with statements as to course of study or research proposed in each case.

The Observatory Syndicate report that they have abandoned the expectation of receiving public subscriptions for the proposed photographic telescope. They now contemplate the erection of a triple apochromatic telescope, the objective of which is to be furnished by Messrs. Cooke, of York, at a cost of £550. The tube of the instrument will be hinged, the larger part of the tube with the eye-piece lying in the polar axis. The rays from the objective at the end of the short movable part of the tube will fall on a flat mirror at the hinge, and be thence reflected to the eye-piece. The flat mirror will be furnished as a gift by Dr. Common, and Sir Howard Grubb is to be entrusted with the construction of the tube at a cost of £1100. The necessary moneys it is proposed to draw from the Sheepshanks Funds, and the Syndicate ask the Senate to sanction this appropriation.

Prof. Ewing, F.R.S., has been appointed Chairman of Examiners for the Mechanical Sciences Tripos, 1896. Among the annual appointments of members of the various Boards and Syndicates are the following:—Mr. Glazebrook, F.R.S., General Board of Studies; Mr. W. Gardiner, F.R.S., and Mr. W. Bateson, F.R.S., Botanic Garden Syndicate; Mr. Love, F.R.S., Library Syndicate and Observatory Syndicate; Mr. Heycock, F.R.S., Museums Syndicate; Dr. Hobson, F.R.S., Proctorial Syndicate, and Mathematical Board; Mr. Capstick, Highest Grade Schools; Prof. Bradbury and Dr. Shore, State Medicine; Dr. D. Hill, Agricultural Science; Mr. Shaw, F.R.S., Fire Prevention, and Board for Physics and Chemistry; Dr. A. MacAlister, Special Board for Medicine; Dr. Gaskell, F.R.S., Board for Biology and Geology.

It is proposed to invite representatives of the chief educational authorities and institutions to meet in Cambridge during the ensuing Long Vacation, in order to confer on questions arising out of the Report of the Royal Commission on Secondary Education. The Vice-Chancellor, on behalf of the University, will convene the conference.

THE Calendar of the University College, Nottingham, for the fifteenth session, 1895-96, has been issued.

THE following are among recent appointments:—Dr. J. Munk to succeed Dr. Gad at the Berlin Physiological Institute; Dr. Paul Kempf and Dr. Wilsing, of the Potsdam Astrophysical Observatory, to be Professors; Prof. Theel, of Stockholm, to be Director of the Natural History Museum there; Dr. Strahl, of Marburg, has been appointed to the chair of Anatomy in Giessen University.

THE *London Technical Education Gazette*—the official organ of the Technical Education Board of the London County Council—contains the following satisfactory announcement:—"It has been part of the policy of the Technical Education Board in connection with higher education, and will be, if possible, through the proposed Teaching University of London, when that University is established, to secure for students who can devote their evenings only to study, a course of instruction of the highest type in all branches for which provision is now made for day students in the universities and university colleges, and to provide that the teachers of these classes shall be the same professors as take the day classes, or others of equal standing. As a step in this direction the Board has arranged with the authorities of University College for the conduct of four courses of lectures and practical work in the departments of Mechanical Engineering, Electrical Engineering, Chemistry, and Applied Mathematics."

SOCIETIES AND ACADEMIES.

LONDON.

Chemical Society, November 7.—Mr. A. G. Vernon Harcourt, President, in the chair.—The following papers were read:—On flame temperatures and the acetylene theory of luminosity, by A. Smithells. The author criticises adversely Lewes's theory of the luminosity of hydrocarbon flames on the ground of ex-

perimental evidence.—A new series of hydrazines, by F. D. Chattaway and H. Ingle. The quaternary hydrazines of the general formula $R_2N.NR_2$ may be prepared from secondary amines by acting on the sodio-derivatives of the latter with iodine.—The action of certain acidic oxides on salts of hydroxy-acids (part ii.), by G. C. Henderson and D. Prentice. A number of crystalline compounds of antimonious and arsenious oxides with salts of citric, malic and mucic acids have been prepared.—Sodium nitrososulphate, by E. Divers aud T. Haga.—The constitution of nitrososulphates, by E. Divers and T. Haga. In these two papers the authors detail evidence showing that the nitroso-sulphates are true sulphates of the constitution $RON_2.O.SO_3K$.—Normal hexane from light petroleum (petroleum ether), by G. L. Thomas and S. Young. Employing their recently described form of dephlegmator, and treating the fractions with mixed nitric and sulphuric acids, the authors have been able to separate an almost pure sample of normal hexane from light petroleum.—The vapour pressures, specific volumes and critical constants of normal hexane, by G. L. Thomas and S. Young. The critical temperature, pressure and volume of a gram of synthetic normal hexane are 234°.8, 22510 mm. and 4·268 c.c. respectively: the oil boils at 69°·0 under 760 mm., and has the specific gravity 0·67696 at 0°.—Acidylthiocarbimides, by A. E. Dixon.—Some constituents of the root of *Polygonum cuspidatum*, by A. G. Perkin. From the roots of this plant, which is a native of China and Japan, the author has separated a new glucoside, cuspidatin, $C_{21}H_{20}O_{10}$, which yields emodin on hydrolysis; a second glucoside, emodin, and a wax were also isolated.—Note on the action of hydrofluoric acid upon crystallised silicon, by G. S. Newth. Gaseous hydrogen fluoride causes the ignition of warm crystallised silicon.—Note on the periodides of theobromine, by G. E. Shaw. The author has prepared four new periodides of theobromine and its hydrochloride.—A synthesis of diphenyloxytriazoline, by G. Young.—Note on piperovatine, by W. R. Dunstan and F. H. Carr. Piperovatine may be rapidly extracted from *Piper ovatum* by percolating the material with ether.—Dibenzaconine and tetracetylaconine, by W. R. Dunstan and F. H Carr.—Molecular volume change during the formation of dilute solutions in organic liquids, by A. W. Jones. A series of determinations of the volume changes occurring when a number of liquids are dissolved in benzene and carbon disulphide have been made.

Royal Meteorological Society, November 20.—Mr. R. Inwards, President, in the chair.—A paper by Mr. J. Eliot, F.R.S., was read, on the origin of the cold weather storms of the year 1893 in India, and the character of the air movement on the Indian seas and the equatorial belt, more especially during the south-west monsoon period. This was really a discussion of the data contained in the *Indian Monsoon Area Charts*, the publication of which was sanctioned by the Indian Government for the two years 1893-4. Cyclonic storms are of frequent occurrence during both the north-east and the south-west monsoons, but they differ in many important respects. The storms of the south-west monsoon originate almost invariably over a sea surface, and travel in very variable directions, and occasionally develop into intense and furious hurricanes. The cyclonic storms of the north-east monsoon almost invariably originate over the plateau of Persia or Baluchistan, or in North-Western India, and travel in an easterly direction at a velocity ranging between fifteen and twenty miles per hour. These plateau-formed storms of the cold weather are the chief instruments of the distribution of the moderate rainfall essential for the great cold weather wheat and other crops of Northern India, and are the chief sources of the snowfall of the Western Himalayas. After giving an account of the more important cold weather storms in January and February 1893, and the results of the tabulation of the wind observations for the equatorial belt, the author describes the "burst of the monsoon." Mr. Eliot says that the evidence of the year 1893 is strongly in favour of the supposition that the south-west monsoon currents in the Indian seas are the direct continuation north of the equator of the horizontal movement of the south-east trade winds; and that the larger variations in the strength of the south-east trades near the equator during the monsoon period are reproduced in the monsoon currents in the Indian seas from June to September.—Mr. W. H. Dines showed an interesting experiment to illustrate the formation of the tornado cloud. The characteristic funnel cloud was readily seen extending from the tray of hot water to the mouth of the pipe at the top of the box, and when the draught was strong and the conditions favourable, a decided protuberance was observed on the surface of the water just under the end of the cloud. Mr. Dines is of opinion that the cloud is formed by true dynamic cooling as the air, saturated by the vapour from the hot water, comes under the influence of the decreased pressure at the centre.—A paper by Mr. C. Davison was also read, on the diurnal variation of wind velocity at Tokio, Japan.

Malacological Society, November 8.—Prof. G. B. Howes, President, in the chair.—The following communications were read:—Descriptions of new species of terrestrial and fluviatile mollusca from the Hadramaut, South Arabia, by J. C. Melvill and J. H. Ponsonby.—Notes on the anatomy of *Hanleya abyssorum*, M. Sars: (*a*) on the presence and position of an osphradium; (*b*) general notes, by R. H. Burne.—Description of a new species of the genus *Cassis*,, by G. B. Sowerby.—Description of a new species of *Vitrina* and new forms of *Helicidæ* together with a list of the Helicoid land-shells hitherto found in the Canary Islands, by G. K. Gude.—Description of a new species of *Streptaxis*, by G. K. Gude. Specimens in illustration of their respective papers were exhibited by the authors.—Mr. Da Costa exhibited a series of land-shells from the Galapagos Islands. Mr. Moss exhibited a white *Helix perplexa*, Fér., from Grenada.—Mr. Sykes exhibited land-shells from a deposit at Blashenwell, Dorset.

PARIS.

Academy of Sciences, November 25.—M. Marey in the chair.—On para-ethoxyquinoline, by M. C Grimaux. The production and properties of para-ethoxyquinoline and some of its derivatives are described. Conforming to Skraup's nomenclature, the name quinethol is given to this substance and its derivatives are termed nitroquinethol and amidoquinethol.—Observations of small planets, made with the great equatorial of Bordeaux Observatory, by MM. G. Rayet, L. Picart, and Féraud.—M. Lannelongue has been nominated by vote as member of the Medicine and Surgery Section of the Academy.—The rapid estimation of nitric nitrogen in vegetable products, by M. P. Pichard. The method is a colorimetric process based on the colouration produced when nitric acid acts on brucine.—Observation of the new comet Perrine (November 16, 1895), made at Marseilles Observatory, by M. Esmiol.—The polar snows of Mars, by M. Camille Flammarion. A comparison of some observations by the author with observations recorded at Lick Observatory.—On the displacement of a trihedral trirectangle around its summit, the position of this trihedral figure depending on two parameters, by M. Maurice Fouché.—On the electro-capillary properties of dilute sulphuric acid, by M. Gouy.—Action of phenol on mercurous iodide, by M. Maurice François. It is shown that phenol has a similar action on mercurous iodide to that of aniline. A certain proportion of the salt is decomposed to mercuric iodide and mercury until a state of equilibrium is set up between this action and the reverse action. Equilibrium obtains when 100 grams of solution contain 2·75 grams of mercuric iodide.—On manganese silicide, by M. Vigouroux. The compound $SiMn_2$ has been produced (1) by the direct action of silicon on the metal, (2) by the action of silicon on the oxide, (3) by the action of carbon on a mixture of silica and oxide. It is a very hard and sonorous substance of metallic lustre, and perfectly crystallised. Its aspect is steel-grey, density at $15° = 6·6$, and it is unalterable in the air and fusible at the temperature of the reverberatory furnace. The chemical properties are given in detail in the paper.—On the toxicity of acetylene, by M. L. Brociner. A note calling attention to some of the author's work published in 1887, and prior to the recent publication on this subject of M. Gréhant.—On some reactions of tartaric acid and alkaline tartrates, by M. L. Magnier de la Source.—On the morphological interpretation of double larvæ in composite Ascidians of the genus *Diplosoma*, by M. Maurice Caullery.—On the effects produced on the rabbit and pigeon by the extraction of the stapes or of the columella and the experimental lesion of the membranous vestibule, by M. Garnault.—Laccase in fungi, by MM. Em. Bourquelot and G. Bertrand.—On the distribution of nitrogenous and mineral matters in bread, by M. Balland.

BERLIN.

Physiological Society, October 25.—Prof. du Bois Reymond, President, in the chair.—Dr. René du Bois Reymond gave an account of experiments made in repetition of Martin's, on the action of the internal intercostal muscles. He confirmed the

conclusions arrived at by this investigator, but he more particularly limited his experiments to an examination of the internal intercartilaginous intercostals. It appeared that the latter, in opposition to the expiratory action of those between the ribs, have an inspiratory function, and contract synchronously with the diaphragm. After an artificial apnœa they enter again into activity at a slightly later period than does the diaphragm, resembling in this the inspiratory external intercostals. Dr. Rawitz recommended the employment of a very dilute solution (three to five drops of the concentrated ammoniacal solution in 30 to 50 c.c. of distilled water) of either hæmatoxylin or hæmatein, when these are used for staining, either alone or as subsequent to the use of eosin. The sections should lie in this solution for twenty-four to forty-eight hours. He then spoke on the use of alizarin and alizaro-cyanin for histological purposes. These substances can only be used with a mordant, of which a chromium salt was found to be most efficient with the former stain, and a salt of iron with the latter. In this way very brilliant permanent stainings may be obtained, which are particularly suited for the investigation of nuclear division.—Dr. Benda exhibited some striking preparations of neuroglia, obtained by a method to be described later on.

Physical Society, November 1.—Prof. du Bois Reymond, President, in the chair.—Dr. Claude du Bois Reymond exhibited specimens of colour-photographs, made by Dr. Joly, of Dublin, and described how they had been obtained. Dr. Rubens gave an account of experiments made by D. C. Cole on the refractive index of water and alcohol for electrical rays of short wave-length. Having failed to obtain any results with a prism for rays of 5 cm. wave-length, he used Fresnel's formula and the reflexive powers of these fluids for vertical and parallel polarised rays. In this way he found that for water the coefficient for rays of the above wave-length is the same as for rays, as previously investigated, of 10 cm. and of 60 cm. In the case of alcohol it was markedly less for rays of shorter than for those of greater wave-length. The method was also applied to petroleum, and gave results similar to those previously obtained for this liquid by other methods.

DIARY OF SOCIETIES.

LONDON.

THURSDAY, DECEMBER 5.

ROYAL SOCIETY, at 4.30.—Studies in the Morphology of Spore-producing Members. Part II. Ophioglossaceæ: Prof. F. O. Bower, F.R.S.—On the Weight of a Cubic Decimetre of Water at its Maximum Density: Prof. Mendeleeff, For. Mem. R.S.—The Measurement of High Potential Difference: H. C. Leake, R. Leventhorpe, and C. S. Whitehead.—Variations in the Electromotive Force of Clark Cells with Temperature: Prof. Ayrton, F.R.S., and W. R. Cooper.

LINNEAN SOCIETY, at 8.—On a New Species of Bromus in Britain: G. C. Druce.—Notes on New or Rare Phasmidæ in the Collection of the British Museum: W. F. Kirby.

LONDON INSTITUTION, at 5.—Old Musical Instruments: A. Dolmetsch.

CHEMICAL SOCIETY, at 5.—The Constitution of Terpenes: Prof. Armstrong, F.R.S.—New Derivatives from α-dibromo Camphor: Dr. M. O. Forster. The Chemistry of Dibromopropyl Thiocarbimide, and the Action of Bromine and Iodine on Allyl Thiourea: Prof. A. E. Dixon.—Ballot for the Election of Fellows.

SOCIETY OF ANTIQUARIES, at 8.30.

FRIDAY, DECEMBER 6.

GEOLOGISTS' ASSOCIATION, at 8.—Notes on Indian Geology, including a Visit to Kashmir: W. H. Hudleston, F.R.S.

QUEKETT MICROSCOPICAL CLUB, at 8.

SUNDAY, DECEMBER 8.

SUNDAY LECTURE SOCIETY, at 4.30.—Lecture by Sir B. J. Richardson, F.R.S.

MONDAY, DECEMBER 9.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Exploration in the Central Alps of Japan: Rev. Walter Weston.

SOCIETY OF ARTS, at 8.—Mechanical Road Carriages: W. Worby Beaumont.

TUESDAY, DECEMBER 10.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—The Recording of High Temperatures by Photographic Means: Prof. W. C. Roberts-Austen, C.B., F.R.S.—A New Form of Apparatus for Measuring the Densities of Photographic Plates: Chapman Jones.

ROYAL VICTORIA HALL, at 8.30.—The Rhine: Prof. H. G. Seeley, F.R.S

ROYAL ASIATIC SOCIETY, at 3.

ROYAL MEDICAL AND CHIRURGICAL SOCIETY, at 8.30.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Discussion upon the Papers by Messrs. Arnold and Wrightson, on the Physical Properties of Iron and Steel.

ANTHROPOLOGICAL INSTITUTE, at 8.30.—The Game of Teetotum, Queensland: R. Etheridge.—Notes on Australian Shields, more particularly the Drunmung: R. Etheridge.—Stone Cooking-Holes and Grooves for Stone-Grinding, used by the Australian Aborigines: R. H. Mathews.—The Burbung of the Wiradjuri Tribes: R. H. Mathews.—The Bora, or Initiation Ceremonies of the Kamilaroi, Part II.: R. H. Mathews.

WEDNESDAY, DECEMBER 11.

SOCIETY OF ARTS, at 8.—Adjourned Discussion on Mr. Cunynghame's Paper on Locomotive Carriages for Common Roads.

PHARMACEUTICAL SOCIETY, at 8.30.

THURSDAY, DECEMBER 12.

ROYAL SOCIETY, at 4.30.

LONDON INSTITUTION, at 6.—The New Far East: Arthur Diósy.

SOCIETY OF ANTIQUARIES, at 8.30.

MATHEMATICAL SOCIETY, at 8.—Note on the Convergency of Series: Dr. R. Bryant.—Sexdecimic Residuality of 2: Lieut.-Colonel Allan Cunningham, R.E.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Annual General Meeting.

FRIDAY, DECEMBER 13.

ROYAL ASTRONOMICAL SOCIETY, at 8.

MALACOLOGICAL SOCIETY, at 8.—The Culture of the Edible Oyster: Prof. Herdman, F.R.S.

CLINICAL SOCIETY, at 8.30.

PHYSICAL SOCIETY, at 5.—A Mechanical Device for performing the Temperature Corrections of Barometers: Dr. John Shield.—On the Existence of Earth-Air Electrical Currents: Prof. A. W. Rücker, F.R.S.

EPIDEMIOLOGICAL SOCIETY, at 8.

SATURDAY, DECEMBER 14.

ROYAL BOTANIC SOCIETY, at 3.45.

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