Nature,
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" *To the solid ground*
Of Nature trusts the mind which builds for aye."—WORDSWORTH

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NATURE

A WEEKLY ILLUSTRATED JOURNAL OF SCIENCE

"To the solid ground
Of Nature trusts the mind which builds for aye."—WORDSWORTH.

THURSDAY, NOVEMBER 2, 1905.

TWO TEXT-BOOKS ON MECHANICS.

An Introduction to the Design of Beams, Girders, and Columns in Machines and Structures, with Examples in Graphic Statics. By W. H. Atherton. Pp. xiv+236. (London: Charles Griffin and Co., Ltd., 1905.) Price 6*s.* net.

Mechanics for Engineers, a Text-book of Intermediate Standard. By Arthur Morley. Pp. xi+282. (London: Longmans, Green and Co., 1905.) Price 4*s.* net.

MR. ATHERTON'S book is for engineering students whose mathematical knowledge does not include the calculus, and such readers will find it a very useful source of information.

The style is very unconventional—a trait which is rather helpful than otherwise—but occasionally the disregard of grammatical niceties and the ordinary rules of composition is carried too far.

The author does not trouble himself in the least about discussions as to absolute and gravitation units of force and the so-called "engineer's unit of mass" (which is about 32.2 pounds). He is a practical engineer, as is sufficiently obvious from the words, "There are only two units of force that will be of much use to us—namely a *pound* for light work and a *ton* for heavy work"; but there is a suggestion of an ancient conundrum about his statement, "So far as we are concerned, force is measured in terms of some unit of weight, as that of a ton of iron." Chapter vi. contains a good exposition of the theory of the bending of beams, together with some useful cautions and explanations of certain discrepancies between theory and practice. The moments of resistance of beams of various cross-sections are all calculated by elementary non-calculus methods. The calculation of moment of inertia (the absurdity of which term the author very properly emphasises) is made in the same manner. It would be a great help to students—even to those who can use the calculus—to give the *particle rule* for calculating all moments of inertia with reference to a triangular (and thence any polygonal) area; the moment of inertia of a triangular area about any axis whatever can be calculated by replacing the triangle by three equal particles at the middle points of the sides, their masses being represented by $\frac{1}{3}\Delta$, where Δ=area of triangle.

While the whole of the book will be found useful, the chapter on the comparative strengths of tubes of various forms may be specially mentioned.

Mr. Morley's work differs from that above noticed in excluding all technical knowledge and terms, so that it is suitable to all students of dynamics, whether engineers or not. It does not employ a knowledge of calculus, its range being covered by algebra and elementary trigonometry, and its scope being that of the London intermediate engineering examination and that for the A.M.I.C.E. The work adopts the plan of founding the science of force on Newton's axiom ii., so that kinetical principles precede the treatment of equilibrium (statics). The great importance of the direct application of the principles of momentum and energy is recognised at the outset by supplying a large number of excellent examples of these principles, so that the work is thoroughly modern in conception and method. There is a large and commendable use of squared paper diagrams for calculating velocities, forces, work, &c., in cases in which these are variable according to other than the most simple laws.

The poundal is, happily, not employed, but the "engineer's unit of mass" is adopted in order to save the definition of force, viz. "force is the rate of change of momentum." It is doubtful if many students are helped by this device, or if they really understand what they are doing when they say that the mass of a body is W/g. We must confine ourselves to a few brief observations on a work which we commend very highly. Is not a "knot" a speed—a geographical mile per hour? The newspapers sometimes speak of "20 knots an hour," so does the author (p. 20). It is a pity that he speaks of "accelerating forces" (p. 43, &c.), because it is essential to teach a student that *acceleration* is the inevitable property of *every* force. The motion in Atwood's machine is calculated first by the strictly valid method of introducing the tension, and then by the old method of "mass moved $= W_1 + W_2$; accelerating force $= W_1 - W_2$, &c.," which latter should either be unmentioned, or, if mentioned, justified (if possible). The formal statement "when a force acts upon a body and causes motion, it is said to do work" (p. 48) is very dangerous doctrine. The tension of an inextensible pendulum cord certainly does no work, though it exists in the motion. Are we to suppose that safety is contained in the word "causes"? If so, the metaphysician must be heard. On the important and almost universal fallacy concerning "centrifugal force" the author is a clear and safe guide.

A large collection of the ordinary statical problems is followed by a discussion of centres of gravity, moments of inertia and rotatory motions of rigid bodies, and a chapter on graphic statics, the whole being illustrated by a large collection of very well chosen examples. M.

INDUCED RADIO-ACTIVITY.

Radium and Other Radio-active Substances; their Application especially to Medicine. By Dr. Charles Baskerville. Pp. 164. (Philadelphia: Williams, Brown, and Earle, n.d.)

PROF. BASKERVILLE'S book is disappointing. On opening a work on a scientific subject by an original worker in the field of which it treats one expects to find the original materials thoroughly digested and worked up, and the relative merits of rival theories and conflicting experimental data carefully weighed; one hopes, too, to find novel suggestions for the interpretation of existing data, and hints to guide experimental research in the future.

In the present work these things are not to be found. It may be said, broadly, that the book is no more than a collection of abstracts of original papers, put together, indeed, in some approach to a consecutive order, as regards subject-matter, but without the attempt to weld them into a homogeneous whole. We constantly find, for instance, that views which have no serious claims to attention, either from the authority of their authors or from the arguments they put forward, are treated with quite as much respect as the opposite conclusions of leading workers in the subject, which are supported by strong experimental evidence.

In some cases the author even goes so far as apparently to endorse conclusions which are opposed to his own. On p. 88 we have a picture, underneath which the following explanation is given:—

"This is a radiograph of a gold fish which had been placed in water rendered radio-active by having suspended in it for 24 hours a *closed tube* (our italics) containing ten milligrams of radium of high activity. By this process the water was rendered radio-active, and the fish was then placed in the water, and, although the radium had been entirely removed, the fish itself was rendered radio-active, and, when placed on a photographic plate, photographed itself by its own radio-activity."

As Prof. Baskerville, contrary to his usual custom, mentions no name in connection with this experiment, we assume that it is his own. None the less, we read, on pp. 92–93:—

"Piffard calls attention to the fact that no authoritative statement has been given as to the rendering of water or other substances radio-active by the presence of a closed tube of radium. He further detected defects in tubes, air bubbles, &c., and regards the statements concerning induced activity by means of closed tubes as based upon the use of defective tubes. As Curie and Rutherford have shown, induced activity requires a naked exposure to radio-active bodies."

For our own part, we have no belief in radio-activity having been produced in the fish under the conditions described. The photographic effects may have been due to imperfect closing of the tube of radium, or they may have been produced by some direct chemical effect of the fish's skin on the film. But however that may be, the author's attitude in emphasising equally two opposite statements is not intelligible. Prof. Baskerville has shown great industry in bringing together the results of different experimenters, but we cannot think that he has presented his collection judiciously.

GARDEN CITIES.

Garden Cities in Theory and Practice. By A. R. Sennett. Vol. i., pp. xix + 557. Vol. ii., pp. xii + 558. (London: Bemrose and Sons, Ltd., 1904.) Price 21*s.* net.

THESE two handsome volumes represent the amplification of a paper on "The Possibilities of Applied Science in a Garden City" which was read by Mr. A. R. Sennett before Section F of the British Association in 1903.

The author first deals very fully with the engineering problem involved in the laying out of garden cities. A comparison of the various plans on which the great cities of the world have been built is given in a most lucid and interesting manner, after which the author shows with many clear and convincing arguments that the best type is that known as the rectilinear configuration, which is the one he adopts —the worst of all being the curvilinear type, not only from an æsthetic, but also from a practical point of view.

An interesting account of the rebuilding of London after the great fire is given in chapter ii. The various plans, especially those of Sir Christopher Wren and Sir John Evelyn, are fully discussed. The plan of the former was more or less adopted, although all his proposals were unfortunately not adhered to, with the result that many fine architectural effects are lost to the metropolis. We cannot do better than recommend those who are interested in this important subject to read the author's own account, which should excite interest even in the apathetic. In regard to the spacing out of the area for his proposed garden city, the author has carefully considered every detail. The proportion of the area to be occupied by the public thoroughfares, promenades, avenues, and private gardens is fully discussed. By a most ingenious and original plan of allotment, each house in the city stands in its own ground without being unduly overlooked or interfered with by neighbouring dwellings, but at the same time fitting harmoniously into the whole. Instead of the usual oblong or rectangular arrangement, the author subdivides the ground into polygonal or, more precisely, hexagonal plots. This he shows preserves a uniform frontage length, and at the same time admits of great elasticity as regards the size of the allotments which different inhabitants may desire.

The city proposed by the author would consist of three separate areas, viz. the city proper, the village with its industrial zone, and the agricultural fringe. Each department is so arranged and laid out that the maximum amount of comfort and utility is combined with the minimum amount of expense. The city as a whole is so designed that it shall be self-supporting. All needless expense and extravagance are scrupulously avoided. The artisan's dwelling is made for the artisan, and the same applies to the housing of every grade and class of society. All are suitably provided for. Public buildings and offices, railway stations, &c., are grouped together within easy access of each other in the centre of the city.

The sanitary and hygienic conditions of every kind are treated in an able and scientific manner. Every health-promoting device that ingenuity can suggest is brought forward in its proper place. It is beyond the scope of a review to mention these in detail. Suffice it to say that nothing is suggested which cannot be easily put into practice; and, further, many of the author's valuable and common-sense suggestions might with great advantage be adopted in our present cities.

The sociological aspect of garden cities is treated in a rational and scientific manner. The doctrine of "equality" which was urged by some when the site of the first garden city was acquired is relegated to its proper place by the author, who reminds his readers that the outcry for equality has proved the curse of industrial England, and points out the absurdity of ranking the "loungers—the quasi-inert and industrially passive atoms—as of equal national value to the active workers or energy-imparting unit." The decentralisation of industry is one of the great objects of garden cities—hence the authorities can deal with nothing below the industrial unit.

Under the heading "Charity" the problem of dealing with the poor and infirm is discussed. The various pitfalls and dangers attendant upon indiscriminate charity are shown by actual examples. The problem is a serious one; but in this, as in other cases, the author finds a way of overcoming the difficulty, especially as regards garden cities which are untrammelled by established practice or tradition, and where methods such as the Elberfeld system, so successfully adopted in the town of that name and in Leipzig, and which the test of time—half a century—has proved to be sound in principle, might quite easily be put into practice.

The work contains a wonderful amount of valuable information written in a readable style, while the illustrations are numerous, well chosen, and admirably reproduced.

OUR BOOK SHELF.

Elementary Experimental Chemistry. By A. E. Dunstan. Pp. viii+173. (London: Methuen and Co., 1905.) Price 2*s*.

So many books on elementary chemistry have been published within the last few years that it is rather difficult to imagine why any more should be written, unless there is something strikingly novel in the style or matter of the book. For anything novel we search in vain in the little book before us.

After being introduced to the metric system, in chapter ii. the student is supposed to find out the difference between chemical and physical changes by having to note the effect of heat upon sulphur, lead, magnesium, and sugar, and at the end of each experiment he has to state whether the change is physical or chemical. Chapter iii. deals with air, chapter iv. with active air. In chapter x. we come to solution, which to our mind would have been better treated earlier.

Formulæ are not mentioned until p. 130, and on p. 131 the union of atoms to form molecules is shown in a diagrammatic manner which we venture to think will leave the student very little wiser than before. Almost all through the book the equations are written in words and not expressed in symbols, as, for example, zinc+sulphuric acid=zinc sulphate+hydrogen. This is not necessarily objectionable in an elementary book, but to formulate all the equations which occur in the course of the book in an appendix is simply wasting type, because the student will never look at them. Furthermore, will the student understand the action of nitric acid upon copper by writing the equation in this manner?

$$2HNO_3\left\{\begin{matrix}2NO\\ H_2O+3Cu=\\ 3\ O\end{matrix}\right\}2NO+H_2O+3CuO.$$

It is then explained that the copper oxide is acted upon by a further quantity of nitric acid, &c.

Some of the experiments which the student is supposed to carry out are more for the lecture table than for the laboratory. For instance, on p. 121 the student has "to find the proportions in which oxygen and hydrogen combine to form water." Dry hydrogen and oxygen have to be collected in a eudiometer *over mercury* and then sparked. On p. 122 a similar experiment has to be carried out, but in this case to show the volume of steam formed. These are not experiments for elementary students, and we doubt whether the author himself allows his students to carry them out.

The book is very fully illustrated, and some of the exercises are undoubtedly good, but for the book to be really useful to the student will require a considerable amount of discrimination on the part of the teacher as to what experiments the student can himself be trusted to work out.

Wayside and Woodland Blossoms. By Edward Step; with coloured pictures by Mabel Step. First series, pp. xiii+176+127 plates. Second series, pp. xv+171+127 plates. (London: Frederick Warne and Co., 1905.) Price, each volume, 6*s*. net.

ABOUT ten years ago Mr. Step prepared two handy little volumes which many country ramblers have found of service in identifying British wild flowers and discovering something about their affinities and the significance of their structure. These volumes have now been completely re-arranged, and the plates have all been newly drawn, so that the revised edition is substantially a new work. In the original books, plants were roughly arranged in the order of the seasons in which their flowers appear, but in the present volumes a more natural grouping is followed, series i. containing representatives of the plant families from the Buttercups to the Composites inclusive, and series ii. from the Composites to the Grasses and Ferns. This arrangement is much more instructive than the former one; and in connection with the descriptions of family characters given at the end of each volume it should facilitate the further study of plants in more elaborate works.

The coloured plates in the two volumes are, with few exceptions, very fine, and will enable the country rambler easily to identify the flowering plants he meets. In almost every case the pictures are truer to nature than those in the original volumes, though these left little cause for complaint. The picture, for instance, of Lady's Smock is much superior to that in the old edition; so is that of Germander Speedwell. The Chicory flower, however, is better represented in the old volume than in the new; and in neither is the illustration of Tamarisk satisfactory. The ideal way to depict flowers for purposes of identification would be to take tri-colour photographs of the flowers and reproduce them by the three-colour process of printing. This method, which has been successfully adopted in the illustration of a few natural history objects, might have been profitably used by Mr. Step instead of lithography. No doubt there are difficulties to be overcome, but they are not very great, and success should attend the work in which the advantages of colour photography are brought into requisition. But while we await these faithful photographic reproductions, it is good to possess Mr. Step's two pocket guides with their clear descriptions and plates, and we are glad that such attractive books exist to awaken interest in plant life.

Quiet Hours with Nature. By Mrs. Brightwen. Pp. xvi+271. (London: Fisher Unwin, 1904.) Price 2s.

MRS. BRIGHTWEN'S books no longer need to be recommended to beginners in natural history. A fresh collection of her simple and sympathetic accounts of animal and vegetable life as studied and enjoyed in her own garden and park is sure to be welcome to all boys and girls who have once begun to take an intelligent interest in natural objects. All we need say about this volume is that, besides some pleasant papers about her tamed wild animals, including squirrels, field-voles, a rook, and even a stag-beetle, which followed his benefactor across the lawn, it contains others on the trees in her garden and some of the plants in her conservatory, all well calculated to arouse just such an interest in common things as may carry the young reader on to more exact and elaborate studies of nature. The book is charmingly illustrated by photographs and drawings.

One word of criticism may be allowed. It is surely as well, in introducing young folks to the study of nature, not to lead them to think that there is an essential difference between the "professional" entomologist or ornithologist and the ordinary observant field-naturalist; or if there be a real difference, it may be as well not to emphasise it. On p. 191 Mrs. Brightwen quotes a scientific description of the head of *Eristalis tenax*, with the comment:—"Now this may be very interesting to a professional entomologist, but it does not convey much information to an ordinary reader, and yet this is the scientific description of my drone-flies, interesting creatures which I kept through a whole winter until they were coaxed into the circle of my winged friends." It is true that the description conveys but little to an "ordinary reader," but a very little trouble will make it convey a great deal, and this small amount of trouble, or of instruction if it can be had, is exactly what our young "nature-lovers" should be encouraged to face. As it happens, the example of Eristalis is a good one; for the history of its confusion with the bees is a most interesting one, showing how much delusion may arise, and not only delusion, but myth, merely from the want of a little knowledge of structure.

Sammlung Schubert, XLII. Theorie der Electrizität und des Magnetismus. Vol. ii. By Prof. Dr. J. Classen. Pp. ix+251; with 53 figures. (Leipzig: G. J. Göschen'sche Verlagshandlung, 1904.) Price 7 marks.

THIS forms the second part of an introductory textbook of electricity and magnetism in which chief stress is laid on the mathematical side. In this volume the Faraday-Maxwell conception of electrical phenomena still forms the central idea; but, since the representation of simple magnetic phenomena in terms of a distribution of energy in a medium presents considerable difficulty from the mathematical standpoint, the classical conception based on action at a distance is retained, but regarded merely as a mathematical device and not as a physical conception. In the section on electromagnetism the author adopts the special form of equations developed by Hertz in his paper on the fundamental equations of electromagnetism for bodies at rest, and expresses his strong opinion in favour of generally adopting these in all treatises of mathematical physics.

Only one part of Maxwell's characteristic treatment of the subject finds no place here, and that is his demonstration of the connection between the fundamental equations of electricity and the general Lagrangian equations of mechanics.

Vegetationsbilder. By Drs. G. Karsten and H. Schenck. Third series. Parts i.–iii., containing plates i.–xviii. (Jena: Gustav Fischer, 1905.)

BOTANISTS who possess the first two series of the "Vegetationsbilder," or who have had the opportunity of admiring these magnificent series of photographic reproductions, will be glad to see that the third series is rapidly taking shape. The subject of epiphytic flower-gardens arising out of ants' nests, which formed part of a previous number, by Mr. E. Ule, is more fully treated in the first part of this series by the same authority. The ant-gardeners are species of Azteca, most often *Azteca Traili* and *Camponotus femoratus.* The plates represent different stages in the formation of the gardens; the plants which develop from seed brought in by the ants are chiefly aroids, bromeliads, and species of Gesneraceæ. In the second part Mr. E. A. Bessey presents a study of the sand-dunes, shifting and stationary, of Russian Turkestan with a vegetation of Calligonum, Salsola, Tamarix, and other xerophytes; the arboreous Salsola is particularly interesting. The photographs of Java, forming the third part, have been supplied by Prof. M. Büsgen, Mr. H. Jensen, and Dr. W. Busse. The subjects chosen include the teak forests, an expanse of the lotus, *Nelumbium speciosum,* a sand-dune bound by the creeping *Spinifex squarrosus,* and a bamboo forest.

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 Coelenterata from the West Coast of Ireland.

I HAVE been allowed to examine a small collection of Alcyonaria and Antipatharia that has been obtained by the fisheries branch of the Department of Agriculture for Ireland from deep water off the west coast of Ireland, and as this reveals some features of special interest I should be glad of an opportunity to write a short preliminary note upon it pending the examination of the species in detail.

The most interesting feature, perhaps, is the Coralliid, *Pleurocorallium johnsoni,* from 382 fathoms, about sixty miles off Achill Island. The family of precious corals to which this species belongs has hitherto only been obtained in the Mediterranean Sea, the Japanese seas, off Madeira and the Cape Verde islands, and in the Banda Sea. The specimens obtained by the *Challenger* in the Banda Sea were "dead," but I have recently published a preliminary note on a new species of precious coral from deep water off the coast of Timor, which was captured "alive" by the naturalists of the *Siboga* Expedition.

The distinction between the genus Corallium, to which *C. nobile,* the precious coral of the Mediterranean, *C. japonicum,* and *C. reginae,* the new species from Timor, belong, and the genus Pleurocorallium is not a distinction of very great importance, and, as recently pointed out by Kishinouye, cannot, with convenience, be much longer maintained. If, however, for the present we retain the two generic names it must be noted that Corallium no longer maintains its monopoly of corals that are precious, as the species *Pleurocorallium elatius* yields some of the most valuable classes of coral obtained in the Japanese fishery. Both in Japanese waters and off the Cape Verde Islands both the valuable and the commercially worthless Coralliidæ occur in the same fishing area, and consequently it would not be a matter for surprise if a renewed investigation of the locality from which the Irish Fishery Department obtained its specimen of *Pleurocorallium johnsoni* yielded some specimens of commercial value.

I should not like to suggest the prospect of a coral fishery off the coast of Ireland, as the sea is too stormy and the water too deep at the station from which the specimen came to render any such fishery commercially successful, but it would be a matter of considerable scientific interest to find that precious corals are growing within a few miles of our British coasts.

The second feature of interest is the occurrence in these waters of at least three species of Antipatharia. This group of Cœlenterata is one which I thought was entirely exotic. I can find no mention of any Antipatharians in any of the lists of the British marine fauna that I have examined, but perhaps some of your readers could inform me if I have overlooked any references to them. The species are, I believe, *Cirrhipathes spiralis, Antipathella gracilis,* and a species which I think must be new, but is allied to *Stichopathes lütkeni* in some respects.

Among the other interesting things in the collection are representatives of the alcyonarian genera Ceratoisis, Stachyodes, and Eunephthya, which I believe are new to the British fauna. The two pennatulid genera Kophobelemnon and Umbellula were obtained in deep water off the west coast of Scotland by the *Knight Errant* (Kophobelemnon only) in 1880, and by the *Triton* in 1882. These also have now been found off the west coast of Ireland. Although these genera may now be included in the British fauna as being found within the British area as defined by the British Association committee of 1888, they really represent the fauna that is common to the "mud line" of Murray of the eastern side of the North Atlantic Ocean.

Thus Pleurocorallium occurs off the Cape Verde Islands, Stachyodes off the Azores, *Ceratoisis grayii* off the coast of Portugal, *Antipathella gracilis* off the coast of Madeira, Kophobelemnon and Umbellula off the west coast of Scotland. These genera, with many others that live with them, constitute a fauna which is quite distinct from the ordinary shallow-water fauna of the British area.

SYDNEY J. HICKSON.

Victoria University of Manchester, October 24.

Action of Radium on Gelatin Media.

SOME misapprehension appears to exist in certain quarters as to the precise nature of the bodies I have called radiobes, as distinct from such aggregations as those which M. Dubois has obtained by the action of the salts of barium, radium, and manganese upon bouillon. M. Dubois describes his bodies as "*grosses vacuolides,*" and their appearance is quite different from that of the bodies I have described, judging by the drawings which have been reproduced in the *Revue des Idées* during the last few months.

I have observed two distinct types of bodies, of an entirely different order of magnitude, one type, radiobes, extremely minute and only visible with the highest powers: the other visible with an ordinary magnifying glass. The latter are decidedly crystalline in their structure, and resemble the bodies obtained in various ways by the action of salts on gelatin. They are like the ones described by Schenck, and very like those obtained by Dubois and others.

The smaller type cannot be said to be large in any sense of the word, and are like the minutest visible diplococci or biscuit-shaped cocci. They do not exceed this size to any great extent.

It is therefore desirable that the two types should not be identified, as their appearance, order of magnitude, structure and behaviour seem to be quite different.

M. Dubois has not noticed these, and therefore it seems to me that his claim to priority is quite irrelevant.

Cambridge, October 21. JOHN BUTLER BURKE.

Border occasionally seen between Light and Dark Regions on Photographic Prints.

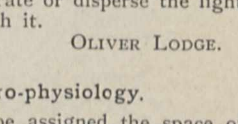
I HAVE once or twice been asked why photographs are apt to show a line or band or edging along the boundary of a bright and dark region. My assistant, Mr. E. E. Robinson, has thought of the reason, and it may be convenient to publish it. In a developed film the exposed portion perceptibly differs in thickness from the unacted-on portion, and accordingly the linear boundary of two contrasted regions may sometimes act as a cylindrical lens, and during printing either concentrate or disperse the light on the positive immediately beneath it.

October 20. OLIVER LODGE.

Terminology in Electro-physiology.

I WOULD deem it a favour to be assigned the space of a letter in order to make a suggestion in connection with the above still vexed subject.

It cannot be said that even now all is peace in the realm of electrical terminology as applied to physiological phenomena, in spite of Dr. Waller's helpful efforts in this direction. Dr. Waller's term "zincative" admirably expresses that a given region (A) of excited tissue is "electromotive like the zinc of a voltaic couple,"[1] is, in fact, a source of current towards a region (B) of less excited or non-excited tissue (the current, of course, travelling in the tissue from the region A to the region B, and in the external circuit from the region B to the region A); but it leaves untouched the solution of the old muddle over the use of the signs + and −.



Confessedly, "zincative" avoids any reference to + and −, but every teacher of physiology knows that sooner or later the + and − must appear, and with them all the ambiguities of "negativity of action," &c., if the student is to make his notes "agree" with his text-book.

[1] "The Signs of Life from their Electrical Aspect," p. 17. (Murray, 1903

A large part of the difficulty arises from the different points of view taken by the electrician and the physiologist respectively, the electrician being concerned chiefly with the surfaces of conductors, the physiologist being interested chiefly in the interiors of living tissues.

Thus the above expression, "region A," is electrically ambiguous, for it may mean (1) either the *surface* of the region A, or (2) the *interior* of the same: certainly physiologically (and it may be also electrically) these are two very different things.

Are we speaking of surfaces or interiors when we talk of tissues and their electromotive states? This seems to me the gist of the initial obscurity.

In Dr. Waller's terminology A is "zincative" to B; but the electrically-minded student wishes to distribute his + and − somehow. The electrician says A is "negative" to B, because he is thinking of the surface at A to which current has been coming from B, as he finds by the galvanometer; but the physiologist, conceiving of what is going on *inside* the excited portion of tissue A, says, or should say, "A is electropositive to B," because he finds that current in the tissue must have come from A to B. The ambiguity is bound up with not distinguishing the surface from the interior.

All doubt, it seems to me, is removed when we say, the region A is, as to its interior, electropositive to B, but as to its surface electronegative to B; as to its *interior*, A is a "*positive plate*," as to its *surface* a "negative pole." Both these ideas are necessarily connoted by "zincative," only implicitly, however; for teaching purposes they must be made also explicit.

"Negativity of action" is then intelligible when it is distinctly laid down that it is only the *surface* of the active region that is being considered, for if the interior of the active tissue is thought of, then positivity of action must be the term descriptive of the electrical state.

If, then, the qualifying term "internally" or "externally," as the case requires, be added, no loophole for confusion is left; thus, A is internally electropositive to B, externally electronegative to B; B is internally electronegative to A, externally electropositive to A; for "externally," "galvanometrically" may be used.

Personally I think the use of the term "negativity of action" is, especially if used in teaching, objectionable, because misleading and mysterious; "internal positivity of action" certainly seems to describe a real state; as terms, the one is but the converse of the other. I have, however, no more sympathy with those people who persist in finding "negativity of action" entirely meaningless than I have with those who will not understand "negative pressure" or negative quantities of any kind.

DAVID FRASER HARRIS.
Physiological Department, University, St. Andrews,
October 31.

The Engineer's Unit of Force.

IN a review of some recent works on mechanics in your issue of October 19, the reviewer calls to account two of the authors whose books are reviewed for "implying that the unit of force in the engineer's system is a variable quantity."

Perhaps there may be others than the authors referred to and myself who would welcome more explicit enlightenment on the subject of the constancy of the engineer's unit of force.

D. J. CARNEGIE.
October 23.

THE engineer's unit of force is equal to the earth's present attraction on the standard pound mass at a specified place, viz., for this country, *London*. Its magnitude is such that it produces unit acceleration when acting on a mass of 32·182 . . lb., the engineer's unit of mass, sometimes called a slugg (sluggish). The formula $M = W/g$, where M is the mass in sluggs, is true for any latitude, g being the acceleration of gravity there, and W the weight of the mass in pounds force, as would, for instance, be registered at the place by a massless spring balance which had been graduated in London. If the pound-poundal system of units is an absolute dynamical one, so also is the pound-slugg or engineer's system.

THE REVIEWER.

PROF. LANKESTER'S "EXTINCT ANIMALS." [1]

THOSE who, like the writer, had the good fortune to be present at the Royal Institution last Christmas and listened to Prof. Lankester's course of holiday lectures to young people will recall the fact that, although a goodly space was occupied by boys and girls from school, the theatre was elsewhere crammed with "grown-ups," who were quite as much interested and amused as the juvenile audience for whom these discourses were really designed.

It is, in fact, an open secret that quite elderly young people, as much as schoolboys and girls, enjoy their "ologies" when given to them in a form easy of digestion and with as few hard words as possible.

Before the memory of those pleasant afternoon discourses has faded from our minds comes a reprint of them in book form, with reproductions of more than 200 of the illustrations given in the text as we saw them on the screen.

Every boy and girl who heard those lectures will wish for a copy of this charming book, and those who did not will now read with delight the pictured story of extinct animals for themselves; nor will the "old boys" fail to take it up also.

Prof. Lankester explains that extinct animals are those which no longer exist in a living state. Animals, of course, die daily, and men too, but the lecturer tells us of extinct *kinds* of animals which no longer exist on the surface of the globe in a living state, although once they flourished and held their own.

He then informs his young friends of his own early experiences as a boy in visiting the British Museum and being fascinated by the huge head of an Ichthyosaurus from Lyme Regis with its large and bony-plated eyes, and its jaws, more than 3 feet in length, armed with powerful teeth.

Then the huge ground-sloth from South America attracted his wonder and admiration by its vast bulk, and he learnt that living upon the leaves of trees, but being too heavy to climb, it stood on the ground and pulled the trees down to it in order to feed on the young branches.

Their remains, often with the bones of the same individual lying in one spot, occur in the vast "pampas formation" and in the alluvial mud of the great rivers such as the La Plata. Here, too, one meets with the giant armadillo, and another strange creature, called the Toxodon, like a huge guinea-pig, nearly as big as a rhinoceros, with tremendous chisel-like teeth in front.

Prof. Lankester shows the thigh-bone of a giant reptile from North America more than 6 feet long (known as Atlantosaurus). What the size of the entire animal must have been we can best judge by paying a visit to the Cromwell Road Museum to see the skeleton of the Diplodocus lately set up there, which is 80 feet long and fully 14 feet high!

Passing rapidly over such forms as the ancient rhinoceros, the northern hippopotamus, the beaver, and great auk—once common in Britain, but now extinct—the author tells how zebras, quaggas, antelopes, and giraffes are being fast killed off in Africa by our sportsmen, whilst the dodo and "Steller's sea-cow" were eaten up long ago, like the giant tortoises, by our early voyagers, who victualled their ships with these rare animals.

The author next explains the causes which have brought about the migration of some animals and the extinction of others, and how changes of climate and

[1] "Extinct Animals." By E Ray Lankester, M.A., LL.D., F.R.S. Pp. xxiv+332; with 218 illustrations. (London: Archibald Constable and Co., Ltd., 1905) Price 7*s*. 6*d*. net.

alterations of coast-lines have modified the existing lands so much that, as in our own islands, Great Britain and Ireland were, at no remote geological time, joined to France, and a continental, instead of an insular, climate prevailed here, with hotter summers and colder winters, suited to the mammoth and reindeer which roved quite freely from land to land.

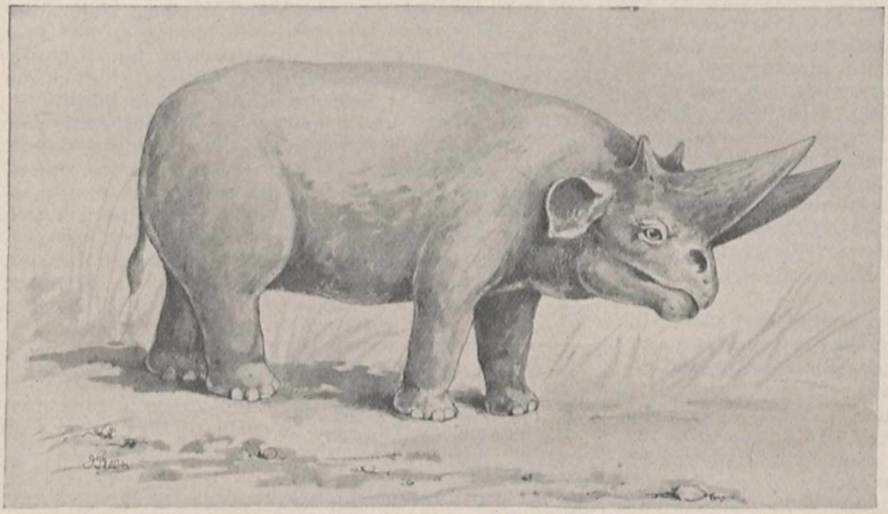


FIG. 1.—A drawing showing the probable appearance in life of Arsinöitherium (original); from the Upper Eocene of the Fayûm, Egypt. From Lankester's "Extinct Animals."

He explains what "fossils" are, and how the sedimentary deposits, in which extinct organisms occur, have been gradually laid down on the sea-floor or along coast-lines. From minor changes he illustrates those greater ones which took place long since involving whole continents, so that where London now is was formerly the sea with marine shells and fishes, aptly reminding one of Lord Tennyson's lines:—

> "Oh Earth! what changes hast thou seen—
> There where the great street roars
> Was once the stillness of the central sea."

The story of the living and extinct elephants is well told, and we get the latest evidence of the progenitors of these very ancient prehistoric beasts, the result of Dr. Andrews's explorations and discoveries in the Fayûm, Egypt, which has carried their ancestry back to the Eocene Palæomastodon and Meritherium. Near to the elephants comes the wonderful Arsinöitherium, also from the Fayûm, with a pair of prodigious horns on the front of its skull, a form of animal which may possibly have had a short proboscis like the tapir (Fig. 1).

The birds and reptiles come in for due share of attention, and from their striking forms they add largely to the attractiveness of the illustrations. The comparison of the wings of Pterodactyle, bird and bat is most instructive, showing that reptiles, as well as mammals and birds, enjoyed the power of flight, as some also equally possess the power of swimming. Dimetrodon was undoubtedly a swimming reptile (see Fig. 2).

Fishes, Mollusca, scorpions and Crustacea, also "sea-lilies," are dealt with in these lectures, and, as might naturally be expected, these simpler forms of life made their appearance far earlier in geological times than the more highly organised creatures now living on our earth.

More surprising still is it to find that the marine king-crabs (Limulus) and the scorpions (the latter at first aquatic, and afterwards terrestrial air-breathers) which are met with in the Upper Silurian rocks in America, Scotland, and Sweden have survived all the Old World changes of land and sea, the king-crabs being still found living in the China and Indian seas and on the east coast of North America, and the scorpions have spread over the *dry lands* of North and South America, Africa, and other countries, and are so little changed in appearance—whole generations of other animals having appeared and disappeared entirely—that we might almost imagine they would go on for ever!

Although it would be quite impossible for the author or anyone else to describe so vast a number of groups of living and extinct organisms in one series of lectures and afterwards to present them in book form with more than 200 illustrations in a single volume of 350 pages, at least Prof. Lankester knows how to give, in an attractive form, a vast amount of information agreeably, and to excite the interest of the merest tyro (whether young or old) and awaken a desire in him or her to learn more. Fortunately the author is also director of the Natural History Museum, where he has abundant opportunities to add still more to our personal knowledge of extinct animals.

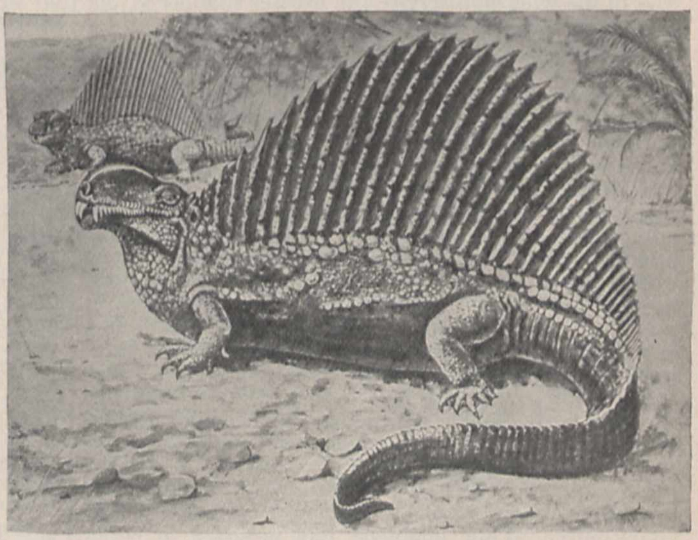


FIG. 2.—Probable appearance in life of the Theromorph Reptile, Dimetrodon, from the Permian of Texas. As big as a large dog. (It had a huge back-fin, evidently fitted for aquatic progression.) From Lankester's "Extinct Animals."

We give the book a hearty welcome, feeling sure that its perusal will draw many young recruits to the army of naturalists and many readers to its pages.

ASTRONOMY AND METEOROLOGY IN AUSTRALIA.

A VERY important paper has been issued recently by the Government printer of Adelaide, South Australia.[1] It is a report of an Inter-State Astronomical and Meteorological Conference, convened in May last, in view of the possible transfer of the observatory departments to the Federal Government as provided for in the Commonwealth Constitution Act. The official directors of the observatory departments of the several States were invited, and there were present Sir Charles Todd, K.C.M.G., F.R.S. (Government astronomer for South Australia), who was called to the chair, Mr. H. A. Lenehan (acting Government astronomer for New South Wales), Mr. W. E. Cooke (Government astronomer for Western Australia), Mr. P. Baracchi (Government astronomer for Victoria), Mr. A. A. Spowers (chief surveyor for Queensland), and Mr. H. C. Kingsmill (Government meteorologist for Tasmania).

The report represents briefly, in the first place, the present arrangements for public astronomical and meteorological work in the several colonies and the provision for weather telegrams. It then proceeds to give its proposals for the future in twenty-two resolutions. Six of them refer to work in astronomy, magnetism, or seismology; the remaining sixteen indicate a scheme of organisation of the meteorological service of the Commonwealth. The scheme is framed on the idea of the establishment of a central federal institution for theoretical and scientific meteorology, "where the observations for the whole of Australia should be collected, discussed and published, and where all the higher problems of meteorological science may be investigated; but such institution should have nothing to do with the daily weather service and issue of forecasts." Duties connected with the latter services, according to the scheme, are to be entrusted to an official in each State; and to the regulation of those services and their relation to the telegraph service the greater number of the twenty-two recommendations are devoted.

Appendices give the separate views of Mr. Baracchi, Mr. Cooke, and Mr. Kingsmill upon some of the recommendations.

The really important matter is the proposal for a separate establishment for the discussion of meteorological observations for the whole Commonwealth. The idea will be warmly welcomed by all those who desire to see the multitudes of meteorological observations brought into the most effective relation with practical life. That such an institution should have "nothing to do with the daily weather service and issue of forecasts" should probably be understood in an administrative sense. The ultimate effect of a scientific establishment upon forecasting would be a good deal more than nothing.

The calling together of the Inter-State Conference for the business-like discussion of the organisation of astronomical and meteorological work will also be warmly applauded in this country. It is one more expression of the fact that work in astronomy and meteorology is of more than local interest and importance. While doubtless real progress in either must still depend upon individual energy and individual genius, exchange of material has become a recognised necessity, and exchange of ideas an indispensable assistance.

It is therefore a pleasant duty to chronicle the appearance of this most promising scheme, which will put the Australian Commonwealth in a position to continue the excellent work of Russell and take its share in tracing out the mysteries of the meteorology of the Indian Ocean. When we remember the powerful appeal of Sir J. Eliot at Cambridge for the cooperation of the British dominions in working out meteorological problems of the widest application the solution of which is foreshadowed by the suggestions of relationship between meteorological phenomena in different parts of the world and of their connection with solar changes, we can only hope that this proposal for the federation of Australia for scientific prosecution of meteorological work is a step in the direction of a wider federation for a similar purpose.

On this planet, north and south and east and west are not so far apart that we in this country or our comrades in America or Africa can affect to regard the meteorological organisation of Australia as a question which does not concern us, and we shall watch the development of the scheme which is put forward, confident in its power of contributing in large measure to the pursuit of a common purpose in an organised manner.

W. N. S.

[1] Report of Inter-State Astronomical and Meteorological Conference, Adelaide, May, 1905. (By Authority, C. E. Bristow, Government Printer.)

FERDINAND BARON VON RICHTHOFEN.

THE unlooked-for death of this distinguished man of science has sent a thrill of deep regret all over the world among those who take interest in the progress of geology and geography. Though he had passed the limit of three-score years and ten, he remained up to the last so active in mind and body, so full of an almost youthful interest in the advances of science, so keenly solicitous and enthusiastic over the welfare of the institutions with which he was connected, that all who knew him looked forward to still many years during which his inspiration and guidance would continue to be at the service of those departments of investigation which have long been so deeply indebted to him; but this augury proved vain. While sitting at his writing table, apparently in his ordinary health, a sudden seizure deprived him of speech. Yet, as he remained otherwise fully conscious, it was hoped that the symptoms might soon pass away. A little later, however, another seizure attacked him during a deep sleep, and after two days and a half he passed peacefully away on October 6, without illness or suffering of any kind.

Belonging to a noble family that possesses large estates in Silesia, Richthofen was born there on May 5, 1833. His early education was received at a seminary under the management of Roman Catholic ecclesiastics, from which he passed to the University of Breslau and then to that of Berlin, where he took his degree of Doctor in Philosophy in 1856. By this time a study of the writings of Leopold von Buch and Alexander von Humboldt had kindled in him a vivid appreciation of the attractions of geological and geographical research. Like the two great masters from whom he drew his inspiration, he appears to have begun his career as an author by publishing some of the results of his investigation of eruptive rocks. His earliest papers, which began in 1856, dealt with the intrusive melaphyres of Moravia and the trachytes of Hungary.

Repairing to Vienna, he made the acquaintance of the geologists of that capital, and notably of the eminent director of the Austrian Geological Survey, Ritter von Hauer, with whom he formed a lasting friendship. He was induced to become a volunteer in this survey and to assist in working out the complicated structure of parts of the eastern Alps. He spent two busy seasons among the Dolomite Mountains, which in after years he looked back upon as one of the happiest periods of his life. The results of these field-surveys were embodied by him in his essay on the Dolomite region, which was a remarkable production for so young a man.

In the midst of his Alpine work he was offered a post as geologist on a Prussian expedition to Japan, China, Siam, and the adjacent regions. The opportunity of foreign travel and exploration was too tempting to be resisted. Quitting his Austrian labours he sailed for the East, and during the next two or three years, from 1860 onwards, contributed to the scientific journals various papers descriptive of some of the tracts which he visited. Owing to circumstances which prevented him at the time from undertaking exploration in the heart of Asia, he crossed the Pacific and spent several years in western North America, where he specially devoted himself to a detailed study of the igneous rocks of that marvellously volcanic region. It was there that he prepared his now classic memoir on the "Principles of the Natural System of Volcanic Rocks," which was published in English among the memoirs of the California Academy of Sciences. This sojourn in America enabled him, moreover, to obtain a mastery of the English language, such as few foreign men of science could equal.

The opportunity of returning to Asia came at last in the autumn of the year 1868, and he eagerly availed himself of it. He spent some years in travelling over most of the provinces of the vast empire of China, studying their physical features and geological structure, and forming an extensive collection of their rocks and fossils. So voluminous were the data which he gathered together that they filled a series of massive volumes, of which the first appeared in 1877, and the Atlas in 1885. This work placed him in the front rank of scientific pioneers. It not merely made known for the first time the physical geography and geology of a vast territory, but presented contributions of great value towards the elucidation of disputed problems in science.

Richthofen's reputation as a travelled and accomplished geographer had now spread so widely that in the year 1875 he was offered, and accepted, the chair of geography in the University of Bonn, where he spent eight happy and fruitful years, and where he married the accomplished lady to whom he had been long attached. From Bonn he was called to occupy a similar position at Leipzig, whence, after only three years, he was invited to become professor of geography in the University of Berlin. In the metropolis of the German Empire he found ample scope for his rare faculties of exposition and organisation. Besides the ordinary duties of his professorship, he instituted meetings of various kinds for promoting the cultivation of geographical and geological studies, and amassed a wonderful collection of books, maps, instruments, models, and other illustrations of the physical features of the earth's surface. His enthusiasm in these efforts was rewarded three years ago by his appointment as director of the new geographical institute in Berlin, where he had ample space to arrange and display the remarkable mass of material which he had gathered together with the view of bringing home to the mind and eye the characteristic aspects of land and sea and the history of exploration and discovery in oceanography.

Baron von Richthofen was a geographer of the highest type. To him the mere addition of so many hundred square miles of territory to what was already known of the earth's surface, and the opportunity of affixing the names of friends and benefactors to peaks and promontories and inlets, were matters of comparatively little moment. It was the grand features of land and sea that interested him, their origin, their history, their relations to each other, their influence on the progress and destiny of mankind. His early geological training eminently fitted him for investigating these problems on the ground, and kept him from making the mistakes which attention restricted to mere superficial features has so often produced. He possessed in rare measure the qualities which ensure the success of an explorer—health and strength, alike of body and mind, a wide range of natural knowledge, courage, patience, endurance, tact, and kindliness. It may have been the consciousness of the possession of these qualities, combined with a recollection of the pleasure which their exercise had given him in his varied wanderings in Europe, Asia, and America, that led him to write, in the midst of his university and other work, his admirable "Führer für Forschungsreisende," which was published in 1886. No one but a born and trained explorer, who had enjoyed ample experience by flood and fell, all over the globe, could have given to the world such a volume, so full of the ripest practical knowledge, so broad in its conception of what exploration should be, and so clear and emphatic in its statement of the accomplishments which are needed for the making of a successful traveller. Every department of observation is luminously presented in his chapters, which may be regarded as a contribution of the first importance to physical geography and geology. The volume is one which ought to be put into the hands of every man who proposes to undertake the examination of new or little known regions, and who is willing to learn beforehand what is expected of him by those most competent to judge.

With Berlin as his headquarters, and a home there which attracted men from all lands, the Baron and his gracious and devoted wife formed the centre of a large circle of friends; but he journeyed far to attend meetings and congresses, where his handsome presence and genial talk were always welcomed. Hence not many men of science of his day were more widely known personally than he. He received endless marks of appreciation from learned societies and academies, both in the Old and in the New World. Our own Royal Society honoured itself by including him in its list of foreign members. His death has left a blank in scientific society which no living man is competent to fill. For many a year he will be regretted by all who even only slightly knew him, and mourned by those who were privileged to enjoy his friendship.

A. G.

THE TREASURY AND MEN OF SCIENCE.

THE subjoined letter from the Earl of Crawford appeared in Monday's *Times*. The parsimony of the Government in everything relating to the scientific work needed for the State service is well known; what is not yet known generally is how much the administration is weakened by the entire absence of science, and therefore of the scientific spirit, in the higher ranks of the Civil Service, and especially of the Treasury. The official action described by Lord Crawford is another indication of the inability of the official mind to understand that science has any place in the nation's activities.

To the Editor of the "Times."

Sir,—The death, noted by you to-day, of my dear friend and colleague Dr. Copeland, His Majesty's Astronomer for Scotland, creates a vacancy in the scientific staff of Great Britain.

Will you permit me, Sir, to offer a word of warning to any who may be asked to succeed him?

Students or masters of astronomy are not, in the selfish sense, business men, nor are they as a general rule overburdened with this world's goods. It behoves them henceforth to take more care as to their future in case of illness or physical infirmity, and not to trust to the gratitude or generous impulse of the Treasury Department.

In old days it was the custom when a man distinguished in science was brought into a high position in the Civil Service that he was credited with a certain number of years' service ranking for pension. This practice has been done away with and a bargain system substituted. A short while ago the growing agonies of heart disease caused Dr. Copeland to feel that he was less able to carry on the duties of his post, and he determined to resign; but he learnt that under the scale, and in the absence of any special bargain, the pension he would receive would not suffice for the necessities of life. The only increase his friends were able to get from the Treasury was an offer to allow him about half-a-crown a week extra by way of a house.

Indignant and ashamed of my Government I persuaded Dr. Copeland to withdraw his resignation and to retain the official position which he has honoured till his death.

I trust, Sir, that this memorandum of mine may cause eminent men of science who are asked to enter the service of the State when already of middle age to take heed for their future welfare.

I am, Sir, your obedient servant,
CRAWFORD.

2 Cavendish Square, October 28.

The number of years *given by Act of Parliament* was twenty, because the ordinary civil servant joined at twenty to learn his work, and men of science joined at about forty because they had to learn it before they were of any use to a Government department.—[ED.]

THE BRITISH SCIENCE GUILD.

THE inaugural meeting of the British Science Guild, the organisation and objects of which were stated in NATURE of October 12 (vol. lxxii. p. 585), was held at the Mansion House on Monday, October 30. The Lord Mayor presided. Among those who had accepted the Lord Mayor's invitation to attend were the following:—

The Bishop of Ripon, Lord Strathcona, Mr. Haldane, K.C., M.P., Sir Norman Lockyer, Lady Lockyer, Sir Michael Foster, Sir William Ramsay, Lady Ramsay, Sir J. F. Maurice, Sir J. Wolfe-Barry, Sir W. Bousfield, Sir G. T. C. Bartley, Sir E. W. Brabrook, Sir C. Bridge, Sir Lauder Brunton, Sir A. Geikie, Sir W. Mather, Sir H. T. Wood, Dr. G. T. Beilby, Dr. Caird, Captain Creak, Dr. Ferrier, Dr. W. Garnett (represented by his son), Mr. Gifford, Dr. Glazebrook, Prof. Gowland, Mr. R. A. Hadfield, Prof. J. Larmor, Prof. Lealey, Dr. Lockyer, Mr. C. W. Macara, Prof. Meldola, Prof. Perry, Mr. J. H. Reynolds, Dr. Shaw, Mr. A. Siemens, Mr. Swinburne, Rev. T. R. Stebbing, Mr. Carmichael Thomas, Prof. S. P. Thompson.

The following are extracts from letters expressing regret at inability to attend the meeting.

Mr. Chamberlain:—

"I am very sorry to find that I cannot possibly be in London on Monday the 30th inst. . . . I very much regret that I cannot take an active part in the meeting on this occasion, but possibly some more convenient opportunity for showing my interest may occur at a later time."

Lord Roberts:—

"I am very sorry to refuse the request contained in your letter of the 12th instant, but I have so much on hand at present that I could not manage to attend. . . . I recognise the value of the Guild and wish I could help it."

Lord Rayleigh:—

"I fear I shall not be able to come to the meeting . . . but I shall be very pleased to join in the movement and become a vice-president if desired."

The following report of the meeting is reproduced, in great part, from Tuesday's *Times*:—

The Lord Mayor in a few words welcomed those who had accepted invitations to be present, and called upon Sir Norman Lockyer to read the report of the organising committee.

Sir Norman Lockyer, having read the report, said that the organising committee was grateful for the consent the Lord Mayor so readily accorded to them to hold their first meeting at the Mansion House. He had every hope that under such auspices the guild might do for British national endeavour in the future what so many ancient guilds, each in its special line of action, were founded to do in the long past. When his own views as to the importance, nay the burning necessity, of such a movement as that throughout the land, among all classes, and in touch with all employments, were expressed some time ago, he suggested that it might be brought about by extending the functions of some existing organisation, such, for instance, as the British Association; but he was soon made to see that that was to take a too narrow view of the matter. It was not a question merely of science and scientific men; it was a question of conducting all our national activ'ties, State service, private service, and what not, under the best possible conditions with the greatest amount of brain-power. To show that it was not a question only for scientific men, he would just refer for a moment to the matter of education. He yielded to none in respect for those studies which embraced ancient civilisations and their literatures, but they alone were as incapable of forming the complete man as would be instruction in the mere facts of science apart from the actual use of the methods of observation and discovery. A complete education must be based upon things and thinking, as well as upon words and memory. We wanted one kind of education for everybody—the best. We wanted that education carried as far as possible in the case of each individual, whether the time for education was long or short. No one should be stopped, save by his own incapacity, from proceeding further down the fair stream of education which should make the complete man, both educationally and physically. We want that stream freed from the impediments with which it was at present dammed—they might spell the word as they liked. These impediments were many of them needlessly hurtful, and most of them unnecessary from a large point of view.

Indeed, they wanted to revert to the ideal of the ancient university, from the curriculum of which *natura rerum* was never absent, and in which the poor student was always cared for. The western world was wondering at the efficiency of both the navy and the army of Japan. There was really nothing to wonder at. Most of the reasons suggested for what had happened were, he held, entirely wrong. If the Japanese religion or the old Japanese civilisation had been in question, then China would have followed suit. What really had happened in Japan was that for the last thirty years everybody, from the Mikado to the smallest boy and girl, had been taught to think. They had been dealing with things as well as words in their schools, and they represented at the present moment the *maximum* of efficiency and brain-power as the result of that treatment. Mr. Chamberlain, Lord Rosebery, and others had referred to the great relative advance of the commerce and industry of Germany and the United States. He would again point out that these were examples of lands with complete and numerous State-aided universities. Surely it was more than a coincidence when we found in those lands the State service and all the national activities carried on in the full light of modern science by men who had received a complete training. If the guild helped us in any way to improve our national position in this respect it would not have been founded in vain, but there was certainly much for it to do along many lines.

The Bishop of Ripon moved the first resolution:—

"That the Right Hon. R. B. Haldane be elected president of the British Science Guild." He said they had met together to enforce as far as they could what had fallen from Sir Norman Lockyer's lips. He supposed that all of them who had reflected would realise that the time had come in which it was desirable that an organisation specifically directed to that end should take its place among the useful institutions and associations of this country. He was quite sure that those who had thought hitherto of the somewhat aimless way in which the benevolent had gone about their work and the somewhat haphazard way in which, indeed, some of the industrious had pursued theirs, must realise that those ways were not likely to conduce to the general welfare, or even to conduce to the very object which the benevolent and the industrious had in view. He knew there were some who still looked askance at the words science and scientific method, and they had a sort of dim idea that science and scientific methods had come to destroy some of the most beautiful instincts of our nature. They were inclined to say to people that the new fangled notions had come in to incommode them in their activities, to destroy their cherished notions, and to check their benevolent intentions. But that was to misunderstand, as he took it, the whole situation. No person, however devoted he might be to the cause of science and scientific method, believed for a moment that science would be able to create faith or to create charity. They might, however, do a great deal to give confidence to faith, and certainly might guide the feet of charity into the ways and methods of wisdom. The value of applying science and scientific methods to all forms of human endeavour lay in the simple fact that there was the educating power which charity and benevolent impulse so generally and so legitimately desired. Everyone desired to help the needy; but who did not know that the methods of indiscriminate charity had really ended in defeating the ends which the charitable had in view? But the scientific study of economic conditions was capable of putting into the hands of the charitable the proper method of dealing with the needy. He could only recall to their minds what an eminent Frenchman said in speaking of France after the war. He said, speaking of his fellow-countrymen and of the subject which had occupied Sir Norman Lockyer's mind that day—namely, the subject of general and specific education from a national standpoint—that they had been defeated, not by Bismarck and Moltke alone, but by Kant and Hegel, Goethe and Schiller and Humboldt, and other great minds which Germany had produced. They had been defeated, in fact, he said, by the brain—the educated brain and the scientific method of those who contended against them. It was not the victory of arms alone, but the victory of brain brought to bear upon the field of war. He could imagine two classes of men becoming strongly and earnestly interested in this endeavour. He could understand the benevolent saying, "Teach us how to do good," and he could understand those who were interested in the prosperity of the nation saying, "Teach us how best to procure it." The benevolent mind was constantly brought into anxiety and suspense by questions of solicitude concerning the safety and the health of our fellow creatures, but here was a simple method by which science might come and say to the benevolent, "We are helping you to prepare the way." Let him direct their attention to two great institutions which existed, one in Holland and the other in Germany. There were two museums, called Museums of Safety, the purpose of which was to show in working models every appliance which had been devised by the care and the study of scientific men and experts for the protection of life and limb, for the promotion of health, for preventing the accident in the mine, the accident in the mill, the danger to health arising from noxious vapours in some of our great places of employment, and the accumulated dust which gets into the lungs of the worker. These and other important matters affecting the safety and the welfare of the people were dealt with in these museums. People were taught the best method of feeding their children by showing them what might be called the various values, the health values, of foodstuffs. They were shown also in economical fashion how a house might be built. These museums existed, and, with their working models, were open five days in the week for the inspection and instruction of the public. What were those great Museums of Safety which they found in Charlottenburg and Amsterdam but living witnesses of how scientific methods might be brought to bear on the protection of the health and life of the people of the world? Our manufacturers, and perhaps our farmers, had been content to go on in what might be called jogtrot ways, not watching how far knowledge had advanced beyond them, and the mere rule of thumb and the traditional methods had prevailed sometimes to the detriment of industry, often to that of the consumer. Those things were precisely the way in which that Science Guild might come forward and do what had been done in Germany, so that there might be places where the manufacturer and farmer might go and get scientific advice of the best character. Those were things which meant the one thing for which the guild had come into existence—namely, the application of scientific methods to human endeavours throughout the world. Precisely because the pressure of the competition of the world had become so great it was for us to say that the old England that we loved and were proud of should hold her place among the nations of the world, and as she had the courageous heart and the enthusiastic spirit so also she should be given the clear-thinking brain and the well-studied handicraft and industry. The urgency of the thing was clear, and the only way in which it could be applied was clear also. He concluded by proposing Mr. Haldane as president, and spoke of him as one who knew what was necessary for the public good, and essential for its industrial prosperity, and who added to that the weight of his name and the strong position which he held in the legal and political world.

Lord Strathcona seconded the motion. In doing so he said that it must be a great relief and satisfaction to all of them to find that they had placed before them something which savoured in no sense of party politics—an object which was for the general good.

Sir W. Mather supported the motion. He said that in this country we had the foundations for the highest scientific industry the world possessed. We had in many of our industries the most brilliant scientific methods and processes. We had plenty of science in England; we knew what the Germans knew, and what the Americans knew. The trouble was that the people of England had not been trained to enable them to use largely the methods of science and the principles of science which the people of other countries—not the select men, not the men specially gifted, not the men of genius only, but the men who had the conduct, even in subordinate positions, of some of the departments of scientific manufacture—possessed. The association had for one of its objects the promotion of scientific education throughout the Empire by encouraging the universities and other institutions, where the bounds of science were extended, or new applications of science were devised. What men like himself looked for in adopting scientific methods generally throughout their workshops was the foreman class, the subordinate managers, the managers who could carry out the advance of science which emanated from the top. He had just returned to England after four months' absence in the United States, and he found, while in America, that the whole tendency and trend of American thought and feeling was to take masses of their young men and train them, so that they might take their part not as managers, employers, capitalists, and so on, but as workers in their industries. That society had before it its greatest work in looking to the education of the people of England. It should work upon the Government of the day, Liberal or Conservative, and take care that there should be sufficient expenditure and sufficient convenience provided throughout the length and breadth of the land to enable our young people to have some opportunities in their lives like those which were afforded to the young people of the United States.

The resolution was carried unanimously.

Mr. Haldane, who was received with cheers, said he gratefully acknowledged that resolution and the honour which they had conferred upon him in electing him president of that new organisation. He did not know that he had other qualifications for it than this—that the matter was one which interested him intensely. Nearly ten years ago, when the political party to which he belonged went out of office, he looked about for something to do, and he thought he might as well turn his hand to the somewhat cobwebbed state of the higher education of this country. After a time he approached the Government, and he found them sympathetic, and they had remained throughout that period sympathetic. There were those who said that some time or other they would go out and another Government come in. He hoped in the same way to have a chance of approaching that Government and trying to persuade it to be sympathetic. Why was it that so many people had come together that day—people of different minds but converging upon the same idea—to call for an activity which should be unhasting and unresting, the organisation of the higher science in its application to the affairs of this country? He thought it was because almost every year in an increasing fashion brought us in this nation an awakening. We were not the only nation which had received an awakening. Japan wakened up the nations of the West from their dogmatic slumber not long since, and we had perhaps not even yet assimilated the lesson which that awakening had taught the world. He agreed with Sir Norman Lockyer that that organisation ought not to mean merely science. It ought not to mean merely instruction; it ought to mean the bringing of method, the bringing of thinking, into the modes of government which applied to our public affairs and which applied to our private industries alike. That was what we wanted, and without that we should fall behind, and that kind of organisation meant science, and it meant education. The Bishop of Ripon alluded to the question of the Poor Law. There was a very interesting pamphlet which was published the other day, and which he commended to all of them who had not read it—the report of the Birmingham brass-workers on what they found when they went to Berlin to compare the condition of the working men of their own trade with that of similar working men in the German capital. One thing which they discovered was that in Germany the unemployed question had been to a great extent solved. There were two ways in which they could deal with the unemployed question without solving it. One was to do nothing at all, but say that so-called economic laws must work their way. That view, he thought, opinion nowadays condemned. But there was another way which he hoped the nation would condemn just as severely, and that was to grant public money in response to any demand which was made by ignorant people without recognising the fact that steps of that kind merely meant that one got a body of honest but weak people who came to depend, not on their own exertions, but on what the State would do for them. The brass-workers found organisation. They found that science had been set to work to solve the problem of the unemployed. They found that the unemployed were sifted out by State, municipal, and private charitable organisations directed and employed by the State. They were sifted into classes. Those who wanted work and could not get it were provided for to almost a complete extent by the cooperation of the Government and the employers and the municipalities. Those who had not got work and did not want it were put into places which were not prisons, but where they were forced to work for a very moderate wage, which was saved up for them and given to them afterwards. The Birmingham brass-workers came back with the view that the provision for the German brass-worker was superior to anything even in Birmingham. They were too enthusiastic. He had lived in Germany, and he knew that the things they saw there would never be tolerated in this country. From the cradle to the grave the German was ruled. Paternal government was exercised over him, well aided by what he might, figuratively speaking, call the birch rod. At no point of his existence was he a free man, and the result was that in Germany to-day there was something like a revolt, and an aspiration for our British freedom. A pamphlet had been published on the Germans and their Fatherland, in which a plea was put forward for the study and imitation of English institutions. It had had an immense circulation in Germany, and ought to be translated into English. The writer advised his readers to go to see Eton and Harrow, where there might not be much learning, but where the boys ruled the school, set up public opinion among themselves, and as a result turned out governors of men and patriots, instead of men who, like the Germans, when they left their country felt in the recollection of their schools that they had left an almost prison life. That great German authority was under the same delusion as the Birmingham brass-workers. He was too enthusiastic. But in that pamphlet the German Emperor was quoted as making the observation that the real truth about the matter lay between the German and the British systems. We had to see how we could get the German faculty of organisation, train people to think more of it, and apply it to the various departments of our affairs. Our executive Government was about as disorganised an institution as anybody could conceive. Suppose they wanted to appoint a man of high scientific mind as an official. They were at once told that it would be against the rules of the department. In vain they would reply they were bringing in a man of science for public purposes; the answer would be that the Civil Service rules made it difficult to do anything of the kind. Some of them had been trying to impress upon the nation that the organisation of the highest education of the universities ought not to be left to haphazard. He was chairman of a committee which sat last year, and they made a report which had been more lucky than most reports. One of its recommendations related to the grants to the university colleges of this country, and was that a scientific advisory body should be created and put at the elbow of the Treasury to advise it in giving money to the universities. He was glad to say that a sympathetic Chancellor of the Exchequer had adopted that suggestion, and in the course of the winter they would learn who the advisory members were to be. Let them take another department—the Board of Trade. The Board of Trade ought to be a great ministry of commerce. We had a vast home trade as well as a vast foreign trade, and the statistics relating to them should be of the most authoritative kind. There was the same necessity for scientific methods in relation to the Home Office and the departments with which it dealt. For himself he believed that things would not be right until we had a scientific corps under a permanent committee, just as the Defence Committee was under the Prime Minister to-day. He meant a body that would not consist merely of officials of the ordinary kind, but should consist of the most eminent men of science, who would go there because they were honoured and put on the footing upon which they deserved to be placed, and were recognised as a body of men who would be at the elbow of the department, and could organise the scientific work of the State. He hoped that if they got to that, the example of a Government adopting science would be followed by the municipalities, as he believed it was going to be followed more and more by our manufacturers. There was great work for that association to do. We lived in a country where science was not so much appreciated as it should be. Our people liked to see cash over the counter, and they did not like to wait for deferred payment. But we were waking up, and we had this enormous advantage, that our very individualism had produced some of the finest scientific talent of the world. He did not like to mention men on that platform, though he could do so, whose names ranked with the highest of the world. We had produced, to speak of those who were absent, our Kelvins, our Rayleighs, our J. J. Thomsons, than whom the world had no greater, to say the least of it. He had no doubt that if the British nation were given a chance it could beat the world. But we wanted knowledge. This was a new century; we had a new Sovereign; we might have a new Parliament; we should have a new chance. Let us see to it that we used our opportunities. The midnight call had come, let us take heed that we were ready. Knowledge was power. That was the great lesson of to-day. Let us hold to it that knowledge was power, and that without knowledge there was no real power in these times of intense competition.

Mr. C. W. Macara (president of the Federation of Master Cotton Spinners' Associations) moved:—"That those whose names are given in the provisional list as vice-presidents and officers of the British Science Guild be elected in those capacities and asked to serve."

This list is as follows:—

Vice-presidents: The Right Hon. the Lord Mayor of London, Sir Lawrence Alma-Tadema, O.M., R.A., the Right Hon. Lord Alverstone, G.C.M.G., F.R.S., Lord Balcarres, M.P., the Right Hon. the Earl of Berkeley, Admiral Sir Cyprian Bridge, G.C.B., Sir William Broadbent, Bart., K.C.V.O., F.R.S., Sir Walter Buller, K.C.M.G., F.R.S., Sir J. Burdon-Sanderson, Bart., F.R.S., Major-General Sir Owen Tudor Burne, G.C.I.E., K.C.S.I., the Right Hon. Joseph Chamberlain, M.P., F.R.S., Sir William Church, Bart., K.C.B., Sir George Sydenham Clarke, K.C.M.G., F.R.S., Sir John Colomb, K.C.M.G., M.P., the Right Hon. the Earl of Donoughmore, the Right Hon. Earl Egerton of Tatton, Sir John Eliot, K.C.I.E., F.R.S., Sir Michael Foster, K.C.B., M.P., F.R.S., the Right Hon. Sir Edward Fry, F.R.S., Sir Archibald Geikie, F.R.S., Mr. F. Du Cane Godman, F.R.S., the Right Hon. Sir John Gorst, K.C., M.P., F.R.S., the Right Hon. Lord Haliburton, G.C.B., Sir Joseph Hooker, G.C.S.I., F.R.S., Sir Alfred Jones, K.C.M.G., the Right Hon. Viscount Knutsford, G.C.M.G., Prof. Ray Lankester, F.R.S., Dr. J. Larmor, F.R.S., Mr. C. W. Macara (president of Federation of Master Cotton Spinners' Associations), Sir Charles McLaren, Bart., K.C., M.P., the Right Hon. Sir Horace Plunkett, K.C.V.O., F.R.S., the Right Hon. Lord Rayleigh, O.M., F.R.S., Prof. Rhys, the Lord Bishop of Ripon, Mr. E. Robertson, K.C., M.P., the Right Hon. Lord Tennyson, P.C., G.C.M.G., Sir Philip Watts, K.C.B., F.R.S., His Grace the Duke of Wellington, K.G., G.C.V.O., Sir John Wolfe-Barry, K.C.B., F.R.S.; *chairman of committees:* Sir Norman Lockyer, K.C.B., F.R.S.; *vice-chairmen:* Sir William Abney, K.C.B., F.R.S., Sir Lauder Brunton, F.R.S., the Right Hon. Sir John Cockburn, K.C.M.G., Sir Gilbert Parker, M.P.; *trustees:* the Right Hon. Lord Strathcona and Mount Royal, G.C.M.G., Sir Henry Roscoe, F.R.S.; *hon. treasurer:* the Right Hon. Lord Avebury, F.R.S.; *hon. assist. treasurer:* Lady Lockyer, 16 Penywern Road, S.W.; *hon. secretary:* Mr. C. Cuthbertson, *pro tem.*

Admiral Sir Cyprian Bridge seconded the motion. In doing so he said that the officers of the Japanese navy had frequently mentioned to him the satisfaction it was to them, and the benefit it had been to them, to have been brought up by officers of the British Navy.

The resolution was agreed to.

Sir J. Wolfe Barry moved:—"That the president, vice-presidents, and officers and the other members of the Guild mentioned in the provisional list be elected members of the general committee of the Guild." He said that the movement must be looked upon as an educational movement, to educate the people at large and the Government and political parties not to undervalue the great resources of science in the development of the kingdom. Much had been done, and he had only to look back on the progress of the nineteenth century to see how leading a part science had taken in the development of the nation. But everybody must admit that we must not rest and be thankful for what had been done. An immense amount remained. This country must not stand still. It had the most vigorous competitors, who brought all the product of science into the contest which they waged against us in so many industrial and social ways. The business of that guild would be, he thought, to urge everybody to go forward in hope, and we must not suffer ourselves to be left behind by the development of other nations from whom we might learn much. At the same time, he firmly believed that this country had nothing to fear if only it were true to itself.

Major-General Sir J. F. Maurice seconded the resolution, which was passed.

Sir W. Ramsay moved a vote of thanks to the Lord Mayor. In doing so he said that in England we had a great deal of scientific ability. Much of it was organised, but its application to the affairs of the State, to the Army, to the Navy, to the service of the nation at large, could be very much better organised than it was. The object of that guild was to attempt to effect that organisation, which was so much required. If that was so he was sure they would all agree that to promote the object of that guild was one of the most important tasks which the nation could undertake. He hoped they would all unite to promote that object and gain adherents for the guild, with the result that before many years we should be less of a disorganised rabble and more of an organised army than we were now.

Dr. Robert Caird seconded the motion, which was heartily carried.

NOTES.

WE regret to announce that Prof. Ralph Copeland, Astronomer-Royal for Scotland and professor of astronomy in the University of Edinburgh, died on October 27, at sixty-eight years of age.

CAPTAIN F. W. HUTTON, F.R.S., curator of the Canterbury Museum, Christchurch, New Zealand, and president of the New Zealand Institute, died on October 27 while returning home by the R.M.S. *Rimutaka* at the conclusion of a visit to England. He was sixty-eight years of age, and was elected a Fellow of the Royal Society in 1892.

AN interesting gathering of the old pupils of Mr. Francis Darwin, F.R.S., formerly reader in botany, was held in the botany school of the University of Cambridge on October 28, when his portrait, by Mr. W. Rothenstein, was presented to the botanical department by a body of subscribers, all formerly his pupils. To Mr. Darwin himself was presented a handsome book containing autographs of his pupils. Speeches were made by members of the staff and by other botanists regretting the severance, after twenty-one years, of Mr. Darwin's connection with the botanical department.

AT a meeting of the general committee of the British Association held on Tuesday, Leicester was adopted as the place of meeting of the association in 1907 by the following resolution, which was passed unanimously:—"That having regard to the fact that no meeting of the Association has as yet been held in Leicester, the general committee decides to accept the cordial invitation from that town, and at the same time expresses its most hearty appreciation of the kind and courteous invitation from the city of Dublin, and ventures to express the hope that the invitation may be renewed at an early date."

ON Monday, October 30, a strong earthquake shock, lasting four seconds, was recorded at Catanzaro in the afternoon; and two earthquake shocks, one rather marked and the other slight, were observed at Monteleone in the evening.

WE have received a letter from Dr. Faulds in which he replies to the review of his book on October 19 (supplement, p. iv). The more important part of his letter lies in the assertion that he *had* devised a method of classifying finger-prints. Where can an exact description of his method be found? His book contains only generalities about it, and his present letter goes no further.

AT the annual general meeting of the Royal Society of Edinburgh, held on October 23, the following officers and members of council were elected:—*President,* the Right Hon. Lord Kelvin, G.C.V.O., F.R.S.; *vice-presidents,* Hon. Lord M'Laren, Prof. Flint, Dr. R. Munro, Sir John Murray, K.C.B., F.R.S., Dr. R. H. Traquair, F.R.S., Prof. Crum Brown, F.R.S.; *general secretary,* Prof. George Chrystal; *secretaries to ordinary meetings,* Prof. D. J. Cunningham, F.R.S., Dr. C. G. Knott; *treasurer*, Mr. P. R. D. Maclagan; *curator of library and museum*, Dr. Alex. Buchan, F.R.S.; *councillors*, Prof. Andrew Gray, F.R.S., Dr. R. Kidston, F.R.S., Dr. D. Noël Paton, Prof. John Chiene, C.B., Prof. J. Graham Kerr, Dr. W. Peddie, Dr. L. Dobbin, Prof. J. C. Ewart, F.R.S., Dr. B. N. Peach, F.R.S., Dr. J. J. Dobbie, F.R.S., Prof. G. A. Gibson, Prof. J. P. Kuenen.

AN International Fisheries Exhibition, to include everything connected with the sea—either oceanographical or sea fisheries business—will be held at Marseilles under official control from April to October, 1906. The oceanographical part of the exhibition will illustrate the work of the principal biological societies, marine zoological laboratories, and similar institutions. The investigations of the Prince of Monaco will occupy a large room, and France, Germany, Portugal, the Netherlands, Norway, Sweden, America, Japan, and England will have separate spaces allotted to them. The practical and industrial side of fisheries in many parts of the world, as well as the products of the sea, will be represented. Applications for space will be received up to January 15, 1906, by the agents, Exposition de Marseille, 5 rue des Mathurins, Paris, who will also supply any further information required.

MAJOR-GENERAL SIR CHARLES WILSON, K.C.B., F.R.S., died on October 25 at Tunbridge Wells in his seventieth year. Trained as a soldier, his aptitude for work outside the routine of regimental duty soon led to his appointment in directions in which his scientific attainments could be utilised. In 1858, when he was but twenty-two years of age, he was appointed secretary to the North American Boundary Commission. From 1864–6 he was engaged on surveys of Jerusalem and Palestine, and for two years after this with the Ordnance Survey of Scotland, when he again left home to undertake the survey of Mount Sinai. This piece of work was followed by seven years as the director of the topographical department of the War Office. From 1876 to 1878 he was engaged on the Ordnance Survey of Ireland, and from 1886 to 1894 Sir Charles Wilson was the director-general of the Ordnance Surveys at headquarters. He was elected a Fellow of the Royal Society in 1874, and was twice president of the geographical section of the British Association, in 1874 at Belfast and in 1888 at Bath. He served as a vice-president of the Royal Geographical Society from 1897–1902. He was the author of several works on those countries in the east where his surveying work was done, in addition to one or two well known guide-books. It is interesting, in view of the attention given in recent years to the claims of geography to be included in the subjects required of army officers, to remember that Sir Charles Wilson, in his British Association address in 1874, spoke of the influence which the physical features of the earth's crust have on the course of military operations, and of the consequent importance of the study of physical geography to all those who have to plan or take part in a campaign.

A MEMORIAL bust of the late Dr. Joule was unveiled on October 28 at Sale, near Manchester. The ceremony was performed by Sir William Bailey, president of the Manchester Literary and Philosophical Society, who delivered an address. In the course of his remarks, Sir William Bailey said that Joule was born in New Bailey Street, Salford, in the year 1818. He studied under Dalton, who advised Joule's father to send him, on the completion of his studies, to Sturgeon, the inventor of the soft iron magnet. Under his instruction Joule became a competent electrician, and the inventor of electric welding. Mr. Denny Lane was at the British Association meeting at Cork in 1843 when Joule read his first paper on the "Mechanical Equivalent," and he assisted Dr. Joule to drum up an unwilling audience of six people, of which he was one. Sir William Bailey compared, in one part of his address, the coal consumption from the year 1840 to the present day. In 1840 the *Britannia*, 740 horse-power, Cunarder, used more than 4¾ lb. of coal, in 1862 the *Scotia* used 3¼ lb., in 1881 a steamboat used 2 lb., and to-day the lowest consumption is 1 lb. per horse-power per hour; much of this economy may fairly be credited to knowledge of the mechanical equivalent. There are about 13·500 British thermal units in a pound of good coal, and if there is no loss in consuming it there would be a power equal to five horses obtained from it; but engineers know that the best engines under the most scientific conditions and skilful attention with boilers under the most skilled superintendence only give a duty of 1 horse-power for 1 lb. of coal. Joule invented electric welding in 1855. With a battery of six Daniel cells he succeeded in fusing steel wires and uniting steel, brass, and platinum to iron. Again, his experiments proved that it takes ⅞ lb. of zinc to fuse 1 lb. of iron. Some portion of Joule's library and apparatus is at the Manchester Technical School.

THE sixth annual Huxley lecture of the Anthropological Institute was delivered on Tuesday, October 31, by Dr. John Beddoe, F.R.S., ex-president of the institute; the chair was taken by Prof. Gowland. The lecturer chose as his subject "Colour and Race," and dealt mainly with the problems of Central Europe and the British Isles. After asserting the right of pigmentation to a high place among somatological data, Dr. Beddoe traced the history of the colour question, maintaining the correctness of his own methods as against those of Virchow and others; he showed, incidentally, that the latter gave incorrect results in certain areas. After adverting to the influence of heat, humidity, and various kinds of disease in causing selection of brunettes in certain localities, he passed on to explain in detail pigmentation maps of Central Europe which he had prepared; fairness was shown to increase from south to north, both in Europe and the British Isles, but it was open to question whether in the latter case historical rather than climatic grounds were not mainly operative. On the map of Ireland the traces of invading races were strongly marked; but in England the Saxons had not exterminated the preceding races, as was sometimes imagined. In conclusion, the lecturer asserted the probability of a change in the direction of dark pigmentation in this country, due to the predominant influence of the proletariat. The Huxley memorial medal was then presented to the lecturer by the president, and suitably acknowledged by the recipient.

IN an interesting article in the *Times* (October 28), some of the current theories on the ætiology of the disease known as "beri-beri" are reviewed. That of Dr. Hose, which ascribes the disease to the consumption of mouldy rice, is considered to accord with the facts better than any other. It must, however, be admitted that in the opinion of those best qualified to judge, this dietetic theory cannot be maintained. At the same time, it would be well, in the present state of our knowledge, to examine critically all theories, and it is stated that experiments are being made at Cambridge, under Prof. Sims Woodhead's direction, to test the truth or otherwise of Dr. Hose's theory.

At a largely attended meeting of the Brighton and Sussex Medico-Chirurgical Society held at Brighton on October 27, Sir Frederick Treves gave an address on the Army Medical Service. He pointed out that in the South African campaign the admissions to hospital were 746 per 1000 on account of disease, and only 34 per 1000 for wounds. Our present medical department is totally inadequate, and a sufficient reserve must be created. Sir Frederick concluded by pointing out what appeared to him to be needed to make the Army Medical Service as perfect as possible. The points were:—(1) The Director-General should be the head of his department and be responsible for its efficiency and economical administration; (2) he should have direct access to the Army Council and Secretary of State; (3) he should have control of the money voted for the medical service; (4) the service remaining, as at present, "under the supervision of the Advisory Board"; (5) an efficient Army Medical Reserve should be formed; (6) the combatant officer should have some knowledge of hygiene as applied to campaigning and barrack life, and a like knowledge, of a still more elementary character, should be possessed by the private soldier; (7) the Army medical officer should be vested with such authority and provided with such *personnel* as would enable him to carry out those sanitary arrangements in the field which experience had proved to be absolutely essential to secure the *minimum* loss of life from disease.

Dr. J. Huber, of Pará, has sent us a separate copy of his paper on the formation of colonies in the ant *Atta sexdens*, from the *Biol. Centralblatt*, to which brief reference has already been made in these columns.

The annual report of the Geological Survey of New Jersey for 1904 includes an illustrated account by Mr. C. R. Eastman of the Triassic fish-fauna of New Jersey, prefaced by a general popular dissertation on fossil fishes. This Triassic fish-fauna is singularly limited but remarkably constant throughout the eastern United States, from Virginia northwards, comprising only half a dozen generic types, of which four are severally represented only by a single species.

We have received five numbers of the *Proceedings of the U.S. Nat. Museum*, the contents of four of which are devoted to the invertebrate faunas of America and the Philippines. New generic types of South American moths are discussed by Mr. H. G. Dyar in No. 1419, while other new forms of the same are described by Mr. W. Warren in No. 1421. A revision of North American fleas, by Mr. C. F. Baker, forms the subject of No. 1417, in which the author directs attention to the circumstance that fleas infesting rats in the tropics are more near akin to those which attack man than is the case with the rat-fleas of cooler climates, and to the bearing of this fact on the propagation of plague. Hymenoptera from the Philippines form the subject of No. 1424; while in No. 1425 Mr. W. H. Dall discusses the "Universal Conchologist" of Thomas Martyn, published in 1784, and the value of the technical names employed therein.

Much interesting information with regard to scientific progress in India will be found in the report of the Madras Government Museum and Connemara Public Library for 1904–5, drawn up by Mr. E. Thurston, who recently returned to his charge after a period of furlough in this country. The scheme for a systematic ethnographical survey of India, recently sanctioned by the Government, enters largely into this report, Mr. Thurston pointing out the difficulties connected with making such a survey in a country of the size of India, and referring to the somewhat unsatisfactory nature of the replies received from some of those who have undertaken to fill up papers connected with the subject. The museum is fortunate in having acquired the valuable series of prehistoric objects collected by Mr. R. B. Foote, late of the Indian Geological Survey, during his long residence in Madras. It may interest numismatists to learn that certain ancient lead coins kept in a wooden cabinet enclosed in an iron safe were found to be reduced to powder, the metal having been converted into carbonate.

We have received separate copies of two papers by Francis Baron Nopcsa, the one from the *Geological Magazine* for July, and the other from the *Annals and Magazine of Natural History* of the same date. In the former the author describes, with a restored figure, a large portion of the skeleton of a large carnivorous dinosaur from the Oxford Clay of Oxford in the collection of Mr. J. Parker of that city. In place of referring this splendid specimen to the well known genus Megalosaurus, Baron Nopcsa considers that it indicates a genus apart, and he identifies it with Streptospondylus, typified by a few vertebræ and limb-bones in the Paris Museum from the Kimeridgian of Havre. Among other peculiarities, the Oxford dinosaur is stated to differ from Megalosaurus in possessing four (in place of three) hind-toes. It may be mentioned in this connection that Phillips, in his description of the typical species of the last named genus, expressly stated that he was uncertain whether there might not have been a fourth hind-toe. In the second paper the author gives a new interpretation of the problematical fossil Kerunia, from the Egyptian Eocene, which has been referred by one authority to a cephalopod and by a second to a hydractinian polyp. According to the author, both these authorities were to a certain degree right, for he regards Kerunia as a hydractinian in which a cephalopod took up its residence (symbiosis). The union of the two organisms was apparently so intimate that while the encrusting zoophyte undertook the construction of the shell of the mollusc, the latter controlled to a certain extent the growth of the zoophyte.

A return has been published, we learn from the *Pioneer Mail*, regarding the measures adopted for the extermination of wild animals and venomous snakes during the year 1904. The total mortality among human beings reported to have been caused by wild animals was 2157, against 2749 in 1903. The most noticeable decrease occurred in Madras and the United Provinces, namely, from 438 and 404 in 1903 to 237 and 193 in 1904 respectively. In the Central Provinces (including Berar), also, there was an appreciable decrease—from 470 to 351. The destruction of human life by tigers in 1904 was smaller than in the previous year, the number being 786 against 866. As usual, the greatest mortality occurred in Bengal. The year's returns show a marked decline in the number of deaths caused by wolves—from 463 in 1903 to 244 in 1904, the decrease occurring principally in the United Provinces, where the mortality from this cause fell from 278 to 90. It is pointed out that the number of wolves destroyed in the United Provinces has fallen from more than 1200 in each of the years 1902 and 1903 to 650 in 1904; and the belief is expressed that this points to a genuine decrease in their numbers. The mortality from snake-bite rose from 21,827 to 21,880. It is reported that in the Seoul district of the Central Provinces anti-venin was used with success in two cases, and the question of introducing more generally the treatment of snake-bite by potassium permanganate is under the consideration of the local Government. The total number of snakes killed was 65,378.

DR. L. COCKAYNE contributes a short article on the far north of New Zealand to the *Young Man's Magazine* (August 1). The narrow strip of land lying north of the thirty-fifth parallel is for the most part a barren waste traversed by a few diggers of kauri gum. A belt of mangroves lines the estuary in Rangaumu Bay, and about North Cape are found the purple-flowered composite, *Cassinia amoena,* the crimson-flowered *Veronica speciosa,* and the curious leafless parasite *Cassythia paniculata.* Especially interesting is the Reinga, a rocky mass jutting out into the sea, whence, according to Maori lore, the Maori spirits took their final leap into the unseen world.

IT is interesting to find, as noted in the *Agricultural News* (September 9), that the new Barbados varieties of sugar-cane, known as B208 and B147, have yielded good results in Queensland; the latter seems to be especially hardy and proof against fungoid attacks. A remedy is suggested in connection with an unsatisfactory shipment of mangoes that the decay which is caused by fungi or bacteria acting on the bruised surface of the fruit may be in some measure prevented by immersion in a weak solution of formalin; it is said that with due precaution the formalin does not spoil even such delicate fruit as strawberries.

AT the beginning of this year an improvement was effected in the general style of the *Indian Forester,* and now, owing to the departure of two members of the controlling committee, a more permanent arrangement for a board of management, presided over by the Inspector-General of Forests, has been established. Mr. E. P. Stebbing, who continues to act as editor, discusses in the August number the *pros* and *cons* of fire protection in teak forests, and concludes with the recommendation to consider how fires can be controlled so as to yield the maximum benefit with a minimum of damage. He also furnishes the life-history of a cecidomyid fly which produces galls or pseudo-cones on *Pinus longifolia.* Mr. E. M. Hodgson presents an interesting account of the arrangements for fire protection in the Mandui range, Surat district.

IN Bulletin No. 26, Bureau of Government Laboratories, Manila, Dr. Richard Strong gives an admirable survey of the clinical and pathological significance of the *Balantidium coli,* a protozoon parasitic in man and swine, and causing diarrhœa and pseudo-dysentery.

THE contents of the *Bulletin of the Johns Hopkins Hospital* for October (xvi., No. 175) are chiefly devoted to medical subjects, but include an interesting summary of our present conceptions as to the cause of the heart beat by Mr. E. G. Martin.

THE *Journal of Anatomy and Physiology* with the October number commences its fortieth volume, and Sir William Turner, F.R.S., who has been an associate editor since its foundation, contributes a preface. The size of the page has been much enlarged, which, it is hoped, will be more advantageous for the reproduction of drawings. The number contains ten important articles and several excellent plates.

THE papers in the October number of the *Journal of Hygiene* (v., No. 4) maintain a high standard. Among others, Dr. H. S. Willson writes on a new process for the isolation of the typhoid bacillus from water by means of precipitation with alum, Mr. Crofton on anti-bacterial sera, Mr. de Korté on a sarcosporidium of a monkey, Dr. Graham-Smith on a piroplasma parasite of the mole, Dr. Nuttall on the prevalence of anopheles, Dr. Harden on the chemical action on glucose of the lactose-fermenting organisms of fæces, and Dr. Haldane on the influence of high air temperatures.

ATTENTION is directed in the *Engineering and Mining Journal,* of New York, to the remarkable developments at Mount Morgan, Queensland, whereby the mine of that name is being converted from a great gold mine into a copper mine. Diamond-drill borings have revealed large bodies of copper gold ore below the previous openings in the gold ore sufficient to warrant the erection of smelting works capable of treating 10,000 tons of ore monthly.

AT the first meeting of the autumn session of the Institution of Mechanical Engineers, an interesting paper on the manufacture of cartridge-cases for quick-firing guns, by Colonel L. Cubillo and the late Mr. A. P. Head, was submitted. The object of the paper was to describe the new plant recently completed at the Royal Spanish Arsenal at Trubia, Spain, for the manufacture of brass cartridge-cases from 3 inches to 6 inches in diameter.

A STRIKING photograph is reproduced in *Engineering* of October 27 showing the extraordinary erosive effect of the discharge from the Assouan dam. The whole of the water of the Nile passes through sluices in the face of the dam. These sluices are at different heights, so that water is never discharged under a head of more than 29·5 feet, which limits the velocity of discharge to less than 35 feet per second. Even at this velocity, however, the water has proved capable of lifting a boulder, weighing more than 60 tons, out of its natural bed in apparently solid rock, and hurling it back against the dam.

THE following method, requiring only a scale and a pair of dividers, for the measurement of angles is given in the *Engineer.* Suppose the length of an arc of 90° to be 90 mm., the length of the radius of the corresponding arch will be $180/\pi = 57{\cdot}3$ mm. Every millimetre, therefore, measured as an arc struck with this radius corresponds to an angle of 1°. For example, if an angle of 33° is required, describe an arc of 57·3 mm. radius and mark off upon it with a pair of dividers 10 mm. three times, and finally 3 mm. for the odd 3°. The method is equally applicable to British measures if the standard radius is taken at 5·73 inches, when the degree corresponds to one-tenth of an inch.

THE October issue of the *Journal of the Franklin Institute,* of Philadelphia, contains an account of the invention and development of the telautograph. Electric transmission of handwriting has received attention ever since telegraphic transmission of printed characters was effected. Prof. Elisha Gray exhibited a telautograph at Chicago in 1893, but cost and difficulty of manufacture led to its abandonment. The instrument has been brought to its present state chiefly through the experimental work of Mr. G. S. Tiffany. It is a variable current instrument with several interesting features, including what may be termed a straight line D'Arsonval movement, which is used to work the receiver. A large number of private line telautographs are now in actual use in the United States.

IN a series of papers in the *Proceedings of the Royal Society of Victoria* (n.s., vol. xviii., part i., August) Messrs. Thiele, Chapman and Hall add to the knowledge of the Palæozoic rocks and fossils of Gippsland. A series of graptolites, including both some new forms and several well known British species, mark the Ordovician age of certain black slates; a new species of Receptaculites comes from Silurian rocks, while some Devonian fossils are re-described.

THE frequent association of the acid igneous rock granophyre with the basic gabbro has attracted the attention of many geologists, and two explanations have been offered—(1) that the two rocks have been differentiated, during slow consolidation, out of a uniform magma of intermediate composition; and (2) that one of them represents the unaltered original magma, while the other has been formed by part of it absorbing and assimilating foreign material. Mr. R. A. Daly, of the International Boundary Commission, describes (*Amer. Journ. Sci.*, 4th ser., vol. xx., No. 117, September) cases he has observed in British Columbia and elsewhere which appear to him to prove conclusively the second theory to be correct. Gabbro-sills, intrusive in a quartzite, have been converted into an acid rock along the upper contact by absorption of silica from the quartzite, the other rock constituents retaining very nearly their original proportions.

WE have received the report on rainfall registration in Mysore for 1904 prepared by Mr. J. Cook, director of meteorology in that province; it contains valuable statistics relating to the seasonal and geographical distribution over that extensive area. The number of Government stations is now 201; but with regard to a few of the stations the director has to lament culpable inattention on the part of the officials concerned, who have allowed the gauges to lie for months without being suitably fixed. Among the heavy falls in twenty-four hours may be specially mentioned 20·67 inches in June, in the Shimoga district, and 13·70 inches in July, in the Kadur district. The geographical distribution is plainly exhibited by two maps, one for the year 1904, and another showing the average for thirty-five years, 1870–1904; the abnormality of the distribution owing to the failure of the north-east monsoon rains is strikingly represented. The thirty-five years' average for the whole province is 37·12 inches; the average for the Kadur district is 74·26 inches, and for the Chitaldrug district 21·46 inches.

PROF. STOUT'S paper on "Things and Sensations," read to the British Academy in May, has been published by Mr. Henry Frowde. Prof. Stout maintains that the problem for philosophy is not, Is there an external world? but *What* is the external world, and how do we know it? He points out that in one aspect the thing and its sensible appearance are regarded as entirely one, and in another aspect as separate and independent. He rejects the solution that the sensible appearance is merely the thing itself appearing, examines hastily but suggestively the views of Locke and Kant, and comes to the conclusion that there is an actual existence other than sensation. This he calls the independent not-self, and he describes it as not unknowable and as not matter, but only one constituent of the complex unity which we call matter. In the concluding section of his admirable essay he argues that we must apprehend this independent not-self as another self, or as a partial aspect of another self more or less like our own.

THE fifth volume of the new series of the *Proceedings of the Aristotelian Society* has been published by Messrs. Williams and Norgate at 10*s.* 6*d.* net. The volume includes the papers read before the society during the session 1904–5, an abstract of minutes of the proceedings, and the report of the executive committee.

THE first two parts of a "Three Years' Course of Practical Chemistry," by Messrs. George H. Martin and Ellis Jones, science masters of the Bradford Grammar School, have been published by Messrs. Rivingtons at 1*s.* 6*d.* each. The second part, dealing with the work of the second year of the course, was originally published privately, and was reviewed in our issue for December 1, 1904 (vol. lxxi. p. 100). An introduction to each volume has been provided by Prof. J. B. Cohen.

AMONG the articles in the current number of the *Quarterly Review* is one dealing with the aborigines of Australia, written by Mr. Andrew Lang. This article reviews the work of the chief observers of the primitive peoples of Australia, examining exhaustively the researches of Mr. A. W. Howitt, Mr. F. J. Gillen, and Prof. Baldwin Spencer. Mr. Lang differs from all these on some points of theory, though he is profuse in his admiration of the matter and manner of their work, except as regards linguistic and philological research. The hypothesis put forward by Mr. Lang is the converse of that apparently entertained by Messrs. Spencer and Gillen. To quote the concluding paragraph of the article:—"they probably regard the Arunta lack of religion as primitive, just as they think the totemism of the Arunta most archaic. They do not indulge in the comparative method in either case; and it is the comparative method that leads us to our conclusions." The same number of the review contains an article on food supply in time of war.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN NOVEMBER:—

Nov. 3. 13h. 35m. to 14h. 56m. Transit of Jupiter's Sat. III. (Ganymede).
,, 5. 10h. 59m. to 12h. 4m. Moon occults σ Aquarii (mag. 4·8).
,, 9. 15h. 52m. to 16h. 51m. Moon occults ν Piscium (mag. 4·7).
,, 13. 6h. 35m. to 7h. 16m. Moon occults α Tauri (mag. 1·1).
,, 13. 9h. 7m. Minimum of Algol (β Persei).
,, 14–16. Epoch of Leonid shooting stars (Radiant 151° + 23°).
,, 15. Venus. Illuminated portion of disc = 0·930. Of Mars = 0·879
,, 16. 5h. 56m. Minimum of Algol (β Persei).
,, 17–21. Epoch of Andromedid shooting stars, with probable maximum November 18 (Radiant 25° + 43°).
,, 20. Saturn. Major axis of ring = 39″·62, Minor axis = 7″·88.
,, 23. 21h. Jupiter in opposition to the Sun.
,, 24. 18h. Venus in conjunction with the Moon. Venus 3° 42′ S.
,, 26. 17h. Mercury at greatest elongation, 21° 41′ E.
,, 27. 18h. Mercury in conjunction with the Moon. Mercury 6° 33′ S.

WAVE-LENGTHS OF SILICIUM LINES.—Because of their especial utility in radial-velocity determinations, Prof. Frost and Mr. J. A. Brown have re-measured the wave-lengths of the silicium lines at $\lambda\lambda$ 4553, 4568, and 4575, which were simultaneously identified by Sir Norman Lockyer and Mr. Lunt, and designated "group iii." by the former observer.

The three spectra measured in this new determination were obtained by passing a strong spark between poles containing metallic silicium and titanium, the sharp titanium lines providing useful standards of wave-length in the subsequent calculation. As a titanium line occurs near enough to the silicium line at λ 4553 to interfere with the measures of the latter, only those photographs were used on which the faintness of the other titanium lines showed that this possible source of error might be neglected.

As a result of this research the following values were obtained for the wave-lengths sought:—λ 4552·64, λ 4567·90, and λ 4574·79. The values obtained by previous observers are given below for comparison:—

	λ	λ	λ
Gill (from stars)	4552·79 ...	4567·90 ...	4574·68
McClean (from stars)	4552·6 ...	4567·5 ...	4574·5
Lockyer (spark)	4552·8 ...	4568·0 ..	4574·9
Exner and Haschek (spark)..	4552·75	4567·95 ...	4574·9

The importance of having the exact wave-lengths of these lines in stellar radial-velocity determinations is shown by the differences which would be introduced into Prof. Frost's recent work on the *Orion* stars by the change from Exner and Haschek's values, as given above and previously used by Prof. Frost, to the new wave-length values. They are as follow:—

	Correction (Frost and Brown.—Exner and Haschek)	
λ	In λ	In kilometres
4553 ...	−0·114 tenth-metres ...	= −7·51
4568 ...	−0·053 ,, ...	= −3·48
4575 ...	−0·109 ,, ...	= −7·14

REPORT OF THE YERKES OBSERVATORY.—Prof. Hale's report of the work performed at the Yerkes Observatory during the year ended June 30, 1904, has just been received, and shows that, during that period, neither the results obtained nor the private pecuniary support accorded to the institution fell below the average of previous years.

The Carnegie Institution of Washington has renewed the grant of 4000 dollars made to the observatory for the previous year, and the money is to be employed in furthering the investigations of stellar parallaxes, the observations of variable stars, and the reduction of the solar photographs obtained with the spectroheliograph of the Kenwood Observatory during the years 1892–5.

The Snow telescope, which was destroyed by fire in December, 1902, has been rebuilt from a gift of 10,000 dollars made by Miss Snow, and has since been erected at the Mount Wilson Solar Observatory.

A gift of a further 10,000 dollars from the Carnegie Institution provided for an expedition, for solar research, to Mount Wilson, where an independent observatory has since been erected under the direction of Prof. Hale, who thus severs his more immediate connection with the Yerkes Observatory.

The Bruce telescope having an aperture of 10 inches and a focal length of 50 inches has now been completed, and, under the direction of Prof. Barnard, is yielding splendid results. This telescope gives sharp definition over a field about 9° in diameter.

The 40-inch refractor is used for the Rumford spectroheliograph, the Bruce spectrograph, and several other attached instruments, and continues to give increased satisfaction.

After describing the above, Prof. Hale gives a somewhat detailed account of the excellent work performed in each department, and thereby shows what an important place in the astronomical world is filled by the Williams Bay observers and observatory.

OBSERVATIONS OF JUPITER'S SIXTH SATELLITE.—The results of a series of photographic observations of Jupiter's sixth satellite, made at Greenwich with the 30-inch reflector of the Thompson equatorial during August, September, and October, are published in No. 4051 of the *Astronomische Nachrichten*. Thirteen photographs were obtained on eight nights, and the time and length of each exposure, and the position angle and distance determined therefrom, are given in the table published. So far as possible, the two latter quantities have been compared with those given by Dr. Ross's ephemeris which appeared in No. 4042 of the *Astronomische Nachrichten*, and the differences are appended.

In order to facilitate the measuring process, the over-exposed image of Jupiter, on each plate, was reduced with ferricyanide of potassium, leaving an easily measurable reversed image, but the present results are to be considered as only provisional.

THE SPECTRUM OF NOVA PERSEI NO. 2.—No. 3, vol. lvi., of the Harvard College Observatory Annals contains a detailed *résumé* of the spectroscopic results obtained at the observatory in connection with Nova Persei No. 2.

Particulars of the photographs obtained are first given, and then each plate is discussed in order, and a description of the spectral changes and of the principal lines in the spectrum given. Special remarks are made in reference to any peculiar appearance or changes in the spectrum, such as took place when the star was rising to its maximum brightness and subsequently when its magnitude was oscillating. In this connection an interesting comparison is drawn between the changes which take place in the spectrum of Mira Ceti during the light-variations of that star and those which were observed in the Nova spectrum. From this comparison it is deduced that both in the case of Novæ and variable stars of long period the hydrogen lines do not become bright until the star has attained a large portion of its light.

REDUCTION TABLES FOR EQUATORIAL OBSERVATIONS.—Appendix No. 3 to vol. iv. of the Publications of the U.S. Naval Observatory contains a series of tables for the reduction of equatorial observations.

These tables have been compiled by Mr. C. W. Frederick, who, in the introduction to them, develops the formulæ for the construction of the tables of differential refraction for micrometer observations made with an equatorial, describes a method of determining the instrumental constants, and explains the use of the six tables included in the work.

The first three tables show the corrections for differential refraction, for the latitude of the Washington Observatory, to be applied separately according to the method of observation pursued.

Tables iv., v., and vi. give the instrumental constants of the 26-inch equatorial, of the Naval Observatory, for use under analogous conditions.

PHOTOGRAPHIC STAR CATALOGUE.—From a communication made by M. Lœwy to the Paris Academy of Sciences, we learn that the first volume of the "Catalogue photographique du Ciel" has been published by the Bordeaux Observatory, relating to the region dec. +16° to +18°, which they undertook to observe. This volume contains the rectilinear coordinates of 49,772 stars, and completes the set of four similar publications undertaken by the French observatories (Algiers, Paris, Toulouse, and Bordeaux) as part of the international cooperative scheme (*Comptes rendus*, October 9).

GEOGRAPHY AT THE BRITISH ASSOCIATION.

IN arranging the programme of work for the South African meeting, the organising committee of Section E tried to secure papers summarising the geographical conditions of the "subcontinent," as it is locally called, or those dealing with general geographical problems. The number of papers by South Africans was smaller than might have been expected, the local committee discovering that geography was the subject for which it was most difficult to secure papers. South Africa is in the position of having many specialists interested in geographical aspects of their specialisms, but has as yet no geographers giving all their time and energy to the subject.

In spite of this, the programme of the section was a full one, and it would have been difficult to dispose of more business than was accomplished.

It will be most convenient to consider first those papers which deal with Africa.

Mr. H. C. Schunke Hollway, vice-president of the section, communicated a paper on the outlines of the physical geography of the Cape Colony. This was illustrated by a new orographical map specially prepared by the Surveyor-general, Mr. Cornish-Bowden, showing contour lines at 1500, 3000, 4000, 6000, and 8000 feet. Unfortunately, sufficient data for plotting the 500-feet contour line—one of the most interesting of all—do not exist; and even the lines shown on this map are only approximations. Here, at the outset, the lack of a good topographical map was bewailed, and throughout the wanderings of the members in South Africa this deficiency was felt at every turn. Mr. Schunke Hollway traced the first efforts to obtain levels, and showed how the railway surveys had been the chief means of securing the knowledge we possess of relief. He then discussed the natural divisions of the Cape Colony, distinguishing (1) the coast, and (2) the Orange River basin. The coast, varying from 80 miles to 170 miles wide, he divided into (*a*) the eastern region, a narrow tract of land which rose in terraces from the sea, east of the south-east sweep of the Sneeuwbergen, Tandjesbergen, and Bankberg ranges, to where it dipped into the Fish River, and along that river to the sea; (*b*) the south-western region, which nearly coincided with the folded mountain belt, and stretched as a narrow zone of mountains not more than 85 miles wide from the Olifants River in the west to the Fish River in the east; (*c*) the lower Karroo region, a comparatively narrow strip of land between the southern mountain belt and the watershed, which extended from Uitenhage and Somerset East to the north end of the Bokkeveld Karroo, south of Calvinia; (*d*) the north-west coast region, which lay between the Olifants and the Orange rivers. The Orange River region consisted broadly of a hollow plain which sloped gently from east to west, with but few isolated ridges and hills scattered over its surface. It was 1000 miles long, rose to more than 3000 feet within 80 miles of the coast, and remained above this height for 250 miles in width. Seen from the tableland, the Roggeveld and other bordering mountains seemed insignificant, but seen from the Karroo the escarpment presented the appearance of a magnificent mountain range. This rose to the Drakensbergen or Kahlamba mountains in the east, 180 miles of which lay within the colony, with an average ridge level of 8000 feet. In the west, valleys containing settlements at more than 6000 feet were to be found. After a detailed examination of each region, its economic conditions were briefly discussed, and their relationship to rainfall pointed out.

The physical geography of the region further north was discussed in Mr. Tudor Trevor's paper on the physical features of the Transvaal. He divided the country into:—(1) the plateau country or High Veld; (2) the slopes of the plateau locally called Banken; and (3) the basement country locally called Low or Bush Veld. These were subdivided as follows:—

		Square miles	Per cent
High Veld ...	... True High Veld	14,900 ...	12·7
	Middle Veld...	18,800 ...	16·0
	Outliers (Zoutpansberg and Waterberg)	4,400 ...	3·7
	Total	38,100 ...	32·4
Slope Country ...	Main Slope	19,700 . .	16·7
	Outliers (Zoutpansberg and Waterberg)	7,400 ...	6·3
	Total	27,100 ...	23·0
Low Veld		52,000 ...	44·6
	Total	117,200	

He described the water systems and pointed out the absence of alluvial deposits, and directed attention to the steady diminution of the water in springs in recent historic times.

Mr. F. S. Watermeyer dealt with a wider area in his geographical notes on Africa south of the Limpopo. He gave a brief historical sketch of the cartography of South Africa, a summary of the history of its population, and an account of the physical features and climatic conditions, especially with regard to the influences on the development of pastoral and agricultural pursuits.

Mr. C. Stewart, Government meteorologist, communicated at Cape Town a paper on the climate of South Africa. The uniformity of mean annual temperature was pointed out—the Royal Observatory, Cradock, Bloemfontein, and Johannesburg being all about 62° F.—the higher altitude neutralising the lower latitude. The mean temperature curve was at a maximum in February; it fell rapidly until June, slightly to July, and rose with a peculiar flattening in September to the maximum. The minimum of the year occurred in a cold spell in July. The flattening in September was associated with an increase in the cloud curve coincident with the change in the prevailing winds from north-west in August to south in September. As to rainfall, there were three regions:—(1) the south-west winter rain region; (2) the small area in the south of constant rains; and (3) the east, with summer rains. Rain came with north-westerly winds in the west, with south-westerly winds in the south and east, and sometimes with north-easterly winds in the east.

Remarkable winds, locally called "Berg winds," blew from the plateau at right angles to the coast and raised the temperature. At Port Nolloth they blew when depressions were commonest in South Africa—from autumn through winter to spring—and made it warmer in winter. The storms of South Africa were associated with Λ depressions, and so were similar to those of southern Australia.

Mr. Hutchings read a paper on the indigenous forests of South Africa. He divided them into:—(1) the dense evergreen indigenous forests of which yellow-wood was the chief species, commonly called the yellow-wood forest; (2) the open timber forest, which generally occupied drier country than the yellow-wood forest, and was of inferior type, though it might contain trees of first importance, such as the cedar forest of Clanwilliam and the Rhodesian teak (*Afzelia cunanzensis*) forest of Wankie; (3) the scrub forests of the dry, hot coastlands and portions of the interior, where the rainfall was scanty and uncertain. There was no timber of large size in the scrub forests, and not much in the open timber forests. The yellow-wood forests were found in the rainy regions of the south coast, where they appeared as dense evergreen woods disposed in two storeys. The lower storey was formed by stinkwood, assegai, hard pear, ironwood, &c., and the upper storey by the large yellow-wood trees, which attained the stature and dimensions of the largest oak trees in Europe. For 1200 miles from Cape Town to the north-east Transvaal the species remained much the same, but in the Rhodesian forests most of the trees were deciduous and of different species to those of the yellow-wood forest.

Major Stevenson Hamilton, warden of the game preserves, gave an interesting account of the past and present distribution of game in the Transvaal, and of the attempts which were being made, with gratifying success, to prevent its extermination.

Two papers dealt with Africa as a whole. Mr. J. Bolton discussed the boundaries and areas more particularly of British colonies and protectorates. The boundary treaties and agreements which have resulted in boundary surveys were specially treated, as these surveys are almost the only pieces of scientific map-making in the continent.

Messrs. Herbertson and Waite showed a new map of the annual rainfall of Africa, based on all available data.

Two papers were communicated on surveying and mapping. The triangulation of the gold fields was described by Mr. van der Steer, who had helped Mr. Melville, vice-president of the section, to carry out the triangulation of the central and most important section. This paper will be published in full in the *Journal of the Institute of Land Surveyors of the Transvaal*.

Colonel Johnston, late director-general of the Ordnance Survey, gave a very clear account of the history and work of the survey, and described the various maps which it issues, illustrating his remarks by specimens and by lantern slides. He pointed out the various advantages to be derived from a topographical survey of South Africa, and showed that it need not be so expensive an operation as was commonly supposed.

There were very few papers dealing with geographical exploration. At Cape Town Mr. L. Bernacchi lectured on the results of the National Antarctic Expedition with the *Discovery*, in which he paid special attention to the magnetic and meteorological results. Mr. Ferrar, another member of the expedition, gave an evening lecture at Pietermaritzburg on the same subject. A paper on the volcanic Gough Island, by Mr. Rudmose Brown, of the

Scottish Antarctic Expedition, was read at Cape Town. Two new buntings, a rich marine fauna, and three new species of plants were obtained. The desirability of further exploration from South Africa was pointed out. In the course of the discussion it was suggested that a meteorological station on Gough Island might be of use to South African weather services. Mr. Yule Oldham gave a summary of the history of the discovery of the coasts of Africa, illustrated by an admirable selection of lantern slides of contemporary maps, showing the various stages in the progress of discovery. The proceedings at Johannesburg were opened by Mr. Douglas W. Freshfield, who described the Sikhim Himalayas, and the route followed by our troops towards Lhasa; this was the only other record of travel. Mr. Freshfield delivered one of the evening lectures at Durban, choosing for his subject "Mountains."

Some interesting discussions took place on questions of physical geography at a joint meeting with the geological section, an account of which will shortly be published. At Johannesburg, Prof. Davis, of Harvard, communicated a paper on the geographical cycle in arid areas—a deductive essay based on observed facts. Starting from suggestions in Prof. Passarge's great work on the Kalahari Desert, he traced the probable sequence of land forms in an elevated and arid region rarely subjected to water erosion, illustrating his remarks by admirable blackboard sketches. He pointed out that, starting with a rough, uneven land, the occasional water erosion would not be related to sea-level, and at an early stage the depressed areas would be slowly filled up, forming lakes of rock waste. In course of time, the slopes would be so worn down and adjacent basins so filled that one communicated with its neighbour. Ultimately a large "integrated" basin would be formed; wind action would increase with smoothness, and might even transport waste outside arid area. This would waste the whole surface and reduce it to a common level, and wearing away by wind might even lower the surface below sea-level. It was suggested that wind erosion might explain the pans of the Transvaal, the origin of which had occasioned considerable speculation.

Two papers were of special interest to teachers of geography. Captain Ettrick W. Creak, F.R.S., vice-president of the section, maintained that the use of globes was essential in teaching geography, and that systematic lessons should be given with globes.

Mr. J. Lomas showed how excursions could be used in teaching geography, and illustrated his points by views taken on some excursions which he had conducted.

The committee of the section asked for the re-appointment of the committees on researches in the Indian Ocean, and on the local names given to geological and topographical features in different parts of the British Isles. They, along with sections B, C, and E, asked for the appointment of a committee to report on the quantity and composition of rainfall and the discharge of lakes and rivers in different parts of the globe.

The whole journey from England to the Victoria Falls and back may be regarded as the longest, most interesting, and most profitable geographical excursion ever made by the section. This has been described in NATURE by another pen, and so need not be recapitulated here. In South Africa the most elaborate special excursions were those arranged by the geologists, and the long trek from Pretoria to Mafeking. These permitted members to see the country more intimately than was possible from the train. The thanks of those geographers who were allowed to take part in these must be recorded.

Since the above was written, the sad news has come that the president of the section, Admiral Sir William Wharton, died at Cape Town on Thursday, September 28, after a short illness. The value of the proceedings in this section was greatly increased by his intimate knowledge of many parts of the world, by his keen interest in all geographical problems, and by the genial way in which he induced those present to take part in the discussions. An account of his career was given in NATURE of October 12 (p. 586), but the writer may be permitted to say how very much the success of the meetings of the geographical section was due to the president, whose loss will be deeply deplored by all who were privileged to come in contact with him.

THE CHELSEA POWER STATION.[1]

THE development of electric traction as applied to railways in Great Britain is about to make one more step forward with the electrification of the underground railways in London, and as this scheme is almost complete, a short description of the power scheme may be of interest.

In most large power schemes that have been completed during the last few years, it has not always been convenient to place the main power station near the centre of the system of power distribution, owing to cost of ground, &c., but this difficulty is got over by employing a number of small distributing stations which are conveniently situated in the area of supply, and are supplied with power from a large main generating station.

The main generating station of the underground electric railway will supply the entire power necessary for the working of the Inner Circle, which it is working in conjunction with the Metropolitan Railway Company's station at Neasden, and for the whole of the District Railway. It will also furnish power to the Baker Street and Waterloo, and the Great Northern, Piccadilly, and Brompton tube railways on their completion.

Coal for the boilers' furnaces is lifted out of barges by two large cranes, each working a 27-cwt. grab bucket, which deposits it in a holder where it is automatically weighed. From the holders the coal is carried by means of automatic conveyors to the coal bunkers, which are situated in the top of the boiler house immediately over the boilers. The coal falls from these through chutes to automatic stokers as required, and as the ash accumulates beneath the boiler furnaces it is removed by means of an ash railway. Thus the handling of the coal is almost wholly automatic from the moment the coal leaves the barges until it is returned to the barges as ash.

The boiler house consists of a basement and two floors, and is 450 feet long by 100 feet wide. In the basement there are eight pumps for pumping the water into the boilers. The boilers are on two floors, each containing thirty-two boilers, with floor space available for eight more boilers on each floor should they be required. They are divided into groups of eight, and each group supplies steam direct to the steam turbine engine to which it is permanently connected. Each group is fitted with economisers for heating the water before it is pumped into the boilers.

The main engine-room is 75 feet wide by 450 feet long, and consists of a basement and one floor.

The eight horizontal steam turbine engines are each coupled direct to a three-phase alternating current generator, and it seems hardly conceivable that each one of these sets is capable of transforming the heat energy of the coal into electrical energy equivalent to 7500 horse-power, while the total output of the station is 76,000 horse-power. The electrical generators are of the fixed armature type, having a four-pole revolving field, and generate at a pressure of 11,000 volts. A system of forced lubrication is employed on the turbines, thus ensuring efficient lubrication.

In addition to the above, there are four high-speed engines of 175 horse-power connected to generators which supply the magnetising current for the revolving fields. The condensing system for condensing the steam after it has performed its useful functions in the engines is very ingenious, and is so arranged that the pumps for pumping the cooling water through the condensers have merely to overcome the friction of the pipes.

One of the most interesting features of the whole system is the switch-board and control system. The system employed aims at having the entire control of the generating in a small space, and at the same time having no dangerous voltages on any part of the control board.

The system is almost analogous to the nervous system of the human body, having the control board as the brain, which it virtually is. All the big high-voltage switches are operated by small electric motors, and it is these motors which are operated from the control board, and as a low-voltage current is used for this purpose

[1] Abstract of a paper read before the students' section of the Institution of Electrical Engineers by Richard F. Chaffer.

there is little or no danger to the operator through faulty switch-gear.

The switch-board proper is carried by three galleries extending the whole length of the north side of the engine-room and continued along the east end. The control board is on the middle gallery and projects slightly, so that the operator has a clear view up and down the engine-room. From the switch-board the energy is distributed to the various substations situated at various points along the system, and it is there converted to low-voltage direct current at 550 volts, and thence distributed to the live rail. Throughout the whole station it is remarkable to find the extent to which labour-saving devices are employed.

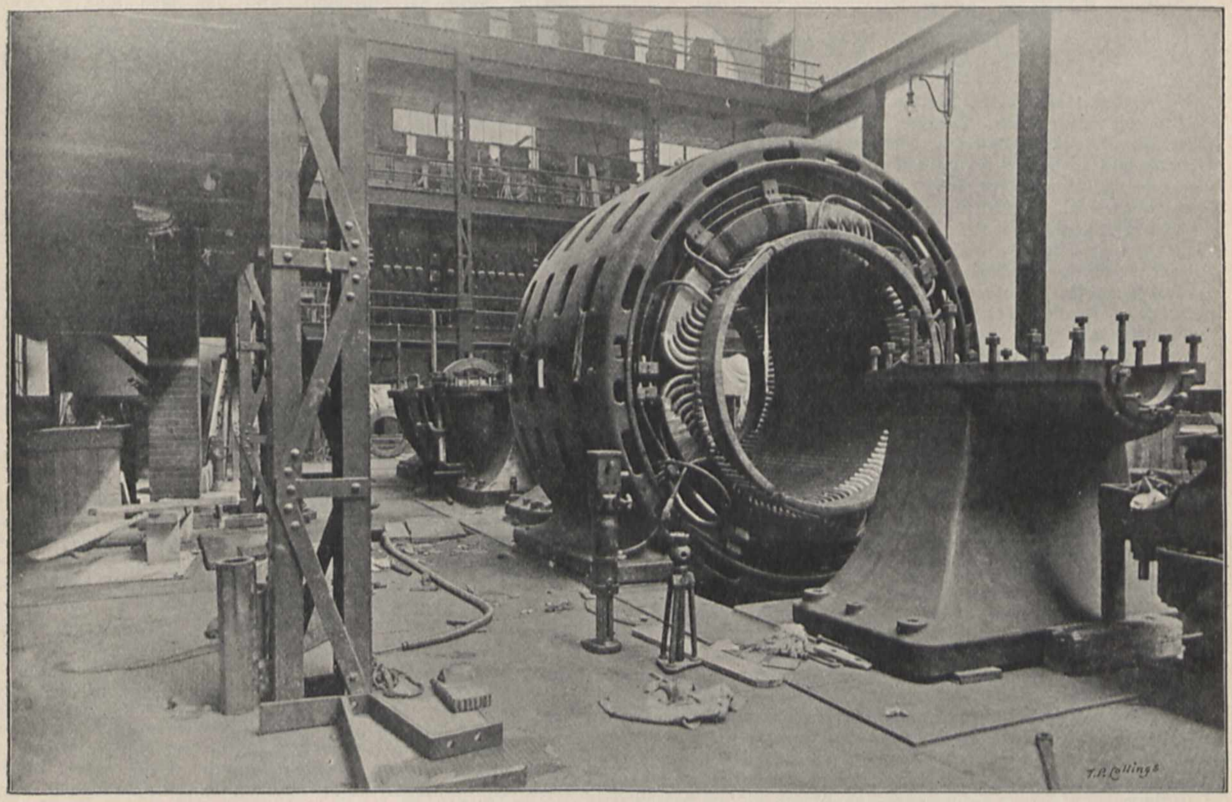


FIG. 1.—Armature of 5500 K.W. Generator.

Thanks are due to Mr. Chapman, general manager and chief engineer, for permission to view the station, and to the Institution of Electrical Engineers for the accompanying illustration of the armature of one of the generators.

REPLICAS OF DIFFRACTION GRATINGS.

FROM an article in No. 2, vol. xxii., of the *Astrophysical Journal*, we learn that Mr. R. J. Wallace, of the Yerkes Observatory, has attained great perfection in the production of replicas from plane diffraction gratings. After some amount of previous research, he decided on following Thorp's method in its essentials with several modifications which his experience suggested. Mr. Thorp first flooded his original grating with high-grade oil before pouring on the celluloid solution on which the replica was made. Mr. Wallace found it better to omit the oil. In the original method a solution of gun-cotton in amyl acetate with camphor added was employed as the material for the replica, but Mr. Wallace found that he could obtain much clearer and brighter copies by not adding the camphor. His successful solution is made by dissolving 38 grains of Anthony's pure snowy cotton in 2¼ ounces of pure amyl acetate, precipitating the resultant collodion in a large tray of pure water—constantly agitating the mixture—thoroughly drying the precipitate, and then re-dissolving it in the same quantity of pure amyl acetate. The collodion thus obtained is carefully filtered, and is then ready for use.

The grating to be copied is levelled in a roomy drying cabinet, which, in order to preclude dust particles, should be as free from draughts as possible, the surface dusted with a soft camel-hair brush, and the collodion flowed over it evenly. The author uses about twenty-five drops of the solution in copying a 2-inch grating. The grating is then replaced on the levelled support and left to dry for about eight to twelve hours; the longer the drying period the better is the resulting copy. After being thoroughly dried the grating is placed in pure distilled water at normal temperature together with the glass (" white optical crown ") support, which has previously been evenly coated with the adhesive medium, plain hard gelatin. After a few minutes' soaking the edge of the film may be sprung from the grating, and the whole of it is then detached and *immediately* placed on the previously prepared gelatin surface and clamped there. Perfect contact is obtained by drawing a piece of the softest velvet rubber *very lightly* over the surface in the direction of the length of the lines.

The contraction suffered by the replica during the twenty-four hours' drying period slightly alters the number of lines per inch, but the effect is very small. In some of Mr. Wallace's copies this alteration produced 572 lines per mm. instead of the 568 lines that occupied the same space on the original. Two reproductions of the solar spectrum, one taken with the original grating, the other with the copy, show the resulting increase of dispersion caused by the contraction, and also show that everything which is resolved by the original grating is also resolved equally well under the same conditions by the copy.

The grating replicas, unmounted, transmit the more refrangible radiations up to λ 2613, practically without absorption, but the glass used as supports for the copies is opaque beyond λ 3400, therefore Prof. Wood has proposed that mica should be employed for the supports where "ultra-violet" work is to be prosecuted. Reproductions of some spectrograms obtained with and without the mica screens show the value of Prof. Wood's suggestion.

Mr. Wallace recommends the "copying" process as the most efficient method of cleaning a dirty grating, and he has also tried it for the production of replicas of concave gratings, but as yet without any notable success.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Mr. T. S. Moore has been elected to a fellowship at Magdalen College after an examination in chemistry. Mr. Moore was educated at the East London Technical College; he gained a postmastership in natural science at Merton in 1898, was placed in the first class in mathematical moderations in 1900, and in the natural science school in 1902. He was lately appointed lecturer in chemistry in the University of Birmingham.

St. John's College recently procured an important change in its statutes which will be of great assistance in the new forestry scheme. The college was bound by the statutes of 1877 to endow a chair of mechanics and civil engineering so soon as its revenue permitted; by the new statute this obligation is removed, and instead St. John's is to contribute in and after 1908 600*l.* a year to the Sibthorpian professorship of rural economy. It is understood that the main subject to be entrusted to the future professor is pathological botany, so that he will have an important share in the instruction of the forestry students. St. John's has also placed a considerable plot of land near Bagley Wood at the disposal of Prof. Schlich for the purpose of starting a "forest garden."

At the first meeting of the delegacy which is to superintend the instruction of the Indian forestry students Prof. Schlich was appointed secretary, and Mr. D. H. Nagel (Trinity College) assistant secretary.

Prof. Osler and Prof. Miers were among the new members of the hebdomadal council who were elected on October 26.

The examinations for natural science scholarships this term will take place at the following dates:—December 5, Balliol, Christ Church, and Trinity; December 12, University, Lincoln, and Magdalen; December 19, Jesus College.

CAMBRIDGE.—A memorial has been presented to the council of the senate requesting the council to take steps by the nomination of a special syndicate or otherwise to ensure the consideration of the following questions:—(1) the advisability of imposing on all such candidates, as may not otherwise be qualified for exemption, the passing of the previous examination or of another examination, in lieu of the previous examination, as a condition precedent to matriculation in the university; (2) the possibility of obtaining the cooperation of the University of Oxford with the University of Cambridge in establishing a joint examination which should qualify for matriculation in either university. This memorial has been signed by some seventy influential members of the university. It has been referred by the council of the senate to the studies and examinations syndicate.

The electors to the Allen scholarship give notice that they are prepared to receive applications from candidates. Any graduate of the university is eligible for the scholarship provided that his age on the first day of the Lent Term 1906 does not exceed twenty-eight years. Next year the scholarship is open to candidates who propose to undertake research in medicine, mathematics, physics and chemistry, biology and geology, moral science. The scholarship is tenable for one year, during which period it will be the duty of the student to devote himself to research in Cambridge or elsewhere. The emolument of the student is 250*l.*, or such smaller sum as the fund, after payment of all expenses, shall be capable of providing. Every candidate must send to the Vice-Chancellor, Trinity Hall Lodge, on or before February 1, 1906, his name and a definite statement of the course of research which he proposes to undertake, together with such evidence of his qualifications as he thinks proper, and with the names of not more than three referees to whom the electors may apply for information. The election will be made towards the end of the Lent term, 1906.

In its report upon its reserve fund, the museums and lecture rooms syndicate enumerate a number of varying sums spent upon the museums. It has granted 100*l.* toward the expenses of housing Prof. Bonney's collections in the Sedgwick Museum, and has also allotted some smaller sums to the furnishing of the rooms in the new medical schools. It is a pity there are not sufficient funds at the disposal of the syndicate to fit up the Humphry Memorial Museum, the bare walls of which cry for shelves and showcases.

THE annual general meeting of the Association of Teachers in Technical Institutes will be held at the Birkbeck College on Saturday, November 4, at 3 p.m., with Mr. W. J. Lineham, chairman of the association, in the chair.

A COURSE of eight lectures on fields of force will be given in Columbia University, New York City, by Prof. V. F. K. Bjerknes, professor of mechanics and mathematical physics in the University of Stockholm, on Fridays and Saturdays in December. The lectures will be open, without charge, to teachers and advanced students in physics. During March and April, 1906, a course of lectures will be given by Prof. H. A. Lorentz, professor of physics in the University of Leyden.

THE Berlin correspondent of the *Times* states that in the presence of the German Emperor, the American Ambassador, the German Foreign Secretary, the Prussian Minister of Education, and other men of distinguished eminence, an inaugural lecture was delivered in English by Prof. Peabody, of Harvard University, in the central hall of Berlin University on Monday, October 30. Prof. Peabody discussed the advantages of the scheme put forward by the German Emperor for the exchange of lecturers between German and American universities, and read a letter which he had received from President Roosevelt approving of the scheme.

WE have received an advance copy of the report of the work of the department of technology of the City and Guilds of London Institute for the session 1904–5. The report refers to some of the ways by which the institute is able to cooperate with the central educational authorities for Great Britain and Ireland, in assisting and guiding schools in their arrangements for the provision of technological instruction, and in effecting a proper coordination between workshop and class teaching. The department of technology suggests schemes for complete courses of evening instruction for artisans and others engaged in different industries, and prepares detailed syllabuses in the technology of each trade subject. The institute registers classes in any of the subjects contained in its programme, provided the conditions preliminary to registration are fulfilled. During the past session 2601 classes were registered in 364 towns. These were attended by 41,618 students, being 671 more than in the previous session. Before registering a class, the institute requires that the qualifications of the teacher shall be submitted to, and approved by, the department of technology. During the session under review, 195 new names have been added to the institute's register of teachers in technology, and 149 have been provisionally approved. The institute has inaugurated a system of inspection of trade classes by professional experts. During the past session 149 classes were inspected by members of the institute's staff. The report also contains full statistics relating to affiliated technological classes, and instructive extracts from some of the examiners' reports on the results of the examinations, 1905.

SOCIETIES AND ACADEMIES.

LONDON.

Entomological Society, October 18.—Dr. T. A. Chapman, vice-president, in the chair.—Mr. H. **Rowland-Brown** exhibited series of Erebias taken this year in the Pyrenees, including *Erebia lefebvrei*, with the varieties *pyrenaea*, Obth., from Mt. Canigou, E. Pyrenees, and var. *intermedia*, Obth., from Gavarnie. He also showed for comparison *E. glacialis* var. *nicholli*, from Campiglio, which at one time was supposed to be identical with *lefebvrei*, then considered to be the Pyrenean form of *E. melas*; specimens of *E. gorgone* and *E. gorge* from the Lac de Gaube, Cauterets, and from Gavarnie; and a short series of *Lycaena orbitulus* from the Central Alps, *L. orbitulus* var. *oberthuri*, Stgr., *L. pyrenaica*, and *L. pheretes* from the Brenner and Cortina districts. It was remarked that there seemed to be a greater superficial affinity between *pyrenaica* and *pheretes* (not reported from the Pyrenees) than between *pyrenaica* and *orbitulus*.—Mr. E. C. **Bedwell** exhibited eight specimens of *Apion laevigatum*, Kirby, one of the rarest indigenous Apions, found on August 31, sheltering under plants of *Echium vulgare* in the Lowestoft district.—Mr. R. **Shelford** showed a Ligæid bug, the fore-limbs of which were remarkably well adapted to fossorial habits and comparable with those of the mole cricket; a Brenthid beetle with a deep channel running along the dorsal part of the prothorax and occupied by achari; and an Anthribid beetle with a crescentic sulcus on the prothorax. All the specimens were from British North Borneo.—Mr. C. J. **Gahan**, on behalf of Mr. C. O. Waterhouse, exhibited a living example of *Phaneroptera quadripunctata*, which species had been found in some numbers in a vinery near Chester.—Mr. W. J. **Kaye** brought for exhibition a long variable series of *Heliconius numata* from the Potaro River, British Guiana, clearly proving that these very variable forms were only aberrations, and not a subspecies, at least in this locality.—Mr. A. H. **Jones** exhibited a collection of Lepidoptera made by him in Majorca during the first half of last June, and remarked upon the great scarcity of lepidopterous life in the island. Only thirteen species of butterflies were observed, all of the commonest kinds and without any indication of variation, with about six species of moths (all occurring in Britain), including *Agrotis saucia*, *Acidalia ochrata*, and *A. degeneraria*, the latter, interesting in point of colour, being much redder. Mr. Jones also exhibited *Melanargia lachesis* var. *canigulensis* from Le Vernet, showing on the under side in the males a strong resemblance to *M. galathea*, and *Melitaea aurinia* var. *iberica*, Obth., from Montserrat, near Barcelona, and a melanic specimen of *Erebia stygne*, taken by Mr. R. S. Standen last June at St. Martin du Canigou, Le Vernet.—Mr. F. P. **Dodd** communicated a paper on a parasitic Lepidopteron from Queensland, Australia.—Commander J. J. Walker read a paper by Mr. E. G. R. **Meade-Waldo** on a collection of butterflies and moths made in Morocco, 1900–01–02. The species enumerated included a Cœnonympha and a Satyrus new to science. But for so luxuriant a country as that visited it was remarkable how few butterflies and moths were observed.

Royal Microscopical Society, October 18.—Dr. Dukinfield H. Scott, F.R.S., president, in the chair.—An old Wilson screw-barrel simple microscope, date about 1750, presented by Major Meade J. C. **Dennis**. The secretary traced the history of microscopes' focusing by means of a screw cut on the body-tube from Campani in 1686, Grindl in 1687, Bonanni in 1691, Hartsoeker in 1694, to Wilson in 1702, who was followed by Culpeper somewhere before 1738 and Adams in 1746.—A simple portable camera for use with the microscope: E. **Moffat**. The arrangement comprised a vertical telescopic standard, drawing out to 28 inches, having a clamp at the lower end for securing it to the edge of a table. At the upper end was fixed a mahogany board ¼ inch thick by 4 inches by 5 inches, hinged at the pillar so as to close up, and having a hole in the centre about 3 inches in diameter. There were two spring clips for securing the dry plate while making the exposure, and guides for keeping it in position horizontally. The back of the dry plate was covered by a piece of cardboard painted dead black, the spring clips referred to pressing upon this card. Depending from the board was a tapered bag of black Italian cloth about 17 inches in length, with a rubber ring at the lower end to secure the covering to the eye-piece of the microscope. The apparatus can be closed up into a space 5 inches by 9 inches by 1½ inches, and will go into a large pocket or knapsack. The weight, if made of aluminium, should not exceed 1½ lb. It will work well up to 700 diameters, and can be made in brass for 21s. Aluminium would cost more.—A form of hand microtome devised and used by Mr. **Flatters**. The microtome was made of brass, having the tube 3 inches deep and 1 inch diameter inside. The spindle had twenty-eight threads to the inch, and had a notched disc at the lower end, acted on by a spring stop the tension of which could be adjusted. Three discs were supplied, permitting sections being cut of 1/2000 to 1/1200 inch in thickness for each notch that the disc was turned. The knife-plate was made of *hardened* brass, the aperture on the under side being of the same diameter as the tube, but somewhat less on the upper side to prevent the specimen turning.—The Finlayson "comparascope": Messrs. R. and J. **Beck**. The president said they had the instrument before them some time ago in a less developed form; it seemed likely to be extremely useful to microscopists, as it could be applied to any microscope, and afforded a ready means of comparing objects directly under conditions which rendered it possible easily to detect slight differences.—Notes on aragotite, a rare Californian mineral: Prof. Henry G. **Hanks**. The mineral, which is a hydrocarbon, was first described by Mr. F. E. Durand in a paper read by him before the California Academy of Sciences on April 1, 1872. It was not until 1893 that Prof. Hanks obtained specimens of the mineral. These he subjected to various experiments, and disputes Mr. Durand's conclusion that it might be some modification of idrialite. He gives a table showing that in chemical composition, colour, streak, hardness, and specific gravity aragotite differs from idrialite.

PARIS.

Academy of Sciences, October 25.—M. Troost in the chair.—Some facts concerning the history of emulsin; the general existence of this ferment in the Orchidaceæ: L. **Guignard**. The examination of various parasitic plants showed the constant presence of emulsin; it would appear that there is a constant relation between the presence of this ferment and parasitism. On further work, however, this was not found to be the case, since a careful examination of *Orobanche Galii* and *O. Epithymum* gave no emulsin. Numerous plants of the Orchidaceæ, both indigenous and exotic, proved to have emulsin in their aërial and subterranean roots.—On the decapod Crustacea collected by the yacht *Princesse Alice* in the course of the voyage of 1905: E. L. **Bouvier**.—Report on a memoir of M. Bachelier on "continued probabilities": H. **Poincaré**.—Observation of the eclipse of the sun of August 30: F. **Jehl**. The observations were made at the Observatory of Aosta (Italy) under excellent atmospheric conditions, and included the times of contacts, visual observations of the spectrum, and temperature changes.—On discontinuous groups: Frédéric **Riesz**.—Researches on gravitation: V. **Crémieu**. The experiments described show the possibility of carrying out the Cavendish experiment in a liquid. Full details of the arrangement of the apparatus are given, but the publication of the results is reserved for a later paper.—On the specific inductive power of benzene and water: F. **Beaulard**. L. Grætz and L. Fomm have pointed out the existence of a phenomenon of polarisation which is in contradiction with the fundamental hypothesis of Poisson-Mossotti, and this relation has been utilised by the author as the basis of his method of measurement. The specific inductive powers thus found were 1·657 for benzene and 11·04 for water.—On the specific heat of solutions of copper sulphate: P. **Vaillant**. The solutions were heated by an incandescent lamp, the current and electromotive force being measured directly. If the specific heat of solution be regarded as the sum of that of the solid copper sulphate and water, negative values are obtained, but this is not the case if the substance in solution be regarded as $CuSO_4.5H_2O$. Even on this assumption constant values are not obtained for the specific heat, and several possible explanations are put forward.—

On the composition of the hydrochloroferric colloid as a function of the amount of HCl in the liquid: G. **Malfitano.**—On some aromatic ethylene oxides: MM. **Fourneau** and **Tiffeneau.** A study of the conditions under which the ethylene oxides tend to pass over into aldehydes.—New researches on the development of green plants: Jules **Lefèvre.** The author's experiments lead to the same conclusion as those of Moll and Cailletet, if carbonic acid is absorbed by the roots it is not utilised by the plant.—An analysis of some anthropometric measurements of men and women of the gipsies: Eugène **Pittard.**—Serotherapy in cases of bleeding: Émile **Weil.** In the cases known as "bleeders," in which a slight wound continues to bleed, it is shown that this effect is due to a property of the blood itself. This disease can be remedied by the injection of normal human or bovine serum. Details are given of the cure of one case, who, on the twenty-fifth day after the last injection, for the first time in his life, had a tooth removed with only the normal loss of blood.—The distribution of fine sediment on the bed of the ocean: J. **Thoulet.**

NEW SOUTH WALES.

Linnean Society, August 30.—Mr. T. Steel, president, in the chair.—Crustacea dredged off Port Jackson in deep water: F. E. **Grant.** Six species of Malacostraca were taken, of which four species, referable to the genera Hyastenus, Cymonomops, Latreillopsis, and Paguristes, are described as new. Of the remaining two species, *Ebalia tuberculosa* and *Ibacus alticrenatus*, only the former has previously been recorded as belonging to our fauna.—Notes on Prosobranchiata, No. 4, the ontogenetic stages represented by the gastropod protoconch: H. Leighton **Kesteven.** The present contribution is a continuation of the writer's attempts to unravel the puzzles presented by the gastropod protoconch. He finds that he is able to define four stages of growth represented, and supposes an "ideal" protoconch to be composed of (1) the "plug" of the primitive shell gland; (2) a portion formed by the veliger; (3) a portion formed during the nepionic stage; and finally (4) a portion formed during early neanic stages.—On a new species of Eucalyptus from northern New South Wales: J. H. **Maiden.** This is a large white gum, much resembling the blue gum (*E. saligna*) when growing, and the timber of which is specially esteemed. Its timber, however, as compared with that of *E. saligna*, is white from the sap to the heart. Its closest affinity appears to be with *E. Deanei*, Maiden.—A gelatin-hardening bacterium: R. Greig **Smith.** The bacterium was isolated from the tissues of *Schinus molle*, which was exuding a turquoise coloured gum-resin. When it was grown upon ordinary glucose gelatin, the medium became deep brown in colour, and was not liquefied when heated to the boiling point of water. Tannin, formaldehyde, or oxidising enzymes could not be detected.—On the supposed numerical preponderance of the males in Odonata: R. J. **Tillyard.** Reasons are given for concluding that the ratio of the numbers of the sexes in the dragon-flies or Odonata is a ratio of equality. The idea of the preponderance of the males, suggested largely by the examination of collections, and voiced from time to time by naturalists, has not been confirmed by experience in rearing a large number of nymphs of *Lestes leda*.

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 2.

CHEMICAL SOCIETY, at 8.30.—Solution and Pseudo-solution, part iv., Some of the Arsenious Properties of Arsenious Sulphide and Ferric Hydrate: E. Linder and H. Picton.—The Molecular Conductivity of Water: P. Blackman.—The Stereoisomerism of Substituted Ammonium Compounds: H. O. Jones.—The Influence of very Strong Electromagnetic Fields on the Spark Spectra of Ruthenium, Rhodium, and Palladium; J. E. Purvis.—Note on the Fluorides of Selenium and Tellurium: E. B. R. Prideaux.—The Constitution of Glutaconic Acid: J. F. Thorpe.—Some Alkyl Derivatives of Glutaconic Acid and of 2:6-Dioxypyridine: H. Baron and J. F. Thorpe.—Note on the Formation of β-Methylglutaconic Acid and of αβ-Dimethylglutaconic Acid: F. V. Darbishire and J. F. Thorpe.

LINNEAN SOCIETY, at 8.—Plant Ecology, interpreted by Direct Response to the Conditions of Life: Rev. G. Henslow.

RÖNTGEN SOCIETY, at 8.15.—The Ruhmkorff Coil: Prof. Wertheim-Salomonson.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Sea Defences: Baron H. T. H. Siccama.

FRIDAY, NOVEMBER 3.

GEOLOGISTS' ASSOCIATION, at 8.—Conversazione.

MONDAY, NOVEMBER 6.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Introductory Remarks: The President, Sir George D. T. Goldie, K.C.M.G., F.R.S.—Travels in the Mountains of Central Japan: Rev. Walter Weston.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—Evaporation *in vacuo* of Solutions containing Solids: Dr. J. Lewkowitsch.

WEDNESDAY, NOVEMBER 8.

GEOLOGICAL SOCIETY, at 8.

THURSDAY, NOVEMBER 9.

MATHEMATICAL SOCIETY, at 5.30.—Annual General Meeting.—The Continuum and the Second Number-class: G. H. Hardy.—On the Arithmetical Nature of the Coefficients in a Group of Linear Substitutions of Finite Order (second paper): Prof. W. Burnside.—On the Asymptotic Value of a Type of Finite Series: J. W. Nicholson.—On an Extension of Dirichlet's Integral: Prof. T. J. I'A. Bromwich.—(1) On Improper Multiple Integrals; (2) On the Arithmetic Continuum: Dr. E. W. Hobson.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Inaugural Address: John Gavey, C.B.

FRIDAY, NOVEMBER 10.

ROYAL ASTRONOMICAL SOCIETY, at 5.

PHYSICAL SOCIETY, at 8.

MALACOLOGICAL SOCIETY, at 8.—(1) Descriptions of New Species of Drymæus, Amphicyclotus, and Neocyclotus from Central and South America; (2) Description of a New Species of Achatina from Mashonaland: S. I. Da Costa.—On a Collection of Land and Freshwater Shells from Sumatra with Descriptions of New Species, part i.: Rev. R. Ashington Bullen. On a New Species of Oliva: F. G. Bridgman.—On the Anatomy of *Ensis macha* and *Solen fonesii* and *S. viridis*: H. H. Bloomer.

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