THURSDAY, MARCH 26, 1908.

MISLEADING SEISMOLOGY.

Earthquakes, an Introduction to Seismic Geology. By William Herbert Hobbs. Pp. xxxi+336. (New York: D. Appleton and Co., 1907.) Price 2 dollars net.

EARTHQUAKES have come home to us of late, and we presume that the more general interest, which is now taken in them, is the cause of the publication of this book, on a subject with which the author seems very imperfectly acquainted. The keynote of the work is struck very early in the book, in a summary of the history of modern seismology, which would lead one to suppose that little of any importance had been done outside Germany and Austria; no mention is made of the Seismological Society of Japan, and it is erroneously stated that the International Seismological Association has "published at regular intervals the 'Beiträge zur Geophysik.'" The reports of the sessions of the association have certainly been published as supplementary volumes of this periodical, which is an independent publication, and one of the reasons for the abstention of those seismologists who have held aloof is that the association has been made to appear as the appanage of a private venture.

A large part of the book is devoted to the geological aspect of seismology, and in this we find what the author regards as his contribution to the science. He plots on a map the places at which earthquakes have been felt, or have exhibited a greater degree of violence, draws a series of straight lines through them, which he calls seismotectonic lines, and regards it as a remarkable fact that these lines should intersect at the points through which they are drawn. To a small extent the "seismotectonic" lines represent a truth which has long been known to students of seismology, but by far the greater number of them are mere figments of the pencil and the ruler, and it is remarkable that the author should make no reference, in this connection, to Col. Harboe's theory of extended earthquake origins, a theory which has some resemblance to that of Prof. Hobbs, but is based on more extensive data, and makes no attempt to force the origins into straight lines.

The author's unfamiliarity with the subject is most conspicuous in his treatment of seismometry, whether by observation of the effects of earthquakes or by the use of instruments. We find no mention of West's formula, or even of acceleration as the cause of earthquake damage, but we do find a most remarkable suggestion that the "simplest and one of the best" of seismoscopes may be made by setting up an ordinary lead pencil upon its end, in part immersed in a bath of sand; it is gravely added that an inch scale may be marked on the pencil by simple notches, to enable the depth of the immersion to be recorded. We can imagine the enthusiastic seismologist frantically digging out the ruins of his dwelling and anxiously determining the direction in which the pencil, embedded, say, only three inches in the sand, had been overturned! Seriously, we wonder if Prof. Hobbs has any idea of the shock necessary to overturn a lead pencil standing on a smooth, hard surface, let alone embedded in sand; it seems a very unstable object, and easily upset, but the shock which will throw it down is severe enough to alarm many people, and even to cause damage to buildings; moreover, the direction of overthrow is now known to indicate little or nothing regarding the wave motion of the earthquake. After this it is not surprising that the description of the horizontal pendulum seismograph should be wrong both as to theory and practice.

This brief review of some of the more striking faults in the book must not be supposed to mean that it is altogether bad. As an introduction to seismology, or even to seismic geology, it is the most misleading that we know, but for the reader who comes to it with sufficient previous knowledge it contains suggestive passages, and as we perused the book we were haunted by the consciousness that its author was capable of better work; we searched for the word which would describe its character until a marginal heading, in block type, supplied the want in "crudeness."

GERMAN SCHOOL BOTANY.

(1) *Mikroskopisches und physiologisches Praktikum der Botanik für Lehrer.* By G. Müller. Pp. xvi+224. (Leipzig and Berlin: B. G. Teubner, 1907.) Price 4.80 marks.

(2) *Handboek der botanische Micrographie.* By Dr. J. W. Moll. Pp. xxii+350. (Gröningen: J. B. Wolters, 1907.) Price 4.25 francs.

(3) *Grundzüge der Pflanzenkunde.* By Prof. K. Smalian. Zweite Auflage. Pp. 288; with 36 coloured plates. (Leipzig: G. Freytag; Vienna: F. Tempsky, 1908.) Price 4 marks.

(4) *Anatomische Physiologie der Pflanzen und der Menschen.* By Prof. K. Smalian. Pp. 86. (Leipzig: G. Freytag; Vienna: F. Tempsky, 1908.) Price 1.40 marks.

(1) ALTHOUGH it is the general practice among teaching botanists to combine in lectures the explanation of physiological principles with descriptions of the organs involved, the combination of microscopical anatomy with physiology in a practical book is unusual. In the present instance there is complete separation into a course of microscopical exercises that occupies about three-quarters of the volume, and a set of physiological experiments and deductions. The anatomical course begins with a description of the necessary apparatus for microscopical technique, after which there follows a series of studies of the cell, stem, leaf, and root, nearly identical with the types in Strasburger's "Botanisches Praktikum," in so far as these relate to flowering plants. This part of the book is excellent, especially for teachers who wish to become thoroughly conversant with all details and skilled in manipulation. The directions are explicit, the hints on reagents and methods are practical, and the accom-

paniment of typical illustrations will be found useful. The physiological course does not produce such a favourable impression. The conduction of water and salts bulks largely in the foreground, and, seeing that it is an unsolved problem, it would seem more rational to give it less prominence. Generally speaking, the experiments appear to have been chosen rather to demonstrate dogmatic ideas than to serve as exercises practicable for general students.

(2) It is an advantage to teachers to obtain an insight into the methods adopted in other classes than their own, and botanists will welcome this introduction to the botanical courses planned by Prof. Moll for students in the University of Gröningen. In the first place the author discusses the comparative uses of demonstrations and practical classes. In practical work, although duly insisting on the necessity for good drawings, he places a high estimate on carefully written descriptions, and in this connection details his schemes for ensuring completeness by taking each character in order. A general course of histology and anatomy is outlined in a series of two hundred and fifty exercises. Some of the specimens selected for examination are innovations, and the examples of bacteria, with hints for obtaining and cultivating them, are particularly useful. On the other hand, the studies of tissues are not well defined or complete; one observes also notable omissions in the systematic types, and a somewhat too rigid uniformity in the use of tests. A special syllabus of products included in the Dutch pharmacopœia is inserted for the benefit of pharmaceutical students in the university, but the most valuable feature is the list of special investigations suitable for advanced students, that are based on, and intended to repeat, original researches. The book can be recommended to teachers having a knowledge of the Dutch language, especially during the preparation of a course of practical botany, as likely to furnish them with new ideas.

(3) This volume consists of a collation of botanical descriptions and information arranged according to the natural orders. The author's object has been to present his information in an attractive form, and to depict the *tout ensemble* of the plant. In this respect he has been quite successful, but he might with advantage have brought into greater prominence the scientific principles of classification, and would thereby have rendered the book more suitable for the purpose intended, as a text-book for use in a "Realschule." The information relates to pollination devices, seed dispersal, and general ecology, also to common insect pests, plants of economic importance, and morphological peculiarities. The sequence is similar to that prescribed by Engler, but differs mainly in the treatment of the dicotyledons, where a beginning is made with the Ranunculaceæ while the Caryophyllaceæ and orders with imperfect flowers are deferred to the end of the Archichlamydeæ. The space devoted to the cryptogams is necessarily so limited that it would have been wiser to omit them and to have extended the account of some of the phanerogams. The book is well illustrated throughout, and is provided with thirty-six coloured plates that are beautifully reproduced. It is a book that would be appreciated by boys and many of their elders who take a keen interest in botany.

(4) It is rightly impressed upon students that the physiology of plants and animals shows certain features in common, whence it might be expected that there would be an advantage in treating the two subjects in one volume. In the present case there is no special attempt to compare the physiological activities in the two kingdoms. The first part provides a concise account of the elements of plant physiology, but is not written with the view of stimulating practical experiment; in fact, the few pieces of apparatus represented in the illustrations are open to serious criticism. The second part, dealing with human physiology, is almost more concerned with form than function.

ELEMENTARY PHYSICS.

(1) *The New Matriculation Heat.* Pp. viii+276; *The New Matriculation Light.* Pp. viii+282; *The New Matriculation Sound.* Pp. viii+211. (Cambridge: University Tutorial Press, Ltd., 1908.) Price 2*s.* 6*d.*, 2*s.* 6*d.*, and 2*s.* respectively.

(2) *A First Year's Course in Geometry and Physics.* By Ernest Young. Pp. xi+169. (London: G. Bell and Sons, 1907.) Price 2*s.* 6*d.*

(3) *A Second Year's Course in Practical Physics.* Pp. vii+148; *A Third Year's Course in Practical Physics.* By James Sinclair. Pp. viii+125. (London: B. Bell and Sons, 1907.) Price 1*s.* 6*d.* each volume.

(1) THESE manuals cover the ground of the London University matriculation syllabus in heat, light, and sound. The treatment is lucid and concise, and thoroughly in accordance with the most recent methods of teaching elementary physics. An outstanding feature of these books is the inclusion of a number of experiments which may be performed with the most simple and inexpensive apparatus, and from which satisfactory results may be obtained.

In the volume on "Heat" a chapter is devoted to methods of approximation, and this should prove extremely useful to the student in reducing observations of actual experiments or performing the numerical exercises with which the book is plentifully supplied. One notes with pleasure, in the chapter on hygrometry, the omission of the classic "Daniell." A simple method for determining the "thermal conductivity" of india-rubber is described in the chapter on heat conduction, and serves well enough to illustrate the definition to elementary students, a point which, as a rule, has been neglected in text-books of this standard. In Expt. 47, p. 135, paraffin wax is a somewhat unsatisfactory substance for the determination of melting point by the cooling-curve method, at least for beginners. On p. 140 it would have been better to use the term "latent heat of water" as synonymous with "latent heat of fusion of ice," and not "latent heat of ice."

The volume on "Light" calls for little comment. The optical formulæ are obtained by the usual geo-

metrical methods, the sign convention being made clear. The "power" of a lens is defined, and attention is directed to the optician's mode of calling a convex lens positive. "Dispersion," "the eye," and "defects of vision" are very clearly treated.

The first six chapters in the volume on "Sound" are devoted to vibratory and wave motion, and the author has succeeded in giving a very clear, and at the same time elementary, exposition of these somewhat difficult subjects for the beginner.

The three volumes form a suitable introduction to the study of physics.

(2) This book is intended for use in schools where a four years' course is given as outlined by the present regulations of the Board of Education. The book is divided into three parts. Part i. represents a first term's work in geometry and physics; part ii. a second and third term's work in geometry; part iii. a second and third term's work in physics. The book is a copious collection of examples and practical exercises in illustration of the chief elementary geometrical properties of the straight line, parallels, triangles, quadrilaterals, polygons, and circles. The construction and use of scales, graphs, measurements of length, area, volume, and density are also dealt with. No instructions are given as to the method of using the instruments employed in performing the various exercises. These are left for the teacher to supply. The book should prove extremely useful as a class-book, the multiplicity and variety of the exercises being a boon to any teacher for purposes either of work in class, in the laboratory, or at home.

(3) These are two elementary laboratory text-books forming, as their titles imply, a second and third years' course in practical physics for schools. The second year's manual deals chiefly with heat, and contains descriptions of methods of performing upwards of seventy experiments, the subjects treated including thermometry, measurement of coefficients of expansion, calorimetry, conduction, convection, radiation, solution, distillation, and crystallisation. In addition, questions and supplementary exercises are given after many of the experiments. The book strikes one as being hurriedly compiled, the diagrams in very few instances being referred to in the text. Again, on p. 81 a wire 12in. long 3/32in. diameter is to be bent 2 cm. from the end. Is such confusion intended? The experiments described on conduction and radiation are novel, use being made of an indicating paint prepared by Mr. Walter Jamieson. This paint, which is colourless at ordinary temperatures, turns green when heated, the green colour disappearing on cooling. The range of sensitiveness may be from 80° C. to 21° C. Objection must be raised to the designation of the curve in the diagram on p. 82 as "heat-curve." Temperature-gradient would be better. We must disagree with the remark on p. 42, footnote; it is certain a boy will be more readily convinced of the anomalous expansion of water by use of the apparatus described in the text (previously described by Mr. H. E. Hadley in the *School World* for June, 1901) than by the performance of Hope's experiment. The diagram of the constant volume air thermometer on p. 53 is unnecessarily complicated, and does not appear any more exact than that on p. 50.

The third year's course is devoted entirely to optics, and is similar in plan to the manual on heat. There are upwards of fifty experiments which may be performed with simple apparatus, and the book contains many supplementary exercises and questions. Experiments 6, 7, 8, pp. 11–19, on photometry are misleading, viz., "To find the relation between the illuminating power and the distance of sources of light." The "intensity of illumination" at a point due to a given source will vary with the distance, but the "illuminating power" of the source remains the same.

OUR BOOK SHELF.

The Mechanism of Speech. Lectures delivered before the American Association to promote the Teaching of Speech to the Deaf by Alexander Graham Bell. Second edition. Pp. xv+133. (New York and London: Funk and Wagnall's Company, 1907.) Price 1.20 dollars net.

THIS is the second edition of a work already reviewed in NATURE, December 27, 1906 (vol. lxxv., p. 196). The first edition was printed during the author's absence in Europe, and he had no opportunity of revising the proofs. As the printers could scarcely be expected to be familiar with the somewhat complicated symbols used by the author's father, Melville Bell, a number of typographical mistakes had crept in. These have now been corrected. A full account is given of Mr. Melville Bell's ingenious system of symbols, which are intended to express the position of various parts of the vocal apparatus in the production of articulate sounds, and illustrations are afforded of the methods by which deaf children can be led to understand the meaning of these symbols, and are thus guided in the operation of placing their vocal organs in the position required for a given word. By patient training and by following the judicious maxims of Mr. Graham Bell a wonderful degree of success has been attained in the education of the deaf.

Mr. Melville Bell's symbols express words, not in letters, nor in the wave vibrations revealed by the phonograph or gramophone, but in forms that indicate precisely the physiological position of the articulating mechanism necessary for the production of a given sound. A first glance at these strange symbols gives one the impression of the system being too complex for practical purposes, but with the aid of Mr. Graham Bell's instructions it soon becomes easy. The writer in a short time found that he could both write and interpret the symbols. One can readily see how the system might be of use to travellers, as, by means of the symbols, they could write down the sounds of an unknown tongue and reproduce them. A knowledge of this system and the use of a phonograph would be invaluable to those who desire to register the articulate expressions of savage tribes. JOHN G. MCKENDRICK.

The Moths of the British Isles. By Richard South. First Series, containing the Families Sphingidæ to Noctuidæ. Pp. vi+343, plates 159, text-figures 24. (London: F. Warne and Co., 1907.) Price 7*s.* 6*d.* net.

BOOKS on British butterflies and moths are now plentiful enough, but we have never seen any which have pleased us so well as the series of which this book is the second volume. It is true that technicali-

ties, even the characters of families and genera, are almost entirely omitted, but the amount of practical information is nearly as great as that to be found in the more bulky work of Mr. Barrett, who dealt with about 100 species in each volume. No popular book, of course, can compete with the huge encyclopædic work of Mr. Tutt; but then he often devotes 40 or 50 pages of very closely printed but large 8vo. pages to a single species, and his work is only slightly illustrated. Mr. South, however, gives us a profusion of admirable illustrations, and much bulk is saved by an arrangement by which the plates (except the frontispiece) are on opposite sides of the same leaf, in most cases coloured figures of moths occupying one side and plain figures of transformations the other. The introduction is good, and includes useful figures of antennæ and wing-markings, &c., and also remarks on collecting.

The general arrangement followed is that of Staudinger's catalogue of 1901. One point of interest in successive works on British Lepidoptera is the shifting of localities for species, combined with the actual extinction of some, and the discovery or naturalisation of others. The comparison of a series of successive works like those of Petiver, Haworth, Stephens, Westwood and Humphreys, Stainton, and Barrett would bring this out very strongly. Most of the best localities of the older London entomologists has been built over or otherwise destroyed; the best locality for "blues," &c., near Brighton, is now turned into allotments; and several species of butterflies and moths common in many parts of England only fifty years ago are now on the verge of extinction as British species.

We must not omit to mention that Mr. South does not share Stainton's prejudice against English names. In Stainton's time it might have been necessary to discourage their use as against that of Latin names; but at present the latter are so familiar that it is no longer necessary. One suggestion we should like to make. The index is good, but we think a table of contents would also be useful; and if restricted to headings and families, it need not occupy more than a single page. W. F. K.

Physiologie und Anatomie des Menschen mit ausblicken auf den ganzen Kreis der Wirbeltiere. By Dr. Felix Kienitz-Gerloff. Pp. vi+130. (Leipzig: B. G. Teubner, 1907.) Price 3 marks.

THIS is a small elementary text-book with a scope similar to that of Huxley's "Elementary Lessons in Physiology." It presents clearly and accurately the main facts of physiology and anatomy from a general educational point of view. While the skeleton, muscles and joints are dismissed with appropriate brevity, the central nervous system, sense organs, excretory organs, and the alimentary, respiratory, and circulatory systems are treated in some detail. As opportunity offers, matters pertaining to general health find suitable mention. The text is lightened by frequent and interesting references to comparative anatomy. The illustrations are taken from standard text-books of anatomy, and are both numerous and well chosen. Although the book is primarily intended for students in a school of agriculture, it ought to have a wide and general circulation. W. W.

The Elements of Geography. By J. H. N. Stephenson. Part i., General Geography. Pp. xiii+160; with illustrations and maps. (London: Edward Stanford, 1908.) Price 3*s.* 6*d.*

WHAT Mr. Stephenson describes as "general" is more commonly known among teachers as "physical" geography; but since an understanding of the broad principles with which he deals in this attractive book must precede a study of the geography of special areas, his title sufficiently describes the character of his chapters. The section styled "organic" geography will prove especially useful to teachers as indicating the way in which man's development has been modified by his surroundings, and the manner in which man in his turn has influenced the character and distribution of life on the globe. The book is exceptionally rich in well-executed maps which will increase greatly its usefulness as a class-manual. The volume may be recommended to the careful attention of teachers of geography.

Lehrbuch der Chemie und Mineralogie für die vierte Klasse der Realschulen. By Franz von Hemmelmayr and Dr. Karl Brunner (the Mineralogical Portion by Heinrich Leitenberger). Third edition. Pp. 180; with two coloured plates. (Vienna: F. Tempsky, 1906.) Price 2kr. 10hel.

THIS is an elementary class-book for use in the fourth class in the Austrian State schools, that is, for boys of about twelve or thirteen years of age. It covers much the same ground as the usual elementary class-books on chemistry. In the longest portion of the book, that on inorganic chemistry, however, there are added brief descriptions of the more important minerals which yield the elements under discussion; the pupil is thus at the same time told how chemical compounds and elements occur in nature. Figures are given of crystals of these minerals, but several of them have been placed upside down in the text. There is a short section on organic chemistry, in which prominence is given to compounds of everyday use. The book is very well and clearly printed on good paper.

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.*]

The Cotton Plant.

THE full acknowledgment Sir George Watt has given to the slight assistance which I was able to afford him—in those portions of his book which deal with Egyptian cotton—renders criticism difficult, but there are a few points arising from Lieut.-Colonel Prain's recent letter (February 6, p. 318) which seem to call for comment.

While not possessing any general knowledge of the genus Gossypium, I have had occasion during the last three years to grow, and to examine in some detail, a number of pedigree cultures of Egyptian cotton—as well as of Uplands and others—in researches on Mendel's law. One result of this work is that I can fully endorse your reviewer's argument that the cotton plant can be studied successfully for systematic purposes in living material only. The herbarium method has many limitations, the most conspicuous of which is perhaps the tendency to take the extreme form of some character which has a large range of fluctuation as the differentiating mark of a variety or species.

Colonel Prain affirms that the ideas of your reviewer as to the meaning of the terms "species" and "variety" do not accord with accepted usage. My general position is the reverse of Colonel Prain's, in that I am unable to obtain any idea as to the nature of species in the genus Gossypium by studying the names accorded by Watt to certain plants with which I am acquainted. A particular case is that of the Sudanese tree cottons from Senaar, referred to in the "Wild and Cultivated Cottons of the World" by my numbers 213–1 and 213–2 (pp. 113 and 138). These were supplied to me by Mr. A. G. Braun, of the Woods and Forests Department, Khartoum, in a

sample of seed which had been sent from Senaar Province. This sample was sown at Ghizeh, and the material sent to Kew was taken from two adjacent plants in the same row, these being plants developed from embryos which had ripened on a tree in Senaar. The reason for sending material from two different plants was because this row showed two distinct leaf-forms, some of the plants having much wider leaf-lobes than the others, and these two types were represented by 213–1 and 213–2. In no other respect could any distinction be drawn between the two types, at least on any character within my grasp; moreover, they all flowered within the same week, ripened within the same week, grew to a remarkably uniform height, and had similar habits of growth; with the one exception of the leaf-shape they were far more alike than a similar group of plants taken from a field of any variety of Egyptian cotton. These two forms were separated by Watt into *G. arboreum* and *G. Nanking*, because "a yellow-flowered *G. arboreum* with deeply laciniate bracteoles and three glands on the under surface of the leaf would destroy the specific isolations" (p. 138). I incline to think that the laciniation of the bracteoles and the glandulation of the leaves should have been made the subject of comparative study—in order to ascertain their capacity for fluctuation—before such erratic characters were entrusted with the responsibility for this violent separation of the two forms into two separate species. Such comparative study would at least have been commenced had these plants been seen growing side by side in my plot.

On the other hand, we find on p. 181 that Moqui Indian cotton from Arizona (209–3) and "Hindi" weed cotton of Egypt (55 A) are placed together under *G. punctatum*. Waiving the query as to why Hindi, a naked-seeded cotton, should be placed in the fuzzy-seeded section, I should like on other grounds—but in all diffidence—to advance the opinion that if the two strains could be grown together at Kew, or examined side by side on my plot in Egypt, they would be systematically removed from one another by a wide interval.

The employment of common names has also been mentioned by Colonel Prain; the following instance, therefore, does not seem altogether pointless:—the plant referred to as 56.C.2 (p. 224) came from a sample of Afifi cotton, and bears lint of the brown Afifi colour; this colour is the characteristic and sole morphological distinction of Afifi from Abbassi, the latter bearing white lint, so that 56.C.2 could by no possibility be described legitimately as "close to Abbassi or Afifi."

The cultivated varieties of Egyptian cottons—and probably of Uplands—consist of many different strains mingled together and cross-fertilised, resembling one another in a few obvious characters of economic importance. Thus, on p. 224, Watt describes the strain 142, plant A, as being distinct from the Abbassi plant described in par. 2 of the same page. In point of fact, No. 142 was taken from a prize sample of Abbassi.

Though I wish to see an exact method adopted for the investigation of this labyrinthine genus, such method to be based on pedigree culture and statistical inquiry, I am nevertheless grateful to Sir George Watt for having gathered together the mass of detailed information which is to be found in his book, and I hope—with Colonel Prain—that we shall not have to wait long for the publication of further researches on the subject.

W. LAWRENCE BALLS.

Cairo, February 27.

IN the courteous letter in which Mr. Balls exercises his right to criticise details in Sir G. Watt's work on cotton, as to which he considers himself a competent judge, he gives expression to some misapprehension that it may be well to remove.

It has not been affirmed that the ideas of the writer of the review which appeared in NATURE for January 16 as to "species" and "varieties" do not accord with accepted usage. What it was necessary to point out was that the reviewer had not made it clear that his interpretation of these words accords with accepted usage. There are two passages in the review in which the words are dealt with together; in one passage they are so used as to imply that the status of a variety is the same as that of a species; in the other they are so used as to indicate that a species is subordinate in status to a variety. The ideas of the reviewer may be as precise as those of Mr. Balls; they may, on the other hand, be as loose as his own phraseology; he has given us no means of deciding.

The position assumed by me has already been explicitly stated. I have reserved perfect freedom of judgment as regards the acceptance of Watt's conclusions, not as to the limits of species in the genus Gossypium alone, but as to all the issues involved. When he explains that his general position is the reverse of this, it will be felt that Mr. Balls does himself an injustice.

The name of the distinguished public servant referred to by Mr. Balls is Mr. A. F. Broun, and is not as given in Mr. Balls' letter. D. PRAIN.

The Isothermal Layer of the Atmosphere.

IN his letter in NATURE of February 27 Mr. Dines asks why the adiabatic conditions which prevail in the lower part of our atmosphere should suddenly cease at a height of about 40,000 feet. The answer comes more readily if the question is altered to, Why does the isothermal condition of the outer layers of our atmosphere suddenly cease at about 40,000 feet? The isothermal condition or even increased temperature with height is the condition which would naturally prevail in an atmosphere surrounding a smooth sphere. For if the sphere is a very hot one its entire gaseous envelope should acquire its temperature, whereas if the solid sphere, like our earth, is cold, and if heat from the sun is warming the atmosphere by radiation, one may expect the outer layers to be warm and the lower layers to be the coldest ones. If, however, there are irregularities, as, for instance, mountain chains on the earth's surface, then the air, whenever it is forced over them, parts with its moisture as it rises on the one side and then descends on the other side as a dry and hot *Foehn*, in which wind the conditions are perfectly adiabatic, the temperature gradient rising steadily with decreasing height. It seems, therefore, that it is our mountain ranges which prevent the isothermal condition from descending below the height at which effective mixing or moisture removing occurs.

This leads to the conclusion that if at one time our mountain ranges were lower than at present, the isothermal condition and its low temperature will also have been lower than at present. This may have been the case during Glacial periods. On the other hand, during tropical periods our mountain ranges may have been higher than they are at present; the isothermal condition will have ended at a higher level, and the steady rise of temperature below this boundary will have resulted in a very high temperature on the earth's surface.

I remember discussing this subject about twenty years ago at Aix-la-Chapelle with Dr. A. Ritter, who had only recently in Wiedemann's *Annalen* (vols. v.–viii., "Heights of Atmospheres and Conditions of Nebulæ") dealt with it very exhaustively. If I am not mistaken, it was the *Foehn* wind which had first led to these inquiries, but, strange to say, Dr. Ritter relied on molecular motions for the necessary mixing of the layers. This may have been due to his feeling that if isothermal conditions were conceded, an interstellar atmosphere would have to be postulated. He therefore almost naturally disagreed as to the possibility of condensing the so-called permanent gases, which had not then been accomplished. My view was that nitrogen and oxygen should be condensable, and that adiabatic condition existed up to the outer limit of the atmosphere, then, at the zero temperature there, both gases would condense and sink to lower levels, to be followed by further and further gases, so that the whole atmosphere would be deposited on the earth's surface. Dr. Ritter merely pushed this difficulty away by saying that, even if oxygen and nitrogen could be condensed, our atmosphere might nevertheless be surrounded by hydrogen. Now that hydrogen has been condensed, helium would have to take its place. But this is a view not easily accepted, our atmosphere surrounded by a very attenuated and possibly [illegible] stellar atmosphere. I think that the rec[illegible]

to which Mr. Dines refers by showing that the conditions of the outer atmosphere are isothermal, and Sir James Dewar's experiences with non-conducting power of high vacua are leading to the conclusion that there is a comparatively warm interstellar atmosphere.

C. E. STROMEYER.

"Lancefield," West Didsbury, March 3.

ONE would naturally expect the upper part of any large mass of fluid to be the warmer, because that condition is a possible one, whereas the converse is not possible as a permanent condition, since it involves a warmer, and therefore in general a lighter, portion of the fluid remaining under a heavier. But when dealing with a gas it is necessary to use the term "warmer" in a special sense, for which the convenient expression "potentially warmer" has been used. This means that the temperature is referred to some standard pressure, and taken as what it would be after adiabatic reduction to that pressure. In this sense the air gets rapidly warmer as we ascend, at the rate of about $0^{\circ}.4$ C. to each 100 metres, but if there were sufficient mixing we should expect to find the same potential temperature throughout, just as in a pond the heavier water is found at the bottom, but in a fast-running stream the specific gravity and the temperature are the same throughout.

We have no evidence at the present time to show how the isothermal layer is influenced by a mountain range, but there are immense stretches of sea and land so far removed from any high mountains that we can hardly suppose any such influence to exist over them.

It must be remembered that the chief heating and cooling effects on our atmosphere are applied at the bottom by contact with the ground. Pure air is almost pervious to radiation. There may be sources of heat to the upper layers; the electric currents which produce the aurora have been suggested, but I do not see that this affords any explanation of the sudden cessation of the temperature gradient.

The well-known phenomena of shooting stars apparently quite negative the suggestion of a stellar atmosphere; beside which, unless it were moving with the earth, in which case it would cease to be stellar, such an atmosphere would produce an enormously increased pressure on the forward side of the earth as it pursued its course round the sun.

W. H. DINES.

The Penetrating Radiation.

IN a letter to NATURE of February 13, the question is raised by Mr. W. W. Strong whether the larger proportion of the penetrating radiation may not arise from active matter in the air rather than in the ground. Unless the earth's supply of active matter is augmented from without, or unless it arises in a manner at present unknown, the question may be negatived, and a numerical answer given with some approach to accuracy.

Strutt has found about 3×10^{-12} grams of radium as the average amount present in 1 c.c. of soil. I have found about 10^{-16} grams of radium to be a measure of the amount of radium emanation present per c.c. of the atmosphere (*Phil. Mag.*, December, 1907). These two quantities are nearly proportional to the amounts of radium C produced per c.c. in earth and in air. The ratio is 0 to 1.

McClelland and Wigger have found that the co- of absorption of the γ rays are proportional to ities of the absorbers, so that the absorptions of from radium C by soil and by air are as their bout 2000 to 1.

as been proved (*Phil. Mag.*, September, 1906) given electroscope near the earth's surface, the radiations from earth and from air will be Q/λ to Q'/λ', where Q, Q' are the quantities c.c. in soil and air, and λ, λ' are the co- sorption of the γ rays by soil and air.

enetrating radiations from the radium C in from that in the air are in the ratio of bove stated, namely, 15 to 1.

radium C in the air is carried earthwards, ng rain, snow, dust, or smoke, but by the ice in the atmosphere. The active matter on the earth's surface is thus augmented and that in the air decreased.

Observers in both hemispheres have found evidence of thorium C in the air, the activity being about half that of the radium C present. The emanation of thorium decays about 6000 times as fast as the emanation of radium, and has a poor chance of escaping from the soil, so that (1) the amount of thorium C in the ground probably exceeds the amount of radium C, and (2) the thorium C in the ground will be more than fifteen times that in the air.

We may conclude, then, that at most localities the penetrating radiation due to active matter in the air is less than one-fifteenth of that due to active matter in the earth.

A. S. EVE.

McGill University, Montreal, March 3.

Mosaic Origin of the Atomic Theory.*

THE recent correspondence on the subject of the identity of the inventor of the atomic theory has led me to think that the following quotation from one of the foremost English scholars of the seventeenth century is worthy of some passing notice in this connection. Ralph Cudworth, D.D. (1617–1688), was the author of a colossal monument to Greek philosophy, the "Intellectual System of the Universe." A smaller work of that author, which was published posthumously (1731), contains the following paragraphs, which throw a glimmering light (new, probably, to most eyes) on the historic continuity of *ancient* philosophy and "modern" science:—

"1. Wherefore we have made it evident, that that very *Mechanical* or *Atomical* Philosophy, that hath been lately restored by *Cartesius* and *Gassendus*, as to the main Substance of it, was not only elder than *Epicurus*, but also than *Plato* and *Aristotle*, nay, than *Democritus* and *Leucippus* also, the commonly reputed Fathers of it. And therefore we have no Reason to discredit the report of *Posidonius* the *Stoick*, who, as *Strabo* tells us, affirmed this *Atomical* Philosophy to have been antienter than the Times of the *Trojan* War, and first to have been brought into *Greece* out of *Phenicia*. *If we may believe* Posidonius *the Stoick, the Doctrine of Atoms is antienter than the Times of the Trojan War, and was first invented and deliver'd by one* Moschus *a* Sidonian, or rather a *Phenician*, as *Sextus Empiricus* cites the Testimony of *Posidonius*. Democritus *and* Epicurus *invented the Doctrine of Atoms, unless we make that Physiology to be antienter, and derive it, as* Posidonius *the Stoick doth, from one* Moschus, *a* Phenician. And since it is certain from what we have shewed, that neither *Epicurus* nor yet *Democritus* were the first Inventors of this Physiology, this Testimony of *Posidonius* the Stoick ought in Reason to be admitted by us.

"2. Now what can be more probable than that this *Moschus* the Phenician, that *Posidonius* speaks of, is the very same Person with that *Moschus* the Physiologer, that *Jamblichus* mentions in the Life of *Pythagoras*, where he affirms, that *Pythagoras* living some time at *Sidon* in *Phenicia*, conversed with the Prophets that were the Successors of *Mochus* the Physiologer, and was instructed by them. *He conversed with the Prophets that were the Successors of* Mochus *and other* Phenician *Priests*. And what can be more certain than that both *Mochus* and *Moschus*, the *Phenician* and Philosopher, was no other than *Moses* the *Jewish* Lawgiver, as *Arcerius* rightly guesses. *It seems that it ought to be read* Moschus, *unless any had rather read it* Mochus or Moses. Wherefore according to the Antient Tradition, *Moschus* or *Moses* the *Phenician* being the First Author of the *Atomical* Philosophy, it ought to be called neither *Epicurean* nor *Democritical*, but *Moschical*, or *Mosaical*."

Dublin, February 26. JOHN KNOTT.

Tabulated Values of Certain Integrals.

IN reply to the letter of Mr. C. E. Adams in NATURE of March 19, a table of the values of the integrals required will be found in Airy's "Undulatory Theory of Optics" (Macmillan and Co., Ltd., 1877) on p. 158.

HARRY M. ELDER.

41 Netherhall Gardens, N.W., March 20.

NOTES ON ANCIENT BRITISH MONUMENTS.[1]

VII.—THE ABERDEEN CIRCLES (*Continued*).[2]

IN December, 1906, I gave an account of my measures of four examples of a very special type of circle which is only to be found, so far as I know, in Aberdeenshire. They were described in relation to other circles by Mr. Lewis in his paper on the stone circles of Scotland. My wife and I again went to Aberdeen last autumn and measured another twenty-five, leaving, I believe, still more than a hundred to be examined.

The survey last year has greatly increased the interest in them, and I hope to show that a complete inquiry into them may advance science in many directions, especially if other allied questions are included in the research.

The instrument employed in the reconnaissance, for time did not allow of a complete survey, was a compass clinometer of Barker's pattern, giving azimuths and angular heights of the horizon, say, to half a degree, a reading quite as fine as can be hoped for, considering the rough condition of the monuments, and the presence of trees on the horizon in many cases. As I said in my 1906 notes, observations of the height of the horizon in winter, when the trees are leafless, are very desirable.

In the observations last year, the orientation was determined by attempting to find the direction of the line across the circle at right angles to the face of the recumbent stone. Last year I worked differently.

The method of observation adopted was to measure the azimuth of the line lying along the common N. and S. surfaces of the supporters and recumbent stone, and in the eastern direction where possible. When there was no common line, supporters and recumbent stone were dealt with separately. In some of the complete and undisturbed triliths the correspondence of the azimuths of both surfaces showed that immense care had been taken in selecting and "planting" the stones.

The mean of the azimuths thus obtained, deducting 90°, gave the direction of the observing line across the circle.

In some cases it seemed as if the circle builders had got this line in the first instance by erecting two stones on the opposite side of the circle about the same distance apart as the two supporters—a kind of avenue, the surfaces of the recumbent stone being placed at right angles to this line.

This premised, I next give a comparison between the Cornwall and Aberdeen monuments:—

(1) Assuming that the recumbent stone in Aberdeenshire was used as a directrix, like the outstanding stones of the Cornish and Gorsedd circles, all the conclusions I arrived at in Cornwall and on Dartmoor are abundantly confirmed.

(2) I have examined no circle in Aberdeenshire the astronomical use of which, with one or two exceptions to be referred to later, is not perfectly obvious in the light of former work.

(3) The directions indicated by the Aberdeen recumbent or directing stones are generally the same as those indicated by the outstanding stones in Cornwall. The exceptions are that the cardinal points N. true and W. true are indicated in the former.

(4) The N. and the W. true alignments may indicate an advance in astronomical knowledge. The N. alignments suggest that time at night was determined by circumpolar stars. The W. alignment shows that the equinoxes were fixed as well as the solstices.

(5) Of the twenty-nine circles I have examined, fifteen are clock-star circles, two are May-year, and three solstitial. Of special circles we have four facing N. and one facing W.

(6) Arcturus and Capella were used as clock-stars in Cornwall; in the higher latitude of Aberdeen Castor might have been used.

(7) So far, and quite provisionally until a larger number of circles is examined, I think Castor was not used.

(8) In the clock-star circles the azimuths range from N. 4° E. to N. 29° E. These azimuths, taking the heights of horizon into account, give us N. declinations from 34° 45′ to 31°. If Capella is in question, the dates lie between B.C. 1200 and B.C. 2000; if Arcturus, B.C. 950 and B.C. 250. Mean dates are:—Capella, B.C. 1600; Arcturus, B.C. 600.

I append a diagram which shows the connections existing between the azimuths, the elevation of the horizon—both measured quantities—and the declinations, and dates of the use of the clock-stars. The numbers on the curves refer to the fifteen clock-star circles enumerated below:—

FIG. 20.—The recumbent or directing stone and supporters of the Cothie Muir Circle, a normal example.

1, Braehead Leslie; 2, Leylodge; 3, Loudon Wood; 4, Tomnagorn; 5, Wanton Wells; 6, Old Keig; 7, South Fornet; 13, Nether Boddam; 8, Aikey Brae; 9, Castle Fraser; 10, New Craig; 11, Loanhead of Daviot; 12, Kirkton of Bourtie; 14, Cothie Muir; 15, Eslie the Greater,

Note that on the diagram the circle (13) is misplaced. The azimuth should be 21° 15′, not 11° 15′; consequently the (13) circle should be moved along the "2° hill" curve until it touches the circle (5).

As an illustration of the use of the curve, take the case of the Cothie Muir circle, number 14. The true azimuth across the circle, *i.e.* at right angles to the recumbent stone, was found to be N. 18° 55′ E., and the elevation of the horizon in that direction 4°. Projecting the point where the 18° 55′ azimuth ordinate intersects the "4° hill" curve, on to the declination scale, we get 34° 42′ N. as the declination. Referring to the time scales for Arcturus and Capella, it is seen

[1] Continued from p. 416.
[2] NATURE, vol. lxxv., p. 150.

that the former had this declination in 920 B.C., the latter in 1300 B.C.

(9) There is so far no absolute demonstration as to which of the stars in question was used, or whether they were used at different times. Some light may be thrown on this point if the approximate dates of the solstitial circles at Midmar, Sunhoney and Stonehead can be determined, using the change of obliquity.

This question of date is, of course, one of surpassing interest, and it is not a little curious that the conditions at Aberdeen are such that no direct solution of the problem is so far possible.

But there are some sidelights.

Against the older date is the fact that the Aberdeen circles, even May-year circles, differ in the method of alignment used in other parts of Britain, including the west coast of Scotland, at the earlier date. But the presence of the recumbent stone is not the only difference; the central stone of the Gorsedd is generally replaced by a cairn, or rings or mounds of stones. The true N. alignments at Dyce, Whitehill Wood, Raes of Clune and Candle Hill (Insch) have no counterpart in the South, and they may be held to indicate possibly an advance in the manner of determining time at night, and therefore an erection at a more recent date.

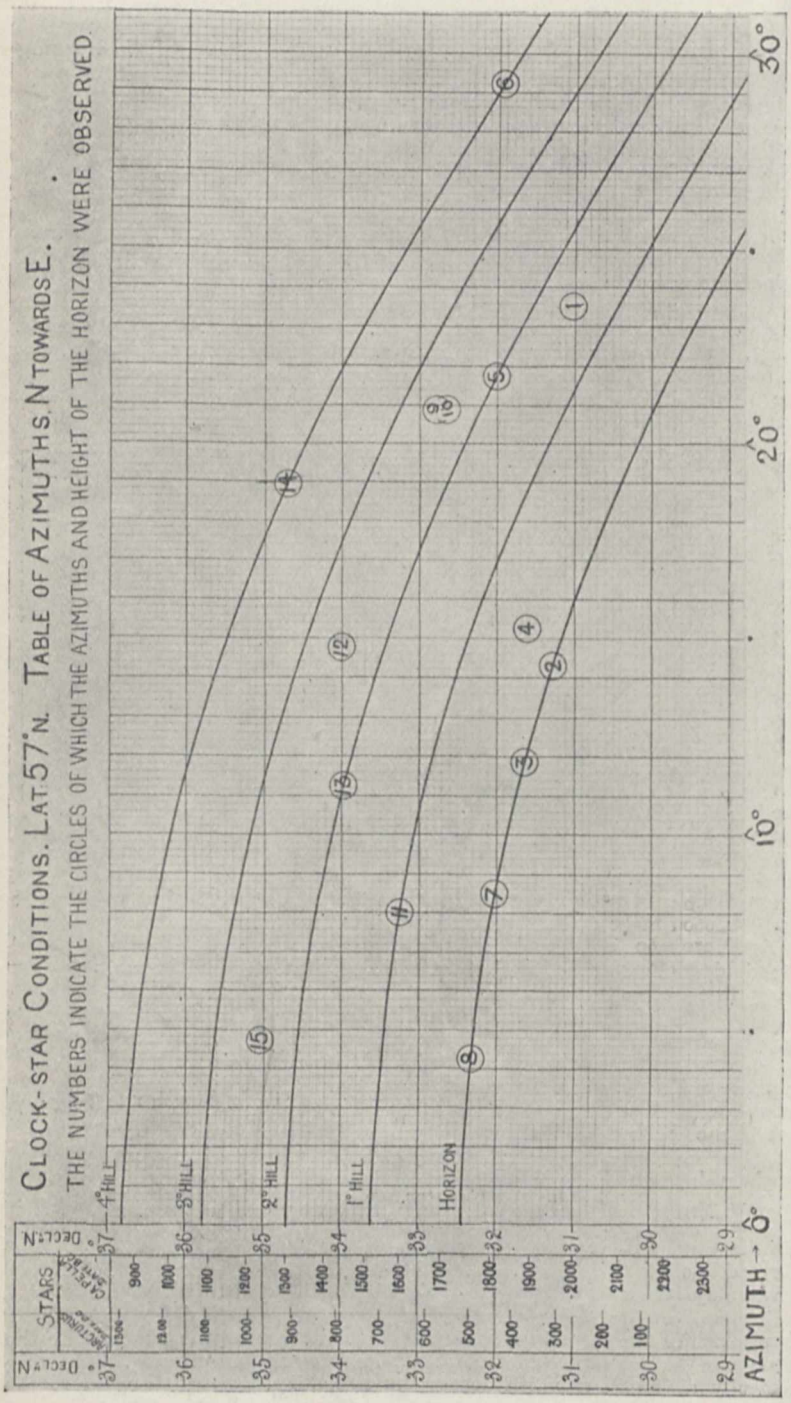

FIG. 21.—Showing azimuths and heights of hills.

Again, the work at the various circles showed that the Aberdeen system of alignment is far inferior to that of the employment of an outstanding stone some distance away from the circle as in the Cornish monuments. But it must not be taken for granted that this inferior method of alignment meant an inferior knowledge of astronomy, which we should be justified in associating with an earlier date. I am rather inclined to attribute it to the fact that an exact knowledge of the length of the year and of the number of days in each quarter having been gained, exact alignments became less necessary. As time went on, the circle became of less importance as an astronomical instrument, though its other uses remained, and this latter view seems strengthened by the fact that in Aberdeenshire the circles are very frequently located on the tops of low hills, convenient places of assembly, whereas in Cornwall this, so far as I now remember, did not often happen. The Aberdeenshire circles, indeed, are generally at a much lower level, among the cultivation. It was chiefly the astronomical requirement of a clear horizon which was fulfilled in Cornwall and Dartmoor, at heights from 1000 to 1500 feet.

Another strong argument against the older date is the absence of cromlechs in the Aberdeen district.

May we not take the absence of the cromlech and the presence of the cist as another proof of modernity? By cist I mean an obvious grave as opposed to the "chambered cairns" of some authors, which were as obviously not built as graves merely. These "chambered cairns," I take it, are really the interiors of barrows, and are large examples of cromlechs. It is immaterial whether the barrows were built of stones or earth to make the chambers rain-tight. This would depend upon which was most handy—stones

in Scotland, chalk at Stonehenge, earth in Cornwall.

Now while "cists" are common to Scotland, Dartmoor and Cornwall, the "chambered cairn" or cromlech is in Scotland special to the west coast. I do not know at present whether there is any representative of it nearer to Aberdeen than Callernish or Stenness. The difference between the east and west coast of Scotland is thus strongly emphasised, and the view of a difference of time in the building operations is strengthened.

I now return for a moment from the side-lights to the clock-star conditions, in order to give a table of the measurements, from which the declinations of the stars were determined by means of a curve connecting azimuth and declination, for different elevations of the horizon, for the general latitude of 57° N.; consequently the measurements are not final, but are sufficiently accurate for a preliminary discussion.

Between 2000 B.C. and 1 B.C Arcturus and Capella were the only first-magnitude stars to come within the declination range shown in the table, and, as my results show that they were used as clock-stars in Cornwall and Devon, I consider that the evidence in their favour warrants the assumption that one of them was used as a clock-star by the circle-builders of Aberdeenshire. I give the dates for both.

Circles at—	Azimuths		Elevation of the horizon	Declination N.	Dates B.C.	
	Magnetic, mean of observations	True, at right-angles across circle			Arcturus	Capella
	° ′	° ′	°	° ′		
Braehead Leslie... ...	132 20	N. 23 35 E.	1½	30 58	250	2000
Leylodge	123 0	N. 14 15 E.	0	31 18	330	1940
Loudon Wood	120 40	N. 11 55 E.	0	31 38	370	1890
Tomnagorn	124 0	N. 15 15 E.	½?	31 42	390	1860
Wanton Wells	130 30	N. 21 45 E.	2	31 52	420	1830
Old Keig	138 0	N. 29 15 E.	4	31 55	430	1820
South Fornet	116 48	N. 8 3 E.	0	32 4	450	1800
Nether Boddam... ..	130 0	N. 21 15 E.	2	32 8	460	1790
Aikey Brae...	113 0	N. 4 15 E.	0	32 18	500	1760
Castle Fraser	129 36	N. 20 51 E.	2½	32 42	570	1680
New Craig	129 34	N. 20 49 E.	2½	32 43	570	1680
Loanhead of Daviot...	116 45	N. 8 0 E.	1	33 14	660	1580
Kirkton of Bourtie ...	123 30	N. 14 45 E.	2½	33 57	770	1460
Cothie Muir	127 40	N. 18 55 E.	4	34 42	920	1300
Eslie the Greater ...	113 30	N. 4 45 E.	2½	35 5	980	1230

In future notes, after referring to some more "side-lights," I shall give the measurements of the May-year and solstitial circles.

NORMAN LOCKYER.

PROPOSED ALTERATION IN THE CALENDAR.

THE last great alteration in the calendar was that which was known as the Gregorian Reformation. It was promulgated in 1582, and at once accepted in all countries which were under the Roman obedience in ecclesiastical matters, but only gradually adopted by those belonging to the Reformed Western Church (which are all usually called Protestant, though that term strictly pertains to the Lutherans only), whilst the Eastern Church adheres still to the old Julian style.

Now it is often forgotten that the change then made was two-fold, the two parts having really no reference to each other, and the assertion frequently made that the Gregorian calendar was constructed, or nearly so, to agree with the astronomical length of the year, applies to only one of these changes, the other, which made a violent hiatus in the succession of days, being effected with a totally different object. For if the year were to be assigned its true length and not the 365¼ days decreed by Julius Cæsar, it would at first sight have seemed most natural to choose a convenient epoch, such as the end of a century, and simply arrange the omission of a leap-year at certain stated times from that. (Here we may parenthetically remark that a regulation to drop a leap-year at the end of each 132nd year would have been more accurate, and quite as simple as that actually adopted.) But it was also thought necessary to bring back the vernal equinox to the date it occupied, not at the Christian era, but at the time of the Council of Nicæa in the fourth century. Hence ten days were omitted from the current sequence, and when England came into line with other western countries, eleven days were omitted in 1752. This, of course, makes great care necessary in comparing events as given in English and Continental narratives between 1582 and 1752.

The change now proposed, and recently brought before the House of Commons by Mr. Pearce, is of a much more drastic kind. It is not a reformation of the Gregorian calendar as regards the length of the year (and a small change of the rule, as already mentioned, would improve its accuracy at long intervals), but a proposal to alter the succession of the days of the week and of the month to secure a degree of symmetry in their correspondence, and an equality in the four quarters of the year. Thus the first of January and the leap-year day, which, however, is to be, not in February, but in June, have each to be considered in every respect a *dies non*; if either falls on a Sunday, not that day, but the next is to be reckoned as Sunday, which, of course, would occasionally throw Sunday one day, or even two days, ahead of its place in the sequence of seven days.

Now it may safely be affirmed that, not only for its practical inconvenience and disturbance of the uniformity and continuity which are so desirable in a calendar, but for other reasons also, even more weighty, this alteration can never be accepted in Christian countries, nor could it commend itself if we began *de novo*.

As regards the days of the month, the case is different. The existing arrangement was a perversion of that decreed by Julius Cæsar. He ordained that the year should begin with January, the 1st being the day of new moon nearest the winter solstice when the change was made, and that that month should have thirty-one days and each alternate month afterwards, the rest to have thirty, excepting February, which should have twenty-nine days in common years and thirty days in leap-years, to fall *every* fourth year. In the reign of Augustus, who looked upon August as his special month, though it was not that of his birth, the convenient and easily to be remembered arrangement of Julius was altered in order that August might have as many days as July. By the earlier arrangement the days of the successive months were 31, 29 (or 30), 31, 30, 31, 30, 31, 30, 31, 30, 31, 30; by the later (now followed), 31, 28 (or 29), 31, 30, 31, 30, 31, 31, 30, 31, 30, 31.

No doubt Cæsar placed the leap-day in February because that had been the last month of the year in the old Roman calendar. There would be no harm, if we were starting afresh, in placing it in June as proposed by Mr. Pearce; but it would injure continuity (always a desirable thing in itself) and not attain his object unless the day, as well as New Year's Day, were made a *dies non*, both in the week and in the

month. Neither of these would be convenient; the first is, for other reasons also, inadmissible.

On one point we agree with Mr. Pearce, and that is as regards the incidence of Easter. There is a common, but false, impression that the existing cumbrous arrangement has the authority of the Council of Nicæa. All that that council decreed was, in opposition to the so-called Quartodecimans, that Easter should always be kept on a Sunday; the particular Sunday was regulated by various cycles, the Metonic being usually followed, and the present rule was initiated by the advisers of Pope Gregory XIII., the English Prayer-Book rule arriving at the same end, when our calendar was reformed, by a slightly different process. It has not secured uniformity in Christendom because the Eastern church still follows the Julian calendar, and therefore its Easter is usually different from ours. A rule to keep Easter on the second Sunday in April (when the first Easter in all probability fell) would be very convenient, but it is an ecclesiastical question, and the alteration should be the act of the whole church. To make it always on the same day of the month, as well as week, as Mr. Pearce proposes, could not be done without accepting his other drastic and inadmissible proposals.

W. T. L.

PECULIARITIES IN THE STRUCTURE OF SOME HEAVENLY BODIES.

PROF. SUESS has recently contributed a suggestive paper on peculiarities in the structure of some of the heavenly bodies [1] to the Academy of Sciences of Vienna. He remarks at the outset that the present phase of geology is similar to that of anatomy at the time when the structure of the human body was first compared with that of other living organisms. For the purpose of comparative study it is essential that the earth should be regarded as a whole, and when this is done it becomes fairly obvious that acid rocks and their derivatives, which form so large a portion of the visible surface, are far less important as constituents of the globe than might at first sight be supposed. We see but little of those heavy substances to which the earth owes its high density, and which appear to be more closely associated with the basic than with the acid rocks. Our author considers that for the general purpose which he has in view three main types of rock should be recognised—SiAl rocks (sal or salic rocks), SiMg rocks (sima or simic rocks), and NiFe rocks (nife or nific rocks). For the simic rocks containing chromium and iron he uses the term crofesima. The most important occurrences of platinum are in the crofesimic rocks, which also contain almost always traces of nickel. These rocks are of deep-seated origin, and it is a significant fact that they frequently occur as intrusions along planes of movement in the younger mountain chains, such as the Alps, *e.g.* zone of Ivrea.

In 1901 the author, in a letter to Sir Norman Lockyer (NATURE, October 24, 1901, p. 629), directed attention to the fact that the metals associated with the basic rocks are not only distinct from those which often accompany the acid rocks, but that they agree closely with those which stand out prominently in the Fraunhofer spectrum and in α Cygni. This led Sir Norman to institute a special research, with the result [2] that "the views of Prof. Suess were confirmed . . . and that the metals conspicuously represented in the spectra of the sun, the chromosphere, and α Cygni are, in the main, those which are associated with basic rocks; also that, with the possible exception of yttrium and lithium, the metals typical of acid rocks are not represented in α Cygni. There is, of course, evidence that several of the acid-rock-metals such as potassium, beryllium, cerium, tin and zirconium are represented in the Fraunhoferic spectrum, but the solar lines are in each case inconspicuous."

Commenting on the above quotation, Prof. Suess points out that if the composition of the earth be considered quantitatively there is every reason to believe that it would, if subjected to the necessary physical conditions, yield a sun in which the basic group of metals would spectroscopically dominate over the acid group.

In considering the distribution of metals of the basic, or, as he now expresses himself, of the simic group, the author directs attention to the local predominence in terrestrial occurrences of certain metals, *e.g.* titanium over nickel and *vice versâ*. Similarly, if γ Cygni be compared with α Cygni, titanium, strontium, and scandium will be seen to be more important, and iron, chromium, and magnesium less important in the former than in the latter.

The special importance of titanium in sun-spots is compared with the predominance of this metal (ilmenite) over nickel in the contents of the diamond-pipes of South Africa, which are regarded as the most striking terrestrial examples of gaseous eruptions.

In the concluding part of the paper the author briefly reviews the theories as to the origin of meteorites, and favours the view that they, together with the planetoids, represent the fragments of an anonymous planet which formerly occupied a position between Mars and Jupiter. "The centre of this planet," he says, "consisted of nife like that of Agram or Elbogen. Towards the exterior the proportion of magnesium increased, and a transition from nife to sima took place, as is probably the case with the earth, although the supposition cannot be verified by observation. A salic outer crust was absent unless it be represented by the perfectly molten tektites." [1]

[1] "Über Einzelheiten in der Beschaffenheit einiger Himmelskörper" (*Sitz. a. k. Akad. d. Wiss. Mathem-naturw. Klasse*, Bd. cxvi., October, 1907.)

[2] "Spectroscopic Comparison of Metals present in Certain Terrestrial and Celestial Light-sources." (Solar Physics Committee, 1907.)

[1] This term has been proposed by Dr. F. E. Suess ("Die Herkunft der Moldavite und verwandter Gläser," *Jahr. geol. Reichsanst.*, 1900, p. 193) for certain peculiar vitreous bodies which he refers to an extra-terrestrial origin.

SIR JOHN ELIOT, K.C.I.E., F.R.S.

THE news of the death of Sir John Eliot, K.C.I.E., F.R.S., in his sixty-ninth year, at his residence, Bon Porto, Cavalaire, Var, France, will be received with great regret by a very large circle of friends. His death was extremely sudden, and took place in the early morning of Wednesday, March 18. He was walking on a steep hill in his own grounds, superintending the work of his men, when he suddenly sat down and passed away. The cause of death is said to have been apoplexy.

Sir John Eliot was throughout his life a most indefatigable worker, and since his retirement from the Indian Service about five years ago he had continued to work with unabated vigour. Indeed, the strenuous work which he undertook may perhaps have undermined his health, and have caused his premature death. He was one of the most genial companions possible, having a most charming personality, together with a keen sense of humour. He was most widely read and well informed in almost every subject, and at the same time he was one of the most modest of men. He was a most accomplished musician, and played the organ and piano with very great execution and feeling. He was also

greatly loved and esteemed by his subordinates and fellow-workers, and by his many friends.

Sir John Eliot had a most distinguished career, and the major part of his life was devoted to India, at first to educational work, and later on to Indian meteorological problems. He was born at Lamesby, in Durham, on May 25, 1839. The details of his earlier education have not been recorded, but he went up to Cambridge University about 1866 and took his degree from St. John's College in 1869, and was second (bracketed) wrangler and first Smith's prizeman of his year. He was then elected to a fellowship at St. John's College, which he held from 1869 up to his marriage in 1876. As a young man his health was not very robust, and he was advised to avoid the climate of England, so that after taking his degree he accepted an appointment in the Indian Government Service as professor of mathematics at the Roorkee Engineering College. This he held from 1869 to 1872. He was then transferred to the regular Indian Educational Service as professor of mathematics at the Muir Central College at Allahabad, an appointment which he held from 1872 to 1874.

About this time he turned his special attention to physics rather than to pure mathematics, and also undertook certain meteorological work at Allahabad. In 1874 he was appointed professor of physical science at the Presidency College, Calcutta, and combined this with the post of meteorological reporter to the Government of Bengal, both of which he held from 1874 to 1886. He was then appointed meteorological reporter to the Government of India and director general of Indian observatories, an appointment which he held until he retired in January, 1903. On his retirement the Government of India published in the *Gazette of India* a most complimentary resolution thanking him for "his long and meritorious services."

As an educationist he has left his mark in the various colleges in India in which he worked, and also in the Calcutta University, of which he was for many years a most distinguished Fellow. Many of the present generation of educated Indian gentlemen who are holding very prominent positions are largely indebted to Sir John Eliot, not only for his actual teaching, which was of a particularly high order, but also for his kindliness and sympathy towards his students. The example shown by his work and character had a great effect on all brought in contact with him, and he was very greatly respected and loved by his students and by all classes of Indian gentlemen, for it may be truly said of him that his great abilities were more than equalled by his extreme modesty and invariable kindness.

In his capacity as Fellow of the Calcutta University he also did very notable work, and by his great influence and marked powers of persuasion he was able to introduce many considerable reforms into the courses of instruction in mathematics and physical science, and in the latter case he was specially successful in making the courses more practical and more thorough than they had hitherto been.

As a meteorologist, India also owes him a large debt of gratitude. As meteorological reporter to the Government of Bengal, he largely extended the meteorological system, and introduced daily weather reports with charts based on telegraphic information, and he also instituted a very comprehensive and effective system of storm warnings for coast stations round the Bay of Bengal, and of flood warnings for inland stations. One of his earliest meteorological papers was a "History of the Backergunge Cyclone of 1876," in which storm about two hundred thousand people were drowned in about half an hour by a huge storm wave, which swept over the Island of Sandip.

In this monograph Sir John Eliot largely developed and extended the theory of the formation of cyclones. This publication indeed excited a good deal of attention both in India and in England, and in both instances this was unusual. So much attention was directed to this memoir and to the cyclone which it described that a request was made in the House of Commons for the report to be produced and laid on the table, and it was then made available to those interested in England.

The reputation as a meteorologist which Sir John Eliot gained while occupying the post of meteorological reporter to the Government of Bengal rendered it a foregone conclusion that when the higher post of meteorological reporter to the Government of India fell vacant it would be offered to him. This post had been created about the year 1875 or 1876, and its first incumbent was the late Mr. H. F. Blanford, F.R.S. Up to about 1875 there had only been local officers in charge of the meteorology of the different provinces (such as Bengal, Madras, and Bombay) into which India is divided, but it was felt that if Indian meteorology was to make any real progress it must be studied as a whole, and not piecemeal. Hence the appointment of meteorological reporter under the Imperial or Indian Government was created, and all the observations taken in the various provinces were, after local use, sent on to the Indian Meteorological Department. Much and most valuable work was done by Mr. Blanford in the development of the department on an Imperial basis, and also in the foundation of systematic and organised investigation and in the prompt diffusion of meteorological information thus obtained, but, as in all great schemes, the progress of consolidation of the work in its imperial aspects was rather difficult.

With Mr. Blanford's work as a basis, Sir John (then, of course, Mr.) Eliot was able to make more rapid progress. He largely increased the area from which observations were received, and also the number of reporting stations in the area already covered. Indeed, during his tenure of office he almost doubled the number of stations which sent in reports, and extended them so as to get observations from very high altitudes (11,000 feet elevation), and also from outlying places like Kashmir and the routes leading towards Central Asia, and from such places as Leh, Ladakh, Dras, &c. He made the work of the observatories more accurate and more systematic, and arranged that by telegraphic communication the latest meteorological information from all parts of the Indian Empire in the form of daily weather reports with charts should be at once available at headquarters.

Indeed, it is not too much to say that from the time he took over charge of the Indian Meteorological Department, its efficiency and usefulness were very largely increased, and that he brought it quite into line with the most modern meteorological organisations. Under him the department published many series of most valuable results and memoirs. He also developed a complete system of storm warnings for the whole of the coast-line of India and Burma, extending over some thousands of miles, and also established flood warnings for the whole of India by which telegraphic warnings are sent of expected floods to all engineers in charge of irrigation and other large works, and in other cases where similar damage may occur. Daily reports with charts dealing with the sea areas of the Bay of Bengal and Indian Ocean were also established, and, further, he established a most valuable system of seasonal forecasts, which gradually became of very great value, though naturally to begin with they were rather tentative and experimental.

Those who navigate Indian seas are also especially

indebted to Sir John Eliot for his work, "Handbook of Cyclonic Storms in the Bay of Bengal," which has in all human probability been the means of saving many vessels and valuable property—possibly from destruction and certainly from damage—by enabling such vessels, by the rules laid down in that work, to avoid the more dangerous parts of these cyclones, and also generally to escape from them altogether by the knowledge thus given of the indications of the approach of such storms and of the tracks usually followed by them in the different months of the year.

Indeed, it would be an easy matter to prove that in many instances the information and warnings conveyed from the Indian Meteorological Department have been the means of helping that Government and individuals in a most remarkable manner, and that even to put the matter on the lowest ground, it has saved the State vast sums of money by giving accurate information of the precise meteorological conditions of the country, and timely warnings of possible famines, and in some cases, when famine seemed looming in the immediate future, of timely information of approaching rainfall, which at once would do away with the necessity of starting famine relief operations on a large scale. The Indian Meteorological Department has far more than justified its existence, for it has really proved itself of far greater value than its relatively small cost.

Sir John Eliot was also very greatly interested in the subject of solar physics, and he was largely instrumental in starting the solar physics observatory at Kodaikanal, in southern India, and immediately on his retirement he was appointed as a member of the Solar Physics Committee, and also on other scientific bodies, and he worked quite as hard as he had always done in India. Indeed, he was at work up to the last, for on the Monday before his death he was engaged on his new book, "A Handbook of Indian Meteorology," and said he was making great progress with it.

One who knows well the work of Sir John Eliot after his return to Europe writes as follows:—

"Sir John Eliot left India full of enthusiasm for the future of his department. As a public servant he had the rare satisfaction of knowing that a scientific enterprise begun with some doubt and misgiving, had, under his direction, established its claim to a recognised position, and had justified the anticipations of its promoters. His last official step was to secure for his successor the increase of the scientific staff of which he had himself felt the need.

"On his return to England he gave expression to his experience and his aspirations in an address to the British Association at Cambridge in 1904 as president of the subsection for astronomy and cosmical physics. Reviewing his own work and stimulated by his success, he looked beyond the forecasts of to-morrow's weather to anticipating, on strictly scientific grounds, the character of the seasons by the correlation of meteorological phenomena over extended regions of the earth and their possible relation with solar changes. He became secretary of the Solar Commission, originated upon the proposition of Sir Norman Lockyer by the International Meteorological Committee, which met at Southport in 1903. The purpose of the committee was to collect comparable meteorological data from all parts of the world and solar data for comparison with them. He spent a considerable part of his last stay in England in planning new arrangements for carrying out the objects of the Commission. In the latter part of his address at Cambridge he advocated the organisation of the British contribution to this side of meteorological work upon an imperial basis. He realised that an imperial combination would treat such questions with a breadth of view that is not possible or permissible in any single colony or dependency, guided, as it must be, by the narrower consideration of its immediate needs.

"His plan was to provide for organised observations from areas too wide to be within the control of any single Government; to place the material thus obtained at the service of workers in all parts of the world by publishing it while it was still of direct practical utility and to ensure its application to the service of the Empire by a special staff of trained workers.

"Anyone who reads the address cannot fail to catch something of his enthusiasm. There is a ring of the "land of hope and glory" about his appeal for the extension of our knowledge of the facts. "Wider still and wider be thy boundaries set" bespeaks the ideal of his meteorological method, and it was to the various parts of the King's dominions that he looked for its realisation. The task was no light one. The British Association made a beginning, but imperial wheels grind very slowly. It says much for Eliot and for India that he carried with him the active support of the Indian Government for the proposal. He welcomed the idea of a meeting of British meteorologists in Canada, because it gave him the opportunity of getting a step forward, and although conscious of the personal sacrifice which it involved, he undertook to make the journey to Ottawa this year for the purpose. The intention cannot be fulfilled."

"It is a bitter disappointment to all his fellow-workers that death has brought his efforts to an untimely end. His enthusiasm was entirely free from any suggestion of selfishness or personal ambition; he could speak from an unique position with unrivalled experience. There is no one now to take his place. But the idea remains, and this country seldom wants for men when there is real work to be done. Remembering Eliot's achievements we are emboldened to fall back upon the refrain, and to add the second couplet without misgiving."

Among the more prominent of Sir John Eliot's publications are numerous accounts of cyclones and severe cyclonic storms occurring within Indian seas; also numerous meteorological discussions contributed to the Indian Meteorological Memoirs, to the Indian Cyclone Memoirs, to the Journal of the Asiatic Society of Bengal, and to the Quarterly Journal of the Royal Meteorological Society; his "Handbook of Cyclonic Storms in the Bay of Bengal" (already mentioned), and his last publication, which took the form of that most valuable work, "The Climatological Atlas of India," published by the authority of the Government of India only a few months ago; while at the time of his death he was engaged in writing a "Handbook of Indian Meteorology" to accompany this, also to be published under the direction of the Government of India.

Sir John Eliot was elected a Fellow of the Royal Society in 1895; he was created a C.I.E. in 1897, and was given his K.C.I.E. in 1903 on his retirement. In 1877 he married Mary, daughter of Mr. Wm. Nevill, of Godalming; his widow survives him, and he has left three sons. A. P.

NOTES.

SIR OLIVER LODGE was unable to deliver his presidential address to the Faraday Society on Tuesday on account of an attack of influenza, from which, however, he is now recovering.

WE regret to state that the Duke of Devonshire died at Cannes on Tuesday morning, at seventy-four years of age. The Duke was a Fellow of the Royal Society and Chancellor of the University of Cambridge.

THE Right Hon. A. J. Balfour, F.R.S., has been elected a corresponding member of the French Academy of Moral and Political Sciences in succession to Lord Reay, who has been elected an associate.

THE Paris Academy of Sciences has accepted a legacy of 400*l.* from M. Sabatier to found a biennial prize to be known as the Sabatier prize.

ON the drill ground at Issy-les-Moulineaux on Friday, March 20, Mr. H. Farman traversed the complete circle two and a half times with his aëroplane, the length of the flight being 2750 yards, and the time 2m. 15s.

WITH regard to the inquiry of a correspondent (NATURE, March 5, p. 417) for particulars concerning the mist and Sicilian earthquake of 1783, Mr. E. A. Martin, The Museum, Croydon, writes to point out that Gilbert White has a reference thereto in his Letter 65 to Barrington ("Natural History of Selborne").

DR. HALL-EDWARDS, who recently had his left hand amputated in consequence of X-ray dermatitis, has been granted a Civil List pension of 120*l.* a year. When Dr. Hall-Edwards has recovered from the effects of the amputation, another operation will be necessary, and at least four fingers of his right hand will have to be amputated.

ON Thursday next, April 2, Mr. R. Lydekker will begin a course of two lectures at the Royal Institution on (1) "The Animals of Africa," (2) "The Animals of South America." The Friday evening discourse on April 3 will be delivered by the Right Hon. Lord Montagu of Beaulieu on "The Modern Motor-car," and on April 10 by Prof. J. J. Thomson on "The Carriers of Positive Electricity."

THE death is announced, in his seventieth year, of Dr. D. B. St. John Roosa, president of the New York Medical Post-graduate School, and professor of diseases of the eye in that institution. He formerly held chairs in the University of the City of New York and the University of Vermont. He was the author of a pocket medical lexicon and of various treatises on the eye and the ear.

PROF. W. A. KELLERMAN, who has held the professorship of botany at the Ohio State University since 1891, has died of malaria in Guatemala, which country he was visiting in order to study its flora. He was born in 1850, graduated at Cornell in 1874, and had taught botany at the Wisconsin State Normal School and the Kansas State Agricultural College. He was perhaps most widely known as founder and editor of the *Journal of Mycology*. Among his books were "Flora of Kansas," "Spring Flora of Ohio," and "Phyto-Theca."

REFERRING to the article on "Some London Problems" published in our issue of March 19, a correspondent directs attention to the arrangement for the construction of deep-water wharves near Gravesend, in Long Reach, about five miles above Tilbury. These wharves have been licensed by the Thames Conservancy and approved by the Board of Trade, though their construction has been delayed because of the Port Bill. This wharf will be capable, our correspondent states, of dealing with three million tons of traffic a year.

THE Royal Commission on Coast Erosion has been directed to inquire whether, in connection with reclaimed lands or otherwise, it is desirable to make an experiment in afforestation as a means of increasing employment during periods of depression in the labour market, and, if so, by what authority and under what conditions such experiment should be conducted. The following new members have been added to the commission:—Mr. J. Galvin, Mr. E. S. Howard, C.B., Mr. H. C. Monro, C.B., Dr. W. Somerville, Mr. F. Story, and Mr. J. Ward, M.P.

THE sixty-first annual meeting of the Palæontographical Society was held on March 20 in the rooms of the Geological Society, Burlington House, Dr. Henry Woodward, F.R.S., president, in the chair. The annual report alluded to the unusually varied contents of the volume for 1907, due to an attempt to provide indexes and title-pages for several monographs which were either complete or discontinued. The council is beginning to favour the plan of publishing smaller works, and has included in the current volume a complete monograph of British Conulariæ, by Miss Ida L. Slater, with five plates drawn by the author. The council welcomed a contribution from the Carnegie Trust for the Universities of Scotland, which provided five plates of Scottish Carboniferous fishes described by Dr. Traquair. Mrs. G. B. Longstaff, Mr. H. A. Allen, Dr. F. A. Bather, and Mr. William Hill were elected new members of council. Dr. Henry Woodward, F.R.S., Dr. G. J. Hinde, F.R.S., and Dr. A. Smith Woodward, F.R.S., were re-elected president, treasurer, and secretary respectively.

NO. 3 of the 1908 issue of the Bulletin of the Imperial Academy of St. Petersburg contains an elaborate and well-illustrated account of the developmental history of the echinoderm Echiurus, by Dr. N. Salensky.

THE third part of vol. vii. of the *Emu*—issued as a special supplement—is devoted to a list of Australian birds on the model of the one now in course of issue by the British Museum. The compiler, Mr. G. M. Mathews, who has recently come to reside in this country, announces his intention of issuing an illustrated work on the birds of Australia, to which the present "hand-list" is a preliminary.

RECENT issues of the Proceedings of the U.S. National Museum include papers by Mr. A. H. Clark on the crinoid genus Comatula (No. 1585), and on the occurrence of infrabasals in certain modern pentacrinids (No. 1582), as well as one (No. 1580) by Mr. C. B. Wilson on North American parasitic copepod crustaceans, and another (No. 1586) by Miss Richardson on isopods from the northern Pacific.

IN an article published in the *National Geographic Magazine* for February under the title of "The Policemen of the Air," Mr. H. W. Henshaw raises the question as to what would happen if birds were completely exterminated. "No one," he observes, "can foretell with absolute certainty, but it is more than likely—nay, it is almost certain—that within a limited time not only would successful agriculture become impossible, but the destruction of the greater part of vegetation would follow. It is believed that a permanent reduction in the numbers of our birds, even if no species are actually exterminated, will inevitably be followed by disastrous consequences." It is added that bird-protection in the United States requires specially stringent laws on account of the large influx of immigrants from southern Europe, to whom every bird, no matter how small, is regarded as food which ought not to be wasted.

A FURTHER contribution to the controversy with regard to the alleged existence of a British willow-titmouse (*Parus atricapillus kleinschmidti*) is made by Mr. H. B. Booth in the March number of the *Naturalist*. It has been stated

that the principal differences between willow-titmice and marsh-titmice are that the feathers on the crown and forehead are longer and more loosely constructed in the former than in the latter. The edges of these feathers are also glossy black in the marsh-titmouse, thus causing the crown to be glossy and of a deeper blackness than that of the willow-titmouse, which is brownish or sooty black. In the latter, again, the tail is distinctly graduated, instead of being almost squared. To these differences Mr. Booth adds the darker rufous colour of the flanks and underparts of the willow-titmouse.

THE evolution of the elephant forms the subject of an interesting article by Mr. R. S. Lull, in the March number of the *American Naturalist*. Starting with the fact that they made their first appearance in the Fayum district of Egypt during the Eocene, the author considers it probable that the proboscideans remained in Africa during the Oligocene, although we have no direct evidence to that effect. Be this as it may, the four-tusked mastodon (*Tetrabelodon angustidens*) made its appearance in the early Miocene of Mogara and Tunisia, whence it migrated by means of a land-bridge connecting Tunisia and Sicily with Italy, and thence by way of Greece, into Asia. Having reached that continent, it apparently gave rise to the Indian *Mastodon cautleyi* and *M. latidens*, from which in turn sprang the primitive, or stegodont, elephants, and from these again elephants of the modern type. Later on the typical elephants themselves migrated westwards to Europe, and thence to Africa, while in the other direction they travelled by way of Bering Strait to America. Hence we are led to conclude, as has been previously pointed out by Mr. Lydekker, that while the Proboscidea originated in Africa, the modern African elephant is of Asiatic parentage, and was an immigrant into the land of its forefathers in company with the ancestors of the giraffes, okapis, and antelopes which now dominate Ethiopia. It is added that, next to man, elephants have been the greatest travellers of all mammals, having reached practically all parts of the world.

UNDER the heading of "Investigations on the Development of Trypanosomes in Tsetse-flies and other Diptera," Prof. E. A. Minchin gives in the March number of the *Quarterly Journal of Microscopical Science* the results of his investigations during a sojourn in Uganda as a member of the commission on sleeping sickness. In the author's opinion, it may now be admitted that trypanosomes undergo development (as distinct from multiplication) in invertebrate hosts, more especially tsetse-flies. It is, however, remarkable that, whereas *Trypanosoma brucei* undergoes a complete cycle of development in at least one kind of tsetse, this is not the case with *T. gambiense*. The explanation suggested is that *Glossina palpalis*, the only kind of tsetse found at Entebbe, is not the proper host of *T. gambiense*, a suggestion supported by the fact that sleeping sickness is a disease of comparatively recent introduction into Uganda. That the Gambian trypanosome has a proper host of its own cannot be doubted, and it is probable this may be a native of the Congo, where it is suggested further investigations on sleeping sickness might advantageously be conducted. In Uganda *T. gambiense* merely commences its developmental cycle in *G. palpalis*, by which, in that district, it is transmitted to the human subject in a purely mechanical and direct manner.

WE have received from Messrs. Zeiss a pamphlet descriptive of Siedentopf's paraboloid condenser, with which an exceedingly well corrected dark ground illumination may be obtained for microscopical work. For observation, medium and high-power dry objectives should be employed. The apparatus is particularly adapted for the observation of such minute objects as bacteria and their flagella, spirochætes, &c., in the fresh and living state, and for photographing the same under these conditions. We have also received Messrs. Zeiss's general catalogue of apparatus for ultramicroscopy, which contains much matter of interest.

IN the *Journal of Hygiene* for January (vol. viii., No. 1) Miss Harriette Chick contributes an interesting article on the theory of disinfection. She shows that a very complete analogy exists between a chemical reaction and the process of disinfection, one reagent being represented by the disinfectant, and the second by the protoplasm of the bacterium. In the case of anthrax spores, the course of disinfection apparently proceeds in accordance with the well-known equation for a unimolecular reaction, if numbers expressing "concentration of reacting substance" are replaced by "numbers of surviving bacteria." A non-sporing organism, *B. paratyphosus*, shows a departure from the simple law owing to permanent differences in resistance to disinfectants among the individual organisms, the younger bacteria proving to be the more resistant. The process of disinfection is influenced by temperature in an orderly manner, and the well-known equation of Arrhenius can be applied. Some evidence was obtained that, in disinfection with mercuric chloride, a toxic compound is formed between the metal and the substance of the bacterial cell.

THE principal article in the *Bulletin du Jardin Impérial Botanique* of St. Petersburg (vol. vii., parts v.–vi.) is an account of the soil and vegetation of the district of Jaila, in the Crimea, communicated by Mr. A. Krischtofowitsch.

TAMARIND seeds are to be reckoned among the fairly nutritious plant products that have been reported to provide food during periods of famine in India. The pulp of the fruit is an esteemed ingredient of certain condiments. The kernels of the seeds when freed from the skin and roasted furnish a not unwholesome flour suitable for mixing with cereals to make small cakes. Further details and analyses are given in the *Agricultural Ledger* (No. 2, 1907) prepared by Mr. D. Hooper and published by the Government of India.

THE annual publication "One and All Gardening" has reached its thirteenth issue. Among the numerous articles, Mr. H. J. Wright furnishes an account of garden teaching in schools, in which he provides a working plan for laying out a school garden, and summarises the progress made in different counties. Mr. S. L. Bastin contributes a note on the method of retarding flowers. The editor takes for his subject the formation of garden associations to stimulate horticulture in country and town; in this connection Mr. F. H. Stead records a remarkable development of gardens in the borough of Walworth, where last year more than one hundred gardens were entered for competition at the local flower show.

THE fauna and flora of the Snares and Auckland Islands form the subject of an ecological descriptive sketch contributed by Dr. L. Cockayne to the *New Zealand Times* (December 11, 1907). The author refers to the evidence furnished by the animal and plant life on the Snares in favour of the view that when a land area is curtailed the exceptional species most frequently survive in the struggle for existence, and so reduced areas generally contain numerous endemic species. The meadows of the

Auckland Isles furnish numerous choice plants, notably the species of the composite genus Pleurophyllum, *Myosotis capitata*, a Celmisia, and gentians. Characteristic plant associations on the islands are the tussock-grasses, *Poa scoparia*, *Poa foliosa*, and *Danthonia bromoides*, confined to special localities determined chiefly by wind conditions.

THE preservation of plants so as to maintain their green colour has been attempted in several ways. Prof. Trail some years ago recommended the use of a solution of acetate of copper in acetic acid, whereby compounds of chlorophyll with copper are formed. He contributes a note to the *Kew Bulletin* (No. 2) to point out the advantage of using a boiling solution. In the same number an article on Jequié manicoba refers to the occurrence in north-east Brazil of rubber trees allied to *Manihot Glaziovii*, the source of Ceara rubber. According to German botanists, three other species, *dichotoma*, *heptaphylla*, and *piauhyensis*, should be distinguished; they are named after the regions in which they grow as Jequié, S. Francisco, and Piauhy manicobas; all are considered to be more valuable than *Manihot Glaziovii*. Determinations of new plants are published as "Diagnoses Africanæ, XXI.," and "New Orchids, XXXI." The identification and occurrence of different patchouli plants form the subject of another article, and Mr. A. D. Cotton discusses the appearance in Great Britain of the alga *Colpomenia sinuosa*, indigenous in the Mediterranean.

THE report of the Chief Inspector of Mines of Mysore for the year 1905–6 (Madras, 1908) is devoted chiefly to official data on the progress of the Kolar gold mines. A decline in production is noticeable, due mainly to the decline in grade of the ore milled. There was also noticeable an increased death-rate from accidents in 1905, due mainly to a serious underground fire at the Nundydroog mine. The total value of gold bullion produced from the commencement of mining operations in Mysore up to the end of 1905 was 23,384,532*l*.

THE Geological Survey of Great Britain issued two additional west-country memoirs at the close of 1907. Mr. Clement Reid's "Geology of the Country around Mevagissey" (price 2*s*.) illustrates Sheet 353, which includes also the gneissic islet of the Eddystone from Sheet 354. This relic is probably part of an Archæan mass running east-north-east, which has governed the trend of the earth-folds in the Mevagissey district. The memoir points out how the Silurian rocks, coloured as "Grauwacke" in the old map of 1839, have now been delineated in some detail; but volunteers are asked for who will elucidate the difficulties still remaining. Beautiful examples of shear-structure in banded slates are given in the photographic plates. The second memoir is by Mr. Ussher, in explanation of Sheet 348, on "The Geology of the Country around Plymouth and Liskeard" (price 3*s*.), and forms a very notable contribution to our knowledge of British Devonian strata. Dr. Flett describes the numerous volcanic and intrusive rocks occurring here on various horizons. An unconformity is suggested between the Lower and Middle Culm-measures, to account for the occurrence of both series directly on Upper Devonian beds in the northern portion of the map. Mr. Ussher believes that the submerged valleys cut in the rock on the south coast owe most of their depth to river-erosion during the epoch of elevation that gave us the raised beach of the district. When this beach, therefore, was being formed at sea-level, these valleys ended in merely shallow tidal inlets. This conclusion is, as Mr. Ussher points out, in opposition to views put forward for similar phenomena in the south of Ireland. Mr. D. A. Macalister contributes a report on the mines and minerals of the district. The colour-printed maps accompanying the memoirs above mentioned are published at 1*s*. 6*d*. each, and include, as usual, clear longitudinal sections of the country in the margins.

ACCORDING to a report in the Proceedings of the Philadelphia Academy for December, 1907, the glaciers of Alberta and British Columbia are passing through a period of shrinkage, which attained special development during the year under review. The Asulkan glacier, for example, which for several years was stationary or slightly advancing, showed a marked decrease during the past season. "Preceded by a cold and stormy winter and a summer with low average of sunshine and low temperature, these conditions point to an interesting series of changes which may ultimately throw some light on the relation between weather conditions and glacier change."

THE Scottish Oceanographic Laboratory at Edinburgh has recently issued, in the shape of a small pamphlet, an account by Dr. J. Hjort, of Bergen, of some of the results of modern international oceanic research. The account, which is translated from the Norwegian, deals firstly with the new methods of current-measurement, and then with the life-history and development of several of the commoner food-fishes, such as haddock, herring, saith, cod, and plaice. Diagrammatic illustrations are given of the form and size of the scales of these fishes at different periods of existence, and the means of thereby ascertaining the approximate age of any individual fish. The ages of the plaice are illustrated, on the other hand, by diagrammatic sketches to scale of four specimens at as many stages of existence. The pamphlet should be of considerable value to all who are connected with our fisheries.

A DETAILED account by Mr. A. Schmauss of twenty-one unmanned balloon ascents made in 1907 at Munich is published in an excerpt paper from the regular meteorological year-book of Bavaria. The experiments, which were made with great care, show that in the lower air strata the temperature gradient is subject to great oscillations, and that the greatest decrease of temperature with height is found between 5 and 8 kilometres. Between 8 and 11 kilometres there is a transitional zone leading to the upper isothermal layer or inversion. After this stratum of increasing temperature follows another slowly augmenting decrease of temperature from about 14 kilometres upwards. Between 1 and 5 kilometres the same rate of decrease of temperature that exists at mountain stations was found to hold good.

IN the *U.S. Monthly Weather Review* for October, 1907, Mr. H. H. Clayton (by permission of Prof. A. L. Rotch) discusses the lagging of temperature changes at great heights behind those at the earth's surface, and types of pressure changes at different levels, as shown by the records of sounding balloons liberated at St. Louis in April and May, 1906. The observations show that at all heights above about 1 kilometre the temperature changes occur later with increasing elevation; at 10 kilometres the maxima and minima are generally about twenty-four hours later than on the ground. Only a few observations at 15 kilometres were available, but they appear to show that the irregular ranges of temperature at that height are much less than at sea-level. Referring to the maxima and minima of pressure, it is found that at 10 kilometres the curve is almost the reverse of that at sea-level; at 15 kilometres it is somewhat similar to that at 10 kilometres, but the ranges are much reduced.

Among other useful articles we may mention Mr. W. A. Bentley's interesting studies of frost and ice crystals, and a mathematical investigation by Prof. F. H. Bigelow on vortices in the atmosphere.

TIDAL bores in China and Japan form the subject of two recent papers differing widely in character. In the *Popular Science Monthly* for March Dr. Charles Keyser Edmunds gives an illustrated account of his visit to the Hangchow bore, while a bore in Odawara which sometimes does much destruction is treated from the hydrodynamical point of view by Prof. H. Nagaoka in a short note in the Proceedings of the Tokyo Mathematico-Physical Society for November last.

THE Bulletin of the American Mathematical Society for March contains an account of a joint meeting held at Chicago in December last between mathematicians and engineers for the discussion of the teaching of mathematics to engineering students. The discussion in question refers mainly to the mathematical requirements of the average engineer who is occupied exclusively in practical applications of known methods. Little or nothing is said by the speakers about the growing need of original workers, who, by bringing the highest mathematical knowledge to bear on engineering problems, are able to devise new methods, and to guide the ordinary practical experimenter.

A SUGGESTION for a new economic arithmetic is the subject of a short paper in the *Economic Journal* for March by Prof. T. N. Carver. The author's ideas are simple and practical, and at the same time scientific. He considers that the teaching of arithmetic can be illustrated with advantage by simple problems based on tables, of which he gives as an example one showing the quantity of corn grown with varying quantities of labour on a given quantity of land. The problems that can be worked out as exercises with such a table include the following:—Given the cost of labour and the value of the corn, how many days' labour can be most profitably devoted to the cultivation of the fields? Or, again, given the number of available days' labour, how many acres can be most profitably cultivated? It is pointed out that complicated mathematical methods or the plotting of curves are unnecessary for the solution of such simple problems, and the author quotes the existing methods of dealing with tariff reform controversy as an instance of the want of such simple training. In support of the author's view, it must be admitted that there is a great deal commonly taught under "arithmetic" which might well be superseded by such studies as he suggests. But where are the statistics necessary for such a course to be obtained?

THE *National Geographic Magazine* (xix., 1) contains an illustrated account of Dr. Alexander Graham Bell's experiments with his *Cygnet* man-lifting kite. This kite was sent up in December, 1907, both with and without a man, Lieut. Selfridge having ascended 168 feet with it, and having remained in the air for more than seven minutes. The kite is described as "tetrahedral" in shape —perhaps it would be better to describe it as a triangular prism with oblique ends. It measures 13 metres laterally at the top and 10 metres at the bottom, 3 metres longitudinally at the bottom, and 3 metres in oblique height. It consists of 3393 winged cells having a surface of 183·6 square metres. It weighs 85 kilograms, and is provided with floats, weighing 9·4 kilograms, which enable it to rest on the surface of a sheet of water. In the experiments performed at Baldeck, Nova Scotia, the kite flew with remarkable steadiness, and Dr. Bell considers this fact a justification for extending the experiments to motor-driven machines constructed on a similar principle.

AN interesting lecture was given by Sir William Preece at the Institution of Electrical Engineers on March 12 on his recent visit to America, and the various improvements in constructional and engineering work since his previous visits were dealt with. The sky-scraper buildings appear to afford a considerable day load in that they employ numerous lifts which are constantly in use, but the public supply does not benefit from these very much, as in the larger buildings the tendency is to erect private plants. On the telephone question, America seems to have gone ahead of us on this side. In most of the hotels telephones are installed in every bedroom, so that business may be transacted with any part of the country. This applies also to the restaurants, where telephones may be plugged on to your table if desired. The Telephone Tariff question has also been thoroughly considered in America, and the message rate has been adopted in preference to the simple annual rental.

IN the Proceedings of the American Academy of Arts and Sciences (vol. xliii., No. 12) Messrs. Gregory P. Baxter and John H. Wilson describe a number of re-determinations of the atomic weight of lead, the true value of which is at present uncertain owing to the wide discrepancies in the results of previous workers. The method of analysis adopted consisted in determining the proportion of chlorine in lead chloride by precipitation with silver nitrate; this method seemed the best to use in view of the fact that the halogen can be determined with great accuracy, and the elimination of moisture from lead chloride is easily effected by fusion of the salt in a current of hydrogen chloride. Silver chloride, moreover, when precipitated from a dilute solution of lead chloride, does not contain an amount of occluded lead salt large enough to be detected. Special care was taken, of course, in the purification of the materials employed. The results obtained were very concordant, varying in one series, in which the ratio $PbCl_2 : 2Ag$ was determined, from 207·173 to 207·202, with an average of 207·188; in another series, based on the ratio $PbCl_2 : 2AgCl$, the average 207·191 was obtained, with a range of variation from 207·181 to 207·204. The mean result, Pb = 207·19 (O = 16, Ag = 107·93), is nearly three-tenths of a unit higher than the value for the atomic weight of lead now in use.

A SECOND edition of Mr. J. W. Hayward's "First Stage Steam" has been published by Mr. W. B. Clive.

THE spring list of the Oxford University Press includes "Floral Mechanism" (part i., types 1 to 12), by Dr. A. H. Church, and "Lectures on Evolution," by Prof. E. B. Poulton, F.R.S.

MESSRS. A. GALLENKAMP AND CO., LTD., have issued a catalogue of the Meker hot-flame burners, Dennstedt's combustion furnaces, accessories for use with the furnaces, and cylinders of compressed air, which they are now prepared to supply.

A NINTH edition of Mr. W. T. Lynn's "Remarkable Eclipses" has been issued by Messrs. S. Bagster and Sons, Ltd. The booklet has been brought up to date, and provides a sketch of interesting facts connected with solar and lunar eclipses.

MESSRS. A. AND C. BLACK will publish shortly a book on "Kafir Socialism," by Mr. Dudley Kidd; a book on botany for young children, by Mr. O. V. Darbishire, of Manchester University; and a re-issue, at a popular price, of

the fourth edition of the late Miss Agnes M. Clerke's "History of Astronomy in the Nineteenth Century."

THE Bibliographischen Institut of Leipzig and Vienna has sent us the first part of a second revised and enlarged edition of Dr. M. W. Meyer's popular work on general astronomy entitled "Das Weltgebäude." The edition will be completed in fourteen parts, to be published at the price of one mark each.

IT is announced that papers on parasitology, which have hitherto appeared in the *Journal of Hygiene*, will in the future be published in a separate volume to be entitled *Parasitology, a Supplement to the Journal of Hygiene*. The publication will be edited by Prof. Nuttall and Mr. Shipley.

A THIRD edition of Mr. Douglas English's "Wee Tim'rous Beasties" has been published by Messrs. Cassell and Co., Ltd. These studies of animal life and character were reviewed in the issue of NATURE for December 24, 1903 (vol. lxix., p. 176), on which occasion we reproduced one of the excellent illustrations with which the volume is plentifully supplied.

WE have received a copy of an interesting and fairly complete international catalogue of the more important periodical publications of the world, which has been compiled by Prof. Émile Guarini, and published in Paris by MM. H. Dunod and E. Pinat. The price is 3 francs, and the catalogue gives the address, publisher, and price of 4063 reviews and journals classified according to countries.

MESSRS. PAWSON AND BRAILSFORD, of Sheffield, have published a third edition of Mr. J. Simpson's "The Wild Rabbit in a New Aspect, or Rabbit Warrens combined with Poultry Farming and Fruit Culture." The book has been revised and enlarged, contains several illustrations, and will probably assist the encouragement of rabbit warrens and rabbit farming, whether conducted for sport or profit.

ANOTHER volume has been added to the series dealing with the fauna of British India, including Ceylon and Burma, edited by Lieut.-Colonel C. T. Bingham, and published under the authority of the Secretary of State for India by Messrs. Taylor and Francis. The new volume continues the consideration of the Coleoptera, and is concerned with a portion of the family Chrysomelidæ. It is the work of the late Mr. Martin Jacoby. In a short preface the editor expresses the hope that the book will direct the attention of collectors in India to this somewhat neglected but important group of phytophagous beetles, and prove of assistance to them in their study.

OUR ASTRONOMICAL COLUMN.

WATER VAPOUR IN THE MARTIAN ATMOSPHERE.—A glance at a print from a series of spectrograms taken by Mr. Slipher on January 15, which Prof. Lowell has kindly sent to Sir Norman Lockyer, leaves but little doubt that water vapour is present in the atmosphere of Mars. This print includes two spectra of the moon and one of Mars, and whilst the *a* band is absent from the former, it is quite a marked feature of the latter spectrum. The exposure for the spectrum of Mars was from 5h. 35m. to 8h. 30m., the mean altitude of the planet being 43°, whilst those for the moon were made at 15h. 26m., the altitude being 30°; the aqueous vapour per cubic foot of air, during the exposures, was found to be 1·25 grains.

THE DISPERSION OF LIGHT IN INTERSTELLAR SPACE.—In No. 6 (February 10, p. 266) of the *Comptes rendus* Dr. C. Nordmann described a method whereby the dispersion of light in interstellar space might possibly be determined. Briefly, the method consists in making photometric observations of quickly changing variable stars, the light of the star being first passed through different coloured screens for each observation. If all radiations traverse space with equal velocities, such observations should give light-curves agreeing in phase among themselves and with those determined in the ordinary method; but if some radiations are relatively retarded, then the light-curves so determined should exhibit marked deviations of phase. Three liquid screens transmitting only radiations of $\lambda\lambda = 5900$ to the extreme red, 5900 to 4900 and 4900 to the ultra-violet, respectively, were prepared, and Dr. Nordmann's preliminary results are published in No. 8 (February 24, p. 383) of the *Comptes rendus*.

Algol and λ Tauri were the stars examined, and in both cases it was found that, whilst the light-curves obtained when the several screens were successively employed agree in amplitude and form with the ordinary light-curves, there is a measurable difference in the epoch of any specific phase. With Algol the difference in time for the red and blue screens amounted to sixteen minutes, whilst for the red and green screens the difference was nine minutes; these preliminary values are probably correct to within about three minutes. The difference between red and blue for λ Tauri was about forty to sixty minutes, *i.e.* approximately three times the analogous difference in the case of Algol; that is to say, the parallax of λ Tauri is, presumably, about one-third that of Algol. Combining these results with Pritchard's value for the parallax of Algol, 0″·0556, it follows, assuming space to be homogeneous, that the difference between the velocities of the extreme ends of the visible spectrum amounts to something of the order of 150m. per second.

Dr. Nordmann points out that this method of investigation offers great possibilities in several lines of research, among which the determination of the parallaxes of variable stars and the gauging of space for dark absorbing material would not be the least interesting from a cosmological point of view.

THE MOVING OBJECT NEAR JUPITER.—Some revised Greenwich positions for the suspected new Jovian satellite are given in No. 4239 of the *Astronomische Nachrichten* (p. 235). This object was observed by Prof. Albrecht at the Lick Observatory on March 8, and its visual magnitude was recorded by Prof. Aitken as 15·0.

DISTRIBUTION OF STANDARD TIME IN EGYPT.—The February number of the Cairo Scientific Journal (vol. ii., No. 17, p. 50) contains a very interesting account, by Captain H. G. Lyons, of the methods of determining and distributing standard civil time in Egypt. The standard now used is the East Europe Time of the thirtieth meridian E. of Greenwich, and Captain Lyons's history of the long sequence of events which led to its adoption is of great interest. The organisation for the distribution appears now to be efficient, and is described and illustrated in the article under notice.

OBSERVATIONS OF ALGOL VARIABLES.—The results of a systematic investigation of the light-changes of ten Algol variables are published by Dr. K. Graff in No. 11 of the *Mitteilungen der Hamburger Sternwarte*. The observations were made during the years 1905, 1906, and 1907, and Dr. Graff, in addition to giving the observational and derived values and the method of reduction, gives charts of the regions surrounding the variables, and a light-curve for each. The stars observed were W Delphini, SW, SY, UW, VW, and WW Cygni, U Sagittæ, Z Persei, Z Draconis, and RW Tauri.

NEBULÆ AND NEBULOSITIES OBSERVED BY PROF. BARNARD.—The purity of the atmosphere at the Mount Wilson Observatory is once more emphasised by some results described by Prof. Barnard in No. 4239 of the *Astronomische Nachrichten* (p. 231, March 17). Nebulosities suspected on earlier photographs are shown unmistakably on those taken during Prof. Barnard's sojourn at Mount Wilson; considerable extensions are shown on others. Messier 8, 16, 17, and 20 are amongst those now described, and in the case of the last-named, the Trifid nebula, extensions appear which have not been seen before by Prof. Barnard; the greatest diameter is 36′ long, in a S.E. and N.W. direction, and the numerous black lanes, which have made this nebula celebrated, are beautifully shown.

RUSSIAN SCIENTIFIC PUBLICATIONS.

IN the Journal of the Imperial Russian Geographical Society, vol. xlii., parts ii. and iii., Mr. V. U. Grigorieff writes on the agricultural position of the natives of the Minusin country, Yenisei government. The author carefully examines the economic and legal relations of Russian colonists and aborigines, and considers that agricultural prospects are good, but would be improved by the introduction of scientific methods. The Tartar natives of Minusin have changed but little during centuries of intercourse with Russians, and this persistence of racial characteristics and habits contradicts the opinion of some investigators that the natives will disappear unless Russified. It is interesting to note that cattle-rearing is carried on best on the borders of steppe and forest land, and is not so satisfactory if conducted exclusively in the steppe or the forest.

Mr. A. V. Koltshak describes the last expedition in search of Baron Toll to Bennett Island, which was fitted out by the Academy of Sciences. The Baron left the vessel *Dawn* in May, 1902, with the intention of exploring the island. The search expedition came across some notes by the Baron, indicating the date of his departure for the south. Thorough search failed to reveal fresh traces, and there appears to be no doubt that the names of Baron Toll and his party have to be added to the long roll of explorers who, since Sir John Franklin, have perished in Arctic regions in the cause of science. Mr. K. N. Tultshinsky writes on a commercial journey to Bering Straits, during which he witnessed mining operations in Alaska. Statistics of means of communication in Russia are contributed by Mr. I. F. Borkovsky.

The various Tartar tribes along the Volga and the conditions of their education have been studied by Mme. S. V. Tshitsherin, who worked among them during the famine of 1899. She describes the "Ilminsky" system of education, the work of an enlightened, patriotic Russian and Slavophil, N. I. Ilminsky, who spent many years among the heathen tribes, winning their love and esteem by sympathy and knowledge of their languages and conditions, and will be remembered for his philanthropic efforts to introduce Russian civilisation. Statistics of population and interesting illustrations accompany this article.

An important contribution, by Mr. A. I. Voieikoff, bears the comprehensive title of "Distribution of Populations of the Earth in Dependence upon Natural Conditions and the Activity of Man," with numerous statistics and charts. It is tempting to dwell on Mr. Voieikoff's facts and figures at great length. In Siberia, Turkestan, and the Caucasus there are opportunities and land enough to sustain millions if the necessary knowledge and capital were applied. Of countries of which details of population are published, New Zealand possesses the smallest mortality, and this may be accounted for by its agricultural people living in plenty, the small number of children, and the fact that the mothers do not labour in the field; but New Zealand is still in its immigration stage, and there are few old men as compared with Ontario and Australia, where the process of colonisation began earlier. Paucity of births in Australia is a serious question. Such hindrances to population as plagues, artificial feeding of infants, and alcoholism are discussed, and two conclusions arrived at are worth noting:—(1) degeneration undoubtedly exists among the more cultured classes of the Russian nation and in the manufacturing population; (2) alcoholism is less prevalent among the Russian people than among other nations of Europe and their colonies. Alcoholism, *i.e.* chronic poisoning by alcohol through daily—though moderate—use of *vodka* or beer, must be distinguished from drunkenness. Scarcely a question is left untouched, and the author's studies range over ancient and modern history, medical and registrars' reports, and the trade statistics of many countries.

Vol. xxxvi., part ii., of the Proceedings of the Imperial Society of Naturalists of St. Petersburg contains a vast amount of important and interesting material. Prof. N. E. Wedensky contributes an obituary notice, with a portrait and account of the work, of Prof. I. M. Setchenoff, an eminent physiologist, pupil of Du Bois Reymond, Funke, Ludwig, and Helmholtz, founder and teacher in the Russian physiological school, and a leading authority on the brain and nerves. With the death of this man of science Russia lost a distinguished son. A list of his writings on medical and chemical subjects follows. An exhaustive study of fresh-water Rhizopoda is given by Mr. S. Averintseff, who begins with the physical properties of protoplasm and passes to the structure of shells. A bibliography, lists of species, and handsome plates are given. The first section is taken up with the general morphology and physiology of Rhizopoda, the second is devoted to *R. testacea*, and a further part on *R. nuda* is promised.

The rest of the volume is occupied with papers on the study of nerves. Mr. W. K. Denemark examines and describes the excitability and conductibility of nerves exposed to the action of distilled water. This influence, due to the extraction of salts, produces in nerves the successive functional alterations observed under the influence of positive agents—narcotics, salt solutions, high temperature, &c. Restitution is only effected by the application of sodium salts. The author considers that the presence of sodium salts in the chemical structure of a nerve is absolutely essential for its functions. The effects of a constant current on a nerve which has been subjected to the action of narcotics are described by Mr. N. N. Malisheff. Mr. G. Levitsheff details the action of halogen acids on nerves, and Mme. H. N. Gulinoff the influence of freezing. Prof. N. E. Wedensky contributes a lengthy paper on the effects of strychnine intoxication on the reflex system.

In No. 17 of the Proceedings of the Zoological and Zootomical Cabinets of St. Petersburg University, Mr. V. Zhuk writes on the lamprey, describing external marks, the organs, skin, skeleton, and muscles, with illustrations. An extensive bibliography of Cyclostomi follows. Studies in the anatomy of Piscicola are furnished by Mr. V. D. Zelensky, with a German *résumé*. *P. geometra* is the only species found in European fresh waters. Mr. Zelensky treats (1) metamerism with reference to the nervous system, and (2) the vessel system. A short bibliography follows. Mr. V. M. Shimkevitsh, one of the editors, writes on the correlations of Bilateria and Radiata. In conclusion, he remarks that, speaking generally, the principle of gradual displacement of one source of origin by a neighbouring one, sometimes even developed from another embryonic layer, has had far greater application in embryology than is usually considered. This principle enables a comparison between organs not at all homologous in origin to be established.

In the Proceedings of the Imperial Society of Naturalists, vol. xxxiv., part v., Mr. K. D. Glinka records extensive observations with regard to weathering. Observations of this nature, he points out, should not be confined to the surface of soils, but should embrace lower strata. An alumino-silicate dissolved in water may, in favourable circumstances, give rise to a series of new combinations, *e.g.* zeolites. Analysis of a fresh piece of rock shows that out of 1 per cent. of alumina, 0·72 per cent. is lost in solution. This high solution indicates that a considerable portion of alumina in sandstone does not exist in the form of primary silicates, but in a free form. The author discusses the genesis of the mineral serizite, first discovered in the Taunus range, and taken for talc, to which it bears external resemblance. Numerous tables of analyses are furnished. Taking widely separate districts in Russia, Mr. Glinka describes weathering of biotites, augites, zeolites, &c., at considerable length. There is a short report by Prof. P. A. Zemiatchensky on the rate of weathering of sand and limestone formations, with hints as to calculation of their antiquity. Mr. V. Lehmann sends a contribution, with a plate, on Terebratulacea in layers with *Virgatites virgatus* and *Oxynoticeras catenulatus*. The attention of palæontologists has been directed chiefly to the study of ammonites, and it is important to examine other forms. The author corrects the hitherto accepted list.

The Bulletin of the Imperial Academy of Sciences is worthy of comparison with the highest publications of this nature. We have received three handsome volumes, containing the proceedings of the physico-mathematical section. In vol. xxii., Mr. T. Wyragevitch writes on the Actinia of the Black Sea in the neighbourhood of Balaclava, and Mr. A. Borissiak contributes notes on

Black Sea plankton. Astronomers will be interested in the calculations of Mr. G. A. Tikhoff with regard to the position of stars. Of wide general interest is the article by Mr. K. N. Davidoff on the islands of the Indo-Australian archipelago. The fusion of Europeans and Malays in Amboina has produced a curious type, and the Malay tongue is mingled with Dutch and Portuguese words. According to a horrid custom, a would-be bridegroom cannot be accepted until he makes the maiden an offering of the head of an enemy. Mr. A. Birula writes on the Solifugæ of Persia, with frequent references to Mr. R. Pocock's notes on this order. In vol. xxiii., the eminent naturalist Mr. V. Bianchi describes Passeriformes and Palæarctic larks (Alaudidæ), basing his observations on collections in the museums of London, Tring, and Paris. He expresses indebtedness to Dr. Bowdler Sharpe, the Hon. W. Rothschild, and other naturalists for help.

Mr. N. Donitch contributes reports of observations of the annular solar eclipse of March, 1904, made at Cambodia, and of the total solar eclipse of August, 1905. In the latter case, observations were made at Alcala and Assouan, and Mr. Donitch acknowledges indebtedness for assistance from members of the British Survey Department in Egypt. Notes of inundations at St. Petersburg are furnished by Mr. S. Griboyedoff, and lengthy studies of rainfall in the capital, with diagrams and tables, are given by Mr. E. Rosenthal. Mr. A. Belopolsky's investigations of the radial velocity of the variable star Algol appear in vol. xxiv., and there is another astronomical paper, by Mme. Zhilov, on the proximate absolute orbit of the minor planet Doris. Mr. V. Bianchi describes a new species of pheasant from the mountain regions of western China. Balloon experiments at Kutshino are described by Mr. V. Kuznetsoff. From fossils collected by the polar expedition of Baron Toll, 1900–3, Mme. M. Pavloff is able to draw deductions as to the changes of climate of east Siberia from the Tertiary period. Several papers on aërial mechanics are by Mr. D. P. Riabushinsky, and Mr. M. Golenkin writes on a botanical visit to Java. The report of the geological museum of Peter the Great (Academy of Sciences) concludes the volume.

THE CORALS OF HAWAII.[1]

THE madreporarian corals present some of the most difficult problems in the matter of the determination of species that are to be found in the whole range of the animal kingdom. So difficult are these problems that Mr. Bernard in his indefatigable labour on the catalogue of the Madreporaria of the British Museum frankly gave them up, and, abandoning the time-honoured binomial system, adopted a new numerico-geographical system of nomenclature.

The difficulty arises from our want of knowledge of the influence played by environmental conditions in the formation of the characters that are presented by a colony of coral polyps and the skeletal structures to which they give rise. In the absence of any direct experimental evidence, upon which alone the problems can be solved, it has been the custom to give specific names to groups of specimens which seem to be separated from other and similar groups of specimens by appreciable differences in the sum total of their characters. The species that are thus constituted inevitably break down if new specimens are found that are intermediate in character between the specific groups already determined, but when they are based on the examination of a very large number of specimens collected from a restricted area, they have at least the advantage of serving a useful purpose for the systematist for a considerable period of time.

It is this system which Mr. Vaughan has adopted in the very handsome memoir of 415 pages, and illustrated by ninety-six plates, which appears under the modest title of "Bulletin 59 of the Publications of the United States National Museum." The author has given himself the task of examining a very large number of specimens from the Hawaiian Islands and the island of Laysan, of forming a conclusion as to the most convenient limits for the specific groups, and of giving an opinion on the species problem based on his extensive knowledge and experience of these corals. The result is a work which cannot fail to be of essential importance to all those who are interested in the Madreporaria, and a most noteworthy addition to human knowledge.

But in spite of its undoubted value, and in spite of the great skill and labour that have been spent in its compilation, there are some points in this memoir on which it is necessary to offer a few words of criticism, not in any unfriendly spirit, but in the hope that they may influence in some way those who follow in the author's footsteps and attempt to write a memoir of a similar kind.

Our knowledge of the anatomy of the coral polyps themselves, as distinct from the skeletal structures they form, is admittedly imperfect, but the researches of Moseley, Bourne, Fowler, Duerden and others have at least thrown some light on the relations of the genera and on those characters of the species that are comparatively free from environmental variation. Such evidence as these researches afford must be taken into consideration in any satisfactory scheme of classification, and must be used, so far as it is possible to use it, in conjunction with the evidence derived from the structure of the skeletal characters.

In the light of this evidence, for example, the division of the order into the old suborders Imperforata and Perforata breaks down. The perforate Eupsammiidæ are not related to the Madreporidæ and Poritidæ so closely as to justify their inclusion in the same suborder, whereas the imperforate Pocilloporidæ are not related to the Oculinidæ and Stylophoridæ with which they were formerly associated, but exhibit much closer affinities with some of the Imperforata. It may be true, as Mr. Vaughan remarks, that there is at present no satisfactory classification of the Madreporaria. It may be that for many years to come no classification will be suggested that will be satisfactory to all students of the group. But there is no reason whatever for ignoring the valuable researches of Duerden, and for retaining a classification that is altogether antiquated and misleading, such as the one that is used in this memoir.

It is clear that until we have obtained far more information than we have at present concerning the structure of the soft parts of the coral anatomy, the skeletal characters must play the most important part in the determination of species, but in such a determination every character that the hard parts exhibit must receive its due recognition. For example, it is well known that some genera, and perhaps some species, are more liable than others to be influenced by the presence of epizoic crustacea, worms, and other animals, and no description of a series of specimens is satisfactory if this influence is altogether ignored. The genus Pocillopora is one of those that is particularly liable to the attacks of the crab Hapalocarcinus, and in a note by Prof. Verrill that is quoted by the author (p. 88), the statement is made that the species of this genus in the Hawaiian Islands are usually subject to the malformations caused by this epizoite. But in the descriptions of the species of this genus the author makes no reference to the crab galls, nor are they clearly shown in any of the photographs that are given to illustrate the text. This is a serious oversight, for when the memoir is used for the purpose of the identification of the species of Pocillopora, the galls will at once present a difficulty which the museum curator will not be able to solve by its help. He will ask how far he is able to neglect the presence of these galls, or in what respect they are the determining cause of the general form of growth upon which the species and varieties are founded.

An interesting form described in the volume is *Leptoseris tubulifera*, which differs from the other species of the genus in showing a number of hollow, tubular cavities around which the corallum is folded. Similar tubes are found in the alcyonarian genus Solenocaulon, in the stylasterine genus Errina, and in the madreporarian genera Neohelia, Amphihelia, &c., and in all these cases there seems to be little doubt that they are due to the influence on growth of epizoic crustacea or worms. It is difficult to believe that this is not also the case in *Leptoseris tubulifera*, and if it is the specific distinction from *L. hawaiiensis* is not very clear.

[1] "Recent Madreporaria of the Hawaiian Islands and Laysan." By T. Wayland Vaughan. Pp. ix+427; illustrated. (Washington: Government Printing Office, 1907.)

Finally, objection must be taken to the proposal to substitute the generic name Acropora for the well-known and widely distributed coral that is usually called Madrepora, a proposal originally due to Verrill, but one which cannot be accepted. The name Madrepora has been used for this genus since the time of Lamarck (1801), and has become definitely established by use in all the principal memoirs on the subject and in the museums of the world. To change it now can lead to no useful purpose, and can but produce a perfectly unnecessary confusion; and the confusion will be all the worse confounded if, as is proposed, the generic name be transferred to the equally well-known imperforate coral Oculina.

It may be true that if we are entirely to conform to the so-called rules of nomenclature the change is justified, but these rules were drawn up, not for the confusion of science, but for its convenience and for the sake of simplicity; and when it is found, as in this case, that they are likely to produce just the opposite effect from that for which they were intended they must either be amended or broken. This is by no means an isolated case, for it has been proposed on the same plea that we should use the name Polypus for the common octopus, Astacus for the lobster, Potamobius for the fresh-water crayfish, and that many other changes of a similar kind should be introduced. It has been found in practice, not only inconvenient, but practically impossible, to make these changes, and the customary names are still used. So it will be with the name Madrepora. We may argue and plead as we like for the change, but custom is too strong for us, and the proposal will not be accepted. The time has come when the committee of the International Congress of Zoology should reconsider seriously the question of the maintenance of the names of well-known or widely distributed genera, and endeavour thereby to prevent the confusion with which the strict adherence to Linnean nomenclature threatens us.

S. J. HICKSON.

COMMEMORATIVE DINNER TO SIR WILLIAM RAMSAY, K.C.B., F.R.S.

IN commemoration of the twenty-first anniversary of Sir William Ramsay's election to the chair of chemistry in University College, London, the professors of the college entertained him to dinner on March 18. The Provost, Dr. T. Gregory Foster, was in the chair, and covers were laid for eighty persons. The guests included Lord Rayleigh, Lord Reay, Sir Norman Lockyer, Sir Alexander Kennedy, the Master of the Temple, the Masters of the Worshipful Companies of Drapers, Mercers, and Carpenters, the president of the Society of Chemical Industry, the Clerk of the Fishmongers' Company, Prof. H. B. Dixon, Prof. A. Smithells, Prof. J. M. Thomson, Prof. Meldola, Mr T. Harrison Townsend, Mr. Henry Higgs, Mr. M. Carteighe, Dr. E. M. Borrago, Dr. F. Clowes, and Colonel Wolseley Cox.

After the toast to the King had been drunk with due honour, the chairman explained that the dinner was, in the first place, the means of expressing the personal affection and admiration of his colleagues for Sir William Ramsay. Leaving it to others to tell what Sir William's contributions to science had been, the chairman referred to the services he had rendered to the college and to London by establishing a great school of chemistry, and also to his perseverance and tact in questions relating to the re-organisation of the University of London. He had never been weary of expressing the great principles of the true relation of examinations to teaching in the University, and of emphasising the view so strongly held by him that in all university examinations the candidates' teachers should of necessity have a share.

Lord Rayleigh then proposed the health of Sir William Ramsay. He told how, twenty-one years ago, when he was secretary of the Royal Society, papers from Ramsay passed in rapid succession through his hands. Many of the older members, perhaps because they were old, hardly approved of his new methods; but, fortunately, these papers were accepted. Proceeding, he reminded the company of the work which Sir William had done in investigating the gases of the atmosphere, of the never failing energy which led him to new discoveries.

Prof. Dixon seconded the toast, and in doing so attempted to take the view of a later generation in looking back on Sir William Ramsay's work. Having briefly summarised that work as a contribution to the developments of chemistry, he concluded by comparing his activity to that of radium itself.

The toast having been enthusiastically drunk, Sir William Ramsay replied. After thanking his colleagues for their invariable kindness and helpfulness, and his assistants and students for their loyalty and devotion to their work, he emphasised the debt that he owed to them in whatever he had accomplished, and went on to explain how he had received the first suggestion which led to the discovery of argon, and how generously Lord Rayleigh had allowed him to follow out that suggestion. He dwelt, further, on the questions raised by the chairman in connection with university organisation, and expressed the hope that the University of London would even more fully than it had at present develop the principles to which reference had been made.

At a later stage in the evening, in reply to an inquiry from one of the guests as to when a new laboratory would be built for Sir William, the chairman stated that, though they have the ground and the plans, they have not yet obtained the money for buildings.

Prof. Ker then proposed the health of the other guests, and Lord Reay replied. In view of his close connection with the college as president and chairman, his lordship said that he could hardly consider himself a guest within the college walls, but he thanked the professors for having done him the honour to invite him to commemorate with them Sir William Ramsay's twenty-first anniversary. He proceeded to tell of the great work which Sir William had done in advising Mr. Tata about the organisation of the new institute that he had founded in India, and how Sir William's influence was likely to be extended through the fact that one of his pupils, Dr. Morris Travers, was holding the position of head of that institution. Referring to the need of new laboratories for the chemical department, and the inconvenient accommodation now provided for Sir William Ramsay, Lord Reay hoped that just as at Essen the little cottage had been preserved from which the great Krupp gun factory was developed, so that when the new laboratories were built, which his lordship hoped would be soon, the room in which Sir William Ramsay's discoveries had been made should be also preserved.

Expressions of regret for absence were received from the Chancellor of the University (Lord Rosebery), from the Principal (Sir Arthur Rücker), from Profs. Tilden, Crum Brown, and many others.

NEW SLIDE-RULES.

MESSRS. J. J. GRIFFIN AND SONS, LTD., of Kingsway, London, have sent examples of two slide-rules which they are introducing at a very low price—the longer one, which is 25 cm. in length, at 2*s*., and the shorter, which is 12·5 cm. in length, at 1*s*. These rules with their slides are made of card, and the divisions are printed. In point of clearness and accuracy they are nearly equal to the best rules divided on celluloid, and they are vastly superior to the old-fashioned box-wood rules of thirty or forty years ago. In each case the upper lines of the slide and of the rule go from 1 to 10 twice over or from 1 to 100, being what are called "A" and "B" lines, while the lower lines of the slide and of the rule are on twice the scale, being "D" lines. Each is provided with a cursor with chisel pointers both to right and left. The back of the slide and all the remaining spaces on the rule are left plain. The accuracy of the surfaces of juxtaposition is specially noteworthy, and is greatly in excess of what is generally associated with card structures. Each is provided with a paper imitation-leather case. With rules such as these, the real utility of the slide-rule may, it is hoped, be brought home to thousands to whom the expense of the now nearly universal celluloid rule is prohibitive; it may even be hoped that some daring mathematical master in a public school may see fit to inculcate the wholesome practice of making calculations not vastly more accurate than any possible knowledge of the data can be, and use rules such as these both to

exemplify the idea and to let schoolboys know how the daily arithmetic of the laboratory and of the workshop is carried out. Masters should also find them useful for curve tracing on squared paper, as the coordinates of any parabola or rectangular hyperbola, or of any curve representing the law of inverse squares, can be read off from the rule with a single setting of the slide.

With such inexpensive slide-rules it is to be hoped that the makers will in time provide two spare slides at a slight additional cost. For instance, one should be divided so as to give sines and tangents; the second should have a scale of equal parts to give logarithms and a log log or P line for exponential calculations. They might also with advantage print on the back of the rule constants that are frequently required, but at no extra cost.

With such extra slides the master would be able to illustrate further curve tracing, and the line of sines would be specially useful in the optical class for reading off angles of incidence and of refraction with any refractive index, or for showing the necessity of total internal reflection when the scale of sines stops short of the number representing the refractive index. He would also find it useful in solving triangles.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Dr. G. H. F. Nuttall, F.R.S., Quick professor of biology and fellow of Christ's College, Cambridge, has been elected to a professorial fellowship at Magdalene College.

MANCHESTER.—By the will of Mr. G. Harrison, who died on January 21, 10,000*l.* is bequeathed to Owens College for scholarships or fellowships, or such similar purposes as the council of the college may direct, subject to the words "George Harrison" being always associated with the objects provided for by this bequest.

SIR FREDERICK WILLS has contributed another 5000*l.* to the fund for establishing a university at Bristol. This brings his contribution up to 10,000*l.* At the beginning of this year Mr. H. O. Wills promised 100,000*l.* toward the endowment of the university provided a charter be granted within two years.

THE University of London Union Society appears to have made good progress since its formation in July, 1906. The annual report for 1906–7 shows that at the end of the session there were 377 members, 180 of whom were graduates. Monthly meetings for discussion were held during the Lent and Easter terms of 1907, and, in addition, friendly relations have been established with the Students' Representative Council, the University Athletic Union, and the University Musical Society. The new union is modelled on the lines of those existing at Oxford and Cambridge, and deserves the support especially of the students of London colleges affiliated to the University. Intending members should apply to the secretary, Mr. D. W. H. Bell, 20 Maxey Road, Plumstead.

A BILL to establish compulsory continuation schools in England and Wales, and to amend the Education Acts of 1870 and 1902 in respect of the age of compulsory school attendance, was introduced in the House of Commons on Tuesday by Mr. Chiozza-Money, and read a first time. In introducing the Bill, Mr. Chiozza-Money said that according to the last census there were in England and Wales 5,000,000 youths of both sexes between the ages of fifteen and twenty-one, and of these not more than 400,000 were receiving any measure of systematic training. This does not include the children of the upper and middle classes, but if 400,000 be added the extraordinary conclusion is arrived at that out of 5,000,000 young people between fifteen and twenty-one years of age only 800,000 continue training after leaving the elementary schools. The practical result is that untrained boys and girls drift into the ranks of the incompetent, the unskilled, and the unemployed. The Bill abolishes all partial or total exemptions of boys and girls under fourteen years of age. It abolishes half-timers, making fourteen years the lowest age at which a boy or girl might leave an elementary school. A continuation scholar is defined as a boy between the ages of fourteen and seventeen, and a girl between the ages of fourteen and sixteen. The Bill makes it the duty of the education authority to establish continuation schools, with technical classes, and the attendance of continuation scholars is made compulsory on the parent and the employer. The hours of attendance would be six per week, spread over one, two, or three days. The cost of carrying out the provisions of the Bill would be defrayed out of money voted by Parliament.

ABOUT a year ago the Board of Education requested its Consultative Committee to consider and advise the Board what methods are desirable and possible, under existing legislation, for securing greater local interest in the administration of elementary education in administrative counties by some form of devolution or delegation of certain powers and duties of the local authority to district or other strictly local committees. The committee has reported to the Board, and the report has been published (Cd. 3952). A prefatory memorandum states that the findings of the committee are under the consideration of the Board, and that the report has been published to provide information in view of the discussion arising out of the Bill recently introduced in the House of Commons to secure compulsory devolution. The Consultative Committee has arrived at certain general conclusions which should prove of value in assisting intelligent action. Every education committee, it is suggested, should, so far as existing powers go, secure as managers of schools the services of persons familiar with the educational needs of the locality and likely to be regarded with confidence and sympathy by parents, teachers, and the education authority. At the same time, there are certain duties requiring a wide outlook and broad educational experience which, the committee thinks, should be reserved by the authority itself. A certain number of counties exist which might with advantage create some form of local subcommittees and delegate to them duties appropriate to their needs and circumstances. It is very important to notice that the Consultative Committee states that it would be difficult, if not impossible, to devise any uniform system which would give general satisfaction throughout the country. It would be fatal to efficiency if a parochial spirit became predominant in the administration of education. It is desirable by all means to encourage an interest in educational matters in all districts by every legitimate means, but every step must be taken to ensure that the supply of efficient education in every locality is a national matter which must not be left at the mercies of local prejudices.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 5, 1907.—"Localisation of Function in the Lemur's Brain." By Dr. F. W. **Mott**, F.R.S., and Prof. W. D. **Halliburton**, F.R.S.

The brain of the lemur, the lowest of the ape-like animals, does not appear to have been subjected previously to a thorough examination. Page May and Elliott Smith brought a brief communication on the subject before the Cambridge meeting of the British Association in 1904. Their experiments were apparently limited to stimulation of the cerebral cortex, and they have never published a full account of their work. Brodmann has worked out some of the histological details of the structure of the cortex cerebri, and Max Volsch has performed a stimulation experiment upon one lemur. The work of these investigators will be referred to again in the course of this paper.

(1) The brain of the lemur has a simple convolutional pattern, and the fissures are few and for the most part shallow.

(2) The motor areas are limited to the central region of the cortex.

(3) Extirpation of the excitable areas is followed by transitory paralysis of the corresponding regions on the opposite side of the body, and by degeneration of the tracts which pass to the bulbar or spinal grey matter which controls these movements. Degeneration also occurs in commisural (callosal) and association tracts in the cerebrum.

(4) The motor areas are characterised histologically by the presence of Betz cells. Localisation by histological study is therefore possible, and there is a close correspondence of the results so obtained with those obtained experimentally.

(5) There are, however, two types of motor cortex in the lemur's brain. The large type of Betz cell is found in the greater part of the motor cortex, particularly where limb and body movements are represented. The smaller type of Betz cell is found in the area governing face, tongue, ear, and eye movements, and in this excitable region there is a layer of granules; it is therefore probably sensori-motor.

(6) Although the investigation relates in the main to motor representation, histological examination of the occipital (and especially calcarine) region shows it to possess the structural characters of the visual cortex in other animals. That no eye movements could be elicited by faradic stimulation of this region is probably due to the difficulty of the experiment, as explained in the text.

February 13.—"On the Determination of Viscosity at High Temperatures." By Dr. C. E. **Fawsitt.** Communicated by Prof. Andrew Gray, F.R.S.

Measurements of viscosity at temperatures higher than 300° C. to 400° C. present considerable difficulties, and until the present year this subject has not been touched by experimenters.

The present communication contains a description of the method used. The method is suitable for the measurement of the viscosity of liquids which are not very viscous —not more than, say, fifty times as viscous as water—and is especially designed for the determination of the viscosity of molten metals and salts. The determination of the viscosity of salts up to 1200° C., or even higher, can be quite satisfactorily carried out by this method. Determinations of the viscosity of metals are much more difficult, owing to the impossibility of preventing a certain amount of surface oxidation. The smallest trace of surface oxidation will completely spoil a series of observations, and the prevention of oxidation is really the chief difficulty in such determinations.

The method used is based on the method originally given by Coulomb, the modifications introduced being due to the special nature of the determinations. In Coulomb's method a horizontal disc is allowed to execute horizontal vibrations about a vertical suspending wire attached to its centre. The viscosity of the liquid can be calculated from the rate of decay of amplitude.

In making a series of observations with this apparatus, the disc is allowed to sink about half an inch below the surface of the liquid. The amplitude of the oscillations is indicated by a pointer (wire) at right angles to the top of the iron rod which carries the disc, and the pointer moves above a circular scale divided into degrees.

With this apparatus, the determination of the viscosity of a liquid is accurate to within 5 per cent. of the absolute value, unless there are special circumstances, as in the case of molten metals, when the results are apt to come out considerably too high.

The results obtained show the availability of this method for the determination of viscosity up to the highest temperature at which a platinum capillary has been used.

Chemical Society, March 5.—Sir William Ramsay, K.C.B., F.R.S., president, in the chair.—The solubility of iodine in water: H. **Hartley** and N. P. **Campbell.** The solubility of iodine in water has been determined at 18°, 25°, 35°, 45°, and 55°, and the heat of solution has been calculated from the temperature coefficient of the solubility.—Nitro-derivatives of *o*-xylene (preliminary note): A. W. **Crossley** and Miss N. **Renouf.** *o*-Xylene yields two trinitro-derivatives, the one melting at 71° and the other at 115° (compare Noelting and Thesmar, *Ber.*, 1902, xxxv., 634). A new dinitro-*o*-xylene melting at 82° has also been isolated, and a substance melting at 115° which is a dinitro-derivative of some condensed benzene ring derivative.—Substituted dihydrobenzenes, part ii., 1 : 1-dimethyl-$\Delta^{2:4}$-dihydrobenzene and 1 : 1-dimethyl-$\Delta^{2:5}$-dihydrobenzene: A. W. **Crossley** and Miss N. **Renouf.** Dimethyldihydrobenzene prepared by the elimination of 2HBr from 3 : 5-dibromo-1 : 1-dimethylhexahydrobenzene has been proved to consist of a mixture in approximately equal parts of these two hydrocarbons, thus refuting the adverse criticisms of Harries and Antoni (*Annalen*, 1903, cccxxviii., 66) on the work published by Crossley and Le Sueur (Trans., 1902, lxxxi., 821).—The viscosity of aqueous pyridine solutions: A. E. **Dunstan** and F. B. T. **Thole.** The authors have repeated their experiments on the viscosity of aqueous pyridine solutions, and find that the same discontinuities occur in the curve as were previously observed (compare Hartley and others, Proc., 1908, xxiv., 22).—The action of thionyl chloride on the methylene ethers of catechol derivatives, ii., piperonyloin, piperil, and hydropiperin: G. **Barger** and A. J. **Ewins.**—Traces of a new tin-group element in thorianite: Miss C. de Brereton **Evans.** The dark brown sulphide of the new element separates with arsenious sulphide, from which it differs in being soluble in water, to form a deep brown solution. It yields a hygroscopic brown oxide, which on reduction in hydrogen furnishes a grey metal. Incidentally, proof was obtained of the presence in thorianite of arsenic, mercury, bismuth, molybdenum, and selenium.—The sulphination of phenolic ethers and the influence of substituents: S. **Smiles** and R. **Le Rossignol.** The authors have confirmed the conclusion that the sulphonium base derived from phenetole is produced in three stages, at which the sulphinic acid, sulphoxide, and base are consecutively formed, by isolating the sulphinic acid.—The relation between unsaturation and optical activity, part ii., alkaloid salts of corresponding saturated or unsaturated acids: T. P. **Hilditch.**—The wandering of bromine in the transformation of nitro-aminobromobenzenes: K. J. P. **Orton** and Miss C. **Pearson.**—A new isomeride of vanillin occurring in the root of a species of Chlorocodon, preliminary note: E. **Goulding** and R. G. **Pelly.** The results obtained show that the odorous constituent of Chlorocodon root is a monomethyl ether of a dihydroxybenzaldehyde having an odour intermediate between that of vanillin and piperonal, but which is not identical with vanillin or any of its known isomerides.—The volatile oil of the leaves of *Ocimum viride*, preliminary note: E. **Goulding** and R. G. **Pelly.** The composition of the oil is approximately as follows:—thymol, 32 per cent.; alcohols (calculated as $C_{10}H_{18}O$), 40 per cent.; esters (calculated as $C_{10}H_{17}.OAc$), 2 per cent.; the remainder consists chiefly of a terpene (or possibly a mixture of terpenes), which is a liquid of pleasant lemon-like odour, boiling at 160°–166°.—Experiments on the synthesis of the terpenes, part xii., synthesis of terpins, terpineols, and terpenes derived from the methyl*iso*propyl-*cyclo*pentanes, $Me.C_5H_8.CHMe_2$: W. N. **Haworth** and W. H. **Perkin,** jun.—The initial change of the radium emanation: N. V. **Sidgwick** and H. T. **Tizard.**

Geological Society, March 4.—Prof. W. J. Sollas, F.R.S., president, in the chair.—*Metriorhynchus brachyrhynchus*, Deslong., from the Oxford Clay near Peterborough: E. T. **Leeds.** Two skulls have recently been obtained from the Saurian zone of the Lower Oxford Clay, in the neighbourhood of Dogsthorpe, Peterborough. The mandibles were missing. The two specimens have been referred to *Metriorhynchus brachyrhynchus*. This is believed to be the first recorded occurrence of the species in England.—The high-level platforms of Bodmin Moor, and their relation to the deposits of stream-tin and wolfram: G. **Barrow.** In this area there are three platforms:—one, which is marine and of Pliocene age, terminating in a steep slope at 430 feet; a second, at a height of 750 feet, seen about Camelford and at the foot of Delabole Hill; and a third, a little under 1000 feet, first recognised on Davidstow Moor. The superficial deposits which bear tin above the 750-feet platform differ markedly at times from those below it. These deposits are not so concentrated as the stream-sorted material below, but they have been frequently worked in past times. The veins from which the wolfram is derived have been found close to the points where the "wash" is enriched by their denudation. The success of working depends to some extent on the slope of the granite-floor on which the detritus rests. On Bodmin Moor the larger marshes have a floor of kaolinised granite, but there is a difficulty in working it at many points in consequence of the water-logging by peaty water.

Royal Anthropological Institute, March 10.—Prof. W. Ridgeway, president, in the chair.—The origin of the crescent as a Mohammedan badge: Prof. **Ridgeway.** It

was demonstrated that the crescent badge had its origin, not in the new moon, as generally supposed, but in the well-known amulet formed of a claw or tusk. These in course of time were placed base to base, with the result that the crescent form arose. The two tushes are joined together by string or by a silver plate, but in later examples the amulet is carved out of one piece of material and all traces of the joint are lost, except that in some cases a panel of ornament survives to mark where the join was originally. Examples were exhibited from Turkey, Greece, Africa, and New Guinea, and Prof. Ridgeway traced the amulet back so far as the date of the sanctuary of Artemis Orthia at Sparta, where an example was discovered in the recent excavations. The crescent seen on modern English horse-trappings was also shown to have originated in this amulet.—Some Megalithic remains in central France: A. L. **Lewis.** The paper dealt principally with monuments in the neighbourhood of Autun, including the dolmen at La Rochefort and the standing stones at St. Pantaléon. With these last the author compared other lines of stones at Carnac, Gezer, Dartmoor, and in the Khasi Hills. He also dealt with the two types of circle in Scotland, and showed that they had each a definite locality, those with recumbent stones being found only around Aberdeen, while those with great chambered cairns in the middle are found round Inverness. He was of the opinion that the two types of circle were contemporary, and that the differences were solely due to local influences.

Physical Society, March 13.—Dr Charles Chree, F.R.S., president, in the chair.—The distribution in electric fields of the active deposits of radium, thorium, and actinium: S. **Russ.** The first experiments were made with the active deposit produced from radium emanation. The amount of active deposit directed to a kathode decreases as the pressure in the vessel is reduced, but after a certain pressure is reached the amount going to an anode shows a corresponding increase under the same conditions. The main feature brought out is that at the lowest pressure reached almost as much activity is obtained on the anode as on the kathode, while at atmospheric pressure the activity of the latter is about twenty times that of the former. Similar experiments conducted in hydrogen, air, and sulphur dioxide indicate that the collisions between the active deposit particles and the gaseous molecules play an important part in the distribution of the active deposit in electric fields. Experiments on similar lines with thorium and actinium show that while at atmospheric pressure nearly the whole of the active deposit particles of thorium are directed to the kathode, this is not necessarily the case with actinium. Other observations indicate that the sign of the electrical charge exhibited by the active deposit particles of actinium is a function of the distance that these particles have travelled through the containing gas before reaching the electrodes.—Note on certain dynamical analogues of temperature equilibrium: Prof. G. H. **Bryan.** Attention is directed to the following results of a method described in 1900 (Archives Néerlandaises) under the title of "Energy Accelerations":—(1) In a system of uniformly distributed particles, a stationary state of statistical equilibrium cannot exist under the Newtonian law of force, whether the forces between the particles be attractive or repulsive, except when the particles are at rest in a state of unstable equilibrium. (2) For energy-equilibrium to exist the force between the particles, if repulsive, must vary according to a higher power of the inverse distance than the square; if attractive, it must vary according to a lower inverse power than the square of the distance. (3) In a system in which the kinetic energy cannot be expressed as a quadratic function of the velocities with constant coefficients, the equations of energy-equilibrium no longer take the form of linear relations between the various components of kinetic energy, so that the commonly assumed analogue between temperature and kinetic energy becomes inapplicable.

CAMBRIDGE.

Philosophical Society, March 9.—Dr. Hobson, president, in the chair.—(1) The formation of lactic acid and carbonic acid during muscular contraction and rigor mortis; (2) the complete hydrolytic decomposition of egg-albumin at 180° C., and on the constitution and synthesis of dead and living albumin: Dr. **Latham.**—(1) The formation of γ-pyrone compounds from acetylenic acids; (2) the action of mustard oils on the ethyl esters of malonic and cyanoacetic acids: S. **Ruhemann.**—The absorption spectra of some compounds obtained from pyridine and collidine: J. E. **Purvis.**—The limitations of the copper-zinc couple method in estimating nitrates: J. E. **Purvis** and R. M. **Courtauld.**—A double sulphate of guanidine and aluminium: F. **Ferraboschi.**—The property of a double-six of lines, and its meaning in hypergeometry: H. W. **Richmond.**—Energy accelerations and partition of energy: C. W. **Follett.**

PARIS.

Academy of Sciences, March 16.—M. H. Becquerel in the chair.—The extension of the theorem of Clausius: E. H. **Amagat.**—The characters of tuberculous infection in their relations with the diagnosis of tuberculosis: S. **Arloing** and L. **Thévenot.** In a *post mortem* examination the absence of macroscopic lesions is no proof of the absence of tuberculous infection, and this is the explanation of the occasional want of agreement between the experimental diagnosis (sero-agglutination or application of tuberculin to the skin or conjunctiva) and the *post mortem* examination.—Report by the committee on the application of the metric system to French coinage. The views of various commissions dealing with this question from the date of the foundation of the metric system are reviewed, and the question of the advisability of introducing a 25-centime piece considered, and reported on unfavourably. To preserve the unity of the metric system the committee conclude that the only coins should be 1, 2, and 5 centimes, 1, 2, and 5 decimes, 1, 2 and 5, 10, 20, 50, and 100 francs, and this view is confirmed by the academy.—The dispersion of light in celestial space. The history of the question and the first results: G. A. **Tikhoff.**—The presence of water vapour in the atmosphere of the planet Mars: P. **Lowell.** Photographic observations made at the Flagstaff Observatory, Arizona, U.S., during January of this year, establish the presence of water vapour in the atmosphere of Mars. The plates used were rendered sensitive to the extreme red rays, and with an exposure of two to three hours were capable of photographing the spectrum in the neighbourhood of the band *a*, the most intense band due to water vapour. Photographs of the spectrum of Mars clearly show this band *a*, whilst the spectrum of the moon taken on the same plate shows no trace of this band, thus eliminating the effects of the earth's atmosphere (see NATURE, March 12, and p. 497 of the present number).—The series of Taylorian polynomials: A. **Buhl.**—The general solution of the problem of equilibrium in the theory of elasticity, in the case where the forces are applied at the surface: A. **Korn.**—The electrolysis of solutions of hydrochloric acid: Th. **Guilloz.** In a recent note on this subject M. Doumer, on the basis of his experiments, raises objections to Hittorf's theory of electrolysis. In the present note the author directs attention to recent work by Noyes and Sammet on the mobility of H and Cl ions in dilute solutions of hydrochloric acid, and points out that these researches afford an experimental proof that the disturbances due to the evolution of oxygen during electrolysis are without effect on the transport numbers.—The velocity of evaporation and a method of determining the hygrometric state: P. **Vaillant.** The liquid the evaporation of which is being studied is placed on a balance, and the rate of evaporation deduced from ten oscillations of the beam. The formula $Q = B(F - f)$, where Q is the quantity evaporated in a given time, F the pressure of the saturated vapour, and f the pressure of the water vapour in the atmosphere surrounding the balance, was shown to be valid experimentally. By using pure water and pure sulphuric acid successively the method can be applied to give f, the determination being reduced to two weighings.—The hydrates of arsenic acid: M. **Auger.**—The pseudomorphoses of the microclines in microgranites from the valley of the Meuse (Ardennes): Jacques **de Lapparent.**—The magmatic parameters of the volcanic series of Anglona and Logudoro (Sardinia): M. **Deprat.**—Asymmetry of the figure and its origin: Richard **Liebreich.** From the examination of several thousand

human skulls, dating from prehistoric times to the present day, the author considers that asymmetry is the normal form of the human figure, and is not, as supposed by Lombroso, a sign of degeneration. A simple physiological reason is put forward as the cause of this asymmetry, which is regarded as the necessary result of the erect position of the human species.—The quantity of X-rays absorbed and transmitted by the successive layers of tissues: H. **Guilleminot.**—An attempt at grafting articular tissues: Henri **Judet.**

CALCUTTA.

Asiatic Society of Bengal, March 4.—Certain unpublished drawings of antiquities in Orissa and northern Circars: Manmohan **Chakravarti.** This paper invites attention to the eleven folios of drawings received by the society in December, 1822, and forming a part of the remarkable collection of Lieut.-Colonel Colin Mackenzie. It takes up two of the folios dealing with the antiquities of Orissa and northern Circars; the one of the smaller size (B) has eighty-five originals, while the other of the larger size has two originals and thirty-two duplicates, and gives a brief description of each in the Appendices A and B. They contain interesting drawings of Hindu sculptures, pillars, and other architectural designs, drawn in 1815.—The exact determination of the fastness of the more common indigenous dyes of Bengal, and comparison with typical synthetic dye-stuffs, part ii., dyeing on silk: E. R. **Watson.**—Oil of *Lawsonia alba*: D. **Hooper.**—A general theory of osculating conics: Prof. **Syamadas Mukhopadhyaya.**

DIARY OF SOCIETIES.

THURSDAY, MARCH 26.

ROYAL SOCIETY, at 4.30.—Bakerian Lecture: The Thermal and Electrical Conductivities of Metals and Alloys at Low Temperatures: Prof. C. H. Lees, F.R.S.—Note on the Values of the Board of Trade Standards of Current and Electromotive Force: T. Mather, F.R.S., and F. E. Smith.—Note on the Rise of Meteorological Balloons and the Temperature of the Upper Air: A. Mallock, F.R.S.

ROYAL SOCIETY OF ARTS, at 8.—The Navigation of the Air: Dr. H. S. Hele-Shaw, F.R.S.

ROYAL INSTITUTION, at 3.—Standardisation in Various Aspects: (2) Electrical Engineering: Dr. R. T. Glazebrook, F.R.S.

CHEMICAL SOCIETY, at 5.—Annual General Meeting.—Presidential Address: The Electron as an Element: Sir William Ramsay, K.C.B., F.R.S.

FRIDAY, MARCH 27.

ROYAL INSTITUTION, at 9.—Radio-active Change in the Earth: the Hon. R. J. Strutt, F.R.S.

PHYSICAL SOCIETY, at 5.—(1) Notes on the Plug Permeameter; (2) On the Use of Shunts and Transformers with Alternate Current Measuring Instruments; (3) On Wattmeters; (4) Experimental Demonstration of Alternate Current Wave Propagation in a Helix: Dr. C. V. Drysdale.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Combustion Processes in English Locomotive Fire-Boxes: Dr. F. J. Brislee.—Combustion Processes in American Locomotive Fire-Boxes: L. H. Fry.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—A Canoe Journey to the Plains of the Caribou: E. Thompson Seton.

SATURDAY, MARCH 28.

ROYAL INSTITUTION, at 3.—Electric Discharges through Gases: Prof. J. J. Thomson, F.R.S.

MONDAY, MARCH 30.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Geographical Conditions affecting the British Empire; (1) British Islands: H. J. Mackinder.

ROYAL SOCIETY OF ARTS, at 8.—Fuel and its Future: Prof. V. B. Lewes.

INSTITUTE OF ACTUARIES, at 5.—On Reversionary Bonuses as affected by Expenses and Variations in Rates of Mortality: H. H. Austin.

TUESDAY, MARCH 31.

ROYAL INSTITUTION, at 3.—The Egyptian Sudan: its History, Monuments, and Peoples, Past and Present: Dr. E. A. Wallis Budge.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Some Methods of Heating adopted in Hospitals and Asylums recently built: E. R. Dolby.

WEDNESDAY, APRIL 1.

ROYAL SOCIETY OF ARTS, at 8.—Dr. Schlick's Gyroscopic Apparatus for Preventing Ships from Rolling: M. Wurl.

GEOLOGICAL SOCIETY, at 8.—The Geological Structure of the St. David's Area (Pembrokeshire): J. F. N. Green.

SOCIETY OF PUBLIC ANALYSTS, at 8.—Lead in Tartaric Acid, Cream of Tartar and Baking Powders: The President.—(1) The Nitrogen Factor for Casein; (2) The Recovery of Amyl Alcohol from Waste Gerber Liquors: H. D. Richmond.—Carapa Oil: Dr. J. Lewkowitsch.—A Rapid Method for the Estimation of Mercuric Salts in Aqueous Solution: S. G. Liversedge.

ENTOMOLOGICAL SOCIETY, at 8.

THURSDAY, APRIL 2.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Complete Survey of the Cell Lamination of the Cerebral Cortex of the Lemur: Dr. F. W. Mott, F.R.S., and Miss A. M. Kelley.—The Alcoholic Ferment of Yeast Juice. Part III. The Function of Phosphates in the Fermentation of Glucose by Yeast Juice: A. Harden and W. J. Young.—The Antagonistic Action of Calcium upon the Inhibitory Effect of Magnesium: S. J. Metzler and J. Auer.—Studies on Enzyme Action, XI., The Hydrolysis of Raffinose: Prof. H. E. Armstrong, F.R.S., and W. H. Glover.—Studies on Enzyme Action, XII., Emulsin: Prof. H. E. Armstrong, F.R.S., Dr. E. F. Armstrong, and E. Horton.—On Some Features in the Hereditary Transmission of the Albino Character and the Black Piebald Coat in Rats, Paper II.: G. P. Mudge.

ROYAL INSTITUTION, at 3.—The Animals of Africa: R. Lydekker, F.R.S.

ROYAL SOCIETY OF ARTS, at 8.—The Navigation of the Air: Prof. H. S. Hele Shaw, F.R.S.

LINNEAN SOCIETY, at 8.—Altitude and Distribution of Plants in Southern Mexico: Dr. Hans Gadow, F.R.S.—The Anatomy of some Sapotaceous Seedlings: Miss Winifred Smith.—Notes on some Sponges recently collected in Scotland: Dr. N. Annandale.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Efficiency of Boiler Heating Surface: C. Humphrey Wingfield.

CHEMICAL SOCIETY, at 8.30.—The Condensation of Epichlorohydrin with Phenols: D. R. Boyd and E. R. Marle.—Rate of Hydrolysis of Chloroacetates and Bromoacetates, and of α-Chlorohydrin by Water and by Alkali, and the Influence of Neutral Salts on the Reaction Velocities. Preliminary Note: G. Senter.—A New General Method of Preparing Diazonium Bromides: F. D. Chattaway.—On the Probable Nature of the Impurity found in the Triphenylmethane Spectrum: W. N. Hartley.—The Absorption Spectrum of Triphenylmethane: A. G. G. Leonard.—The Constituents of Cyprus Origanum Oil. Isolation of a New Terpene (Origanene): S. S. Pickles.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—High Speed Electrical Machinery: G. Stoney and A. H. Law.

FRIDAY, APRIL 3.

ROYAL INSTITUTION, at 9.—The Modern Motor Car: Lord Montagu of Beaulieu.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Notes on the Foundations of an Indian Bridge: G. W. N. Rose.

SATURDAY, APRIL 4.

ROYAL INSTITUTION, at 3.—Electric Discharges through Gases: Prof. J. J. Thomson, F.R.S.

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