

THURSDAY, NOVEMBER 28, 1907.

THE VERTEBRATE NERVOUS SYSTEM.

The Nervous System of Vertebrates. By Prof. J. B. Johnston. Pp. 370. (London: J. Murray, 1907.) Price 15s. net.

THE author's aim has been "to produce a text-book of comparative neurology, giving an account of the nervous system as a whole, to trace its phylogenetic history, and to show the factors which have determined the course of evolution." He states (in the preface) that the functional point of view is the chief characteristic of the present work, but that (p. 10), as an introduction to the study of the nervous system, it deals chiefly with structure.

The work starts with a brief, though clear, summary of the various methods used in the investigation of the nervous system, and then proceeds to a very useful description of the general morphology of the same, more particularly as found in the Cyclostoma, Selachians, and Amphibia. Then follows a lucid account of the main features and processes in the development of the nervous system, especially as seen in the lower vertebrates, and valuable light is thrown on the evolution of those parts of the nervous system associated more directly with the visceral arches, spiracular and branchial clefts, and of the lateral line structures. We note the author, without hesitation, ascribes taste, or gustatory, functions to structures distributed more or less widely on the outside of the head, and in extreme cases, as in some bony fishes, on the fins and over almost the entire body, yet the true and specific function of these organs remains still to be determined.

In a brief description of the nerve elements and their functions the formulation of the neurone theory is ascribed (p. 10) to Waldeyer, in 1891, whereas this distinguished savant did little more than suggest the term "neurone" for structures the conceptions of which in this connection had been gathering strength since the days of Schleiden and Schwann, some fifty years earlier.

In discussing nerve degeneration and regeneration the author *inter alia* states (p. 90) that the proximal portion of a divided peripheral nerve remains in a healthy condition. This may be true for some of the lower vertebrates, but is incorrect for many of the higher forms, as v. Gehuchten and others have proved.

In chapters v. to xii. the author discusses with much originality and lucidity the four kinds of nervous activity, viz., the somatic afferent, somatic efferent, visceral afferent, and visceral efferent, and these chapters, together with that on the evolution of the cerebral hemispheres, may be accounted some of the most valuable in the book. The description of the neuromasts is especially useful, and though on debatable and obscure ground the whole matter is suggestively and clearly treated. However, the author not infrequently falls into the common error of confusing or using indiscriminately the term "afferent" and "sensory," and throughout the work seems more at

home with the subject as it concerns the lower than with that of the higher vertebrates, especially in connection with recent work.

Perhaps, too, reference may be made to the following assertions:—On p. 110 it is stated that "sensory cutaneous fibres emit collaterals which cross directly to the opposite side of the spinal cord." These crossing fibres have never yet been shown degenerated in a mammal, and the statement is incorrect for at least the majority of the higher vertebrates. Again, on p. 115 it is stated that "a part of the secondary neurones of the V. nerve ascend on the same side of the body," whereas recent work tends to show the contrary, at least in mammals.

In the description of the cerebellum several statements call for modification. Thus it is stated, p. 240, that "all three peduncles of the cerebellum carry both incoming and outgoing fibres," whereas many recent workers on higher vertebrates have shown the inferior cerebellar peduncle to contain only afferent fibres. Again, on p. 243, it is stated that "primary somatic sensory fibres from spinal roots enter the cerebellum directly." On p. 245 that "the direct cerebellar tract from Clarke's column ends, according to most observers, in the deep grey nuclei of the cerebellum" (instead of in the cortex of the vermis); and on the same page that "the axones of the Purkinje cells pass to the spinal cord and inferior olive," and that "the fibres passing to the Nucleus Dentatus seem to include fibres from the posterior column nuclei." With all of these statements we are in disagreement, and naturally, therefore, with deductions drawn therefrom. Moreover, we regret in the account of the cerebellum the absence of reference to the views of Hughlings Jackson, or to the recent work by Sherrington, whilst the general conception that the cerebellar cortex is a large recipient surface for afferent impulses from all parts of the body; that this gives off its efferent impulses along the fibres to the cerebellar nuclei, and these gain efferent impulses to the bodily structures as advocated more particularly by Clarke and Horsley, Déjerine, Thomas, Klimoff, &c., seems insufficiently emphasised.

The last chapter offers briefly a review of the more important facts concerning the neopallium, and would have been more useful had it in the discussion of the sensori-motor areas treated of such sub-divisions as the audito-sensory, audito-psychic, visuo-sensory, and visuo-psychic, which are not mentioned; and had the motor area not been depicted as involving the post-central gyrus which Grünbaum and Sherrington disproved for Anthropoids, and many surgeons have disproved in man.

On the whole, the book gives the impression of having been written by an able zoologist interested in neurology, rather than by a pure neurologist, and therein lies a good deal of its value. No more abstruse problem has ever been presented to man than that of the vertebrate nervous system, and in the present work the author presents a very readable and succinct account of his subject, which forms a valuable and welcome addition to the literature relating to it.

W. PAGE-MAY.

ELECTRIC POWER AND TRACTION.

Electric Power and Traction. By F. H. Davies. Pp. vi+293. (London: A. Constable and Co., Ltd., 1907.) Price 6s. net.

ELECTRIC power and traction is such an immense subject that it is rather a bold undertaking to deal with it in a small volume of 293 pages, even if the reader is supposed to know the elementary laws of electrical engineering. The book, however, does not pretend to be a regular text-book, but it is evidently intended for those whose knowledge of electrical engineering is limited, and to these as well as students it can be recommended.

Four chapters deal with the generation and distribution of power. The various systems of direct and alternating current are briefly discussed, and descriptions of typical installations are given. As the author briefly touches upon the subject of direct-current high-tension transmission, it is rather surprising that no mention is made of the Thury system, which has come into prominence during the last few years.

Two chapters are devoted to D.C. and A.C. motors, and their principles are expounded. In directing attention to the starting-up of induction motors, the author omits to mention the important method of changing from "star" to "delta" on the stator, which is used for most squirrel-cage motors up to 20 horse-power.

The chapters on the application of electric power are the best in the book, and the advantages of electric driving are clearly brought out. On p. 124 there appears a statement which shows that, in the author's opinion, the time is not far distant when the voltage for lighting ships will be raised to 200 or 240, but this prediction will not command universal assent. The modern tendency even on shore is to return to 110 volts, especially since the introduction of metallic filament lamps, and it seems more probable that 100 or 110 volts will remain the standard voltage for marine work.

The last ten chapters of the book are devoted to electric traction, and although one may find in them a few statements which are open to criticism, they contain a good deal of practical information. The conduit and surface-contact systems are dealt with, and the advantages of electric traction are briefly set out. Full details are given of the direct-current system in use on the Metropolitan, District and London tube railways. The benefits of "multiple-unit control systems" are briefly touched upon. In view of the prominence given to the Westinghouse control system, it is surprising that no mention is made of the British Thomson-Houston system, the more so as the latter is in use on nearly all the London tubes and underground railways.

In his remarks on substations the author, in dealing with motor-generators, has omitted to mention Bruce Peebles' motor-converters, which in recent years have come largely into use, notably on the Great Western Railway, where it is the standard equipment for all substations.

On p. 240 the novel statement appears that the middle rail on the Metropolitan and District railways

is not protected, "because it is practically at earth potential." Perhaps if the author would try it, by touching it, he might change his opinion.

The exposition of the *pros* and *cons.* of three-phase, single-phase, and D.C. systems is not absolutely convincing, because, to judge from the disproportionately numerous descriptions of single-phase locomotives, it would almost seem that the author has an unduly high opinion of this system. It might have been of interest if particulars had been given of the New York Central locomotives, as they represent the most recent practice in D.C. traction, and surpass anything that has been done, so far, with the single-phase system. The book is well printed, and illustrated by excellent photographs. It contains a good deal of sound practical information, and can be recommended to the class of readers for whom it is intended. L.C.

SCHOOL CHEMISTRY AND PRACTICAL ORGANIC CHEMISTRY.

The Complete School Chemistry. By F. M. Oldham. Pp. viii+416. (London: Methuen and Co., 1907.) Price 4s. 6d.

Practical Chemistry for Army and Matriculation Candidates. By Geoffrey Martin. Pp. viii+144. (London: Crosby Lockwood and Son, 1907.) Price 2s. net.

Systematic Practical Organic Chemistry. By G. M. Norman. Pp. viii+98. (London: W. B. Clive, University Tutorial Press, Ltd., 1907.) Price 1s. 6d.

A Course of Practical Organic Chemistry. By T. Slater Price and D. F. Twiss. Pp. xiii+239. (London: Longmans, Green and Co., 1907.) Price 3s. 6d.

A Scheme for the Detection of the More Common Classes of Carbon Compounds. By F. E. Weston. New edition. Pp. viii+95. (London: Longmans, Green and Co., 1907.) Price 2s. 6d.

MR. OLDHAM'S book provides a complete course of instruction for schools. He has had in view the London matriculation and the Army entrance examination, but has added important sections not included in either syllabus, which he says with a touch of irony "should be taught wherever a teacher is free from the trammels of an examination syllabus and need think only of giving sound instruction."

Judging from a general survey of the book, we are inclined to think that the syllabuses above mentioned were not altogether present in the author's mind when he wrote it, for sound instruction is certainly the keynote of his method.

Part i. especially is excellently arranged, clearly written, and admirably illustrated. If the school time admitted of it one could not devise a better course for the beginner in chemistry; but the standard eventually reached is far beyond that of any matriculation candidate, and one is doubtful if even three school years would suffice to cover the ground mapped out, unless, indeed, the experimental part were performed for, instead of by, the student, which would be a misfortune. The programme is an ambitious one; but we believe it is thoroughly sound, and if it could be

begun at school and carried to the end of part i. slowly and methodically, it would form an excellent groundwork for a subsequent college course.

There is little to criticise. Attention should be directed to one omission which is not uncommon in elementary text-books. It states on p. 40 that "you have found out that hydrogen is contained in acids." It is quite true that hydrogen is described as being obtained by the action of acids on metals, but there is no suggestion as to where the gas comes from, and, so far as any information to the contrary goes, it might just as well come from the metal. Some explanation or comment is called for, because a few pages further on the action of acids on carbonates is described, and in this case the process appears to be reversed, the gas coming from the solid and not from the acid.

We should like to see electrolysis entirely banished from elementary books. The decomposition of water by the current is a mysterious and unconvincing experiment. It is difficult to understand why the gases appear at the ends of two different platinum wires, and why the volumes which collect should represent the true composition of the liquid. The union of the two gases to form water by means of the electric spark only serves to heighten the mystery. A careful drilling in these two operations gives the schoolboy an agent which in his imagination will produce or decompose every compound gas that ever existed, and he uses this knowledge, as we all know, with a reckless facility. It is a satisfaction to find that Lavoisier did not, as we are generally told, institute experiments to prove the conservation of matter, but, as the author states, did several experiments which showed it. Lavoisier simply took the principle for granted, as most chemists had done before him, from Boyle onward. Dalton, by the way, was not exactly a schoolmaster in Manchester, though he served in that capacity at Kendal.

The attractive appearance, substantial get-up, and exquisitely drawn diagrams of Dr. Martin's book command at once a careful perusal. It differs essentially from the foregoing in confining itself to the practical, or, perhaps more strictly, to the manipulative side of chemistry. Each experiment stands alone, and has no necessary connection with the one that precedes or follows it, minute directions being given for its performance. It is also for Army and matriculation candidates, and will no doubt prove very useful to both candidate and teacher as a laboratory *vade mecum*.

Mr. G. M. Norman's "Systematic Practical Organic Chemistry" is one of the organised science series, and is intended to meet the requirements of stages i. and ii. of the Board of Education examination. It contains a description of a series of simple preparations and a variety of useful tests. It is satisfactory to find that the Board of Education now requires evidence that the candidate has carried out a number of preparations before presenting himself. It is to be hoped that before long the Board of Education will take the further step of requiring the evidence without the candidate. No kind of chemistry lends itself to a two or three hours' practical examination, organic

chemistry perhaps least of all, and the evidence of knowledge elicited by the sort of experiment set at these examinations has very little value. That, however, does not impair the usefulness of the book under review, which may be safely commended both for the purpose it is intended to fulfil and also as an introduction to practical organic chemistry.

Messrs. Price and Twiss's "Practical Organic Chemistry," like the preceding volume, owes its origin to the new syllabus of the Board of Education, and is intended to meet to some extent the requirements of stage iii. (theoretical organic), as well as to prepare for stages i. and ii. (practical organic) of the Board's examination. The treatment of the subject is full and comprehensive. It contains the usual series of simple preparations, an account of the qualitative and quantitative examination of organic compounds, molecular-weight estimations, and useful schemes of analysis. Without introducing any specially novel features, it presents a fairly complete programme of practical study which if carefully carried out should form a sound basis for subsequent research in organic chemistry. The descriptions are clear and concise, and the illustrations, though not numerous, are probably sufficient for the purpose. It may be recommended as a thoroughly safe book for the laboratory.

Mr. Weston's book on the detection of organic compounds deals, as it states, with qualitative methods only. That such a book should have reached a second edition and should serve the needs of the final B.Sc. of the London University and of the honours stage of the Board of Education is a hopeful sign of the times, if we must have this kind of test. Such defects as the book possesses, and they are not numerous, are to be attributed to the fact that it is written to meet the requirements of a practical examination where time is an important factor.

The author confines his attention to the study of pure organic substances only, giving directions which, if carefully followed, should lead to their detection, and at the same time to the acquisition of much useful information and manipulative skill on the part of the student.

This is all thoroughly sound and satisfactory so long as it is recognised that it is an introduction to analysis, and that the real laboratory problems involve such things as the separation of mixtures and the purification of impure products. It appears from a general perusal of the book that some of the directions need amplifying. This refers more particularly to the means of ascertaining the presence of oxygen, upon which the grouping of the compounds is based, to the identification of aromatic hydrocarbons (p. 12), to Fenton's oxidation method for detecting ketohexoses (p. 47), and to Fischer's benzaldehyde green reaction for aldehydes (p. 40). We would also suggest the following additions or modifications in a future edition:—the use of bromo- and nitro-phenylhydrazine, methyl sulphate and semicarbazide as useful reagents and of Tollens' reagent (the name, by the way, is spelt with an "s") for pentoses, also the consistent use of the modern system of nomenclature and a good index.

J. B. C.

OUR BOOK SHELF.

Vergleichende Morphologie der Pflanzen. I. Theil, mit 200 i.d. Text gedr. Abbild. u. zwei lith. Doppeltafeln. By Dr. Jos. Velenovský. Pp. 277+plates. (Prag: Fr. Rivnác, 1905.)

DR. VELENOVSKÝ has written the earlier portion of a work which will be found of no small interest to botanists, not only because the author has brought together a number of new observations of his own, but because he deals with the whole mass of facts from a definite point of view. Probably, as he himself hints in the preface, his views may not command general acceptance, and we confess to experiencing a certain sense of disappointment after reading the book. The point of view which the author adopts is, it seems to us, too rigid and formal. Morphology has really outgrown the stage of pure formalism. We have come to recognise that the task of trying to understand why and how development has followed on the lines one can actually trace, is overshadowing the purely formal abstractions which used to constitute morphology.

Twenty years ago it was the fashion to divorce physiological notions from morphological concepts. At the present time, probably most botanists have an inkling, if not a conviction, that morphological "laws" really do resemble those of the Medes and Persians. The "laws" in both cases last just so long as they can continue to be tolerated. With increased knowledge the bonds of the old laws are loosened, and fresh working theories become needed to comprehend the increased range of intellectual vision.

But it must not be thought that the foregoing remarks are intended to depreciate the value of the book before us, for it appears to us to be one that can be read with considerable interest and profit. Much of the author's railing against certain practices which are not uncommon at the present time is justifiable, although he is apt perhaps to overstate the case.

"In modern times hardly anything but a monograph is appreciated; each author is acquainted with his own particular genus, or it may be, family, and he cares for nothing else. . . ."

But when Dr. Velenovský leaves generalities and comes to closer quarters with his subject-matter, he is on ground where he will meet with less opposition, albeit his methods may awaken some surprise. In these days laborious description of anatomical detail too often replaces an attempt to give a comprehensive account of the plants themselves. The author, however, scarcely devotes any space at all to internal structure, and finds room thereby to give a more complete account of the range of external variation within the cryptogamic groups to which this volume is devoted; and it is not impossible that some of his readers may experience a kind of mild shock at finding many unfamiliar forms included in a group which they have hitherto only known through one or two laboratory "types."

The book contains many new illustrations, and it is not unlikely to meet with a better reception than its author seems to think it will obtain. J. B. F.

De Vormen der Aardkorst: Inleiding tot de Studie der Physiographie. By J. van Baren. Pp. viii+232. (Groningen: J. B. Wolters, 1907.)

This little book attempts, in the course of 207 pages, to cover the whole ground of physical geology, and to give an account of the most important observations and discoveries made in this branch of science up to the year 1905. It is necessarily, therefore, somewhat sketchy, but ample compensation for this will be found in the freshness of its information, whether conveyed by illustrations or letterpress. The illustrations are

particularly good, and the only one which strikes us as distinctly old-fashioned is the diagram showing the distribution of seismic areas.

In the opening pages the student is introduced to the meaning of elementary technical terms, with their equivalents given in English, French, and German. These would be more useful if they were more exact; the English for "Streichen" is not "direction," but "strike," and an "overthrust" is not identical with either an inclined or a recumbent fold. It is singular that many Continental geologists, notwithstanding their apparent familiarity with the structure of north-western Sutherland, should still seem to find a difficulty in grasping the real significance of our "overthrust."

The author does not attempt to found any system of his own, and in disputed questions generally contents himself with summarising the opinions of others; hence, in treating of the internal state of the earth, the important bearing of recent seismological observations is overlooked, for if distortional waves do really traverse the whole mass of the planet, we need no longer give serious attention to theories which involve a gaseous interior.

The origin of coral atolls is briefly discussed, and the boring in Funafuti is referred to as furnishing a proof that in certain cases Darwin's theory holds good; on the other hand, it is asserted that this theory will not apply to the atoll-like reefs of the West Indies. This latter statement would seem to show that the author cannot have read Darwin's "Coral Reefs" with sufficient care, for Darwin himself expressly excluded these reefs from his explanation. In this oversight, however, the author by no means stands alone.

To the general reader, whose interest is restricted to results, this work will provide a useful epitome, nor is it without a claim upon the advanced student; it brings together many new facts hitherto scattered and disconnected, and builds them into the edifice of his science.

Nests and Eggs of Birds found Breeding in Australia and Tasmania. By A. J. North. Vol. ii., part ii. (Australian Museum, 1907.)

THIS part of the second volume of the new edition of Mr. North's excellent work on the nests and eggs of the birds found breeding in Australia and Tasmania describes the greater portion of the large and important family Meliphagidae, commenced towards the latter end of the preceding part, and the families Nectariniidae, Zosteropidae, Dicædæ, and Pardalotidae. The figures of the eggs, which are of the natural size, were reproduced by heliotype process at the Government Printing Office from photographs of specimens. The letterpress contains descriptions of the birds, their nests and eggs, and a general account of their life-history. The excellent detailed description of the birds, the copious field notes, and the beauty of the illustrations all call for notice. This important and most interesting work is a publication of the Australian museum, beautifully produced, and at a very low price. In the present part we have 138 pages of letterpress (large 4to), three plates (one showing the nest of Lewin's honey eater *in situ*, and the other two comprising sixty-six figures of eggs), besides illustrations in the text of birds, nests, and breeding haunts, for 7s. 6d.

Grundzüge der Tierkunde für höhere Lehranstalten. By Prof. Karl Smalian. Pp. 304; illustrated. (Leipzig: G. Freytag; Vienna: E. Tempsky, 1907.) Price 4 marks.

THIS work, which is intended as a companion to the author's "Grundzügen der Pflanzenkunde," is more attractive than the generality of school text-books on

account of being illustrated by thirty coloured plates, which are excellent examples of the three-colour process. Not only are they for the most part good pictures of the animals they purport to represent, but they also show in most cases the natural surroundings of the respective species, so far as these can be reproduced with fidelity to nature. Unfortunately, in one instance that has come under our notice the wrong species has been depicted. We refer to the plate of giraffes and zebras facing p. 42, where the animal purporting to be the true or mountain zebra (*Equus zebra*) is the northern race of the bonte-quagga, or Burchell's zebra (*Equus burchelli granti*). Had the true zebra been depicted, the plate would then have been wrong, as showing a mountain animal on the open plains. The text includes a brief but well-compiled survey of the whole animal kingdom, from Primates to Protozoa, including sporozoans, with some mention of extinct forms, and the work as a whole appears thoroughly suited to its purpose.

R. L.

Précis des Caractères génériques des Insectes, disposés dans un Ordre naturel par le Citoyen Latreille.

A Paris, chez Prévôt, Libraire, Quai des Augustins, et à Brive, chez F. Bourdeaux, Imprimeur Libraire. A Brive, de l'Imprimerie de F. Bourdeaux, an 5 de la R. [1796]. Pp. xiv+208. (Imprime à 200 Exemplaires par A. Hermann, n.d.) Price 7 francs.

THIS is a reprint of a very rare book, which is seldom to be found even in the best entomological libraries. It commences with a table of the fourteen classes into which the author divides insects (understanding by that term Arachnida, Crustacea, and Myriopoda, as well as Hexapoda), followed by systematic characters for 351 genera recognised by Latreille, one or two others, described by other authors, being passed over as at present unknown to him. Several very familiar genera, such as *Ypsolophus* and *Adela*, are characterised in this book for the first time, but without indication of types, for which reference must be made to Latreille's later works. It is always unsatisfactory to entomological authors to be in doubt respecting the actual contents of a book they only know at second-hand, and we are glad that this scarce book has now been rendered accessible to them in a complete (and, we hope, accurate) reprint.

The Metric and British Systems of Weights, Measures and Coinage. By Dr. F. Mollwo Perkin. Pp. 83; with 17 diagrams. (London: Whittaker and Co., 1907.) Price 1s. 6d.

DR. PERKIN here provides a simply written and clearly expressed account of metric measures of length, area, volume and weight, and, in addition, treats of specific gravities, temperature measurements, and money. As Lord Kelvin has said, "our weights and measures are time-wasting and brain-wearing," and all attempts to familiarise British boys with the simplicity and convenience of the decimal system deserve encouragement. This small volume should prove useful in both day and evening schools, and all engaged in manufacture and commerce would derive advantage from its study.

The Story of Scraggles (A Sparrow). By George W. James. Illustrated from drawings by Sears Gallagher and from photographs. Pp. 88. (London: Chatto and Windus, 1907.) Price 2s. 6d.

THE greater part of this booklet is in the form of the autobiography of an ailing song-sparrow, which could not fly, and was kept in a house for three months. The story, which purports to represent the bird's thoughts and feelings, will probably appeal to little girls, and encourage them to be kind to animals.

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.]

Specific Stability and Mutation.

MR. R. H. LOCK at the close of his letter in NATURE of October 17 (vol. lxxvi., p. 616) makes a remark which, after some consideration, still perplexes me. The question involved is so interesting and, indeed, important, that I feel sure that many of your readers would be glad to know the grounds, doubtless not without weight, which led him to it. I quote the passage:—"that natural conditions lead to the obliteration of a host of mutations is as fair a deduction from the fact that such mutations appear under cultivation as the current deduction that the conditions of cultivation actually cause the occurrence of this kind of variation. We have the testimony of de Vries and others that the former process actually takes place. That the latter process does so is an assumption which still lacks the support of facts."

It contains two propositions:—(1) mutations appear under cultivation; (2) that the conditions of cultivation actually cause the occurrence of this kind of variation . . . is an assumption which still lacks the support of facts. It is the latter on which I think some discussion would probably be illuminating. At first sight the two propositions look contradictory. It is possible, however, that Mr. Lock is using "cause" in a very technical sense. But as Mill remarks, "in practice that particular condition is usually styled the cause, whose share in the matter is superficially the most conspicuous." Now, our knowledge of mutations is almost exclusively drawn from cultivated plants. In such cases cultural conditions are obviously an inseparable antecedent to mutations. What I do not understand is why it is an "assumption" to state that there is a causal nexus between the effect and the conditions.

To avoid ambiguity, I may explain that by "variation" I mean insensible and continuous organic change; by "mutation," that which is large, palpable, and discontinuous.

I believe that in nature variation never ceases, and yet "species" do not perceptibly vary. I pointed out some years ago, in a discussion at the Royal Society, the explanation of this seeming paradox. What we mean by a species is an abstraction which has no concrete existence. It is the mean or average of a host of varying individuals. It will be hardly contested nowadays that, so long as the conditions remain constant, the species remains unchanged. As has been frequently pointed out, the Egyptian flora furnishes a remarkable illustration of the fact over a long period of time. Plant remains from tombs believed to be 4000 years old differ in no respect from the species now living to which they belong, and the mere fact of their preservation shows that the physical conditions have undergone no change. To this persistence under constant surroundings I have given the name of "specific stability."

That mutations occur and exist is obvious to everyone. But that they are of frequent occurrence under purely natural conditions is, I think, unsupported by evidence, and, if they do occur, I agree with Darwin that it may be doubted if they "are ever permanently propagated in a state of nature" ("Origin," fifth edition, p. 49). The reason is that an organism is so nicely adjusted to its surroundings that it is in the highest degree improbable that a sudden and extreme structural change would fit in with them.

If species arise in nature by discontinuous variation or mutation, one would expect to see some evidence of their doing so; but in the British flora I can only call to mind a very few instances. There is a form of *Chelidonium majus* with lacinate leaves and petals. It is said to have first appeared at Heidelberg in 1590; according to Hooker it is only known in cultivation. There are two striking mutations of *Plantago major*, one with a paniculate inflorescence, the other with leafy bracts, which reappear

from time to time independently, but always, I think, in cultivated ground. There is a tendency in maples to revert to a ternary symmetry, as is shown by the occasional production of three carpels instead of two. The sycamore often produces seedlings with three cotyledons. I grew some of these, and they had for a time leaves in whorls of threes, but soon reverted to pairs. I have only heard of one case of an adult wild maple with leaves three in a whorl.

There are some singular mutations which occur in the broad-leaved trees of temperate countries, but probably always under somewhat artificial conditions. They seem to be merely correlated with habit, and are quite independent of affinity. The normal angles at which the branches are set on either become very acute or very obtuse; in the one case we get pyramidal forms like the Lombardy poplar, in the other weeping forms. Or the cell-sap is deeply coloured red, masking the green of the chlorophyll corpuscles (copper-beech). In other cases the leaves lose their normal circumscription, and are deeply divided (fern-leaved beech). Apparently all these mutations are in some degree perpetuated by seed, but they do not hold their own in nature, and owe their preservation to planting in gardens and elsewhere. It is not easy to speculate as to the cause of these singular mutations. One may infer from the fact that they are related to habit, and not to affinity, that they are not due to reversion.

While specific stability under constant conditions appears to be the rule in nature, it is widely different in cultivation. When a plant is brought under cultural conditions it maintains its type for some time unaltered, then gives way and becomes practically plastic. From my experience at Kew, where I saw the process continually going on, I hazarded the generalisation that any species, annually reproduced from seed, could be broken down in about five years. During that period specific stability, though menaced, tends to maintain itself. Darwin was well aware of this, and as for the moment his books seem to be little studied, I will quote the passage:—

"We have good grounds for believing that the influence of changed conditions accumulates, so that no effect is produced on a species until it has been exposed during several generations to continual cultivation or domestication. Universal experience shows us that when new flowers are first introduced into our gardens they do not vary; but ultimately all, with the rarest exceptions, vary to a greater or less extent" ("Animals and Plants," ii., p. 261).

He quotes in support the testimony of well-known experts. Thus Salter, the great raiser of chrysanthemums, states:—"Everyone knows that the chief difficulty is in breaking through the original colour and form of the species." Vilmorin, the most distinguished French horticulturist of his time, maintained that "the first step is to get the plant to vary in any manner whatever; for the fixed character of the species being once broken, the desired variation will sooner or later appear."

Abundant illustrations of the fact which has been stated are furnished by the history of individual species. Thus Sabine says of the first dahlia plants introduced into Europe:—"At Madrid they were a long time in the Royal Garden without any indications of change." The history of the Zinnia and of the Swan River daisy is the same. A few years ago Mr. Watson, the curator of Kew, gave me notes of cases which had come under his own observation. *Primula japonica* was introduced in 1871 as "a new crimson primrose." In 1877 it produced rose-coloured as well as various shades of magenta flowers. *Anthurium scherzerianum*, introduced in 1862, had in 1874 produced enormously developed spathes, and in 1880 a form with two spathes to each spadix. In 1874 it was crossed with a white variety, and that called *rothschildianum*, with mottled spathes, was the result. It is interesting to note that "the seedlings are nearly all mottled like the parent." *Impatiens Sultani* was introduced at Kew from Zanzibar in 1881. For several years it did not vary. It now exhibits half-a-dozen distinct shades of red in the flowers. The fine Cape orchid, *Disa grandiflora*, has long been in cultivation in this country; varieties were unknown until it was raised from seed by Dr. Moore at Glasnevin.

I may add two cases which have more particularly come under my own notice. *Nemesia strumosa*, a rather local South African plant, was introduced about 1892. It now shows indications of breaking up into two distinct races, with the greatest variety in the coloration of the flowers.

The most remarkable, however, is that of *Primula obconica*, introduced in 1882. For many years it was perfectly stable, but within the last few has exhibited the most surprising variation both in the number, form, and colour of the flowers.

In all these cases I think we may safely infer from the persistent specific stability at the commencement of cultivation that the changes which subsequently occur would not have occurred in nature. We cannot regard the one state as in any way a continuation of the other. The changes which occur under cultural conditions are, in fact, something *sui generis*. We may say, of course, if we like, that the potentiality of such changes was latent in the species in nature; but, as a matter of fact, if so, it was suppressed, and there is no evidence of its being called into activity.

The evidence, on the other hand, that such changes follow cultural conditions as a result is simply overwhelming, and I do not suppose that Mr. Lock denies it to be the case. The only question can be as to how they operate. Now there is one point in connection with plants under cultivation the importance of which I have not seen referred to. It is this: in nature we deal with a host of individuals; in cultivation with a very limited number. In my view specific stability is maintained partly by the weeding out of unfavourable variations, partly by wide interbreeding. Now it is obvious that under cultivation the latter agency is inoperative, and cultural conditions bring other influences to bear, especially as regards nutrition; but these I have no space to discuss.

I take it that the species in nature has two weapons in reserve for self-preservation. Of these, variation is the most effective if given time, as it will act automatically. Mutation, on the other hand, though it might now and again hit the mark, is likely in most cases to overshoot it, and is therefore seldom called into play or utilised; and observation seems to confirm this.

In the development of a plant under cultivation the horticulturist takes advantage of both variation and mutation. In the case of the Cyclamen, I have shown that the fine forms now existing are almost entirely the result of accumulated variation. As with the garden Cineraria there has been mutation in floral coloration; but the small amount of variation in the foliage proves, I think conclusively, that in other respects the latter has gradually been evolved from the wild *Cineraria cruenta*, though Darwin, from second-hand information with which I supplied him, stated otherwise.

The case of the Chinese primrose is extremely interesting. When introduced in 1820 it had probably already undergone some cultural development at the hands of the Chinese. It was slowly developed in Europe for a long period without manifesting any striking structural change, until it bore little superficial resemblance to the wild stock. This was discovered in the gorge of the Yangtse, and when introduced into this country proved very intractable of cultivation; in fact, I doubt if at the moment it is to be found in our gardens. Within about the last quarter of a century the cultivated form has exhibited two very remarkable mutations, and it is interesting to observe that these appear to recur independently. The first was the so-called "fern-leaved form." I do not know if this was ever fixed, but, if so, it did not take the public taste, and was not preserved; but fern-leaved individuals appear to occur casually in batches of seedlings of quite distinct races with the ordinary foliage. The transition from the palmatifid to the pinnatifid form of leaf is theoretically interesting. Nothing can well look more different than a fan-palm and a feather-palm, but we can see an intermediate stage in an Australian *Livistona*. The second mutation, the "ivy-leaved form" is much rarer, and in every way more remarkable. It is apparently accompanied by more or less floral abortion, and it has not been found

possible to perpetuate it. The fern-leaved form is, it can hardly be doubted, a reversion to an ancestral type which has been perpetuated in other species, and this may also be the case with the ivy-leaved form, though this is more obscure.

The races of *Oenothera* which De Vries has raised are nothing more than what a horticulturist would expect; and it may be conceded that if such races could hold their own in nature, distinct species might originate in this way. But there is no evidence that they do; and the probability of their being able to do so is against them. *Oenotheras* are pretty prolific where they occur, and so far as my experience goes they keep true to type.

Cultural mutations seem, as a matter of fact, to have little, if any, capacity for holding their own in the struggle for existence. I cannot call to mind a single instance of one which has been successful, and even in cultivation there is some reason to think that they are short-lived; but this is a point on which we are in urgent need of carefully ascertained facts. One is told, for example, that new varieties of the potato mostly cease to give satisfactory results after a few years. This is, however, a case of purely vegetative reproduction, and similar statements are made about the sugar-cane, which it is now hoped to regenerate by seminal reproduction. I can remember when potato-fields were covered with flowers and subsequently with fruit. I suppose it was thought antagonistic to tuber-production, as it probably was, and sterile races were selected accordingly. Prof. Hildebrand came to this country to study the subject, and I was able to supply him with information which I had collected for another purpose.

There is practically nothing to add to what has been said on the subject by Asa Gray ("Darwiniana," pp. 338-347). It is notoriously difficult to get hold of old cultivated strains of garden plants, and change of fashion hardly seems sufficient to account for the difficulty. Gray points out "that with high feeding and artificial appliances comes vastly increased liability to disease, which may practically annihilate the race." This has all but happened to the hollyhock, and, left to itself, the Phylloxera would have exterminated the vine in Europe. The existence of a species in nature implies a complicated adjustment to the surroundings. It is not sufficient to launch upon them a new form; in order that it may hold its own, the adjustment must be provided as well. It is by no means always an easy thing to transfer a species from one part of the earth's surface to another. The seed of the Kerguelen cabbage brought back by the *Challenger* germinated freely at Kew, but not a single plant was raised from the seedlings, which all succumbed to a ubiquitous *Peronospora*.

De Vries has done good service in directing attention to the study of mutations, the nature and origin of which deserve the most attentive study. They graduate into monstrosities which are even more mysterious. It is worth while directing the attention of those who are interested in mutations to the material which exists in Japanese horticultural books. Japanese taste in such matters is widely different from European. In the case of the garden convolvulus (*Ipomœa*), which is pretty stable with us, the Japanese have figured an extraordinary range of variations which no one else would dream of preserving.

W. T. THISELTON-DYER.

Witcombe, November 9.

The Winding of Rivers in Plains.

BEFORE writing to NATURE on the theory of winding rivers, it would have been wiser for me to have had some observations made as to the conditions of actual flow in the field in different circumstances. It is possible that the more complicated conditions which obtain in some places render the simple theory only partially applicable. My letter was immediately applicable rather to the flow in Prof. James Thomson's simplified model, where the artificial stream had a wooden bed, and the tendency to silt was indicated by short pieces of cotton pinned by one end to the bottom. It may be that the deposit of drift

on the inner side of some streams retards their flow by an unexpected amount; and probably there are other causes which prevent the James Thomson theory from being the last word on the subject. I do not pretend to be a field naturalist in any sense, and my cautionary note concerning the flow of glaciers I would ask readers to apply to the flow of rivers also, and to interpret the whole of my letter as a hint and exposition of theory rather than as an assertion and statement of fact.

OLIVER LODGE.

November 20.

SIR OLIVER LODGE'S letter in NATURE of November 7 on the winding of rivers in plains has induced me to measure the velocity of flow in different parts of a bend in the river Wey near here. A short line—17 feet—was measured on the bank at the bend, and marks set up at right angles to it, and the time taken by blocks of wood to move between the marks measured with a stop-watch. The distances of the blocks from the inner bank were estimated in terms of the breadth of the river, with the following results:—

Distance from inner bank	Velocity in feet per second
0.3	0.30
0.5	0.45
0.6	0.55
0.8	0.71

This does not bear out his statement that "the flow is most rapid on the inner or sediment-depositing side of the bend," and that the water near the concave bank is nearly stationary, but upholds the common opinion of boating men and others.

The numbers refer to the surface flow only, and it is quite probable that there may be the undercurrent across the bed of the river; in fact, the sudden shelving so often noticed in rivers, and harbour channels where there is a strong tide, has led me to suspect for a long time such cross-currents.

The surface flow-lines are neither parallel nor straight. For this reason a short base line was used, and the velocities obtained are only approximate, but are certainly not far from the above values.

At the end of the experiments two blocks of wood were simultaneously floated down the stream, one near the inner, the other near the outer bank, and the latter won the race by twelve seconds.

However, I noticed that close to the outer bank (within 2 or 3 feet of it) there were back eddies forming a set of feeble whirlpools, and these may play an important part in the scouring.

R. C. SLATER.

Charterhouse, Godalming, November 17.

The Occurrence of Copper and Lithium in Radium-bearing Minerals.

It is possible that the remarkable action of radium emanation on copper, as recently announced by Sir William Ramsay (NATURE, July 18, vol. lxxvi., p. 269), may not be confined to solutions, but may also occur in the solid state. If so, it should be found that those minerals which contain both radium and copper contain lithium also.

In connection with another investigation, I had separated a sample of pitchblende, from Gilpin County, Colorado, into its principal constituents. The amount of copper in the sample was considerable. The final filtrate, remaining after the separation of the various analytical groups, contained only ammonium and alkali salts. After the evaporation of a portion of this solution, representing about 3 grams of the mineral, and the volatilisation of the ammonium salts, a small residue was left which, when examined spectroscopically, gave a very bright lithium line. This result led me to examine four other samples of uranium-radium minerals. These samples com-

prised a second specimen of pitchblende from the same locality as the first; carnotite from Montrose County, Colorado; gummite from North Carolina; and pitchblende from Bohemia. All the minerals, with the exception of the gummite, contained both copper and lithium in easily recognisable amounts. The qualitative analysis of 1 gram of the gummite showed no copper, but did show the presence of lithium in small amount.

The discovery of lithium and copper in uranium-radium minerals does not necessarily indicate the change of copper into lithium, since the presence of lithium may have been fortuitous; but assuming the accuracy of Prof. Ramsay's observation, the presence of lithium in uranium-radium-copper minerals is precisely what one should expect. The presence of lithium and absence of copper in the sample of gummite may be explained by the assumption that the change of copper into lithium has been completed. It may be added that even if further investigation should reveal the absence of lithium in any uranium-radium-copper mineral, the result would not constitute a valid argument against Prof. Ramsay's hypothesis, since the latter referred to copper in solution and not in the solid state.

HERBERT N. MCCOY.

University of Chicago, November 6.

A Convenient Formula in Thermodynamics.

It is possible that many teachers of thermodynamics may not have noticed that the characteristic equation for 1 kilogram of air takes the easily rememberable form $p\bar{v}=T/10$, when p is measured in standard atmospheres, \bar{v} in cubic feet, and T in thermodynamic centigrade degrees, the accuracy of the even integer being fully as great as that of the gas law itself. These units are, of course, a curious mixture of the English and Continental systems, but this seldom makes much difference in actual problems, and the convenience of the formula for rough mental computations is sometimes very great.

The data upon which this computation of the gas constant is based are the statements in the third (1905) edition of Landolt and Boernstein, that 1 litre of air under standard conditions weighs 1.2928 grams, and that an English yard is 0.91438 metre, and the value $T_0=273^{\circ}.13$ given by Buckingham in the Bulletin of the Bureau of Standards for May. The value $R=0.1$ is consistent with these assumptions within less than one-fiftieth of 1 per cent.

The corresponding values of C_p and C_v , reduced from the mean of the results of Regnault (1862), Wiedemann (1876), and Witkowski (1896), are $C_p=0.3467$ and $C_v=0.2467$ cubic-foot-atmospheres.

Cambridge, Mass.

HARVEY N. DAVIS.

A Miocene Wasp.

IN NATURE of June 13, 1901 (vol. lxiv., p. 158), I described a curious variation in a bee (*Epcolus*), the second transverso-cubital nerve of the wings having its lower half absent. This aberration was evidently an example of "discontinuous variation," and from its occurrence in several specimens captured at the same place, it seemed that it must be inherited. There is a genus of Scoliid wasps, *Paratiphia*, in which the absence of the lower part of the first transverso-cubital nerve is normal. The species, found principally in the southern and western parts of North America, are quite numerous; and the broken nerve, looking exactly like the aberration described in the bee, is a good generic character. Nothing has hitherto been recorded concerning the past history of this genus, but I have before me a well-preserved *Paratiphia* from the Miocene shales of Florissant, Colorado, collected by Mr. S. A. Rohwer at station 14 in 1897. This insect, which I shall call *Paratiphia prae fracta*, is black, with the thorax large and robust (about 4 mm. long and $3\frac{1}{2}$ mm. broad); the head rather small (slightly more than 2 mm. diameter); the antennae thickened; the abdomen constricted between the first and second segments, and parallel sided beyond; the hind

tibiae dentate on the outer side; the wings clear hyaline, anterior wing about 7 mm. long, with the large stigma very dark, the nervures light ferruginous. The specimen is a male. The venation is perfectly normal for *Paratiphia* in every respect, including the broken transverso-cubital vein.

It is certainly an interesting fact that a character like that of an imperfect vein, which can arise suddenly as a mere aberration, should persist from Miocene times (at least) to the present, and characterise a whole genus. From observations on bees and other Hymenoptera, it is evident that this modification has occurred many thousands of times without becoming permanent; that it has become so in the case of *Paratiphia* is therefore all the more remarkable.

T. D. A. COCKERELL.

University of Colorado, Boulder, Colorado,

November 7.

The Eggs of the Platypus.

SINCE writing the notice of Mr. le Souef's book on Australian wild life in NATURE for October 24 (vol. lxxvi., p. 635), I have been making inquiries as to the existence in collections of any examples of platypus egg definitely known to have been taken from the nest after extrusion. It has been suggested to me that Mr. Caldwell and Dr. Semon might possess such specimens. The former gentleman told me, however, some years ago that he never found an extruded specimen, and I learn from Dr. Semon that he was equally unsuccessful in this respect. In his letter he writes that "I have never found extruded eggs of *Ornithorhynchus*, but only intra-uterine specimens. To obtain the former, it would be necessary to open a very large number of burrows."

In the central hall of the British Museum is shown an egg-shell of a platypus sent from Queensland by Mr. G. P. Hill in 1902, but this, like Mr. le Souef's specimens, was doubtless found in its present broken condition.

Such broken shells might, apparently, be extruded from the uterus with the fetus; and, so far as I can find, there still appears to be no definite evidence that the eggs are really laid entire.

THE REVIEWER.

November 15.

Literature relating to Australian Aborigines.

IN NATURE of May 9 (vol. lxxvi., p. 32) I observed a communication from Mr. R. H. Mathews in which he makes certain statements imputing to me, by insinuation, what amounts to literary dishonesty. Will you kindly permit me to express my views on the subject?

Mr. Mathews says that I have "ignored" certain statements made by him in communications to scientific societies, and which were published before the appearance of my "Native Tribes of South-East Australia" in 1904, in which I record the same facts.

Mr. Mathews speaks of my account of the Dora ceremony, and makes the following insinuation:—"Dr. Howitt 'ignores' that I described that rite in January, 1900. If he did not avail himself of my work, which appeared four years earlier than his, then there is a wondrous agreement in our details."

My account of the Dora ceremony was given to me by Mr. Harry E. Aldridge in 1882. It was from his own experiences at the ceremonies on more than one occasion, and he had a knowledge of the tribal language.

Mr. Mathews also says that I "ignore" a map which he published in 1900, and which is substantially the same as one at p. 44 of my work. He adds the following sentence:—"In comparing the two maps and the explanatory letterpress accompanying mine, we observe a marvellous coincidence. Many other examples could be cited."

The map showing the native tribes of South Australia at p. 44 of my work was compiled from data supplied by the Rev. Otto Siebert, who obtained them by careful and protracted inquiries from persons knowing the several localities, as well as from personal knowledge. Practically

the details as to the tribes of the Lake Eyre district and of the Flinders Range are substantially the same as those given in a sketch-map which accompanied one of my pioneer papers entitled "The Dieri and other Kindred Tribes of Central Australia," which appeared in the Journal of the Anthropological Institute of August, 1890. This was the result of investigations made from 1871 to that date. In this instance, if I were to follow Mr. Mathews's example, I might suggest that he has "ignored" this pioneer work, and express something similar to his "wondrous agreement in our details." There is, however, nothing to wonder at in the agreement of two investigations of the same subject. My statements are based upon independent investigations, made in some cases many years ago, when the results were recorded for future publications. If Mr. Mathews finds instances in which his information has a "wondrous" agreement with mine, he may rest assured that his conclusions are correct.

My information as to the Yantruwunta class-names *Tiniwa* and *Kulpuru* was received from my correspondent the Rev. Otto Siebert, and was based on his personal knowledge, in 1897.

I learn from Mr. Mathews's letter that he has sent "more than one hundred contributions to various scientific societies." I have only met with two of them, neither of which recommended itself to me by its accuracy. It is therefore difficult to understand how I can have "ignored" statements of which I am ignorant.

It will be evident that there is no foundation for Mr. Mathews's injurious insinuations, which, I regret to say, bear upon them evidence of a personal animus. The case is one of *Honi soit qui mal y pense*.

A. W. HOWITT.

Metung, Victoria, July 8.

IN the foregoing remarks Dr. A. W. Howitt states that at the time his book appeared, in 1904, he was not aware that I had published a description of the Toara (Dora) ceremony, and also a map of South Australia, four years previously. It seems incredible that he did not make himself acquainted with the current literature bearing upon the Australian aborigines up to the time he published his book.

If Mr. Howitt obtained his account of the Dora from Mr. Aldridge in 1882, it is remarkable that he did not publish it until twenty-two years afterwards, especially as he was very prompt in publishing his report of the Kuringal ceremony in 1884 and the Jeraeil in 1885. He does not, however, appear to have had much confidence in Mr. Aldridge's account of the laws of marriage and descent in vogue among the same tribes who practised the Dora ceremony. He says that Mr. Aldridge sent him "a number of tables of marriages and descents, which differed considerably amongst themselves; so much so that the correctness of some of them seemed doubtful."¹ Mr. Howitt did not run the risk of printing more than one table out of them all, but even that one is erroneous, as I have demonstrated elsewhere.

Mr. Howitt refers to a "sketch-map" published by him in 1890.² In that map he showed the *Urapuna* (my *Arrabunna*) tribe as being located away to the north of the *Awmani* (my *Ahminnie*). Not content with this inaccuracy, he increased its magnitude by placing another tribe, which he called the *Wongkurapuna*, on the east of the *Urapuna* and *Awmani*. He was, apparently, not at that time aware that the two names, *Urapuna* and *Wongkurapuna*, represent the same people, the prefix *wonk* merely meaning "speech."

Again, the *Kuyani* (my *Kooyeeunna*), which I place on the southern end of Lake Eyre, is shown on Mr. Howitt's "sketch-map" as occupying the country I have correctly allocated to the *Kutchnamooha* tribe. His map is altogether a blank as to the numerous tribes occupying the country from south Lake Eyre to Port Lincoln and Fowler's Bay. Even Mr. Howitt himself did not reproduce his own map in his book of 1904, but preferred to

utilise one which is identical with mine. Spencer and Gillen were apparently misled by the worthless map of 1890. In referring to the *Urabunna* tribe, they speak of "the Dieri, whose territory adjoins the *Urabunna* on the south."¹ My map shows the *Urabunna* on the western or opposite side of Lake Eyre to that on which the *Dieri* is situated.

Mr. Howitt states that he got the phratry names *Tiniwa* and *Kulpuru* independently. Even if so, he should have made himself acquainted with and referred to my prior reports of 1899 and 1900. He shirks my statement that he "had never heard of the Blood divisions," and he also passes over my claim to priority in reporting certain important facts in the sociology of the *Wiradjuri* tribes.

It is asserted by Mr. Howitt that he has only seen two of my articles on the Australian blacks. I contributed five articles to the Royal Society of Victoria, of which Mr. Howitt was a member, and I was told that he took part in the discussions upon some of them. They were all printed in the Proceedings of that society, vols. vii., ix., and x., and these volumes were issued to Mr. Howitt in virtue of his membership.

Numerous articles of mine have been published by the anthropological societies of the following places:—London, Berlin, Washington, Paris, and Vienna, as well as by other societies. I presented forty separate copies (reprints) of various papers written by me on the aborigines to the public library in Melbourne in 1899. A bibliography of nearly all the articles published by me is printed in the Journal of the Royal Society of New South Wales, vol. xxxviii., pp. 376–381. The whole of my works are therefore within reach of any man who wishes to consult them.

As I am about to make a strong assertion, I will confine myself to five articles published in the Proceedings of the Royal Society of Victoria and twelve in the Journal of the Anthropological Institute. If Mr. Howitt still maintains that he has not seen these seventeen articles, I cannot believe him.

In regard to Mr. Howitt's remark that where I find "instances" in which my information agrees with his I may rest assured that my "conclusions are correct," I may briefly mention that on one occasion, in 1894, I did rely on Mr. Howitt's assertion that descent in the *Kaibara* tribe is in the male line. From personal inquiries among the blacks in 1898 I was able to correct my former statement, and to show that descent is in the female line.² Mr. Howitt, however, repeats his former error in his book at p. 229, where he says that "descent [in the *Kaibara*] is in the male line."

Mr. Howitt accuses me of "personal animus." There cannot be any question about the "personal animus" which prompted him to ignore my prior work, which had the effect of temporarily misleading an English reviewer. Nor can there be any mistake about the animus evinced in the statement that he has "only met with two of my papers, neither of which recommended itself to him by its accuracy." His object in both cases is manifestly to make little of my work. Even now, while he tells us that he ignored my prior work in "ignorance," he does not express any regret, but attempts to justify the course he adopted.

In the present case both authors reside in the same country and are known to each other as workers among the same tribes. I cannot help repeating that it is both "marvellous" and "wondrous" if they did not make themselves acquainted with each other's publications, especially as there were intervals of four, five, and eight years in which to do so. Mr. Howitt's experiences should be a warning to others to avoid the pitfall of claiming originality for work which has already been published some years in scientific journals of undoubted repute.

R. H. MATHEWS.

Parramatta, New South Wales.

[No further correspondence can be published on this subject.—ED. NATURE.]

¹ "Native Tribes of S.-E. Australia," p. 231.

² Journ. Anthropol. Inst., xx., p. 30.

¹ "Native Tribes of Central Australia," p. 59.

² Proc. Amer. Philos. Soc., Phila., xxxvii., p. 33c, with map.

NOTES ON ANCIENT BRITISH MONUMENTS.¹II.—*The Cornish Cromlechs.*

FROM the point of view of orientation, the interest in barrows, tumuli, chambered cairns, dolmens and cromlechs lies in the assumption that they were built for live men to dwell in. That they all represent different stages of the same structure—stages depending upon decay due to the action of rain, or wanton destruction in the interests of agriculture—can be gathered from a complete study of the whole evidence.

Borlase, in his "Dolmens of Ireland" (p. 426), refers to some of it. Mr. John Bell, of Dundalk, a famous antiquary, disinterred no less than sixty cromlechs from cairns or barrows in Ulster. Many "cairns," indeed, on the early Ordnance maps are marked dolmens in subsequent editions, the interior stone framework being the only thing remaining after the covering of soil had been re-distributed over the fields, an ordinary "agricultural" operation.

Borlase insists upon the fact that large tumuli were not essential; "all that was necessary was that the walls of the cell or crypt should be impervious to the elements and to wild animals" (p. 427). As a corollary to this, "in distinction from the cist, it was the intention and object of the builders that access should be had to it [the cell or crypt] from without."

It was this intention which has provided us with "creeps," "fougous," "allées ouvertes," and "allées couvertes," and these, as I shall show, are of as high importance as the cell itself from the orientation point of view. They all constituted, not only entrances, but "outlooks" for the man inside; and it matters not whether the cell was as extensive, as complicated, as carefully built, and the creep as long, as at Maeshowe, or whether we deal with a cell of the simplest and rudest form, with a bare entrance and outlook, such as the creephole in one of the stones at Treveithy.

Archæologists, as a rule, though not, I think, universally, consider the whole series of structures we are now dealing with as having originally, whatever their present stage, been constructed for tombs.

For them there is little difference between such a cell with an entrance such as the barrows and cromlechs reveal; and a cist, which is simply a rude small coffin built up of five or six stones, in which there is only room for the body, and to which there is no entrance at all. The evidence on which they rely is that certain things have been found in these cells, which they consider can only have been associated with burials.

¹ Continued from p. 59.

The argument against this view does not only depend upon the details of structure, such as revealed in Maeshowe, perhaps the most perfect cell now remaining, but upon their association with other stone monuments, especially with stone circles; so that as the Gorsedd we see to-day is but a survival of the ancient stone circle which was associated with living men, the cromlechs must, in all probability, have been also associated with living men. They are not merely tombs. I hold that they were never meant for tombs, and to argue that they were built for sepulchral purposes because people have since been buried in them is to deny that a church was built for the worship of God because we find corpses in it.

If we consider frankly and fairly the position of the first priests and leaders of the people who controlled the worship and the daily life of the early inhabitants of Britain, we can arrive at a quite plausible theory concerning these cromlechs.

The circle builders had to look after the welfare of the surrounding population, and see what they could do to help them in every way; and when we consider



Photo. by Lady Lockyer.

FIG. 7.—Cromlech on Lesquit Farm, near Bodmin. The upright stone on the right is oriented to the May sunrise.

that, I think much of the mystery surrounding the cromlech is at once cleared away. In the first place, there is no doubt in my mind that these people, who had command of the sea, and came over here and built the circles and cromlechs along our shores, and cared very little for going inland where they could not be supported by their constantly returning ships, were Semitic in their origin, or familiar with the Semitic peoples. In any case they must have lived somewhere, and with some kind of shelter.

Now we know from Robertson Smith that Semitic worship was carried on in caves, and one reason for this might have been that the priests really lived in caves.

Now the cromlech was really an improvement upon the natural or artificial cave, and, further, if there were no caves, some shelter must have been provided. The easiest way to protect the priests and priestcraft from the elements and from animals was by erecting such a structure as stones would enable them to do,

and then covering it with earth which could not fall upon them, and I look upon the stones of the cromlech as the skeletons of the barrows which were thus built to protect the people living in them.

One of the first things that they wanted to be pro-

They must have required food as well as drink, and they must have cooked their food, or have eaten it raw; the evidence of bones and ashes shows that they cooked it. Considerations of this kind suggest that many of the things, including structure and contents,

that archæologists have associated with death may as reasonably and probably have been associated with the life conditions possible to the early inhabitants of our islands.

The above-stated view that men really lived in the cromlechs, which we know to have been associated geographically with the circles, would be strengthened if we could show that the construction of the cromlechs was such that they were associated with circles in other ways, and in such ways as would require the presence of the same men in both.

I have recently commenced the study of the cromlechs from this point of view, using the orientation theory as my guide. The work at the circles has shown conclusively—to my mind at all events—that they were used, among other things, as calendars or almanacks, to watch the sun's course throughout the year and so locate the various festivals which are all older than Christianity; and as

night-dials to determine the lapse of time during the night and the rising of the morning star, so that the morning fire-sacrifice could be made at the moment of sunrise.

tected from was damp. It was important to keep out the rain, because they had their fires to look after, not merely for cooking purposes, but for sacred purposes, and if they did not keep their sacred fires going, as

Mr. Baring-Gould believes they did, they must have been, at all events, sure of a supply of dry wood. That is one reason why they should try to keep out the damp. Britain was then much richer in wild animals than it is now, and measures had to be taken to protect the priests, both in the day and during the night, from the incursions of animals by keeping them out in some way or other. I think this is a point which archæologists have not sufficiently considered. There were no carpenters in those days. They could not cut down a tree. They could not make a door. When we consider the matter carefully, we find that the only way to protect themselves was by constructing, however large the chamber, an entrance to it which should be very small, because it must have been closed by a small stone, capable of being handled by one or two men, the only way they had of sealing it.

Then these people had to drink, and it was only natural that they should have a water supply in these cromlechs. May that not be the real origin of all the crockery, large or small, and the horn spoons, that one finds in these places?

Now all this would require a staff, and both the staff and the fire would require some shelter. I have assumed the cromlech to be this shelter, and this assumption enables us to go a step further. A convenient arrangement would be that much or most of



Photo. by Lady Lockyer.

FIG. 8.—Druid's Altar at Pawton, near Bodmin, looking to May sunrise.



Photo. by Lady Lockyer.

FIG. 9.—Druid's Altar, looking towards November sunset.

the watching during the night—it was all night work if in the term night we include the dawn—could be done in the shelter itself, and this could be managed if the entrance to it was aligned on the part of the horizon to be chiefly watched.

Now what were those points? The circles supply the information. They were chiefly, as the May-year was then paramount, the sunrise place in May and August, when the sun's declination is 16° 20' N., and that in November and February, when the sun's declination is 16° 20' S., these two sunrise places marking off the quarters of the year and the chief festivals. Next came the rising place of the clock-star, and later the place of sunrise on the longest and shortest days—the solstices.

The question to be settled, then, is, Do the entrances to the cromlechs point in these directions? Could the priests have done their night work under shelter?

Some of the data used in the attempt to answer this question I have obtained myself from the monuments; in other cases I have endeavoured to get the required information from the so-called plans or surveys to be found in archæological records. The great majority of these, however, I have found to be utterly useless for my purpose. A brilliant exception, however, is found in the carefully oriented work of Lukis on the Cornish monuments, so I will begin with Cornwall and the May-year sunrises.

The following table gives the theoretical values of the azimuths of the sunrise places. It has been previously shown in my book, "Stonehenge," that the circles conform to them.

Cornwall. Lat. 50°.

*Conditions	True Azimuths	
	May and August sunrise	November and February sunrise
Sea horizon, refraction, semi-diameter	N. 62 58 E.	S. 64 32 E.
1/2° hill " "	N. 63 44 E.	S. 64 22 E.
1° " " "	N. 64 30 E.	S. 63 34 E.
1 1/2° " " "	N. 65 16 E.	S. 62 50 E.
2° " " "	N. 66 E.	S. 62 5 E.

Following this table I give another, showing the azimuths of most of the chief Cornish cromlechs.

Orientation of Cornish Cromlechs.

Name	Remarks	Azimuths (true)
SERIES 1		
Lesquoit Farm	My own observations, April, 1907, near Bodmin. Hill, 1 1/2°	N. 64 E.
Druid's Altar ..	My own observations, April, 1907, at Pawton. Hill, 1 1/2°	N. 64 E.
Lanyon Quoit...	This was "re-erected" before Lukis's time, so I have taken Borlase ("Antiquities of Cornwall," plate xxi), assuming his N. is N. true ...	N. 66 E.
Mulfra Quoit ...	Lukis, plate xix	N. 63 E.
Chywoone Quoit	" " xx	N. 64 E.
Zennor Quoit ...	" " xxi	N. 64 E.
Three Brothers of Grugith ...	" " xxiii	N. 64 E.
SERIES 2		
Trewethy ...	My own observations, April, 1907, near St. Cleer	S. 62 E.
Caerwynen ...	Lukis, plate xxiv	S. 65 E.
Pennance ...	" " xxix	S. 64 E.

We see, then, that many of the chief Cornish cromlechs are aligned on the May and August or the November and February sunrises as carefully as are the outstanding stones connected with the associated circles.

The true azimuths have been determined from magnetic observations made by Lukis and myself by subtracting 20° 30', the west variation in Lukis's time, and 18° at the present in the case of my own observations; it will be seen that they agree closely with the theoretical values given above.

The above list, however, does not exhaust all the cromlechs in Lukis's work perfect enough to allow of their orientation to be determined. We have:—

Name	Remarks	Azimuths (true)
Tregiffian ...	Lukis, plate xv... ..	N. 52 E.
Barrow near Tregaseal circles	Lukis, plate xvii, reproducing } Trounson... .. }	S. 50 E.

These are solstitial alignments. The variation of 1° or 2° in this and the preceding table no doubt arises from the fact that the height of the horizon varies from place to place, and no information on this head is given by Lukis.

NORMAN LOCKYER.

THE PRESERVATION OF EGGS.

FEW people not directly connected with the trade have any adequate idea of the extent to which the egg of the domestic fowl is imported into this country. Whether the volume of this trade ought to be an unmixed source of satisfaction to us is another question, for there can be little doubt that if some of the energy, enterprise, and organising power which have been turned to such excellent account in Denmark, for example, were applied to the production of eggs in this country, we should be less dependent than we are on foreign supplies. Intimately bound up with this question of egg production is that of their preservation, but although much has been written on the value of particular methods, no systematic investigation of the conditions under which eggs must be kept to maintain and ensure their quality as food has hitherto been attempted, nor has any proper comparison been made as to the relative merits of the various methods which are practised. Those who are interested in this important subject will therefore welcome the appearance of a paper by Mr. Fr. Prall in a recent number of the *Zeitschrift für Untersuchung der Nahrungs- und Genussmittel* (No. 7, vol. xiv., October 1, 1907, p. 445), in which the question is treated both observationally and experimentally with all the precision and care which should characterise a scientific inquiry.

The adequate solution of this problem demands that the eggs when preserved shall maintain their normal appearance, smell and taste; in other words, they must in nowise differ in chemical and physical characters, or in behaviour on cooking, from fresh eggs. The chemical and physical changes to which eggs are naturally subject are largely dependent on the temperature and relative humidity of the air, and on the presence in it of moulds and germs. In an absolutely sterile atmosphere at a sufficiently low temperature and of a proper degree of humidity, eggs will preserve their "freshness" for very long periods of time, if not indefinitely; and all successful methods of keeping eggs imply a practical recognition of these conditions.

Of the various methods of distinguishing old and

bad eggs from fresh eggs, one of the simplest is to make a hole of about the size and shape of an egg in a wooden or tin box, and hold the egg in the inside of this box against the light behind the hole. Good sound eggs are thus seen to be perfectly transparent without striations or spots, and the bubble of air within is not wider in diameter than a sixpence.

Eggs selected for preserving should be those of well-fed fowls—preferably from those of which corn is the chief diet. The eggs should be quite clean; if dirty they should be washed with a little dilute alcohol (50 per cent.), and carefully dried.

In what may be called "dry conservation," the main thing is to keep the surrounding air as clean as possible, and free from smell. The temperature should be low, but should not sink much below 32° F., otherwise freezing might cause the eggs to burst. The relative humidity should be from 60 to 80. The best plan is to stand the eggs on an egg-rack in a cool, light cellar, and preferably in an ice closet, or, on the large scale, in cold-air stores, with their points downwards, so that the air can circulate freely round them. Nothing is gained by turning the eggs at short intervals, say weekly, as recommended by some; or by packing them in salt, sawdust, powdered coal, or charcoal, wood ashes, sand, &c. Some of these things are found to "taint" the eggs; others are apt to become damp and set up the action of moulds.

It is occasionally recommended that the egg should be protected from the outer air by covering the shells with fat, vaseline, paraffin wax, collodion, &c., or that the shell should be treated with salicylic, boracic, or hydrofluosilicic acid, or even sulphuric acid, whereby the calcareous material is chemically altered and made less pervious. Immersing the egg in Condy's fluid or a solution of potassium permanganate has also been suggested. Eggs so treated in no case were found to keep better than by cold storage in pure air.

Eggs which cannot be kept in cold stores or in an ice-chest may be preserved by Hanika's method. This consists in first putting the clean eggs into recently-boiled water at a temperature of about 110°, and then dipping them into boiling water for 10 seconds, after which they are to be immediately put into cold water. By this treatment all organisms are killed, and a hard coating is formed between the shell and the "white." The shells are finally washed with a little strong alcohol, dried, and placed in clean, dry saw-dust. Eggs so treated were found to be in perfect condition after the lapse of nine months.

Attempts are frequently made to preserve eggs by immersing them in solutions of various salts, or of substances which are known to act as antiseptics. Few of these solutions give a wholly satisfactory result; indeed, many of them, as, for example, salt, salicylic acid, borax, and glycerin, penetrate the shell, and either harden the yolk or impair the flavour. Of these liquids lime-water has been most frequently used, but by long immersion in this solution the yolk is apt to mix with the white, and the shell is rendered so fragile that it is very liable to be broken on boiling. The white of an egg which has been kept in lime-water is difficult to "whip." Much better results are obtained by the use of a 10 per cent. solution of water-glass, especially if the shells are smeared with fat or vaseline, whereby the slight taste of the alkali which the eggs are otherwise apt to acquire may be obviated.

Mr. Prall's paper, which contains the results of many hundreds of experiments and carefully made observations, arranged in tabular form and set out in detail, is a valuable contribution to the economics of an important food problem, and merits careful study by those who are interested in the subject.

NOTES.

ON Thursday last, November 21, the Lord Mayor of Liverpool presided over an influential gathering of Welshmen from that city and from the Principality, and the following resolution was carried unanimously:—"That this meeting believes that the time has come for the early history of Wales to receive full and systematic investigation by all the means at the disposal of modern archaeological science." The Oxford professor of Celtic (Sir John Rhys) supported this at some length, pointing out that sporadic excavations were not enough in themselves, and that a systematic survey should also be made of all the antiquities of Wales and the Marches. This would entail, not only the digging over of barrows and graves, but the orientation of stone circles, cromlechs, and camps. The theodolite as well as the shovel should be called into requisition; in fact, no means should be neglected which might tend to increase the value of the investigation. Two other motions were passed, and a committee, which includes Dr. Arthur J. Evans and Prof. Haverfield among its members, was appointed for the carrying out of the work. The weight of the undertaking will fall on the University of Liverpool, which, however, is to receive assistance from the Welsh colleges. Our readers need not be reminded that Liverpool University lays special stress on the study of archaeology, and includes among its staff Prof. Bosanquet and Prof. John Garstang. We have every confidence that any work undertaken by Liverpool will be done well and thoroughly. The organising secretary is Mr. Owen Rhoscomyl, 38 Bedford Street, Liverpool.

THE Wilde medal for 1908 of the Manchester Literary and Philosophical Society has been awarded to Prof. J. Larmor, F.R.S., and will be presented to him on March 3 next. Prof. Larmor will on that date deliver the Wilde lecture on "The Physical Aspect of the Atomic Theory," and will be entertained afterwards at a dinner in his honour.

THE Physical Society announces that the third annual exhibition of electrical, optical, and other physical apparatus will be held at the Royal College of Science, South Kensington, on Friday evening, December 13, from seven to ten o'clock.

THE executive committee of the National Physical Laboratory has appointed Mr. G. W. Walker, official assistant to the professor of natural philosophy in the University of Glasgow, as superintendent of the Eskdalemuir Observatory. Mr. Guy Barr, of Christ's College, Cambridge, has been appointed to an assistantship in the metallurgical and chemical department of the National Physical Laboratory.

THE death is announced, at the age of sixty-nine, of Prof. T. Barker, professor of mathematics at Owens College, Manchester, from 1865 to 1885.

AN international exhibition of applications of electricity will be opened at Marseilles on April 19, 1908, under the patronage of the Government of the French Republic, and with the cooperation of the local authorities, municipal council, general council, Board of Trade, and other bodies. Particulars can be obtained at the office of the Commissariat-General, Boulevard Louis Salvator, 52, Marseilles, and at the Secretariat-General, 63 Boulevard Haussmann, Paris.

THE *Times* correspondent at Cape Town reports on November 23 that the Chief Justice, presiding at a meeting of the National Preservation Society, urged the need of stronger measures to preserve rare flora and fauna from

extinction. The gnu, gemsbok, mountain zebra, eland, and giraffe were all nearly extinct. He said he remembered, when a barrister on circuit, seeing great herds where there are now railway stations.

At a meeting of the Royal Society of Edinburgh, held on November 4, the following were elected honorary fellows:—(1) as *British Honorary Fellows*, Sir A. B. W. Kennedy, F.R.S., Sir E. Ray Lankester, K.C.B., F.R.S., Dr. J. A. H. Murray, Prof. C. S. Sherrington, F.R.S.; (2) as *Foreign Honorary Fellows*, Prof. Emil Fischer, Berlin; Dr. G. W. Hill, New York; Prof. F. W. G. Kohlrausch, Charlottenburg; Prof. H. F. Osborn, New York; Prof. I. P. Pavlov, St. Petersburg; Prof. G. Retzius, Stockholm; Prof. A. Righi, Bologna; Prof. L. J. Troost, Paris.

THE meeting of the second International Conference on the Sleeping Sickness, which was to have assembled at the Foreign Office on November 1, has been postponed in order that the delegates may have before them the results obtained by Prof. Koch, who has lately been carrying out an exhaustive inquiry into the subject on the spot, and is now engaged in the preparation of his report. The conference will probably not meet before the middle of February. The British delegation will consist of Lord Fitzmaurice, Sir Walter Foster, M.P., Mr. A. Walrond Clarke, Mr. H. J. Read, Sir Patrick Manson, K.C.M.G., Colonel David Bruce, C.B., F.R.S., Dr. J. Rose Bradford, F.R.S., and Sir Rubert Boyce, F.R.S.

A COMMITTEE having for its object the collection of information dealing with sleeping sickness, the stimulation of research into the cause, method of transference, and cure of the disease, and the publication from time to time of communications with reference to it, has been formed at Liverpool. The committee comprises Sir Alfred Jones (chairman), the Lord Mayor of Liverpool, Prof. Moore, Prof. Salvin-Moore, Prof. Annett, Prof. Sherrington, F.R.S., Dr. Stephens, Dr. Anton Breinl, Dr. Prout, C.M.G., Dr. A. Evans, Dr. M. Nierenstein, Mr. J. W. Garrett, and Dr. J. L. Todd. Sir Rubert Boyce, F.R.S., and Mr. A. H. Milne are the corresponding secretaries.

A DESPATCH recently received at Washington from Lieut. B. H. Camden, commanding a revenue cutter in Alaska, reports the entire disappearance of McCulloch Peak, Bogoslof Island (which rose from the sea in 1796), as the result of volcanic disturbances. The explosion which destroyed this peak has been followed by remarkable changes in the profiles of Mount Makush and neighbouring mountains, which are now softened to a general symmetry by a padding of lava dust that has almost disguised them beyond recognition. A vast quantity of this material, hundreds of feet in depth, has been deposited over the entire island.

It is announced in *Science* that the Field Museum of Natural History, Chicago, has profited by a decision of the Chicago Probate Court to the extent of 86,000l. The money was paid by the late Mr. Marshall Field to the trustees of the museum prior to the date of his will, which contained a bequest of 1,600,000l. to the institution. A suit was brought by the trustees against the executors of the will to determine whether the bequest was intended to be exclusive of the amount previously donated. The judge decided the suit in favour of the museum. From the same source we learn that about four acres of ground have been set apart in the block adjoining Washington Park and the Midway Plaisance to serve as a botanic garden for the University of Chicago. The garden will

be easily accessible from the Hull Botanical Laboratory, and is to be strictly a laboratory garden, which will add greatly to the facilities for experimental work. The area, it is hoped, will be largely increased later.

THE Home Secretary has appointed a departmental committee to inquire into the subject of artificial humidity in cotton-weaving factories. The members of the committee are Sir Hamilton Freer-Smith (chairman), Mr. J. Cross, Mr. H. Higson, Mr. T. Roberts, Mr. D. J. Shackleton, M.P., and Prof. J. L. Smith. The terms of reference to the committee are to inquire and report:—(1) what temperature and humidity are necessary in each case for the manufacture of different classes of cotton fabrics; (2) at what degrees of temperature and humidity combined definite bodily discomfort arises under the conditions of the work carried on by the operatives, and what, if any, danger to health is involved by continuous work at those degrees; (3) what means of cooling humid sheds (where necessary) exist, whether combined with the means of humidifying or otherwise, which are both efficient and practicable, having regard to the conditions required for the manufacture of the several classes of goods; (4) what special arrangements, if any, are necessary in order to admit of the proper ventilation of dry weaving sheds without prejudice to the process of manufacture. The secretary to the committee is Mr. D. R. Wilson, to whom correspondence may be addressed at the Factory Department, Home Office.

ONE of the most famous establishments for the distribution of new and rare plants in this country is that of James Veitch and Sons, Ltd., Chelsea, the late managing director of which company died on November 13 at Exeter at the age of thirty-nine years. Mr. James Herbert Veitch was a son of John Gould Veitch, who died in 1870. The son was admitted to the firm whilst still young, and when he was twenty-three years of age was sent on a botanical tour to Australia, New Zealand, India, Corea, and Japan, a tour which occupied a period of two years. After his return, Mr. Veitch published in "A Traveller's Notes" some impressions he had obtained in regard to the public and private gardening and botanical establishments he had visited for the purpose of studying the cultivated plants in those countries, and obtaining information as to the possibility of introducing new species to English gardens. After the lapse of several years he was appointed managing director of the Chelsea business, and continued to discharge the responsibilities of that position until last year, when failing health compelled him to retire from business. During the time he was managing director, a special representative was dispatched to the western portion of China, approaching to Tibet, for the purpose of collecting new species of plants suitable for cultivation in English gardens. The collector, Mr. E. H. Wilson, visited China twice, the two visits occupying a period of four years, and, as a result, a large number of new species of decorative trees and shrubs, conifers, perennial herbaceous flowering plants, and some biennials were secured. One species that has already become common in gardens is the Tibetan poppy (*Meconopsis integrifolia*), and others that have been distributed include species of *Senecio*, *Vitis*, *Davidia*, *Berberis*, *Buddleia*, *Clematis*, *Corydalis*, *Cypripedium*, *Deutzia*, *Jasminum*, *Primula*, *Rubus*, and many other genera. Mr. Veitch rendered a good service to botanical and horticultural literature by publishing last year the "Hortus Veitchii," which contains short descriptions and references to publication of most of the exotic plants introduced to British

gardens by the firm of Veitch during a period of more than fifty years.

IN the introduction to a paper on parasites of Bermuda fishes, published in the Proceedings of the U.S. National Museum (No. 1560), Mr. Edwin Linton observes that fishes from the inner reefs appear to be freer from encysted parasites than those living on the outer reefs and in deep water outside. This he explains by the fact that, owing to the exceeding clearness of the water, sharks, which are the great dispersers of cestode ova, do not frequent the shoal-water. In contrast to the comparative immunity enjoyed by the shallow-water forms is the strong infestation of the deep-water species, the large "groupers" and rock-fish, living at a depth of about fourteen fathoms, harbouring numerous encysted cestodes on the viscera, more especially the walls of the stomach.

THE young stages of two fresh-water American crayfishes form the subject of an elaborate memoir by Prof. E. A. Andrews, of the Johns Hopkins University, published in the Smithsonian Contributions to Knowledge (vol. xxxv., No. 1718). Of the two genera, *Cambarus* is limited to North America east of the Rocky Mountains, while *Astacus* is common to the Pacific slope of the northern half of the American continent and the two great northern continents of the Old World. As the former is the more specialised form of the two—more especially as regards the adaptation of the young for a life of association with the female parent—it is a reasonable hypothesis that the group reached the New World by way of what is now Bering Strait, while the evolution of *Cambarus* from *Astacus*-like ancestors took place in the region of Mexico. In regard to the latter part of this theory, it might, we think, be stated that the evolution took place from *Astacus* itself, seeing that this genus is common to both hemispheres. The larval stages of the two genera are found to differ in a number of important particulars, and other results of the investigation furnish a basis for practical application to the problems of the artificial cultivation of crayfishes and the introduction of new species.

IN the October issue of the *Emu* Mr. A. H. Mattingley gives some harrowing details of the results of the visit of a party of "osprey"-plume hunters to a colony of egrets. The writer had visited the site some months previously, when all was well, but on re-visiting the place at Christmas it soon became evident that mischief had been done. "As we drew nearer, what a spectacle met our gaze—a sight that fairly made my blood boil with indignation. There, strewn on the floating water-weed, and also on adjacent logs, were at least fifty carcasses of large white and smaller plumed egrets—nearly one-third of the colony, perhaps more—the birds having been shot off their nests containing young. . . . There were fifty birds ruthlessly destroyed, besides their young (about 200) left to die of starvation! This last fact was betokened by at least seventy carcasses of nestlings . . . which had fallen from the nests into the water and been drowned; while in the trees above the remainder of the nestlings could be seen staggering in the nests." Some of these unfortunates fell from time to time into the water, others died of inanition as they sat, while yet others stretched out their necks in the vain attempt to attract the attention of others of their own kind as they flew by with food in their beaks.

ACCORDING to the report for October, the additions to the Zoological Society's menagerie during that month were 214 in number, of which 107 were acquired by presentation

and three by purchase, while ninety-two were received on deposit, ten by exchange, and two were born in the gardens. Special attention is directed by the secretary to the following:—two chinchillas (*Chinchilla lanigera*), presented by the Countess De Grey; five viscachas (*Lagostomus trichodactylus*), three presented by the Countess De Grey and two deposited; a spotted cuscus (*Phalanger maculatus*), a species new to the collection, purchased; and a naked-throated bell-bird (*Chasmorhynchus nudicollis*), a ground-hornbill (*Bucorvus abyssinicus*), and two Arizona poisonous lizards (*Heloderma suspectum*), deposited.

THE University of California continues its useful series of publications on the religion, sociology, and languages of the Indian population of the State. The most valuable of those recently issued is a monograph, by Mr. A. L. Kroeber, on the religion of the Indians of California. This is a form of Animism; but its distinguishing characteristic is the strong belief in Shamanism, generally in connection with disease and death. Dancing, always accompanied by singing, is a conspicuous element in all tribal ceremonials. In one tribe the dance is performed by the women, who stand up to their hips in water. The author gives full details of the mode in which the Shaman or medicine-man is initiated. The profession, though lucrative, can hardly be said to be desirable. Among some tribes, if he loses several patients in succession, he is held responsible by the relatives; in another, murder seems to be his normal end; in a third, if he fails to cure, he is obliged to return his fee. The author also gives a most interesting account of the rites of initiation for girls and boys, of the domestic and tribal celebrations, and of the mythology and popular beliefs. In a second paper he furnishes an elaborate analysis of the Washo language of east central California and Nevada. It is satisfactory to learn that the University has acquired the large MS. collections on the North American Indians made during a long service among them by the late distinguished scholar, Dr. Washington Matthews. These are now being published, the first instalment being a collection of Navaho myths, prayers, and songs, with the text and a translation.

THE importance of algal growth in the colonisation of new ground is well recognised, but there are few records of detailed examination, so that the paper contributed by Dr. F. E. Fritsch to the *Geographical Journal* (November), embodying primarily the results of observation in the tropical climate of Ceylon, furnishes valuable data for reference and for extended inquiry. The blue-green algae, by reason of their colour and sheaths, are peculiarly protected against insolation and desiccation, and therefore comprise the bulk of aerial algal colonies in Ceylon. Dr. Fritsch distinguishes four methods of growth, which he calls *adhesive*, *tangled*, *tufted*, and *stratified*. The adhesive is the earliest and simplest type; tangled and tufted colonies, being better adapted as regards respiration and water absorption, proceed from the adhesive; the stratified form is a special modification determined by light or possibly by moisture conditions.

THROUGHOUT Germany the moors form an important feature of the vegetation, and on this account have engaged the attention of botanists, who have investigated their origin and formation. With the view of providing ocular demonstration of their development, Dr. C. A. Weber has designed two attractive coloured plates indicating in section elevation the different strata that have formed successive stages in the production of a moor. The diagram of the low-moor pictures the various zones from a mineral substratum

through rush-turf to coniferous forest. The plate illustrating the high-moor decked with cotton grass shows additional layers, notably sphagnum-zones superposed. The plates, measuring 110 cm. by 150 cm., are published by Gebrüder Borntraeger at the price of twenty shillings, or mounted on linen thirty-two shillings, a pair. The same firm is also publishing a set of plates illustrating pharmaceutical products at a subscription price of twenty-five shillings for five plates. A specimen plate of *Lignum Guaiacum* bears figures of wood and cortex as seen in different sections, also of the broken elements. The plates have been drawn by Mr. J. Pohl under the direction of Dr. E. Gilg.

THE latest Bulletin (No. 26) issued by the Geological Survey of Western Australia contains a series of miscellaneous reports which in themselves are not of sufficient length to warrant issue as separate publications. The volume covers eighty-seven pages, and contains fourteen illustrations and six maps. Mr. A. Gibb Maitland contributes papers on the occurrence of artesian water in the Northampton and Geraldine district, on the geology of Princess Royal Harbour, with special reference to the occurrence of petroleum, and on recent advances in the knowledge of the geology of Western Australia. Mr. H. P. Woodward gives an account of the geology of the country between the Ashburton and Minilya rivers. Mr. W. D. Campbell describes the phosphatic deposits near Dandaraga. The discovery is one of great value to the State. The deposit occurs in a series of beds which have been followed for twenty-two miles, one bed of fossil bone and coprolite rock, 7 feet in thickness, containing 15.32 per cent. to 39.34 per cent. of phosphoric acid. Mr. W. D. Campbell also contributes some notes on a geological map of the Greenough River district. Mr. E. S. Simpson describes a small meteorite, a siderite of the octahedrite type weighing 120.2 grams, from the Nuleri district of Western Australia. He also contributes a valuable report on the prevention of the external corrosion of goldfields' water-supply pipes. The Survey is to be congratulated upon the issue of these reports in a collective form, as they cannot fail to help to make known the varied mineral resources of Western Australia.

A THOROUGH change has occurred in the type of the weather during the past week, and more wintry conditions than at any time this season have been experienced. Night frosts have occurred in many parts of the country, and heavy snow has fallen over the northern portion of England. Cyclonic disturbances continue to arrive from the Atlantic with considerable frequency, and at times these are accompanied by winds of gale force. On Monday a whirlwind was experienced in the neighbourhood of Deal, and some farm buildings sustained considerable damage. The autumn has, on the whole, been exceptionally mild, the day and night temperatures being generally at least 5° above the average.

WE have received the fourteenth annual report of meteorology in Mysore, being the results of observations at Bangalore, Mysore, Hassan, and Chitaldrug for 1906. To the present report the daily means for the twelve years 1893-1904 have been added for each of those important stations. The director (Mr. J. Cook) states that, in accordance with the recent action of the Government of India, which has reduced the majority of its second-class observatories to third-class ones, the last two of the above-mentioned stations will hereafter be of the third class. For this reason the twelve-year means now published for

those places will be valuable as climatic standards of reference.

AN important article by Captain Tancredi in the *Rivista Coloniale* on the climate of the Italian colony of Eritrea, from observations at fourteen stations, is summarised in the Quarterly Journal of the Royal Meteorological Society for October. The observations at Massaua extend over ten years, and these, so far as regards temperature, rainfall, and humidity, have also been discussed with others extending (with small interruptions) over eighteen years (1885-1902) by Drs. Eredia and Memmo in the Bulletin of the Italian Geographical Society. The lowest of the mean monthly minima, 72°.3, occurs in January, and the mean maximum, 103°.1, in July; the mean yearly temperature is 86°.0. The year may be divided into two periods; from May to October the monthly means are above, and from November to April below, the mean value. The average annual rainfall is small, being only 7.19 inches, of which 6.04 inches fall between October and March; none falls in June. Malaria depends especially upon the altitude; places above 6000 feet are practically free from it, while in the low-lying regions it is endemic, and assumes an epidemic character in some months, apparently depending upon the régime of the rainfall in the locality.

THE Smithsonian Institution has published ("Miscellaneous Collections," xlix.) a memorial of the late Prof. S. P. Langley, accompanied by a bibliography of his published writings. It contains addresses by Dr. Andrew D. White, dealing with biographical details; by Prof. E. C. Pickering, dealing with Prof. Langley's contributions to astronomy and astrophysics; and by Mr. Octave Chanute, dealing with his contributions to aerodynamics. The last-named address is of considerable interest in consequence of the conflicting statements which appeared in the Press at the time in reference to the alleged success or failure of Langley's experiments on aeroplane flight. The facts of the case as chronicled by Mr. Chanute will now become a matter of history.

IN the Proceedings of the Edinburgh Mathematical Society (xxv.), Mr. R. F. Muirhead directs attention to a simple method of calculating first and second moments of certain elementary figures. By "second moments" are meant the same as "moments of inertia," the term being preferred, as it does not imply that we are concerned with masses. The method in question, or one very similar to it, was known at Cambridge many years ago, but does not seem hitherto to have been much discussed in print. As applied to the triangle, this method consists essentially in dividing a triangle into four smaller triangles by joining the middle points of the sides, and applying Huyghens's principle of parallel axes to obtain a relation between the moments of the original triangle and the four smaller ones.

AN interesting account of the Amalgamated Radio-Telegraph Company's new Transatlantic wireless station at Knockroe appears in the *Electrician* of November 15. The station is nearly completed, and when finished an Atlantic shipping service will be started, while as soon as the Canadian station is opened a Transatlantic service will be commenced. Three masts, 350 feet high, carry the insulated ends of some 300 wires, which descend in a cone to nine short masts, 70 feet high, erected in a circle about the taller ones. The Poulsen system of wireless telegraphy by undamped waves is employed, and it will be interesting to compare the Marconi and the Poulsen systems in a Transatlantic service. Possibly in this station

a higher voltage than that usually employed in the Poulsen system—400 to 500 volts—may be found necessary, but otherwise the apparatus installed does not differ very considerably from that at other stations. A great many improvements have been made in the different parts of the apparatus since Mr. Poulsen gave a demonstration of his system at the Queen's Hall, a full account of which appeared in these columns at the time (*NATURE*, vol. lxxv., pp. 105, 106), and the transmitter at Knockroe station has been designed to transmit waves 3000 to 5000 metres long, and capable of giving the desired wave-length without any variation. The company has also a new thermo-electric detector with which it expects to print Transatlantic messages, and in consequence to be independent of telephonic reception. The Poulsen-Pedersen "ticker" method of reception also has been adapted to working a relay and a Morse ink. This "ticker" receiver has been greatly improved upon, and the latest form recently established a long-distance record, receiving a ship signal at a distance of 2060 miles.

THE theory of the formation of the rainbow has been worked out more completely than hitherto by Prof. T. Tanakadate in the August number of the Proceedings of the Tokyo Mathematico-Physical Society. Taking account of the loss of light on reflection and refraction, and of the effect of polarisation, the author follows Airy's treatment, and obtains an expression for the intensity of light of each of the four bows due to drops of a particular size, in a form suitable for numerical calculation.

IN the *Physical Review* for October Prof. W. S. Franklin and Mr. L. A. Freudenberger describe an arrangement they have found very satisfactory for measuring the resistance of electrolytes without the use of electrodes. The electrolyte is placed in an annular glass tank which encircles the iron of a small transformer the primary of which forms one arm of a resistance bridge. In the corresponding arm of the bridge a similar transformer is placed, and the resistance of its secondary adjusted until the bridge is balanced, when an alternating current is supplied to it. The apparatus is so simple and the results are so good that electrodeless methods should replace some of those at present in use.

THE *Physikalische Zeitschrift* for October 24 contains abstracts of many of the papers read at the *Versammlung deutscher Naturforscher und Aerzte in Dresden* in September. The meeting, owing largely to the exertions of Prof. Hallwachs, was very successful. Of many papers of great interest, two may be mentioned. Drs. E. Gehrcke and O. Reichenheim have measured the change of wave-length of the light of the anode rays when they are seen end on, and have shown that when the anode is of sodium, lithium, or strontium the rays consist of molecules of these metals thrown off from the anode. Drs. Scheel and Heuse have measured the expansion of platinum between -183° C. and $+16^{\circ}$ C., and find as the mean result of three determinations by the two-microscope method and by Fizeau's method 1602×10^{-4} cm. per centimetre.

ARRANGEMENTS are being made by which the Proceedings of the London Mathematical Society may be subscribed for by the public at a uniform price per volume, the volumes to be supplied either in parts, as issued, or in volumes at the option of the subscriber. The arrangement will begin to take effect with the next volume, the first part of which will probably be published early in January, 1908.

THE *Anglo-German Courier* of November 23, published by the *African World*, is entirely devoted to an illustrated description in German and English of the recent visit of

the German Emperor and Empress to London. This is the final number of that periodical, which was started to promote friendly feelings between the people of Great Britain and Germany—a mission that may now be regarded as accomplished.

Two well-illustrated and conveniently arranged catalogues have been received from Messrs. Casella and Co. One deals with self-recording instruments for scientific, engineering, and industrial purposes, and the other provides descriptions of anemometers, air meters, and wind-direction instruments. The catalogues deserve the attention of meteorologists, teachers of geography, and other observers.

A SECOND English edition, which has been re-written, of Prof. A. F. Hollemann's "Text-book of Organic Chemistry," has been published in this country by Messrs. Chapman and Hall, Ltd., and by Messrs. John Wiley and Sons in New York. The first English edition was reviewed in *NATURE* of June 18, 1903 (vol. lxxviii., p. 149), and it will suffice to say that the present volume is, like the former, the translation of Dr. A. Jamieson Walker, and is from the third Dutch edition. The translator has had the cooperation of the author and the assistance of Dr. Owen E. Mott.

MESSRS. J. M. DENT AND CO. have published the first number of the *New Quarterly*, a review of science and literature, edited by Mr. Desmond MacCarthy. The price of each issue is 2s. 6d. net. If science is to receive the same amount of attention in subsequent numbers, the review should become popular in the scientific world. Of the nine articles included in the present issue, four deal with various departments of scientific work. Lord Rayleigh, P.R.S., discusses the question, "How do we perceive the direction of sound?" The Hon. Bertrand Russell writes on the study of mathematics; the Hon. R. J. Strutt, F.R.S., deals with the question, Can we detect our drift through space? and Mr. G. A. Paley contributes an article on biology and politics.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN DECEMBER:—

- Dec. 1. 2h. Mercury at greatest western elongation ($20^{\circ} 20'$).
 3. 18h. 30m. Mercury 4° W. from the Moon.
 7. 11h. 42m. Minimum of Algol (β Persei).
 10-13. Epoch of the Geminid meteoric shower.
 10. 17h. Mars in conjunction with Moon. (Mars $3^{\circ} 25'$ S.).
 10. 8h. 31m. Minimum of Algol (β Persei).
 11. 22h. Venus in conjunction with Uranus (Venus $0^{\circ} 59'$ S.).
 12. 3h. 35m. to 4h. 28m. Moon occults 30 Piscium (mag. 4.7).
 ,, 5h. 28m. to 6h. 42m. Moon occults 33 Piscium (mag. 4.6).
 13. 5h. 20m. Minimum of Algol (β Persei).
 ,, 3h. 54m. to 4h. 44m. Moon occults 20 Ceti (mag. 4.9).
 15. 2h. 55m. to 3h. 47m. Moon occults ξ^2 Ceti (mag. 4.3).
 17. 12h. 53m. to 13h. 18m. Moon occults δ^1 Tauri (mag. 3.9).
 ,, 14h. 9m. to 15h. 18m. Moon occults δ^3 Tauri (mag. 4.2).
 20. 22h. Vesta in conjunction with the Moon. (Vesta $0^{\circ} 59'$ S.).
 22. 12h. Sun enters Capricornus. Winter commences.
 23. 2h. 6m. Jupiter in conjunction with Moon (Jupiter $1^{\circ} 53'$ S.).
 30. 10h. 14m. Minimum of Algol (β Persei).
 31. 3h. Mars in conjunction with Saturn. (Mars $1^{\circ} 50'$ N.).

SATURN'S RINGS.—Further observations of the invisibility of Saturn's rings during the recent passage of the earth through the plane containing them are recorded in No. 4215 (p. 249, November 17) of the *Astronomische Nachrichten*. According to the calculations of Prof. B. Peter, of Leipzig, the second disappearance should have taken place on October 4. M. Schaer, of Geneva, saw the rings as a luminous line without any difficulty on October 2, using a reflector of 140 mm. aperture. On October 3 the weather was unfavourable, but the rings were still visible, with a reflector of 160 mm. aperture, at 6h. 45m. on October 4. At 7h. 30m., however, the last trace of the bright line had disappeared. Continuing the observations with a refractor of 34 cm. aperture, at 7h. 45m. the rings could be seen momentarily, but were totally invisible at 8h. Bands of a brownish tint were several times seen on each side of the trace of the rings.

Dr. Hassenstein made observations with the 13-inch refractor at Königsberg on October 1 and 3. At 8h. (G.M.T.) on the former date the rings were undoubtedly visible, but at 5h. (G.M.T.) on October 3 they were invisible; at 10h. the rings could not be seen, but dark streaks and the shadow of the rings were visible. Dr. Hassenstein concludes that the passage of the earth through the plane of the rings took place at 0h. (G.M.T.) on October 3.

PHOTOGRAPHS OF JUPITER.—The November number of the *Bulletin de la Société astronomique de France* (p. 481) contains a reproduction from a photograph of Jupiter taken by M. Quéniisset at the Juvisy Observatory on March 2. The instrument employed was the Viennet objective of 0.16 m. (6.3 inches) aperture and 2.9 m. (114 inches) focal length, and about 100 exposures were made. The resulting images show many details, and some of them are remarkably well defined, presenting nearly all the details seen with the 240 mm. equatorial at the same time. On some of the photographs the Great Red Spot is even more apparent than in the visual observation. A reproduction from a drawing made forty minutes earlier shows how well the details are registered on the photograph.

The same journal contains reproductions from Prof. Lowell's photographs of Mars taken on July 11 and 28 respectively.

FINAL DESIGNATIONS OF RECENTLY DISCOVERED VARIABLES.—No. 4212 of the *Astronomische Nachrichten* (p. 181; November 7) contains a table giving the final designations of recently discovered variable stars allotted by the commission of the A.G. catalogue for variable stars. The list gives the provisional and final designations, the position for 1900, the precession, the chart place, and the range of magnitude for each variable, and includes twenty-four variable stars of long period, eleven irregular and twenty-five short-period objects, and thirteen variables of the Algol type.

A LARGE ERUPTIVE PROMINENCE.—Four excellent photographs of a large eruptive prominence, taken by Mr. Fox on May 21 with the Rumford spectroheliograph of the Yerkes Observatory, are reproduced in No. 3, vol. xxvi., of the *Astrophysical Journal* (October, p. 155). On the first photograph the prominence was seen strongly attached to the sun's limb, but on the succeeding plates it is shown as greatly altered in form and considerably weakened in its lower parts. Thirteen plates were exposed, using the H line, between 4h. 2m. and 5h. 59m., and during that period the height of the prominence, as measured on the photographs, varied as shown in the following table:—

G. M. T.		Height			G. M. T.		Height				
h.	m.	#	kms.	miles	h.	m.	#	kms.	miles		
4	2	228	6	167,800	103,200	5	44	370	4	271,900	168,850
5	1	280	5	205,800	126,800	5	55	423	3	310,700	192,950
5	43	431	8	316,900	196,800	5	59	412	7	303,000	188,150

SURVEYS OF NEBULÆ.—Future workers on the possible changes in nebulae or in the stars involved in such masses will find the exhaustive surveys of the Andromeda, the ξ Persei, and the 12 Monocerotis nebulae, recently carried

out at the Astrophysical Institute, Königstuhl-Heidelberg, of invaluable assistance.

The results of these surveys are published at length in the *Publikationen* of the institute, No. 1, vol. iii., containing those obtained by Herr P. Gotz from his researches on the Andromeda nebula, and No. 11, vol. ii., embodying Herr Lohnert's results concerning the star-densities of the nebulae near ξ Persei and 12 Monocerotis respectively. The former treats of 1259 stars involved in the great spiral nebulae, and gives the position and magnitude of each star for the equinox of 1900; then follows a catalogue of fifty-four recognisable points in the nebula which have been measured, and of which the positions (1900) are given. The treatise concludes with a detailed description of the nebula, a discussion of the relation of the star-density to the form and brightness of the gaseous mass in various parts, and the results of a statistical investigation of the distribution of the stars. Among other results, Herr Gotz finds that all the stars concerned are fainter than the ninth, whilst sixty-four are fainter than the sixteenth, magnitude. The greatest number, taken in magnitudes, are between magnitude 14.0 and 15.0, there being 316 of this class.

Herr Lohnert's work deals similarly with the distribution of the stars in the other two nebulae named, the results being given in tables and also shown diagrammatically, as are those appertaining to the Andromeda research.

NEW GEOLOGICAL SURVEY MAPS AND MEMOIRS.¹

(1) **THE** Geological Survey is making rapid progress in the publication of its re-survey of Cornwall; the memoir on the geology of Falmouth and Truro (Sheet 352) has already been reviewed in *NATURE*, and that on the Newquay district was described in the issue for May 16. Now we have the Penzance sheet of the map (adjoining that of Falmouth), and an explanation thereof.

This area includes not only the "Land's End district," including Penzance and St. Ives, but also the neck of land which unites it to the rest of Cornwall. The district possesses several interesting physical features, for the granite areas up to a height of about 420 feet above the sea exhibit smooth and undulating contours, the ground forming a dissected plateau and rising gently to the foot of a well-marked bluff, which is an ancient sea-cliff. The age of this plateau cannot be fixed for certain, and though Mr. Reid seems inclined to refer it to early Pliocene time, he admits that it may be much older (? Eocene), and may only have been re-modelled and graded in Pliocene times. The low-lying neck of land which lies between Mounts Bay and St. Ives Bay has also an interesting history; originally it may have been part of an Eocene river-valley, but in Pliocene times it was a strait, and the Land's End district was then an island.

The most important rock-masses delineated on the colour-printed map and described in the memoir are:—(1) the three members of the Lower Palaeozoic system, which are probably of Ordovician age, but have received local names in Cornwall—the Mylor series, the Falmouth series, and the Portsatho series; (2) the masses of intrusive igneous rock—granite and greenstone—which have been thrust through these ancient strata.

The contact-alterations produced by these successive intrusions are fully explained. The greenstones (diabasic rocks) are earlier than the granite, and their effects are different from those produced by the latter. Each area of granite is surrounded by an aureole or belt of altered rock, and the border of the granite itself has been converted into schorl-rock (quartz and tourmaline). It is in these altered belts and in the adjacent parts of the granite that the principal mineral wealth of the country has been found.

There is a chapter on the elvans or dykes of quartz-

¹ (1) "The Geology of the Lands End District." By Clement Reid, F.R.S., and Dr. J. S. Flett, with contributions by Messrs. Wilkinson, Dixon, Pollard, and MacAlister. Pp. viii+158; with six plates. (London: H. M. Stationery Office, 1907.) Price of memoir 3s. 6d., of map 2s. 6d.

(2) "The Geology of the Country around Hungerford and Newbury." By H. J. Osborne White. Pp. iv+150; illustrated. (London: H. M. Stationery Office, 1907.) Price of memoir 2s. 6d., of map 1s. 6d.

porphyry which traverse the district, and are of slightly later date than the granite. Fifty-seven pages are devoted to economic geology and mining, much information being given about the mineral lodes and the mines, some of which are now being re-opened.

Brief accounts are given of the Pliocene deposits of St. Erth and of the later Pleistocene accumulations.

The photographic views are clear and well reproduced, as may be seen from the example here given. The map is well printed on good thick paper, and the only fault we have to find with the colouring is that the tints indicating Pliocene and Valley Gravel are barely distinguishable from one another.

(2) The second memoir deals with an area which includes parts of Berkshire, Wiltshire, and Hampshire, the larger portion being in Berkshire and traversed by the valley of

found in two small outliers, which are due to shallow synclinal flexures.

By aid of this zonal work Mr. White is able to show the exact nature and extent of the unconformity between the Chalk and the Eocene. This proves to be a gradual overstep, the Eocene passing transgressively on to older and older beds in a northerly direction. Hence it would seem that, prior to the Eocene sedimentation, the whole area had a continuous slope from north to south, and that the Kingsclere-Pewsey anticline is entirely of post-Eocene date.

Chapters are devoted to the Reading beds, the London Clay, the Lower Bagshot beds, the Clay-with-Flints, the Plateau Gravel, the valley gravels, alluvium, and economics. There are also appendices on the Mollusca of the alluvium of the Kennet by Messrs. A. S. Kennard and B. B. Woodward, and on the insoluble matter in



View of the south side of the Land's End. From "The Geology of the Land's End District."

the Kennet. Nothing older than the Selbornian (Upper Greensand) reaches the surface, and the greater part is occupied by Chalk, Eocene beds, and Clay-with-flints. The colouring of the map is clear, and the paper on which it is printed is thicker than that of sheets issued in previous years.

It is some time since this area was surveyed, and in the meantime Mr. Osborne White has made a detailed study of the Chalk and its zones in Berkshire, as well as of the superficial deposits of this and neighbouring districts, so that the preparation of the memoir could not have been put into better hands.

Of the Cretaceous rocks described, the chief interest centres in the Upper Chalk, which is dealt with zone by zone; two of these, the zone of *Marsupites testudinarius* and that of *Actinocamax quadratus*, have only been proved to exist in Berkshire within the last three years. The former has a continuous outcrop from the western border as far east as Newbury, and this outcrop is indicated on a sketch-map in the memoir; but the higher zone is only

samples of Upper Chalk by Dr. W. Pollard and Mr. H. H. Thomas. Finally, the memoir is furnished with a bibliography and a good index.

RECENT PUBLICATIONS OF THE U.S. MUSEUM.¹

THE subjoined list (which is exclusive of a large number of minor publications) affords a striking example of the energy with which scientific research is being pushed in America, a noteworthy fact being that,

- (1) "The Birds of North and Middle America." Part iv. By R. Ridgway. Bull. U.S. Nat. Museum, No. 50. Pp. xxii+973.
- (2) "Catalogue of the Type and Figured Specimens of Fossils, Minerals, Rocks, and Ores in the Department of Geology, U.S. Mus." Part ii. By J. P. Merrill. *Op. cit.*, No. 53. Pp. v+370.
- (3) "The Families and Genera of Bats." By G. S. Miller. *Op. cit.* No. 57. Pp. xvii+282.
- (4) "Herpetology of Japan and Adjacent Territory." By L. Stejneger. *Op. cit.*, No. 58. Pp. xx+577.
- (5) "Report on the Diatoms of the *Albatross* Voyages in the Pacific Ocean, 1888-1904." By Albert Mann. Contr. U.S. Nat. Herbarium, vol. x., part v. Pp. v+221-424.

out of the five memoirs, only two are devoted solely to American biological subjects. Since all five are by well-known experts, the following brief remarks may in the main take the form of commendation rather than of criticism.

As regards No. 1, Mr. Ridgway is to be congratulated on having got through rather more than half his heavy task, the present part bringing him nearly to the conclusion of the perching birds, of which no less than 1675 species and races are recorded in the first four parts. As in the previous volumes, generic terms are employed in the modern restricted sense, and the "keys" to the various family and generic groups are all that can be desired in the way of lucidity and comprehensiveness.

The catalogue standing as No. 2 in our list is a work exclusively for the benefit of specialists, to whom it will no doubt prove invaluable. The invertebrates having been completed in the first part, the present issue is devoted to fossil vertebrates, fossil plants, and minerals, rocks, and ores, which are severally arranged in three main sections. In the vertebrate section the specimens are referred to their respective classes, in which they are catalogued according to the alphabetical order of their names. This seems, on the whole, the most satisfactory arrangement; but we venture to think that the author has carried the alphabetical plan a little too far in making it extend to the class-divisions, the sequence of birds, fishes, mammals, and reptiles being, in our opinion, decidedly unsatisfactory. The system of cross-references in cases where a specimen has been referred to more than one genus is well planned, but the addition of a species index to each section or class would have considerably added to the value of the catalogue as a work of reference.

With No. 3 we come to a work of prime importance, which cannot fail to be of the highest value to systematists. No complete revision of the families and genera of bats has, we believe, been published since the issue of Dobson's invaluable catalogue, and as great progress in our knowledge of the group has been made since that date, such a revision was urgently wanted. For this task few zoologists are better equipped than Mr. Miller, who for some years past has devoted much attention to the order, and has studied the chief collection on both sides of the Atlantic. Perhaps the most important divergences from the Dobsonian classification are the wide sundering of the Emballonuridae and Vespertilionidae, and the transference of the mastiff-bats from the former group to a separate family following the latter; the second change being a further development of one inaugurated by Winge and endorsed by Max Weber.

Dr. Stejneger's work on the reptiles of Japan, the Liu Kiu and neighbouring islands, and a considerable proportion of the mainland of the Far East, will take rank as a valuable systematic monograph, in which special attention is devoted to geographical distribution.

In his memoir on the Pacific diatoms collected by the *Albatross*, standing last on our list, the author directs attention to the importance of collecting these organisms on account of their value in determining difficult questions connected with the extent and volume of ocean currents, and the origin of the materials deposited on the bed of the sea. Now that this has been pointed out, there is little doubt that the authorities will see their way to the collection of diatoms in a much more careful and systematic manner than has hitherto been attempted in America.

R. L.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The board of anthropological studies has put forward a proposal to establish a diploma in anthropology. The board believes that the interests of anthropology will be best served by the encouragement of research, and that the proposed diploma in anthropology should be granted for an original dissertation, and not by examination.

On the recommendation of the general board of studies the readership in animal morphology is to be transferred to the more general subject of zoology. It is proposed

that the board be authorised to appoint a reader in zoology with the annual stipend of 100*l.*, to be paid from the common university fund. The board also proposes that a demonstrator in petrology be appointed.

Mr. W. Welsh has been appointed chairman of the examiners for part i. of the mathematical tripos, 1908 (new regulations).

Prof. Ridgway, the Disney professor, gives notice that he will maintain the thesis "that Sergi's theory of 'the Mediterranean race' is untenable," on Wednesday, December 4, at 5 p.m., in the archaeological lecture-room.

LONDON.—At the meeting of the Senate on November 20 a report was received from the committee specially appointed to advise the Senate on the question of the establishment of the proposed Institute of Medical Sciences at South Kensington. The committee found that the financial support offered for the original scheme was inadequate, and that, apart from the money difficulty, the scheme had become impracticable on account of the opposition of the medical faculty. The Senate therefore decided that the donors to the fund should be informed that the money paid was at their disposal.

Prof. Starling, F.R.S., has been elected by the medical faculty a member of the Senate, in succession to Dr. Lauriston Shaw, resigned.

MANCHESTER.—A deputation from the University, supported by the members of Parliament and municipal authorities of Lancashire and the surrounding counties, waited upon the Chancellor of the Exchequer on November 20 in reference to the proposed reduction of the Government grant to the University from 12,000*l.* to 10,000*l.* per annum. Throughout this district numerous public bodies interested in higher education have passed resolutions expressing disappointment at the recommendation of the advisory committee, and requesting the Government to continue its full support. The Vice-Chancellor gave evidence to show that this reduction in the grant will seriously hamper the steps which have been taken to develop in various directions the higher branches of the work of the University. The Chancellor of the Exchequer emphasised the determination of the Government not to reduce the total grant of 100,000*l.* devoted to higher education, but, whilst admitting that there was no suggestion that the work of the University had been slackened in any of its departments, pointed out that the advisory committee was unbiased and free from pressure from any quarter. Further consideration of the case was promised. Quite apart from its local effect, the "principle of a maximum" is regarded here as one of great danger to the advance of higher education. The *Manchester Guardian* remarks:—"In our own opinion the committee has not only incidentally done serious damage to the University, but it has done violence to a principle much more important than the one it has introduced. That principle is, that while there are many valid reasons why the amount spent by the State on educational institutions should be increased, there is only one valid reason for its ever being reduced—their inefficiency. It is right to penalise a college or a school because it does not come up to standard, but it is contrary to justice and to public policy to penalise one of which nothing but praise is uttered."

OXFORD.—A grant of 300*l.* having been made from the University chest to the professor of pathology for the provision of a lecturer and a demonstrator in his department, the professor has nominated Dr. E. W. Ainley Walker as lecturer in pathology.

SHEFFIELD.—Mr. Haldane visited the University on November 20, and inspected various departments and addressed a large gathering of the students, staff, and others, presided over by Sir Charles Eliot, the Vice-Chancellor. Mr. Haldane spoke of the developments of recent times which have brought universities into contact with industrial life. The closest connection of science and industry may be made to the lasting advantage of both, and without damage to either. It is becoming truer every day that no man can hope to control a great university who has not at his disposal resources which science alone can give. The laboratory and the professor have inspired

some of the greatest industrial movements of the time, and all indications are that that will continue to be so more and more. It is sometimes said that the only source of wealth is labour. This was true in old days, when science was little applied to industry, and there were capitalists and labourers and little else, but conditions have since then been changed. There is an abundance of labour, but also a greater abundance of capital. It is becoming apparent that labour undirected, labour without knowledge and without scientific ability to direct it, is incapable of serving the purpose of those who wish to develop the resources of nature. The real source of wealth is the direction of labour and capital to the right points of application. Knowledge is the source of wealth—scientific knowledge, business knowledge—the capacity of the trained man; and the men with that capacity, the men of brain and of science, are emerging more and more as those who have the power of controlling the resources of the earth, and labour and capital are becoming more and more instruments in their hands.

GIFTS and legacies to the funds of Yale University amounted to more than 100,000*l.* during the fiscal year recently completed. Gifts amounting to 70,000*l.* were received by the New York University during the past fiscal year. The value of this University's property is more than 1,000,000*l.*

PROF. BEDSON last June completed his twenty-fifth year as professor of chemistry at the Armstrong College, Newcastle-upon-Tyne. The event was the occasion of many congratulations and suitable presentations. In addition to the celebration arranged last summer, we notice from the report of the principal of the college that the council has "deemed it only fitting to mark the occasion, and its profound appreciation of Prof. Bedson's exceptional services to the college, by unanimously voting him a 'jubilee' vacation of six months, to take effect in the course of the coming year, together with a sum of 200*l.*" We congratulate Prof. Bedson, and commend the course of action adopted by the Newcastle authorities to the notice of other college councils.

THE fifth annual report of the Manchester Education Committee deals with the year 1906-7, and provides much information concerning the successful attempts made in the city to coordinate educational effort and to prevent overlapping and waste. Full particulars are given as to the work during the session of the Municipal School of Technology. There was for some reason a decrease of 164 in the total number of individual day and evening students enrolled, which, however, reached 5149. The total volume of work of the evening departments, computed in student hours, that is, by multiplying the number of students enrolled by the total number of hours of instruction, was 444,827 student hours, whilst the actual volume of work, namely, the total number of hours of instruction multiplied by the actual attendances, was 290,046, or 65 per cent. of the total volume of work.

THE inaugural address delivered by Prof. Willis G. Tucker at the opening of the present session of the Albany Medical College has been reprinted from the Albany Medical Annals of the present month. The address dealt with educational democracy, and in it Prof. Tucker indicated several directions in which, unless care is taken, danger may result to American higher education from the large private benefactions of recent years. Quoting from a speech of Chancellor MacCracken at New York University, Prof. Tucker urged that, as a result of the gifts of millions of dollars from great American financiers, the universities are in danger of being reckoned the purchased servants of a narrow caste. He went on to insist that in a country like the United States "higher education should be in no way dependent upon the variable and perhaps ill-directed impulses of individuals, however generous and philanthropic they may be." He maintained that it is the duty of the State to provide technical and higher education for the people, enumerated the reasons for his belief, and indicated some of the directions in which he thought the necessary funds might be raised.

THE report of the council of University College, Bristol, presented to the governors at their annual meeting on November 20, is a record of steady progress as regards number of students and results of original investigations. For a college with limited means and indifferent local support, the amount of research carried on is particularly noteworthy. A department in economic biology has been formed with the object of rendering assistance to those engaged in agriculture and kindred pursuits. By carrying out investigations and experiments, and by suggesting preventive or remedial measures where crops and fruit trees have been threatened or attacked by insect or other pests, it is hoped that the department will meet a real need. The committee of the Bristol Museum has consented to form collections illustrative of economic biology. Though the college is a centre of intellectual life and interest in the city of Bristol and neighbourhood, it derives only a meagre income of about 500*l.* a year from the sustentation fund. If this may be taken as an index of public support to higher education in the west of England, the prospects of a university do not seem very promising. It is hoped, however, that the King will visit the city to open the Avonmouth Docks next year, and that the promoters of the scheme for a university will be justified by that time in asking for a charter.

THE report for the session 1906-7 of the department of technology of the City and Guilds of London Institute has now been published. During the session, 3311 classes in technological subjects were registered at 376 centres, in 286 towns. These classes were attended by 46,048 students, being 1580 more than in 1905-6; 21,728 candidates were presented in technology from 439 centres in the United Kingdom, and of these 13,054 passed. By including the candidates from India and the colonies, and those for teachers' certificates in manual training and domestic economy, the total number of examinees was 23,572. These figures show an increase on those of any previous year. Members of the institute's staff for the examination, inspection, or organisation of classes visited ninety-two centres during the year. The report points out two main causes which impede progress in the technical instruction of artisans and prevent the results of the teaching from being as satisfactory as might be desired. They are, first, the difficulty of finding competent teachers, and, secondly, the unduly large proportion of artisan students who enter technical classes without the preliminary knowledge necessary to take full advantage of the instruction they receive. It is fully recognised in the report that the teaching of technology has improved greatly during the past decade, but it is noted that the examiners have still to direct attention repeatedly to the insufficient knowledge that candidates possess of the principles of the subjects, and to point out that the fluctuating quality of answers in different groups of papers indicates faulty teaching as the source. As regards the preliminary training of the students, it is desirable, the report says, that more encouragement should be given to the further attendance of pupils at a school in which provision is made for manual training, English, and practical science teaching, before commencing the distinctly technical part of their course of training.

SOCIETIES AND ACADEMIES.

LONDON.

Chemical Society, November 7.—Sir William Ramsay, K.C.B., F.R.S., president, in the chair.—Gaseous nitrogen trioxide: H. B. Baker and Mrs. Baker. Liquid nitrogen trioxide can be converted into the gaseous state if it is dried completely. The liquid is green at the ordinary temperature, but becomes blue below -2° . In liquid air it solidifies to a mass of dark blue crystals.—The atomic weight of tellurium: H. B. Baker and A. H. Bennett. During the last thirteen years the authors have investigated tellurium, and the possibility of its containing a second element, but so far all the evidence obtained points to the homogeneity of the element.—The isomerism of the double sulphites of sodium and potassium: M. H. Godby. No evidence of the existence of the two isomeric salts $\text{KO}_2\text{SO}_3\text{Na}$ and $\text{NaO}_2\text{SO}_3\text{K}$ could be obtained.—Studies

in the camphane series, part xxiv., camphoryldithiocarbamic acid and camphorylthiocarbimide: M. O. Forster and T. Jackson. Descriptions of both these compounds are given.—The vapour pressures of triethylamine, of 2:4:6-trimethylpyridine, and of their mixtures with water: R. T. Lattey. The total pressure curves obtained experimentally for these mixtures conform to the type expected theoretically. The partial pressure curves can be calculated by a form of the Duhem-Margules equation.—Liquid triethylamine: R. T. Lattey. Evidence is brought forward to show that the amine is a unimolecular liquid.—Note on the constitution of homoeriodictyol: F. B. Power and F. Tutin. It is shown that in so far as the observations of Mossler (*Sitz. K. Acad. Wiss. Wien*, June) with regard to this compound are accurate, they can be explained by the formula previously suggested by the authors. (*Trans. Chem. Soc.*, xci., 889).—The alkyl compounds of gold. Diethylauric bromide, preliminary note: W. J. Pope and C. S. Gibson. This colourless crystalline substance, the first alkyl compound of gold described, is obtained by the action of auric bromide on magnesium ethyl bromide in ether.—The interaction of methylene chloride and the sodium derivative of ethyl malonate. A correction: F. Tutin. The yellow sodium salt previously described (*ibid.*, xci., 1141) is the sodium derivative of ethyl dicarboxylglutamate, formed by the action of chloroform present as an impurity in the methylene chloride.—Preparation of aliphatic nitro-compounds: P. C. Rây and P. Neogi. The nature and quantities of the nitrites and nitro-compounds obtained by interaction of various alkyl iodides with mercurous nitrite are given.—Some mercury derivatives of camphor: J. E. Marsh and R. de J. F. Struthers. A description of the compounds obtained by heating camphor with alkaline mercuric iodide.—Contributions to the chemistry of the terpenes, part ii.: G. G. Henderson. The addition product of chromyl chloride and limonene is described, as well as the decomposition products obtained from this.—The synthesis of acridines and phenanthracidines, tetra- and hexa-methylacridines, dimethylphenanthracidines, dixylmethylenediamines: A. Senior and A. Compton.—The root and leaves of *Morinda longiflora*: M. Barrowcliff and F. Tutin. These materials are reputed in Sierra Leone to possess valuable medicinal properties, but the products obtained from them, viz. (a) hydroxymethoxymethylanthraquinone, (b) morindanol, $C_{38}H_{61}O_3 \cdot OH$, m.p. 278, (c) a phytosterol, (d) hentriacontane, (e) a mixture of lower fatty acids and citric acid, and (f) resins and other amorphous products, possess no pronounced physiological activity. A small amount of the alizarin monomethyl ether, which occurs in "Chay" root, was also obtained.—Ethyl α -cyano- γ -phenylacetoacetate: A. R. Smith and J. F. Thorpe.—Aromatic amides and imides of camphoric acid: W. O. Wootton.—The melting point of *d*-phenylglucosazone: F. Tutin. The phenylsazones of sugars occurring naturally in a number of plants have been prepared, and found to melt at temperatures varying from 205° to 210°. On re-crystallisation from pyridine they melted at 215° to 218°, which is the melting point of *d*-phenylglucosazone, similarly re-crystallised from pyridine.—The interaction of cyanodihydrocarvone, amyl nitrite, and sodium ethoxide: A. Lapworth and E. Wechsler.

Royal Anthropological Institute, November 5.—Prof. D. J. Cunningham, F.R.S., president, in the chair.—A new method of ascertaining the stature and making other measurements of the living person: Prof. D. J. Cunningham. The apparatus consists of a large bed of slate placed against a wall and divided into centimetre squares. The subject is placed against the slate, and by the aid of a carpenter's square the height and other measurements can be read off.—A series of so-called "grave stones" and other objects of a similar nature from the west of New South Wales: N. W. Thomas. The objects, most of which are apparently manufactured of a mixture of gypsum and sand, are in many cases marked with parallel grooves and signs resembling broad arrows. Some of them are long, banana-shaped objects with a cup-shaped hollow in the base. These are said to be found in sandhills associated with implements and other remains of old camps. As to the meaning of these there is absolutely

no information. Others, which are shorter, thicker, and sometimes helmet-shaped, are certainly placed upon graves, but the precise object is uncertain.

Royal Astronomical Society, November 8.—Mr. Newall, president, in the chair.—Pogson's Observations of Variable Stars, edited by C. L. Brook and H. H. Turner: Prof. Turner.—Note on the ancient solar eclipses discussed by Mr. Cowell: A. C. D. Crommelin. The author had made an independent calculation of the six most important ancient eclipses, and obtained results practically identical with those of Mr. Cowell. Further reasons were given for supposing that the eclipse of -1062 was witnessed from Babylon itself, and a brief statement was given of the point at issue between Mr. Cowell and Prof. Newcomb and Mr. Nevill.—Disappearance of Saturn's ring system, October 3: R. T. A. Innes. The ring was easily seen with the 9-inch refractor of the Johannesburg Observatory at 4.45, in twilight, but became invisible by 10.30 the same evening, so the earth must have passed through the plane of the ring soon after invisibility.—The ultra-violet region in sun-spot spectra, and spectrum of comet *d*1907: J. Evershed. The papers were read by Dr. Michie Smith, who showed a series of sun-spot spectra taken at Kodaikánal Observatory, and also a photograph of the comet spectrum showing several lines extending into the tail, and a pair of very bright lines confined to the nucleus, which were identified with the lines of cyanogen.—Photograph of comet *d*1907 taken at the Royal Observatory, Greenwich: A. S. Eddington. The tail of the comet appeared to consist of a number of fine straight rays spreading from the nucleus.—Note on the permanency of some photovisual lenses: Dr. W. J. S. Lockyer. Six of these lenses, of apertures of 3 inches to 12 inches, have been in use at the Solar Physics Observatory, and in periods of from twenty-three to eighty-three months they have all developed curious markings on one or more of their inner surfaces. The markings appeared on the inner surfaces of one or both of the outside lenses, and not on the inner lens, as had been expected. A series of photographs was shown, the markings being crystalline formations, sometimes covering the entire lens. It was concluded that the formation was due to the absorption of water vapour by the glass, setting free its alkaline components to form carbonates, which are deposited as crystals. Further particulars were given in a note by Mr. Dennis Taylor, appended to Dr. Lockyer's paper.—Spectroscopic observations of cyanogen in the solar atmosphere and in interplanetary space: H. F. Newall. The author had found by the method of Cornu that cyanogen was present in the solar atmosphere, but it also appeared to exist in space, and the suggestion was made that the presence of cyanogen in comets, as shown by their spectra, might be due to the latter circumstance rather than to its existence in comets themselves.—A series of spectroheliograph photographs of solar faculae and prominences taken at the Kodaikánal Observatory, India: Dr. Michie Smith.

Mathematical Society, November 14.—Prof. W. Burnside, president, in the chair.—Hyper-complex numbers: J. H. Maclagan Wedderburn. The object of the paper is to develop a treatment of hyper-complex number-systems by aid of the calculus introduced by Frobenius, and applied by him to the theory of groups.—The invariants of a binary quintic and the reality of its roots: Dr. H. F. Baker. It is usual to express the invariants of a quintic in terms of a set of four, which are connected by a syzygy. In the paper three rational functions of the four are introduced, each of them an invariant, and two of them absolute invariants, in terms of which each of the four, and any other invariant, can be expressed rationally, and the explicit expressions of the four original invariants in terms of the three new invariants are given. When the two new absolute invariants, denoted by X , Y , are regarded as coordinates of a point in a plane, the conditions that the quintic, with real coefficients, may have one, three, or five real roots are determined by the division of the plane into four regions by means of a certain quartic curve, corresponding to the vanishing of the discriminant, and an arc of a certain cubic curve which touches this quartic. The number of

real roots is determined without any ambiguity by the situation of (X, Y), whether it is in one of these regions or on a bounding line.—The application of quaternions to the problem of the infinitesimal deformation of a surface: J. E. **Campbell**. Weingarten's characteristic function in this problem can be interpreted kinematically as the normal component of the rotation, which an element of surface undergoes in the course of the deformation. The direct application of the method of moving axes, to obtain the characteristic equation, can be simplified very much by the use of quaternions.—Addendum to a paper on the inversion of a repeated infinite integral: T. J. I'A. **Bromwich**.—Generalisation of a theorem in the theory of divergent series: G. H. **Hardy**.—Uniform and non-uniform convergence and divergence of a series, and the distinction between right and left: Dr. W. H. **Young**.—Nodal cubics through eight given points: J. E. **Wright**.—A transformation of hypergeometric series: Dr. E. W. **Barnes**.—A transformation of a certain hypergeometric series: Prof. M. J. M. **Hill**.—A general theorem on integral functions of order less than one-half: J. E. **Littlewood**.

PARIS.

Academy of Sciences, November 11.—M. A. **Chauveau** in the chair.—A new mineral species, arising from the Athenian plumbiferous scoria of Laurium: A. **Lacroix** and A. **de Schulten**. This is one of a series of minerals arising from the action of sea water upon scoria rich in metallic lead and galena. Its composition corresponds to the formula $Pb_3(AsO_4)_2 \cdot 3PbCl_2$. The crystallographic measurements are given, and the hardness (3.5) and density (7.1) measured. The name georgiadesite is proposed for the mineral.—The influence of feeding on the course of experimental tuberculosis: MM. **Lannelongue**, **Achard**, and **Gaillard**. In sixty strictly comparative experiments, in three classes of diet in which fat, carbohydrate, and nitrogenous food respectively predominated, the animals with the fatty food died in forty days; with sugar, eighty-seven days; and with gluten, 371 days. This confirms the result of the authors' early work, clearly demonstrating the superiority of a strongly nitrogenous diet in fighting tuberculosis.—Continued algebraic fractions: Edmond **Maillet**.—The periodic solutions of the equation

$$\Delta u + \lambda a(x, y, z)u = 0:$$

A. **Myller**.—The method of colour photography of MM. A. and L. **Lumière**: Adrien **Guébbard**. A discussion of the phenomena attending the reversal of the image in this process.—The measurement of the anomalous dispersion in crystals at different temperatures, and on some theoretical consequences: Jean **Becquerel**. It is shown that the large increase of intensity observed for the majority of the absorption bands of tysonite when the crystal is plunged into liquid air is not entirely due to the contraction of the bands, but is also caused by an increase in the total energy absorbed, corresponding to the increase in the dielectric coefficient of the electrons.—A comparison of the effects of the X-rays and radium upon the plant cell. Value of the unit M in plant physiology: H. **Guillemainot**.—The action of radium bromide on precious stone of the alumina family: F. **Bordas**. A modification of the method described in a previous paper. Colourless corundum has been transformed into topaz, the depth of colour of natural topazes increased, and a similar effect produced with faintly coloured rubies. Colourless fused alumina, submitted to the action of radium bromide, became first rose-coloured and then reddish yellow. Since this action takes place equally well at -200° , the conclusion is drawn that the phenomenon of coloration is not due to oxidation.—The diastatic function of colloids: J. **Duclaux**. From a quantitative study of the catalysis of hydrogen peroxide solutions by colloidal solutions of ferric hydrate, the author concludes that the hydrolysed part of the salt does not intervene in the catalysis, and that it is the undecomposed ferric chloride which effects the change.—The action of gold on the dioxide of sodium and barium: Fernand **Meyer**. Precipitated gold reacts with fused sodium dioxide, yielding sodium aurate, and barium dioxide attacks gold similarly, although the reaction is less complete. From these substances auric acid can be prepared by the action of sulphuric acid. Auric acid, dried in a vacuum in the dark, has the composition $Au_2O_3 \cdot 3H_2O$ or

$Au(OH)_3$. The preparation of the pure aurates of sodium, potassium, barium, strontium, and calcium from this acid is described. These aurates are decomposed by heat or light, the insoluble residue being Au_2O_3 , and not gold as supposed by Frey.—The preparation of some iodides *in vacuo*: Marcel **Guichard**. The preparation of the anhydrous iodides of iron, nickel, silicon, and aluminium is described.—The action of amorphous arsenic on the alkyl halides: V. **Auger**. Amorphous arsenic, prepared by the reduction of a hydrochloric acid solution of arsenious anhydride with stannous chloride or a hypophosphite, is very active. It reacts with methyl iodide at the ordinary temperature, and at higher temperatures in sealed tubes with CCl_4 , $CHCl_3$, C_2H_5Br , $C_2H_4I_2$, CHI_3 , and various alkyl iodides.—The iodohydrins and alkylidohydrins derived from styrene: Marc **Tiffeneau**.—The action of urea, thiourea, urethane, and some amides on xanthidrol: R. **Fosse**.—The application of the Hoffmann reaction to sparteine: Charles **Moureu** and Amand **Valeur**.—The estimation of fat in skimmed milk: R. **Lezé**. Three litres of the milk are mixed with ammonia and caustic soda, and the whole passed through a centrifugal separator.—The coloration of certain precious stones under radio-active influences: Daniel **Berthelot**.—The products of the volcano Monte Ferru, Sardinia: M. **Deprat**.—The influence of high altitude on the loss of water by the organism: H. **Guillemard** and Aug. **Moog**. The effect of high altitude is not to increase the rate of loss of moisture from the body, but, on the contrary, to reduce it. The experiments leading to this conclusion were conducted at Paris, Chamonix (1050 metres), Grands-Mulets (3050 metres), and the summit of Mt. Blanc (4810 metres).—The development of the energy of the voice: M. **Marage**. A description, with diagrams, of a set of exercises to increase the volume of air expelled from the lungs.—The visibility of night signals at sea: André **Broca** and M. **Polack**. The practical conclusions drawn from this investigation are as follows. If a signal of doubtful colour is better seen by direct vision than by indirect vision, it is red. In the contrary case the light is blue or colourless.—A new method of determining the accelerating power of neutral potassium and sodium salts on the coagulation of milk by vegetable ferments: C. **Gerber**.—The mitosis of cells containing *Bacillus cuenoti*: L. **Mercier**.—The experimental study of medicines stimulating the movement of the stomach by the aid of fluoroscopy: G. **Carrière**.—A new Myxomycetum, an endoparasite of insects: Louis **Léger**.

November 18.—M. Henri **Becquerel** in the chair.—The transit of Mercury across the sun of November 13 and 14, 1907. Observations made at the Observatory of Nice: M. **Bassot**.—Observations of the Daniel comet, 1907*d*, and a general plan of organisation for the complete physical study of comets: H. **Deslandres**.—The transit of Mercury of November 14, 1907, at the Observatory of Lyons: Ch. **André**.—Observations made at the Observatory of Toulouse of the transit of Mercury of November 13-14: B. **Baillaud**.—Similar observations made at the Observatory of Marseilles: E. **Stephan**.—Similar observations from the Observatory of Bordeaux: L. **Picart** and E. **Esclangon**.—Similar observations from the Observatory of Bourges: Th. **Moreux**.—The occultation of the satellites of Jupiter: G. **Le Cadet**.—The observation of the transit of Mercury across the sun, November 13-14, 1907: A. de la Baume **Pluvinel**.—Remarks on the relation between the solar activity and magnetic perturbations: MM. **Cirera** and **Balcells**.—The transit of Mercury, November 13-14, at the Observatory of Besançon: MM. **Bruck**, **Chofardet**, and **Pernet**.—The correction of the astigmatism of doubly refracting prisms: C. **Tissot** and Félix **Pellin**. The astigmatism can be corrected by the use of an appropriate cylindrical lens.—The propagation of telephone currents on subterranean lines: Henri **Abraham** and M. **Devaux-Charbonnel**.—The magnetic double refraction of organic liquids: A. **Cotton**, H. **Mouton**, and P. **Weiss**.—The multiplicity of sounds emitted by tuning forks: G. **Sizes** and G. **Massol**.—The action of the Röntgen rays upon crystallised alumina: F. **Bordas**. The author has described in previous papers the alteration of colour produced in various forms of crystallised alumina by the action of the rays from radium

bromide. From the fact that the radium salt acts from the inside of a glass tube, the α rays are excluded from the action. Since similar colouring effects are now shown to be produced by the Röntgen rays, it is probable that the effects observed are due to the γ rays.—The presence of *p*-methoxycinnamic aldehyde in essence of estragon, and on some derivatives of estragol: Maurice **Daufremo**. The aldehyde was isolated from the essence by repeated fractional distillation under reduced pressure, and by its reactions and analysis identified with *p*-methoxycinnamic aldehyde. Since, however, the constants did not agree with those of the same aldehyde, as described by Scholtz and Wiedemann, a synthetic sample was prepared, and found to be identical with that from the essence.—The artificial reproduction of heavy spar, celestine, and angle-site, and on isomorphous mixtures of these substances: Paul **Gaubert**. The method used is the re-crystallisation of the precipitated sulphate from sulphuric acid at, or slightly below, its boiling point.—The influence of the concentration of sugar solutions on the development of the spikes of *Ulex europaeus*: Marin **Molliard**.—Floral anomalies due to mechanical action: M. **Ducamp**.—The use of heat for the treatment of coffee plants against the attacks of the Indian borer (*Xylotrechus quadrupes*): Louis **Boutan**. To have any practical results it is necessary that all parts of the plant affected should be raised to a temperature of 50° C. This cannot be done by the direct action of a burner, and the author has designed a special stove for this purpose.—The possibility of establishing the diagnosis of death by radiography: Charles **Vallant**. In a radiograph of a living person the stomach and intestines are not visible. Owing to their stationary condition after death, and possibly owing also to the development of gases which reinforce the action of the rays, these organs are clearly shown immediately after death in the radiograph, and the clearness increases with lapse of time after death.—The study of the epiploic sero-appendices: R. **Robinson**.—The north Pyrenees and pre-Pyrenees sheets of *charriage* to the east of the Neste: Léon **Bertrand**.—An ancient bed of the Pliocene Loire: E. **Chaput**.—The relation between the radio-activity of subterranean waters and their hydrology: F. **Dienert** and E. **Bouquet**.

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 28.
 INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Development of Turbo-Generators: Dr. Robert Pohl.

FRIDAY, NOVEMBER 29.
 SOCIETY OF ARTS, at 8.—The Hygiene of Work in Compressed Air. (Diving, Caisson Work, Sub-aqueous Tunnelling, &c.): Dr. J. S. Haldane, F.R.S.

SATURDAY, NOVEMBER 30.
 ESSEX FIELD CLUB (at Essex Museum of Natural History, Stratford), at 6 p.m.—Notes on an Ancient Human Skeleton found at Foxeair, Essex: J. M. Wood.—A History of the Mineral Waters and Mineral Springs of Essex: Miller Christy and (Miss) May May Thresh.

MONDAY, DECEMBER 2.
 SOCIETY OF ARTS, at 8.—The Theory of the Microscope: Conrad Beck.
 ARISTOTELIAN SOCIETY, at 8.—Purpose: Prof. Robert Latta.
 SOCIETY OF CHEMICAL INDUSTRY, at 8.—The Estimation of Naphthalene in Coal Gas and Spent Oxide of Iron: C. J. Dickenson-Gair.—Note on the Influence of Formal on the Properties of *Funtumia elastica*: Dr. P. Schidrowitz and F. Kaye.—The Polarimetric Determination of Sucrose: Dr. F. Watts and H. A. Tempany.—Niam Fat: Dr. J. Lewkowitzsch.

TUESDAY, DECEMBER 3.
 INSTITUTION OF CIVIL ENGINEERS, at 8.—Experiments on Wind Pressure: Dr. T. E. Stanton.

WEDNESDAY, DECEMBER 4.
 GEOLOGICAL SOCIETY, at 8.—The Faunal Succession in the Carboniferous Limestone (Upper Avonian) of the Midland Area (North Derbyshire and North Staffordshire): T. F. Sibly.—Brachiopod Homoeomorphy: *Spirifer glaber*: S. S. Buckman.
 ENTOMOLOGICAL SOCIETY, at 8.—Notes and Descriptions of Pterophoridae and Orneoididae: E. Meyrick, F.R.S.
 SOCIETY OF PUBLIC ANALYSTS, at 8.—The Volumetric Determination of Reducing Sugars: Part i.; The Determination of Invert Sugar in Presence of Varying Amounts of Cane Sugar: A. R. Ling and T. Rendle.—The Quantitative Separation of Barium from Strontium: Miss Zelda Kahan.—(1) The Action of Dimethyl Sulphate (Valenta's Reagent) upon Oils of the Aromatic and Aliphatic Series; (2) Titration with Permanganate in Presence of Hydrochloric Acid: T. W. Harrison and Dr. F. M. Perkin.—Routine Methods for the Bacteriological Examination of Water: A. R. Tankard.

THURSDAY, DECEMBER 5.
 ROYAL SOCIETY, at 4.30.—*Probable Papers*: Reciprocal Innervation of Antagonistic Muscles. Eleventh Note, Further Observations on Excessive Induction: Prof. C. S. Sherrington, F.R.S.—On the Distribution of the Different

Arteries supplying the Human Brain: Dr. C. E. Beevor.—Localisation of Function in the Lemur's Brain: Dr. F. W. Mott, F.R.S., and Prof. W. D. Halliburton, F.R.S.—On the Supposed Extracellular Photosynthesis of Carbon Dioxide with Chlorophyll: Prof. A. J. Ewart.—The Influence of Increased Barometric Pressure on Man, No. 4, The Relation of Age and Body Weight to Decompression Effects: L. Hill, F.R.S., and M. G. Greenwood, jun.—On the Present Distribution and Origin of the Calcareous Concretions in Coal Seams known as "Coal Balls": Miss Stopes and D. M. S. Watson.—On the Structure of *Stigillaria scutellata*, Brongn., and other Eugillarian Stems in Comparison with Those of other Palaeozoic Lycopods: E. A. Newell Arber and H. H. Thomas.

CHEMICAL SOCIETY, at 8.30.—The Affinity Constants of Bases as Determined by Methyl Orange. Preliminary Communication: V. H. Veley.—The Velocity of Reduction of the Oxides of Lead, Cadmium, and Bismuth by Carbon Monoxide, and the Existence of the Suboxides of these Metals: F. J. Brislee.—The Relation between Unsaturation and Optical Activity, Part i., The Menthyl and Bornyl Esters of β -Phenylpropionic, Cinnamic, and Phenylpropionic Acids: T. P. Hilditch.—The Constituents of the Essential Oil of Nutmeg: F. B. Power and A. H. Salway.—Methyl Ethers of some Hydroxy-antraquinones: A. G. Perkin.—The Colouring Matters of the Stilbene Group, Part iv., The Action of Caustic Alkalies upon Paranirotoluene and its Derivatives: A. G. Green, A. H. Davies, and R. S. Horsfall.—The Replacement of Alkyl Radicals by Methyl in Substituted Ammonium Compounds: H. O. Jones and J. R. Hill.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Automatic Cab-signalling on Locomotives: J. Pigg.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY, at 8.—Retaining Walls: A. T. Walmisley.

LINNEAN SOCIETY, at 8.—Report on Aleyoaria of the Sudanese Red Sea: Prof. J. Arthur Thomson.—Report on the Crinoidea of the Sudanese Red Sea: H. C. Chadwick.—Notes on some Marine Algae from the Red Sea: Prof. R. J. Harvey Gibson.—*Exhibitions*—Specimens of *Spartina Townsendii*, as illustrating its Distribution in Britain: Dr. Otto Stapf.—Lantern Slides showing Stages of Soil-denudation consequent on the Removal of Forests: A. P. Young.

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