THURSDAY, AUGUST 4, 1904.

"MUTATION" v. SELECTION.

Evolution and Adaptation. By Thomas Hunt Morgan, Ph.D. Pp. xiii+470. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1903.) Price 12*s.* 6*d.* net.

THE author of the present work is one of those biological theorists who, while accepting the doctrine of evolution, and apparently admitting that natural phenomena must be capable of rational explanation, yet think it necessary to adopt a severely critical attitude towards the only principle which seems able to account for the facts of organic development, the principle, namely, of selection, as first propounded and illustrated by Darwin and Wallace.

Among the difficulties which those who impugn the doctrine of selection have to face, the existence of adaptation in every department of organic nature is one of the most formidable. After every allowance has been made for hasty allegations which further knowledge has tended to disprove, there remains an immense body of facts relating to the adjustment of organisms to their surroundings that demands to be accounted for in accordance with the known laws of nature. What rational means of explanation are still open to those who would dispense with the Darwinian key to the puzzle of adaptation? This is, in brief, the question which Dr. Morgan asks and attempts to answer in the volume before us. It is true that his acceptance of the facts of special adjustment is somewhat grudging; even in the case of Kallima, which, as Weismann says, is "decisive for adaptation," he appears to question the utility of the very perfect concealment afforded by the underside. But whatever scepticism he may be justified in showing with regard to particular instances, neither he nor anyone else can deny with reason the general principle of adaptation. It must be set down to the author's credit that he does not seek refuge in the views of the Lamarckian school, whether new or old:—

"Despite the large number of cases that they (the Lamarckians) have collected, which appear to them to be most easily explained on the assumption of the inheritance of acquired characters, the proof that such inheritance is possible," he justly says, "is not forthcoming."

Where, then, are we to find a solution of the mystery? The answer, according to Dr. Morgan, lies in the "mutation theory" of De Vries. But here comes in a curious inconsistency of which the author himself seems to be partly, but only partly, aware. If he urges one point with greater insistence than another, it is that De Vries's theory "stands in sharp contrast to the selection theory." Yet the whole drift of his argument goes to show, though he seldom acknowledges it in so many words, that even if De Vries's account of "variations" and "mutations," and of the relation between them be accepted, selection must still be called in to explain the aspect of the world around us.

Let us for the moment lay aside the subject of the nature of variation, admitting that it is capable of a more minute analysis than Darwin gave it, and that much remains to be learned concerning different kinds of variation and their power of transmission by heredity. We are still face to face with the question, "How is it that the favourable variations form the majority of those that we see? What has become of the others?" The answer shall be given in Dr. Morgan's own words:—

"Over and beyond," he says, "the primary question of the *origin* of the adaptive, or non-adaptive, structure is the fact that we find that the great majority of animals and plants show distinct evidence of being suited or adapted to live in a special environment, *i.e.* their structure and their responses are such that they can live and leave descendants behind them. I can see but two ways in which to account for this condition, either (1) teleologically, by assuming that only adaptive variations arise, or (2) by the survival of only those mutations that are sufficiently adapted to get a foothold. Against the former view is to be urged that the evidence shows quite clearly that variations (mutations) arise that are not adaptive. On the latter view the dual nature of the problem that we have to deal with becomes evident, for we assume that, while the origin of the adaptive structures must be due to purely physical principles in the widest sense, yet whether an organism that arises in this way shall persist depends on whether it can find a suitable environment."

What is this but selection? The fineness of the distinction here drawn appears to have struck the author himself, for he immediately adds:—

"This latter is in one sense selection, although the word has come to have a different significance, and, therefore, I prefer to use the term *survival of species.*"

We need not dispute over the term, provided that the principle, which is essentially Darwin's, be admitted.

The more we examine Dr. Morgan's argument as against Darwin, the greater difficulty do we experience in defining the precise point at issue between them. It is not the origin of variation; for if Darwin did not attempt to account for this, neither does De Vries. Nor is it the existence of the discontinuous variations called "mutations" by De Vries, for some of these were well known to Darwin. Nor, again, is it the principle of selection; for this, as we have seen, is virtually admitted on all hands. We might have been inclined to say that it was the question of the origin of species by large as against small variations, but for the fact that the author expressly states that "as De Vries has pointed out, each mutation may be different from the parent form in only a slight degree for each point." We are reluctantly impelled to the conclusion that the controversy is rather of a personal than of a material nature, and that at the root of it lies a kind of jealousy—no doubt unconscious—of Darwin's position and influence. It would

doubtless be unfair to say of the author that, so far as his treatment of Darwin is concerned—

"Willing to wound, and yet afraid to strike,"

he would

"Just hint a fault, and hesitate dislike;
Damn with faint praise, assent with civil leer,
And without sneering, teach the rest to sneer"—

but we cannot acquit him of a somewhat captious method of dealing with Darwin's clear and well considered utterances. We have seen of late a great deal of groundless objection to the Darwinian position, and many quite uncalled-for attempts to minimise the value of the Darwinian contribution to evolutionary theory. We may freely concede that the opinion expressed in the "Origin of Species" in favour of the transmission of acquired characters has not stood the test of investigation; but this is a negligible matter in comparison with the enormous impulse to evolutionary theory given by the doctrine of selection, which doctrine it was the peculiar merit of Darwin and Wallace to have presented in such a form as to command the attention of all scientific workers, and the assent of most. It cannot be said that the various attempts to dispense with selection have met with success, and in spite of the "carpers carping with their carps," we think that the Darwinian treatment of variation and selection still affords the only basis for a reasonable account not only of adaptation, but also of the origin of species. F. A. D.

THE FAUNA AND FLORA OF ALASKA.

Harriman Alaska Expedition. Edited by Dr. C. H. Merriam. Vol. v. Cryptogamic Botany (pp. ix+424). Vols. viii. (pp. ix+238) and ix. (pp. 284). Insects. Vol. x. Crustaceans (pp. 337); illustrated. (New York: Doubleday, Page and Co., 1904.)

FROM time to time brief notices have appeared in our columns of various issues of "Papers from the Harriman Alaska Expedition," published in the *Proceedings* of the Washington Academy of Sciences. The whole of these papers, together with others hitherto unpublished, are now in course of re-issue in the form of a series of handsome and well illustrated volumes, with the title cited above, and under the editorship of Dr. C. Hart Merriam, the well known chief of the Biological Survey of North America. As the various papers are reprinted from the original electrotypes, and the original pagination is given in brackets, there is no likelihood of any confusion arising by quoting from the re-issue. Of these volumes, four are now before us.

Before going further, it may be well to state that the work does not attempt to give a complete account of the fauna and flora of the Alaskan peninsula. In the insect volumes, for example, many of the papers deal only with the material brought back by the expedition, although in a few instances the existing state of our knowledge of each group is given so far as Alaska is concerned. Even where no attempt is made to formulate complete lists, in many cases the material obtained was, however, so extensive as to include the greater part of the representatives of the group described. In every instance the description and identification of the specimens collected have been assigned to specialists.

The volume on cryptogamic botany contains not only the new information acquired as the result of the expedition, but an account of the previous state of knowledge of the subject. Special interest attaches to the general account of Alaskan vegetation given in the introduction. The southern districts of Alaska, it appears, are characterised by the grandeur of their forests and the brilliancy of the flowers beyond the forest tract, the usual alpine conditions prevailing above the timber belt. Closer examination even of the wooded area reveals, however, a wealth of flowerless vegetation which gives to the flora a character it would otherwise lack; while the flowers of the mountain tops and prairies are set in beds of moss and fern. In the forest, owing to the abundant rainfall, every mouldering log, as well as the standing stems, are clothed with moss, which carpets the ground, and hangs in festoons from the branches. Among the mosses and liverworts grow many of the more delicate flowering plants, while the many fleshy funguses make this carpet their special home. The open glades are occupied by peat-mosses (Sphagnum) in considerable variety, which afford a basis for cranberries, sundews, and butterworts. North of the forest zone appears a wet, boggy tract, passing into the frozen Arctic tundra, the mossy carpet of which is, however, spangled in summer with a perfect blaze of flowers. In these open areas ferns grow in great luxuriance, and on Kadiak Island the traveller may wade through beds of bady-fern nearly waist-deep.

No less than eight specialists have given their services to the determination and description of the cryptogams collected during the expedition.

Passing to the volumes on insects, we have to note, in the first place, that this department in the expedition was confided to Prof. Kincaid, of Washington University, who collected some 8000 specimens, representing about 1000 species, and, secondly, that under the general title of insects are included both myriapods and arachnids. In the first of the two volumes, special value attaches to the paper on myriapods by Mr. O. F. Cook, since it treats of all the known members of that little-worked group hitherto obtained from north-western North America. Previous to the Harriman Expedition, our knowledge of the Alaskan insect fauna was mainly restricted to the Coleoptera and Lepidoptera, and consequently special efforts were made to collect the other groups. The result has shown that Alaska possesses a rich entomological fauna which awaits other collectors to reveal fully. Out of the 1000 species collected, 344 have been regarded as new to science. Special attention was devoted to the study of the adaptation of Alaskan insects to their surroundings, more particularly in the Sitka district, where the annual rainfall attains the enormous total (for a non-tropical or subtropical zone) of 105 inches. As might have been expected, the Diptera were found to form the predominating element in the insect fauna, but of this group only a small percentage has hitherto been, in all probability,

collected. In addition to those on myriapods and arachnids, the first of the insect volumes includes papers on Alaskan Coleoptera, Lepidoptera, Neuroptera, Orthoptera, Homoptera, and various minor groups. Special interest attaches to the chapter by Prof. Kincaid on the metamorphoses of Alaskan Coleoptera, in the course of which the author points out that the prevalent idea as to the extreme difficulty of rearing adult beetles from their larval condition is to a great extent founded on error.

The second of the two volumes on insects (ix.) is devoted to the Diptera and Hymenoptera, the article on the former being written by Mr. W. Coquillett, and the one on the latter group by Mr. W. H. Ashmead. In addition to these are three minor papers on certain sections of the aforesaid groups. A sample of the excellent results of Prof. Kincaid's energetic collecting is afforded by the case of the Hymenoptera, in which group less than thirty species were known from Alaska previous to the expedition, while the number now recorded is no less than 335, 201 of these being regarded as new to science. Of Diptera, 2423 specimens, representing 276 species, were collected, out of which one genus and 63 species are described as new.

As regards the volume on crustaceans, the great bulk of this is occupied by Miss Rathbun's elaborate and exhaustive memoir on the decapod section, Miss Richardson contributing a short account of the isopods, while Messrs. Holmes and Cole are severally responsible for the amphipods and pycnogonids, or sea-spiders. Miss Rathbun has treated her portion of this extensive subject from a very broad standpoint, discussing the crabs and shrimps not only of the Alaskan seas, but of the western coast of America generally, from the Arctic Circle to southern California. The decapod fauna of the North Pacific has proved very rich in individuals, if not in species. Among the more abundant types are the hermit-crabs, of which many species have local centres of distribution, where they attain their maximum development, both as regards size and numbers. In certain localities this crowding of crustacean life has been specially favourable to the development of parasitism. The decapods form the staple food of many kinds of fishes, and certain species are commonly used by fishermen as bait, or caught for the table. In many cases the northern limits of the species are determined by the winter line of floating ice in Bering Sea.

As regards the other groups, it must suffice to say that while Mr. Holmes restricts himself to the amphipods collected during the expedition, the isopods and pycnogonids of the whole western coast, from Alaska to California, are discussed. It is perhaps this variation in the mode in which the different groups are treated that constitutes the main ground for criticism in regard to the general plan of this magnificent and valuable work. Both editor and contributors are to be congratulated upon the results of their labours, so far as these are at present before the public, while the thanks of the scientific world are especially due to Mr. Harriman, as the generous provider of the means whereby this important addition to knowledge has been rendered possible. R. L.

THE THEORY OF DETERMINANTS.

The Theory of Determinants. By R. F. Scott, M.A. Second edition. Revised by G. B. Mathews, M.A., F.R.S. Pp. xi+288. (Cambridge: University Press, 1904.) Price 9*s.* net.

THIS well known treatise has been revised and enlarged in several respects. For instance (chapter xi.), the theory of linear equations is more complete than in the first edition, and Bezout's method of elimination is explained, as well as Sylvester's.

An introductory chapter has been inserted, containing an elementary account of three-rowed determinants; this should prove a considerable help to beginners. As a whole, the new edition is probably easier reading than the first; but even now the style seems rather too condensed for the average reader, and illustrations of general theorems by special cases are somewhat scarce.

A chapter (x.) on infinite determinants has been added; this appears to be based on the work of von Koch and Cazzaniga, but as some investigations have been abbreviated, occasional difficulties may be encountered at a first reading. Thus von Koch's proof that a normal determinant converges (art. 5) would be clearer if reproduced in full, and the convergence-test employed here[1] might be explained at greater length. The investigations of arts. 6 and 10 assume that certain infinite sequences (a_{ik} and C_{ik}) have upper limits; von Koch establishes this property by comparison with infinite products.

Semi-normal determinants are defined, in art. 11, after Cazzaniga; von Koch's definition would give a more elegant form to the theory without loss of generality. The two rules for multiplying semi-normals are stated in art. 12; but C is not proved to be equal to AB, and the statement (p. 128) "the series c_{ik} is absolutely convergent" must not be taken to refer to Σc_{ik}. Some examples like Cazzaniga's would emphasise the contrast between these rules and the four rules of art. 10 (for multiplying normal determinants).

On several grounds it is regrettable that chapter x. is not more complete. No proof is given that the value of a normal determinant is the same, wherever the origin may be taken on the principal diagonal; and various analogies with finite determinants are omitted.

A new chapter (vii.) has been inserted, containing the simpler theorems on *Elementartheiler* of determinants; this term is translated literally *elementary divisors*, although several English writers have used *invariant-factors* as the equivalent. The treatment follows Dr. Muth's book very closely; we have explained elsewhere (*Bulletin* Amer. Math. Soc., vol. vii. p. 308) that some changes in Dr. Muth's order might make the work more readable. But, in default of any English text-book, we must welcome this chapter as a useful introduction to the subject.

Frobenius's calculus of bilinear forms is explained

[1] "A sequence A_n converges if $\lim_{n=\infty}(A_{n+p}-A_n)=0$, for all positive integral values of p." In this test, *p must be free to vary with n*; for instance, if A_n is $\log n$, and b is *fixed*, the limit is zero, although the sequence diverges.

in arts. 1–9 of chapter xiv., but more use might have been made of the method. Applications may be found in the theory of orthogonal substitutions (xiv., 19, 24) and in "the equation of secular inequalities" (xi., 19). The expression given in xiv., 7, does not correctly represent the square-root of a bilinear form; in fact $[\chi(x)]^2 - x$ is not divisible by $\psi(x)$, the last equation on p. 185 being wrong. The right value will be found in Muth's book (pp. 37, 38); see also *Proc.* Camb. Phil. Soc., vol. xi. p. 81.

The reduction of a quadratic form to squares (xiv., 10) may prove misleading, for it is natural to suppose that the reducing substitution belongs to the same *unitary* type as those in the article quoted (vii., 10). But this inference is not usually correct; thus $2x^2+2xy+2y^2$, which has the matrix $\begin{pmatrix} 2, & 1 \\ 1, & 2 \end{pmatrix}$, *cannot* be reduced to the form $\lambda(ax+by)^2+\mu(cx+dy)^2$, where λ, μ, a, b, c, d are *integers*. It is remarkable that a corresponding reduction *is* possible for an *alternate* form; this contrast might be mentioned. We are surprised that Weierstrass's theorem on equivalence of bilinear forms is not stated, although Kronecker's theorem (xiv., 8, 9) is proved; the latter can hardly be appreciated without the former.

Instead of the bibliographical list which closed the first edition, Mr. Mathews has given a brief historical note. It would have been better to add some references in the course of the text, for, even with a bibliography at hand, it is often difficult to identify the original sources from which extracts have been taken.

T. J. I'A. B.

A MANUAL OF MEDICINE.

A Manual of Medicine. Edited by W. H. Allchin, M.D., London, F.R.C.P. Vol. v. Pp. xii+687. Plates ii.; charts and diagrams. (London: Macmillan and Co., Ltd., 1903.) Price 10*s.* net.

THE volume before us is the fifth of Dr. Allchin's manual of medicine, and is devoted to diseases of the digestive system, the liver, the peritoneum, the vessels of the abdomen, the kidneys, and the ductless glands.

The volume begins with two short articles by the editor upon the normal anatomy of the alimentary canal and the physiology of digestion. These articles seem to be well up to date, and in the former due importance is attached to the surface anatomy of the parts, so important to the clinician. It is, however, rather to be regretted that in the physiology of digestion no mention is made of the recent work upon pancreatic secretion. These articles are immediately followed by one on food and diet by Dr. R. Hutchinson. In twenty pages, only the merest outlines of this subject could be discussed, and the value of articles so condensed is open to question; the principles, however, of dietetics and the chemical composition of the most important food-stuffs and food preparations are given. A useful note upon the bacteria of the alimentary canal, with some suggestions concerning the therapeutic use and actions of so-called intestinal antiseptics, is written by Dr. Lazarus Barlow.

The following eighty pages are devoted to diseases of the mouth, tongue, pharynx and œsophagus, an account of these being supplied by Dr. Bertram Abrahams. These diseases are treated in a comprehensive and systematic manner. We would draw special attention in this connection to the parts of the article devoted to throat complications of acute infectious diseases and the differential diagnosis of acute sore throat. The practitioner will find these sections exceedingly useful. The next section of the work treats of diseases of the stomach and intestines, this section occupying practically 200 pages and being written by the editor. Interpolated in the above is a short account by Dr. Bertrand Dawson of the physical examination of the stomach and intestines. This includes the ordinary clinical methods and the examination by the Röntgen rays and by so-called gastro-diaphany, and also directions for the chemical examination of the gastric contents after the administration of test meals. The reviewer cannot, however, find any directions for the chemical or microscopic examination of the fæces, which might well have been incorporated. In view of recent work upon the subject, a short article by the editor upon diseases of the pancreas will be of interest.

A hundred odd pages are devoted to diseases of the liver, this subject being introduced by a general article upon the morbid anatomy of the liver by Dr. Barlow. Hepatic abscess and perihepatitis are dealt with by Dr. Crombie; degenerations, new growths and gall-stones by Dr. Hebb.

The next section of the book treats of diseases of the peritoneum, and it is also introduced by a short note on the general anatomy of the peritoneum. The consideration of retro-peritoneal suppuration and tumours and sub-phrenic abscess concludes this monograph, for which Dr. Hale White is responsible. Dr. Bryant writes a short account of the diseases of the abdominal blood-vessels, and the volume concludes by an article by Dr. Bradford upon diseases of the kidneys, and one by Drs. Sydney Coupland and Bertram Abrahams upon diseases of the ductless glands.

It will be seen from the above remarks, which amount to little more than an elaborated table of contents, that the volume before us deals very fully with the diseases of the abdominal organs. In conclusion, we may add that this last addition to Dr. Allchin's manual of medicine maintains the standard of its predecessors, and is likely to be of much value to the professional reader. Its usefulness is enhanced by a complete and accurate index.

F. W. T.

OUR BOOK SHELF.

The Racing World and its Inhabitants. Edited by A. E. T. Watson. Pp. vii+309; illustrated. (London: Macmillan and Co., Ltd., 1904.) Price 12*s.* 6*d.* net.

THIS volume, which consists of a reprint of a series of articles contributed by various writers to the *Badminton Magazine*, is essentially a work written by racing men for racing men, and as such seems admirably adapted for its purpose. An important feature is that each article is written by one who has

made the subject of that article his particular pursuit, relaxation, or study; a trainer writing on training, a breeder on breeding, and so on. Under Mr. Watson's able editing, all these diverse factors have been woven into one harmonious and continuous whole.

To the naturalist the most interesting chapter is perhaps the one on breeders and breeding, in which the writer strongly advocates the advisability of plenty of fresh air and exercise for young horses of all kinds, as well as change of pasture. Contrary to the opinion of some of his fellows, the author firmly believes in heredity, and therefore advises the selection for breeding purposes of mares which have made a name on the turf.

As regards shape, he prefers long, low, and broad animals, but it is somewhat curious to notice that in the chapter on trainers and training the writer considers this an old-fashioned view, pointing out that "St. Simon," who was anything but a long and low horse, has done much to modify opinion on this point. It is satisfactory to learn that, according to the last mentioned writer, there is much less viciousness prevalent among racehorses than was formerly the case, this being attributed to gentler and more humane methods of training and treatment.

One other point and we must take leave of this brightly written and well illustrated volume. The point in question relates to the proper manner of drawing a racehorse at full speed. As the frontispiece of Mr. Watson's work we have a picture of a race in which the horses are represented as seen in a photograph, one of them having all four legs off the ground, and looking as though it were about to fall on its nose. In contrast to this, we have, facing p. 103, a reproduction of Herring's well known picture of "Flying Dutchman," in which the horse is represented as galloping *ventre à terre*, with the fore and hind limbs stretched out to their full extent. Obviously it is an inconsistency to have these two types of representing a galloping horse in the same work, as one must obviously be wrong. From the fact that when we draw the wheels of a carriage in rapid motion we represent the spokes as forming a continuous blur, and not as seen in a photograph, our own opinion inclines to the advisability of drawing racehorses somewhat after the old conventional manner, and not as they appear in photographs, when the postures are quite unlike the appearances presented to our eyes.

R. L.

Geologie von Deutschland und den angrenzenden Gebieten. Zweiter Teil. Lieferung i. By Dr. Richard Lepsius. Pp. 246. (Leipzig: Engelmann; London: Williams and Norgate, 1903.) Price 8*s.* net.

THIS part of the text elucidating Dr. Lepsius's well known geological map of Germany maintains a high level, and secures the acceptance of the book as a permanent work of reference. It is not so redolent of the country itself as is the great work on Austria-Hungary recently noticed in these columns (May 19, p. 49), but it embodies the results of extensive researches, and the individuality of the author is agreeably seen when he marshals and reviews the conclusions of those who have gone before him. The present section is of especial interest to students of metamorphic areas. The amphibolites and marbles of the "kristalline Grundlage im Erzgebirge" will recall many occurrences in our Scotch and Irish highlands. The description of the saturation of a schistose area by invading granite (p. 104), and the consequent origin of the gneissic *massif* of the Erzgebirge, will appeal to those who have sought to show that our own "Archæan" gneisses may often be of composite origin, and in places of post-Silurian age. The famous area of granulite in Saxony is dealt with from the point of view so long maintained, in other regions, by French geologists, to whom personal recognition is accorded (p. 172). Dynamic metamorphism is relegated to a relatively unimportant place, and the granulite is treated as a part of the Carboniferous granitic intrusion, making its way, under pressure of superincumbent layers, into a great dome of schists. The pyroxene-granulites and other variations arise from the absorption of diabases, quartzites, and so forth, into the invading mass. The observations of Callaway in Galway and Barrois in Brittany thus receive confirmation from the stronghold of the dynamometamorphic school.

The present part also includes a description of the sandstone area of the Elbe, with lists of Cretaceous fossils, and of the post-Cretaceous overthrust (p. 182) of granite and syenite on the right bank of the river at Hohnstein.

G. A. J. C.

Traité Élémentaire des Enroulements des Dynamos à Courant Continu. By F. Loppé. Pp. vi+78. (Paris: Gauthier-Villars, 1904.) Price 2 f. 75 c.

Étude sur les Résonances. By G. Chevrier. Pp. 76 (Paris: L'Éclairage Électrique, 1904.)

M. LOPPÉ'S little book is an elementary treatise on dynamo windings which we have no doubt will prove useful to many students of this subject. The treatment is quite simple, and the mathematics required are of the most elementary nature. The book is divided into two chapters, the first dealing with bipolar and the second with multipolar machines; only ring and drum windings are discussed. There are a number of good diagrams and winding tables.

The subject of resonance in electric cables carrying alternating currents has already become of considerable importance in electrical engineering, and is likely to come still more to the front as the development of power distribution at high voltages proceeds. M. Chevrier's book is a welcome essay on the subject, as the author has endeavoured to coordinate the existing knowledge and to present the elements of both the theoretical and practical aspects in a clear manner. After a general discussion of oscillating motion, electric circuits are considered in detail, and the various cases of resonance or possible resonance in distributing mains are treated at some length.

Lehrbuch der experimental Physik in elementarer Darstellung. By Dr. Arnold Berliner. Pp. xvi+857; with plates and illustrations. (Jena: Gustav Fischer, 1903.) Price 14 marks.

THIS is an elementary but not a rudimentary treatise. The aim of the author has evidently been to present as completely as possible the fundamental principles and facts which form the groundwork of physics (including mechanics). It can be confidently recommended to any second or third year student of experimental physics who is familiar with German. The mathematics in it is of a very elementary character; the author relies, in fact, not on mathematical demonstrations, but on general descriptions aided by diagrams. Many of these diagrams are very well conceived, and materially assist the description in the text. The author is fond of the use of analogies, and we think him very successful in employing them. We were rather surprised to find the Boer war figuring as one of these analogues.

The book will be found most useful to those students whose mathematical knowledge is only slight. The medical student has, in fact, been kept in view in its elaboration.

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.]*

Octopolarity and Valence.

OF the elements and their compounds there is a general property which is related to the peculiarities of their periodicity in a remarkable manner. This property is that of crystallisation, and in the isometric system is seen in its least complicated form. Among the conceivable causes which might act to produce the regular arrangement of particles evidenced in crystals, the view that considers the atom as having eight fields of polarity radiating from it, corresponding to the eight corners of a cube or the eight faces of an octahedron, agrees well with a wide range of facts. When an isometric crystal is heated and cooled under suitable conditions, polarity is developed in this manner. Four of the centres of polarity are positive and four are negative; the angle between the direction of like poles is 109° 28′.

Consider the bonds of chemical affinity or valence in the first two series of the elements. Helium, the first element of the periodic table proper, is devoid of affinity to combine; the valence of lithium, the first member of the first series, is one, of beryllium two, of boron three, and of carbon four. From stereochemical considerations it is believed that the four bonds of affinity in carbon are alike, and are disposed about the centre of the atom at angles of 109° 28′ apart, as are the four portions of the isometric crystal that have the same polarity. In the first four members of the series there is a regular increase of one bond of affinity to each succeeding element, and all are of the same character. In the next member, nitrogen, the valence is five, but one is of a different character, while four are alike in all respects as in compounds of the type NH_4Cl. Nitrogen forms compounds also on another type of valence, as in NH_3, where it is trivalent. These three bonds of affinity are of the same character. Two bonds of opposite character, one positive and one negative, are rendered latent, a self-balanced pair. Oxygen, the next member, has only two active bonds and also latent pairs, but these are more difficult to render manifest than those of nitrogen. Fluorine has one active bond of affinity, and gives some evidence of possessing latent pairs also. The valence of neon, the last member of the series, is zero, being similar to helium. The next series of eight, Na, Mg, Al, Si, P, S, Cl, and A, corresponds perfectly in regard to the number of active bonds of affinity with the preceding series, while the latent pairs are more easily rendered manifest in combination, with the exception of argon, which has not been made to enter into chemical union. The series exhibits these valencies:—

Na_1	Mg_2	Al_3	Si_4	P_5	S_6	Cl_7	—
				P_3	S_4	Cl_5	—
					S_2	Cl_3	—
						Cl_1	—
							A_0

Thus the arrangement of the pyroelectric poles of an isometric crystal may serve to illustrate the changes of valence of the elements with increment of atomic weight. It would seem that when all eight polar faces have received the increment there is perfect balance, and the structure is no longer chemically active, as in helium, neon, and argon. Each of the first four members, Na, Mg, Al, and Si, has a definite valence which does not change, while P, S, and Cl have, beside the maximum valence, 1, 2, and 3 pairs respectively which can be rendered latent in pairs, as a positive field of force neutralising the effect of a negative field.

With this clue as to the nature of the increment of atomic weight, a conception of the structure of the atom can be formed which presents many remarkable and unexpected points of agreement with the system of the elements. If the increment of atomic weight or the principal factor of increment is due to addition of a ring, and no other structure be found to adapt itself, the original atom form will consist of eight rings arranged like the eight circles inscribed on the faces of an octahedron. That rings will unite to form this as a structure of maximum stability will depend on their possessing the following properties. The material of the ring is a conductor of electric current, and a field of magnetic force permeates the space about the ring. The magnetic field on one side of the ring plane is of opposite polarity to that of the other side. The ring is elastic, and in vibrating would have a number of equidistant non-vibrating nodes about its circumference, separated by internodes of vibration. Briefly it is an elastic, current-bearing ring in rapid motion. After examining all conceivable combinations of this ring, it became apparent that the structure of maximum stability resulting from combination of these rings is that of eight rings arranged like the eight circles inscribed on the faces of an octahedron. The essential condition of stability is that contact of rings should be at non-vibrating nodes, otherwise the energy of vibration would drive them apart, also that the flow of electric current in contiguous rings should be in the same direction in each ring at the point of contact, otherwise there would be magnetic repulsion.

Rings may be added to the eight-ring structure in the order indicated above from study of the crystal and the change of valence in the series, and the stability of the structure retained or even increased. As the external arrangement remains the same, the first rings are forced inward, and as more are added the further in these first rings become, but they will not be strongly vibrating like the outer rings, and so can come in stable contact at any point of the circumference.

As there would very evidently be a limit to the number of series possible, a wire model was made of rings to determine this. When eighty rings were used, forming nine series of eight members each, after the original eight-ring form, no more rings could be added. The four innermost rings had come in contact and would go no further in, being arranged like the four circles inscribed on the faces of a tetrahedron. If a free ring was laid on the surface of the eighty-ring structure, it would be first attracted strongly by the magnetic field, and instead of being held in stable combination would be driven off by vibration of the internodes of the ring where it was laid. Such a structure would spontaneously lose rings, and these liberated rings, in accordance with their properties, would form the original eight-ring structure corresponding to helium.

FRANK A. HEALY.

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Botanical Nomenclature.

AN event of considerable importance to botanists is the publication of a new code of botanical nomenclature, prepared by a commission appointed by the Botanical Club of the American Association for the Advancement of Science. This document, which has the approval of a large number of the leading botanists of America, appears in the *Bulletin* of the Torrey Botanical Club for May, being printed in three languages. The commission proposes to move in the Vienna Botanical Congress of 1905 that the code now offered be adopted bodily, and all other articles abandoned.

In these circumstances, it must be admitted that discussion is opportune. The authors state that they have found the Paris code of 1867 unsatisfactory, because "many important principles are either not recognised, or else given altogether too meagre consideration, and that there is a want of definite and exact statement, which leads to ambiguity." While there is very much in the new code to approve and admire, it seems to me that upon certain points these very words are exactly applicable to it. Without attempting to cover the whole ground, I desire to refer to a few special points.

(1) "Names published for primary subdivisions of species are treated as subspecific names, however designated by their authors." One example given is *Zizia aurea*, var. Bebbii, Coult. and Rose. No example is given of a plant designated a form, or of mutation; are these intended to be excluded? It seems evident that many plants designated varieties are not in any sense subspecies, and so to consider

them is improper. A nomenclatural technicality should not be allowed to obscure the facts.

(2) "A subspecies elevated to specific rank retains the same name, unless the resulting binomial has been previously published." However, *Juncus acuminatus robustus*, Engelm., 1868, though a valid species, does not become *Juncus robustus*, because of *Juncus robustus*, S. Wats., 1879. Further on, we read, "A specific or subspecific name is a homonym when it has been published for another species under the same generic name. Two subspecies of the same genus shall not retain the same name." If two subspecies in a genus may not retain the same subspecific name, as I suppose is intended, though not clearly stated,[1] may a species and a subspecies do so? It appears logically to follow, though again it is not stated, that they may not. Hence in the above case of Juncus, the Watsonian *Juncus robustus* is invalid from the first, because of the Engelmannian subspecies, and there would result from the combination of these rules the dropping of the name "*robustus*" altogether, which seems absurd.

(3) "A generic or subgeneric name is a homonym when previously published, or proposed in print, for another genus." But we are not told whether the publication of a subgeneric name precludes its use in another sense for a genus, or whether when a subgenus is elevated to generic rank it is obligatory to use the subgeneric name, if it is not a homonym. These things are recognised by zoologists, and it does not seem proper for the botanists to ignore them in their code, and then do as they individually please.

(4) Names are considered identical when "mere variations in the spelling of the same word." This seems to me a dangerous rule, and illogical since it ignores the fact that names belong to the objects they designate, independent of derivation. By considering derivation, one can prove that crab and crayfish are "mere variations" of one word,[2] and most assuredly Theodore and Dorothy are one! The examples cited in the code expressly exclude differences of gender in generic names as valid distinctions, and while the specific names Greenei and Greenii (after Greene and Green) are admitted, we are not allowed *virginianus* and *virginiensis*. In this last case, I think a difference in the sense of the adjective may be detected, apart from its application to the plant. It is the same difference that is found between the statements that a man is English, and that he lives in England. One refers to quality, the other to place.

(5) Hybrids may be named like species, with the sign × before, as × *Salix capreola*. I should prefer to write *Salix* × *capreola*. The naming of hybrids in this manner seems necessary, on account of the possible instability of the combination-names. Thus *Castilleia confusa* × *acuminata*, Ckll., *Bot. Gazette*, April, 1900, p. 280, is better called *Castilleia* × *Porterae* (a name I have long had in MS.), because the plant formerly known as *acuminata* is now called by a different name. T. D. A. COCKERELL.

Colorado Springs, Colorado, May 21.

The Formation of Coral Reefs.

SEEING (NATURE, April 21, p. 581) that this delicious bone of contention has once more been clawed from its resting place, I would beg editorial permission to join in discussing it.

That dead coral is soluble in warm seas is indisputable, but that solution in coral regions exceeds deposition is an issue to be tried not in a European laboratory, but on a coral reef. It is claimed that the lagoon of an atoll was excavated by solution, and that the matter removed was poured into the open sea through the reef channels. In opposition to this I reply that the central floor of a lagoon in process of excavation should present a bare surface of eroded rock like the basin excavated by a waterfall; but the middle of a lagoon floor has been shown by many observers, and especially by Mr. G. H. Halligan's boring, to consist of weed, mud, sand, and shingle. These are indications of an area of accumulation, not erosion. Let those who believe that the lagoon floor is dissolved away produce water from the seat of action heavily charged with solution!

Again, it is contended that the water flowing from the lagoon through the exit channels bears away in suspension and solution both matter excavated from the lagoon floor and matter washed by the waves into the lagoon. In denying that either is so drained away to any considerable extent, I would point out that water unarmed with sediment has no cutting power; but if the exit channels conveyed heavily charged water, the sand blast thus produced would cut to pieces every living thing in the passage. By my observations these passages are well carpeted with luxuriant life. To elucidate this important point the next biologist to report on coral fauna might be instructed to survey a main lagoon passage in detail.

If, as I maintain, the lagoon is an area of rapid accumulation from both growth and deposition, then, if no subsidence of the atoll occurs, the lagoon must in time be filled in. Every phase from a chain of islets to an atoll filled in solid is represented in the Pacific.

The destiny of every lake and pool on the earth's surface is to be obliterated by alluvium. It is here contended that the inevitable fate of a stationary atoll is the same, the only difference being that matter is poured from above into the terrestrial lake, whereas it is washed up from below into the atoll lagoon; but, as Darwin observed, while subsidence continues it will preserve to the atoll its lagoon.

CHARLES HEDLEY.

Australian Museum, Sydney, N.S.W., June 20.

The Traction of Carriages.

IN reference to a letter on the above subject in your issue of July 21, the draught of a vehicle depends largely, though not entirely, upon the ratio that exists between the distance from wheel to wheel and the height of the centre of gravity from the ground. If the wheels are far apart and the centre of gravity low, the carriage is hard to draw; if the wheels are closer or the load higher, the draught is lighter.

The reason for this fact may, I think, be readily seen by the following illustration:—Let us suppose a bicycle and rider, the centre of gravity four feet above the road, and vertically mid-way between the wheels. For the present purpose we will disregard the effect of springs and of speed. If the front wheel goes over a stone, say, two inches high, the centre of gravity, or load, is partly lifted vertically and partly thrown back over the hind wheel, describing, with relation to the machine, part of a circle having its centre at the point where the hind wheel touches the ground; and if the wheels are four feet apart, centre to centre, the load is raised about half an inch and moved backward to a much greater extent.

But we can imagine a bicycle of the same weight and having the same load with wheels, say, forty feet apart, and if this machine meets the same obstacle the load will be lifted nearly a full inch, the back-throw being scarcely perceptible; or, on the other hand, we may conceive of a bicycle with wheels four feet apart and the centre of gravity forty feet high, in which case the two-inch stone will scarcely lift the load at all, but only send it (dangerously, no doubt) back over the hind wheel.

Heavy draught depends upon, or is caused by, having to lift the centre of gravity rapidly, and may be lightened by easy springs, large wheels, putting the load high, or putting the wheels near together. CECIL G. SAUNDERS.

Tower House, Canonbie Road, Forest Hill, S.E., July 25.

The Word Cingalese.

ON p. 131 of the current volume of NATURE, the expression "Cingalese fishes," and on p. 78 of the same volume the expression "Cingalese outlier" are found. The word Cingalese is also used in the "Cambridge Natural History" (Mollusca) to denote a subregion. In the first place the word should be spelt Sinhalese, the form above quoted being a quite incorrect transliteration. In the second place, the adjective corresponding to Ceylon is Ceylonese, the word Sinhalese meaning "of or belonging to the Sinhalese race."

Ceylon, July 6. A. K. COOMARASWAMY.

Residual Affinity.

IF Mr. Pickering has imagined that fractions of a charge are necessary, and has not discriminated between fractions of a charge and fractions of a bond, it is not surprising that his contribution of thirteen years ago failed in impressiveness. OLIVER LODGE.

[1] It is, however, clearly indicated by an example given.

[2] Krebis, krebs, crab; krebis, ecrevisse, crayfish, and American, crawfish!

AMERICAN EXTINCT VERTEBRATE ANIMALS.[1]

SINCE the foundation of a department of vertebrate palæontology in the American Museum of Natural History in 1891, the curator, Prof. H. F. Osborn, and his assistants have made some most remarkable contributions to our knowledge of the extinct vertebrate animals of North America. The published work of the first six years was collected in one volume at the end of 1897, and the still more numerous papers contained in the museum *Bulletin* during the last six years have just been bound together in a second volume, which is now issued for sale or exchange. Since 1897, five large quarto memoirs on extinct Reptilia and Mammalia have also appeared under the same auspices. All these publications are illustrated both by photographs and by excellent drawings, which not only explain the technical points of the descriptive letterpress, but are also in many cases beautiful works of art.

The pioneer explorations of Leidy, Marsh, and Cope in the arid regions of the west, where the rocks are not obscured by vegetation, revealed more or less in-

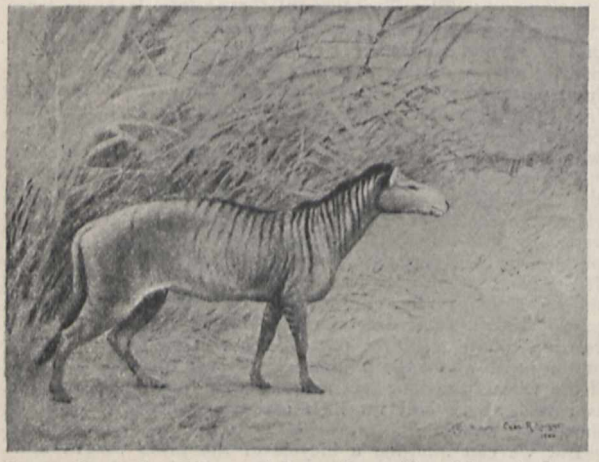

FIG. 1.—Restoration of Four-toed Horse (Protorohippus) from the Lower Eocene of Wyoming.

complete evidence of the evolution of several groups of land mammals. Their work is now ably continued by the American Museum in the more favourable circumstances which result from the spread of civilisation and railroads in the remote territories where the fossils occur. Instead of making hurried forays with an armed escort, the explorers are now able to collect at leisure and make detailed observations of the rocks. Photographs are taken of all the important sections and diggings, and notes are made to determine the exact geological position and relative age of all the skeletons collected. The succession of extinct animals in western North America is thus being gradually determined with certainty, and rests less on inference than formerly. The fossiliferous deposits themselves are also better understood, and some of the earlier conclusions as to their origin have been considerably modified by these later researches. For instance, it appears from Dr. W. D. Matthew's work in connection with the American Museum that many of the famous bone-beds in the west are not contained in the sediments of old lakes of immense extent, but are largely wind-borne, and have accumulated on plains where there were varying swamps, pools, and wandering streams.

While adopting these careful methods of collecting, the American Museum has recently, with the aid of a generous donation from Mr. William C. Whitney, devoted special attention to the ancestry of the horses. Since 1899 expeditions have been sent out each year into the various Tertiary regions to collect fossil horses, and the result is that the volume now before us contains some of the most important contributions to this test-case of evolution that have hitherto been published. It is curious that although remains of horses were dug up and recognised in America so long

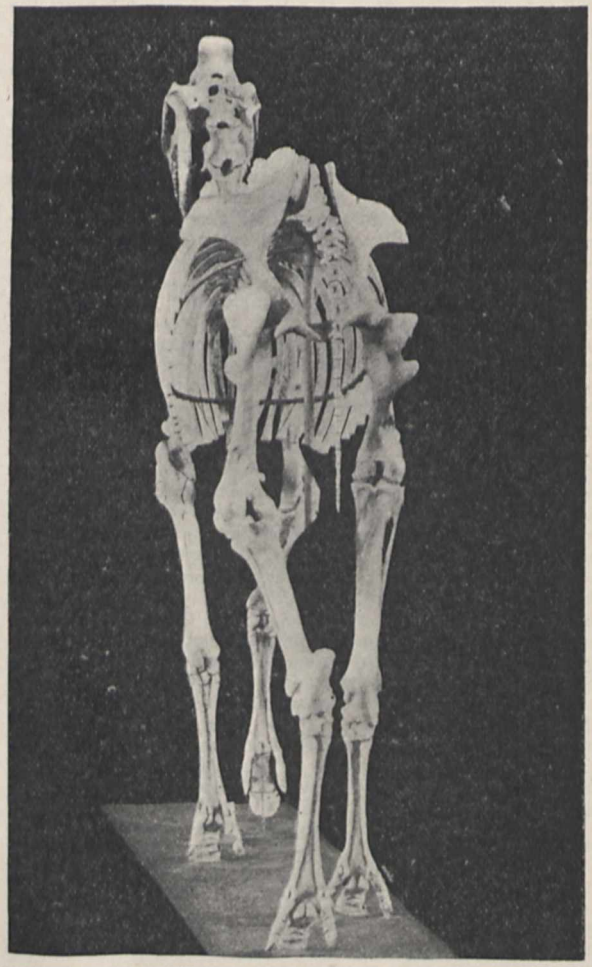

FIG. 2.—Rear view of Skeleton of Three-toed Horse (Hypohippus) from the Middle Miocene of Colorado.

ago as 1826, no complete fossil skeleton had been found until Mr. J. W. Gidley quite lately discovered that of the *Equus scotti* in the Lower Pleistocene of Texas. His collection now in the American Museum comprises satisfactory remains of many individuals, and makes it possible for the first time to realise the exact nature of the true horses which were once so abundant on the North American continent, and strangely became extinct before the dawn of history. A complete skeleton of a three-toed horse (*Neohipparion whitneyi*) is also described by Mr. Gidley from the Upper Miocene of South Dakota, and another nearly similar complete skeleton (Fig. 2) was discovered by Mr. Barnum Brown in 1901 in the Middle Miocene of Colorado. These remarkable fossils are mounted in the American

[1] "Fossil Vertebrates in the American Museum of Natural History Department of Vertebrate Palæontology." Vol. ii. Articles collected from the American Museum *Bulletins* of the years 1898–1903. With a preface by Henry Fairfield Osborn, Curator.

Museum with the older ancestral skeletons and feet obtained from the Cope collection and other sources, and the whole series is described in a popular manner by Dr. W. D. Matthew in an admirable small handbook which can be purchased by the visitor. The interest of the general public in the "dry bones" is also roused by some attempted "restorations" of the various animals as they appeared when alive, Prof. Osborn having secured the services of a skilful artist, Mr. Charles R. Knight. As an example of this popularisation, we reproduce the life-like drawing of the ancestral four-toed horse, Protorohippus (Fig. 1).

Prof. Cope's well known researches on the ancestry of the camels and llamas, which were originally North American animals, have been extended by Dr. Wortman, and he devotes one of the most important papers in the volume now before us to this subject. He and Dr. Matthew also treat of the ancestry of the dogs, while Prof. Osborn himself not only deals with the evolution of the rhinoceroses, but likewise with that of the Amblypoda—the small-brained herbivores of the Eocene period which eventually became bulky and developed fantastic horns when on the verge of extinction. It is curious that the extinct rhinoceroses of North America never developed a horn, except, perhaps, an incipient trace in one species. It is also remarkable that in some of the earliest normal and hornless Amblypoda (Coryphodon) Prof. Osborn is able to discover slight indications of a bony thickening where the horn-cores were destined to grow in the later members of the race.

Numerous primitive small-brained carnivores (Creodonta) are described and discussed by Drs. Wortman and Matthew, and a new classification by the latter author advances far beyond any scheme previously published. These animals are very important, because they are not only to be regarded as the ancestors of the higher Carnivora, but are also closely related to the marsupials of the Australian region and South America. The North American specimens appear to be abundant, and many are especially well preserved. Collections like those made by the American Museum are thus of more scientific value than the fragmentary remains with which palæontologists have hitherto been obliged to remain content in the Old World.

Among the remains of true Carnivora discovered by the American Museum expeditions, one of the most interesting is a gigantic skull, 18 inches in length, found with a few other bones of the skeleton in the Upper Miocene of Texas. This specimen evidently belongs to a massive animal which is neither a bear nor a dog, but something intermediate between the two. Dr. Matthew compares it with Dinocyon from the Upper Miocene of France, and describes various fragments of allied genera. It now appears that the late Prof. Cope was referring to a jaw of one of these animals when he made the announcement some years ago of the discovery of a fossil hyæna in North America. There is still no evidence of hyænas in the New World.

The ancient American lemurs form the subject of an elaborate technical paper by Prof. Osborn. The possible earliest ancestors of the rodents, from the basal Eocene, are also discussed by him. A horned rodent—the first known horned member of its order—is described by Dr. Matthew from the Upper Miocene of Colorado. This animal (*Ceratogaulus rhinocerus*) seems to have been related to the beaver, and bears a pair of bony horn-cores on the nose. There is also a paper by Dr. Matthew on the first remains of a true hedgehog discovered in North America.

The perfection of the modern methods of collecting and preparing fossils is well seen in the wonderful carapace of an extinct armadillo, *Glyptotherium texanum*, from the Lower Pleistocene of Texas. It has been known for many years that the typical South American Glyptodonts ranged northwards over the Isthmus of Panama into the southern United States before their final extinction, but no example so nearly complete as that now mounted in the American Museum (Fig. 3) had previously been obtained.

Besides Mammalia, the American Museum has collected many Reptilia, notably Dinosauria from the Jurassic of Wyoming. Since 1898 a party has been sent each year to the so-called Bone Cabin Quarry, which has proved especially rich in megalosaurian and dinosaurian remains. During the first season alone, no less than six nearly complete limbs and three fore-feet were disentombed from this spot. Since then a nearly complete skull of the megalosaurian Creosaurus, and the greater part of a skeleton of a new small and slender Dinosaur (*Ornitholestes hermanni*) have been obtained, besides less important fossils. All these are described by Prof. Osborn, and add valuable facts to our knowledge of the animals to which they belong. A well preserved skull of the horned Cretaceous Dinosaur *Triceratops serratus* is also described in much greater detail than heretofore by Prof. R. S. Lull.

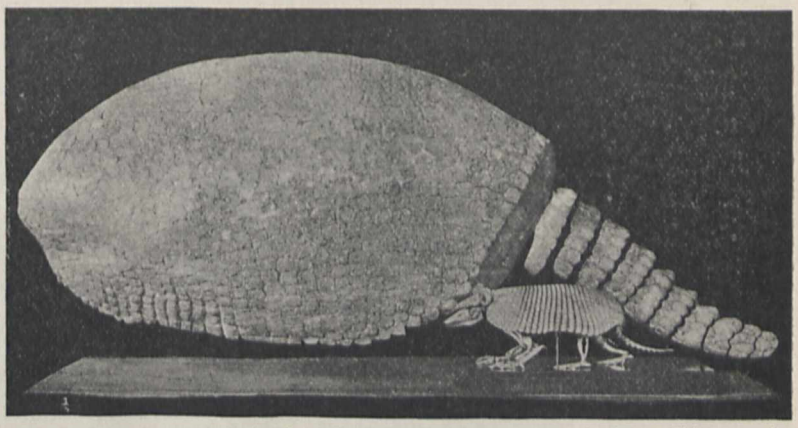

FIG. 3.—Carapace and Tail-sheath of *Glyptotherium texanum* from the Lower Pleistocene of Texas; with a modern Armadillo for comparison.

It only remains to add that the lower vertebrates are by no means neglected by the American Museum. In the present volume there are two valuable papers on Cretaceous fishes by Dr. O. P. Hay, the one dealing with American specimens in the Cope collection, the other with well preserved fishes from the fissile chalk of the Lebanon, Syria. The latter is particularly interesting as making known much new evidence of the forerunners of the saw-fishes and eels, which were almost completely developed in the Cretaceous period.

In conclusion, it must be remembered that the American Museum of Natural History is only in part a public institution. It receives only limited support from the municipality of New York and the State Board of Education. The department of vertebrate

palæontology depends almost entirely upon private munificence for the means of research. The staff is thus to be congratulated all the more on its remarkable achievements in advancing this branch of science. The collection it has mounted for public exhibition is unique as an illustration of the facts of organic evolution, and the specimens themselves have never been surpassed as examples of skilled collecting and preparation. A. S. W.

MANCHURIA UNDER RUSSIAN RULE.[1]

THIS book, dedicated to the "Gallant Japanese Nation," is a reprint of letters from Manchuria written during the autumn of 1903 for some Far Eastern publications. The narrative of events is brought down to the outbreak of war between Russia and Japan, and a "prologue" has been added to serve as a sketch of the history of Manchuria from the earliest times of which there is any record to the present day. The author is well versed in his subject, has travelled extensively in all three provinces of Manchuria, is a careful observer, and shows a sound judgment. His style is easy, and the book well worth reading from beginning to end. Indeed, we may say that it should be read by everyone who wishes to form a true opinion of the remarkable events now taking place in the Far East. For remote as Manchuria is from western Europe, its occupation by Russia, coupled with the lease from China of the peninsula of Kwan-tung, the construction of the "Chinese Eastern Railway," and the war are of great importance to the whole civilised world.

FIG. 1.—The Entrance to Port Arthur. From "Manchu and Muscovite.'

The story of this extraordinary leap in the dark of a great Power whose policy had been hitherto not wanting in prudence and foresight is well told by the author in his opening chapters. The idea, it seems, first occurred to Prince Uktomsky while accompanying the present Tsar, then Tsarevitch, in a tour round the world ten years ago. He was astonished at the success which had "attended the spread of Anglo-Saxon trade and ideas under the ægis of England's undisputed naval might," and he thought the time had come for Russia to establish an empire in the Far East. To carry out such a gigantic undertaking it was necessary to secure the services and collaboration of men of genius and untiring industry. Such a man was found in Count Cassini, the Russian Minister at Peking, whose name is associated with that of Prince Uktomsky in this vast project. "These two men," says our author, "did more than any others to set the snowball rolling down from bitter Siberia on to China."

The next step was to organise the Russo-Chinese Bank, for without this Russia could not have gained even a temporary success. M. Pokotiloff, the agent of this bank, and Mr. Victor von Grot, one of Sir Richard Hart's most valued colleagues, were entrusted with the measures necessary to ensure the credit of the Russian Government. Success at first crowned the labours of these men, and the possibilities of the future grew more and more attractive, the ultimate destruction of China and the reduction of Japan to the rank of a secondary Power being not the least important. The first blow to Russian supremacy occurred in 1895, when Japan defeated China and obtained the cession of Liau-tung. This, however, was neutralised by skilful diplomacy, and China retained possession of the forfeited territory at the price of the concession for building the trans-Manchurian Railway. By 1900 the Russo-Chinese Bank had attained the high-water mark of prosperity. But even then there were symptoms of something not being quite right, and when the following year the Russian railway administration decreed that henceforth passenger fares and freight charges must be paid for in rouble notes the whole edifice of Russian Empire in Manchuria began to totter. The defeat of the "travelling rouble" is well told by Mr. Weale—how the dollar-loving Chinaman resented the threatened loss of what he considered his birthright by the arbitrary decrees of the Russian bureaucrats, how he prepared for battle, and how finally the rouble notes, tons of which had been imported into China, were discredited and disappeared.

The three chief instruments of Russia in her policy of expansion in Manchuria were the rouble, the Russo-Chinese Bank, and the railway. These three were so intimately associated and so well planned to work together that you cannot explain one without mentioning the others. In the words of our author, "they are a three-headed Medusa that turn their threatening faces on poor China and either enchant or quell her with their looks." It was becoming evident that the task Russia had so lightly undertaken was beyond her powers. She had misjudged the resistance she would encounter from the yellow race; great as her own resources were, she had over-rated these. Too confident of her strength, and relying on her successes

[1] "Manchu and Muscovite." By B. L. Putnam Weale. Pp. xx+552. (London: Macmillan and Co., Ltd., 1904.) Price 10s. net.

in overawing the native races of Central Asia, with a great faith in her destiny, she had embarked on these projects of expansion without due preparation and almost in a reckless spirit. Russia urgently requires peace, reform and retrenchment, and all these grand schemes of expansion, whether eastward to the Pacific or south to the Persian Gulf, must be abandoned. The whole system of administration is corrupt, and as long as it remains so she cannot expect to prosper, however well her soldiers fight. The lessons of this war will, it is to be hoped, turn her attention to other matters than conquest.

In the course of three years our author visited the principal towns of Manchuria—Port Arthur and its docks; Dalny, the future commercial port, upon which millions have been wasted; Newchwang; Harbin, the great railway city; Mukden, the old capital; Tsitsihar, on the Nonni; Petuna; Ninguta; and Kirin, the centre of the lumber trade. All these places are admirably described, and the incidents of the journey, whether by road, rail, or river, are amusingly told. One of the most entertaining chapters of the book is that entitled "Russia's Great Manchurian General *alias* the Chinese Eastern Railway." What this railway has cost the Russian Government will probably never be known. The author estimates it at forty-five millions sterling, though others regard this as too moderate a sum, for many accidental charges have to be added to the original cost. There were the re-laying of the rails, for these at first were far too light to resist the train weights, the changing of the sleepers, the re-building of many miles of road destroyed during the Boxer troubles, new steel-bridge work, new feeder lines, the enormous administration buildings, and stone towers for guarding the line. There were the railway, sea-going and river-steamer services, the railway barracks, the railway mines, and many other offshoots belonging to the Chinese Eastern Railway Co. The railway managed as it is can never be a commercial success, yet so rich is the country through which it passes that if properly administered and in English hands it would pay a fair return on the outlay. At present it is a frightful failure, and the best thing that could happen would be for Russia to sell the whole undertaking to Englishmen—"the only men who have been able so far to handle the Chinese with real success in trade and industry."

We learn a good deal concerning the productions of Manchuria from this book—"the greatest wheat producer in the East, the greatest lumber-field and the greatest gold mining centre." Beans constitute at present the agricultural wealth of the country, but this will not remain so for long. Manchuria is a wheat country, and flour will in a few years have taken the place of beans in the export list. The climate is described as excessively cold in winter and hot in summer, but otherwise very healthy.

BRITISH ASSOCIATION MEETING AT CAMBRIDGE.

SECTIONAL ARRANGEMENTS.

IN an article published in NATURE, July 21, p. 277, a general account was given of the local arrangements for the forthcoming meeting. As the main items in the sectional programmes have now been settled, it may be of interest to give a short list of papers, lectures and discussions. A new feature in the sectional arrangements this year is the increased prominence given to discussions and afternoon lectures of a semi-popular character. The number of favourable replies to the usual invitation circular received from leading men of science in Britain justifies the hope that the meeting will be a thoroughly representative one. Invitations have been issued to an unusually large number of American and foreign men of science, and in spite of the St. Louis Exhibition and other counter attractions the committee hopes to have the pleasure of entertaining about 140 guests.

Section A (Physics).

The guests include Prof. Abraham, Göttingen; Prof. Burkhardt, Zürich; Prof. Birkeland, Christiania; Prof. Dieterici, Hanover; Prof. Kayser, Bonn; Prof. Korteweg, Amsterdam; Prof. Lummer, Charlottenburg; Prof. Langevin, Paris; Prof. Leduc, Paris; Prof. MacLennan, Toronto; Prof. Pockels, Heidelberg; A. L. Rotch, Director of the Blue Hill Observatory, U.S.A.; Prof. Rubens, Charlottenburg; Prof. Sommerfeld, Aix-la-Chapelle; Prof. Voigt, Göttingen; Prof. Volterra, Rome; Prof. Wood, Baltimore; Prof. Wien, Würzburg.

The most important items will be a discussion on the radio-activity of ordinary matter, opened by Prof. J. J. Thomson, a discussion on standard wave-lengths of light by Prof. Kayser, and one on the units used in meteorological measurements. Prof. Larmor will make a communication relating to the laws of radiation; Prof. Rubens promises a paper on "Reststrahlen" and the optical qualities of metals, and Prof. Wood will contribute papers on anomalous dispersion and colour photography. Prof. Poynting will deliver a popular afternoon address on radiation in the solar system, and on the last day of the meeting Prof. Fleming will give an address dealing with some recent advances in connection with wireless telegraphy. Dr. Glazebrook is expected to give an account of some recent work at the National Physical Laboratory, and Prof. Birkeland will make a communication on the connection between solar physics and meteorology.

Section A (Mathematics).

The guests include Prof. Bendixson, of Stockholm, and Prof. Meyer, of Königsberg.

The following papers have been arranged:—Prof. Franz Meyer, die Ziele der Geometrie; Sir Robert Ball, note on a special homographic transformation of screw-systems; Major MacMahon, the theory of linear partial differential equations; Prof. A. R. Forsyth, notes on the theory of groups; Prof. F. Y. Edgeworth, the law of error; Prof. F. Morley, geometry of the complex variable; Prof. Bromwich, on the roots of the characteristic equation of linear substitutions; A. N. Whitehead, Peano's symbolic method; Harold Hilton, notes on plane curves; G. H. Hardy, Taylor's series.

There will be an exhibition of geometrical models in the large room of the Cavendish Laboratory.

Section A (Astronomy and Cosmical Physics).

Dr. H. R. Mill, on the unsymmetrical distribution of rainfall about the track of a barometric depression; Miss F. E. Carr, the application to meteorology of the theory of correlation; H. N. Russell, on the masses of the stars. Papers are promised also by Father Cortie, S.J., Dr. Lockyer, H. F. Newall, and A. R. Hinks.

Section B.

The following have accepted the invitation to attend the meeting:—Prof. Aschan, Helsingfors; Prof. Brühl, Heildeberg; Prof. Busch, Erlangen; Prof. Cohen, Utrecht; Dr. Etard, Paris; Prof. Feist, Kiel; Prof. Franchimont, Leyden; Prof. Freund, Frankfort; Prof. Guye, Geneva; Prof. Gabriel, Berlin; Comte de Gramont, Paris; Prof. Haller, Paris; Prof. Knoevenagel, Heidelberg; Prof. Meyer, Brunswick; Prof. Meyerhoffer, Berlin; Prof. Michael, Tufts College, U.S.A.; Dr. Noelting, Mülhausen; Prof. van Romburgh, Utrecht; Prof. Thiele, Strassburg; Prof. Thierfelder, Berlin; Prof. Traube, Berlin; Prof.

Tschirch, Berne; Prof. Wegscheider, Vienna; Prof. Walden, Riga; and Prof. Wollenstein, Berlin.

It is expected that the following communications will be made:—Dr. T. M. Lowry, dynamic isomerism; H. O. Jones, the stereochemistry of nitrogen; Prof. Paul Groth, on crystal structure and its relations to chemical constitution; Prof. Isidor Traube, on the velocity of osmosis and on solubility; Dr. E. A. Perman, the decomposition and synthesis of ammonia; Prof. C. Dieterici, on the energy of water and steam at high temperatures; D. L. Chapman, on the active variety of chlorine; R. S. Morrell and A. E. Bellars, the oxidation of carbohydrates by hydrogen peroxide in the presence of ferrous sulphate; R. S. Morrell and E. K. Hanson, studies in the dynamic isomerism of the α- and β-crotonic acids; F. G. Donnan, a suggested explanation of the phenomena of opalescence observed in the neighbourhood of critical series; M. le Comte Arnaud de Gramont, sur le spectre du soufre dans la photographie de l'etincelle des minéraux; H. J. H. Fenton, mesoxalic semialdehyde; note on the influence of radium radiations on atmospheric oxidation in presence of iron; a reaction for ketohexoses; H. J. H. Fenton and J. P. Millington, a colour reaction for methylfurfural and its derivatives; Prof. Ossian Aschan, on the pentavalent nitrogen atom; G. Barger, saponarin, a glucoside coloured blue by iodide; Dr. W. A. Bone and R. V. Wheeler, the union of hydrogen and oxygen in contact with a hot surface; Prof. Richard Meyer, the constitution of phthalein salts; G. T. Beilby, the intensification of chemical action in the neighbourhood of hot metals and other surfaces; reactions between solid salts.

Section C.

The guests include Dr. Ami, Ottawa; Prof. Brögger, Christiania; Prof. Bächström, Stockholm; Prof. Busz, Münster; Prof. van Calker, Groningen; Prof. Groth, Munich; Prof. Goldschmidt, Heidelberg; Dr. Rothpletz, Munich; Prof. Sjögren, Stockholm; Dr. Seligmann, Coblenz.

It is expected that the following communications will be made to the section:—B. N. Peach and G. Horne, the base line of the Carboniferous system round Edinburgh; G. W. Lamplugh, note on Lower Cretaceous phosphatic beds and their fauna; H. B. Woodward, note on a small anticline in the Great Oolite series north of Bedford; P. F. Kendall, evidence in the Secondary rocks of persistent movement in the Charnian Range; Dr. Ami, the geological resources of Canada; E. Greenly, the lava domes of the Eifel; A. Harker, exhibition of Tertiary plutonic rocks from the Isle of Rum; Prof. Busz, notes on some Cornish rocks; Prof. Bäckström, origin of the great iron-ore deposits of Lapland; L. J. Spencer, on the different modifications of zircon; F. W. Harmer, the Great Eastern Glacier; Rev. W. Lower Carter, glaciation of the Don and Dearne valleys; E. Greenly, notes on the glaciation of Holyhead Mountain; W. Whitaker, on a great depth of drift in the valley of the Stour, Suffolk, and some Cambridgeshire wells; Rev. W. Lower Carter, river captures in the Don system; Rev. O. Fisher, on the elephant trench at Dewlish, Dorset; Prof. W. J. Sollas, on the structure of the Silurian Ophiurid, *Lapworthura miltoni*; E. A. Newell Arber, on the fossil plants of the Upper Culm Measures of Devon and on derived plant petrifications from Devonshire.

There will be a discussion on the nature and origin of earth movements, opened by the president (A. Strahan), Dr. Teall, Prof. Sollas and G. Horne. Dr. Marr will give a lecture on the geology of Cambridgeshire.

Section D.

Acceptances have been received from the following zoologists:—Prof. Boveri, Würzburg; Dr. Calkins, New York; Prof. Hubrecht, Utrecht; Prof. Keibel, Freiburg; Prof. Minot, Cambridge, U.S.A.; Prof. Osborn, New York; Dr. Przibram, Vienna; Prof. W. B. Scott, Princetown; Prof. Max Weber, Amsterdam; Prof. Ramsay Wright, Toronto; and Prof. E. B. Wilson, New York.

On Thursday afternoon Prof. Osborn, of New York, will open a discussion on recent contributions to the evolution of the horse. The discussion will be continued by Prof. Cossar Ewart and Prof. Ridgeway. On Friday there will be a discussion on heredity, in which the following have promised to take part:—The president (W. Bateson), Miss Saunders, and Messrs. A. D. Darbishire, Hurst, Biffen, Doncaster, Lock and Staples-Browne. In connection with this discussion there will be an exhibition of animals and plants in illustration of the several contributions. Monday morning will be devoted to a joint discussion with Section K on the significance of the reduction division of the nucleus, in which Profs. Calkins, E. B. Wilson and others are expected to take part. In the afternoon of Monday Prof. Przibram and Mr. Brindley will open a discussion on regeneration and asymmetry. Mr. Keeble will deliver a popular lecture on the coloration of marine Crustacea. On Tuesday afternoon Dr. C. W. Andrews will give a lecture on Egyptian Eocene vertebrates and their relationships, particularly with regard to the geographical distribution of allied forms.

The sectional programme includes also papers by Prof. Keibel and Prof. Calkins on the Cytoryctes, the protozoan said to be the organism of small-pox; G. H. F. Nuttall, on the precipitation tests in the study of animal relationships; Prof. Graham Kerr, on the African collections of the late J. S. Budgett; J. W. Jenkinson, on the origin of the cleavage centrosomes in the axolotl egg; J. H. Bryce, on the histogenesis of the blood of the lepidosiren larva; Prof. Elliot Smith, on Loos's researches on Ankylostoma (the miner's worm), which he has studied in Egypt.

Section E.

The foreign visitors include M. de Déchy, Odessa; Prof. Hettner, Heidelberg; and Dr. Wind, Utrecht.

Popular afternoon lectures will be delivered by Mr. A. Silva White on scenes and sketches of life in the Nile Valley, and by Dr. Tempest Anderson on the Lipari Islands and their volcanoes. The list of papers includes the following:—(*a*) *Travel*: Major Burden, people and places in Nigeria; A. W. Hill, a journey round Lake Titicaca; Colonel Delmé Radcliffe, surveying in Western Uganda; Dr. von Drygalski, the German Antarctic Expedition. It is hoped that Mr. Bruce, of the Scottish Antarctic Expedition, may be able to attend the meeting. (*b*) *Historical Geography*: Rev. H. S. Cronin, Ptolemy's map of Asia Minor, methods of construction; D. G. Hogarth, Cyrene—an illustration of the bearing of geography on history; C. R. Beazley, the first true maps (Portolani of the early fourteenth century); Rev. A. Hunt, the site of the battle of Brunanbush (Lincolnshire) in the tenth century; H. Yule Oldham, changes in the features of the Fen district. *Physical Geography*: M. Déchy, the glaciers of the Caucasus; M. C. Rabot, glacier-bursts; Dr. H. R. Mill, a new physical map of Great Britain; Prof. Yapp, vegetative features of the Fen district; F. J. Lewis, botanical survey of parts of Westmorland; R. T. Günther, changes in the coast-line in the Bay of Naples. There will also be a paper by Major Close, R.E., on recent improvements in survey methods.

Section F.

The following have signified their intention of being present:—Prof. Dietzel, Bonn; M. Yves Guyot, Paris; Dr. Körösi, Budapest; Prof. Lotz, Munich; Prof. Mahaim, Liège; Dr. Mandello, Budapest; Dr. Pierson, the Hague.

The following papers have been arranged in connection with this section:—Prof. Flux, on improvements in agriculture and their effect on economic rent; Prof. Edgeworth, a moot point in the theory of international trade. Friday, August 19, will be devoted to a discussion on the theory and practice of foreign trade at home and abroad. Contributions will be made by Prof. Dietzel, Prof. Lotz, M. Yves Guyot, and L. L. Price. It is hoped that most of the leading English economists will be present. On Monday Mrs. Bosanquet will read a paper on the economic importance of the family, and there will possibly be a communication on cotton-growing in the Empire. In the afternoon of Friday, August 19, some members of the section will visit the Garden City near Hitchin. Among other papers may be mentioned those by J. A. Baines, distribution of rural population in India; T. C. Horsfall and Mrs. Fisher, on the housing question, and possibly a communication on some allied questions by His Excellency Dr. Pierson. It is expected that the programme will include the following additional items:—Prof. Mahaim, changes in Belgian wages; A. L. Bowley, measurement of national progress; C. J. Hamilton, trade unions in the United States of America; H. A. Roberts, employment of graduates; and W. G. Adams, modification of the income tax.

Section G.

Prof. Schröter, of Munich, is expected to attend the meeting. After the presidential address the most important items of the programme are a discussion on internal combustion engines, opened by Mr. C. Dugald Clark and Prof. B. Hopkinson. On Thursday afternoon Mrs. Ayrton will give a lecture on the origin of sand-ripples, illustrated by experiments which were recently shown at a conversazione at the Royal Society. On Monday, August 22, papers will be read by C. H. Merz on the use of electricity on the North-Eastern Railway and on Tyneside; A. A. Campbell Swinton, electricity from water-power; W. M. Morley and A. G. Hansard, energy losses in magnetising iron; Prof. J. A. Fleming, large bulb incandescent lamps as secondary standards of light. The following communications have been arranged for Tuesday, August 23:—Major Sir Hanbury Brown, K.C.M.G., on the Nile irrigation problem; J. H. Wicksteed, a universal testing-machine of 300 tons for full-sized members of structures; S. Cowper Coles, a new process for applying zinc to metallic surfaces; J. W. Hayward, the effects of receiver drop in a compound engine.

Section H.

The guests who have accepted the invitation to attend connected with this section include Prof. Deussen, of Kiel; Mr. Howitt, Australia; Prof. Kabbadies, Athens; Prof. Montelius, Stockholm; Prof. Schmidt, Copenhagen; and Dr. R. Livi, Rome.

The address of the president (Mr. Henry Balfour) will be delivered on Thursday at 10.30, and will deal with the theory of evolution in the material arts, as expounded by the late General Pitt-Rivers, and illustrated in the Pitt-Rivers Museum at Oxford. The same subject will be pursued by Prof. Montelius, of Stockholm, in a study of the evolution of the lotus-ornament, by Prof. Flinders Petrie in regard to the series of Roman lamps discovered in this season's excavations at Ekhnasya, in Egypt, and by Mr. R. T. Günther in a paper on the *Timaruta* charms from Naples.

Friday's session will be devoted to papers on anthropological surveys, actual and projected, in various parts of the world. Special stress will be laid by Prof. D. J. Cunningham, Mr. J. Gray, Mr. F. C. Shrubsall, and others on the practical value of such surveys of the physical characters of a complex modern population in providing data for inquiries of hygienic, economic, and even political nature; and a discussion is arranged on the best means of organising such surveys, with special reference to the work of the committee on physical deterioration, the report of which is, fortunately, now available for consideration.

Another important discussion, also set down provisionally for Friday, deals with the report of the committee on the present state of anthropological teaching.

Monday will be devoted to papers on social and religious institutions, and on folklore, and to a discussion of Sir Richard Temple's method of recording the languages of savages.

Tuesday's programme deals with recent work in Greek lands, with papers by Dr. Arthur Evans, Miss Boyd, and Messrs. Bosanquet and Dawkins, on their respective excavations in Crete; and with a demonstration by Prof. Montelius on the geometrical period in Greece. Other archæological papers deal with recent excavations on prehistoric sites in Denmark, Scotland, and elsewhere.

The papers hitherto received on points of human anatomy are of less popular interest and will probably be discussed by a subsection on one of the days of the meeting, to be announced later.

Section I.

The following American and foreign physiologists hope to be present at the meeting:—Prof. Atwater, Middletown, U.S.A.; Dr. Asher, Berne; Prof. Adamkiewicz, Cracow; Prof. Boruttau, Göttingen; Prof. Biedl, Vienna; Fräulein Bienenfeld, Vienna; Dr. Barbieri, Paris; Dr. Camus, Paris; Prof. Cavazzani, Ferrara; Prof. Dupuy, Paris; Prof. Donaldson, Chicago; Prof. Fröhlich, Vienna; Prof. Gley, Paris; Prof. van Gehuchten, Louvain; Prof. Johannson, Stockholm; Prof. Kossel, Heidelberg; Prof. Munk, Berlin; Prof. Magnus, Heidelberg; Prof. Mareš, Prague; Prof. Macallum, Toronto; Prof. Nicloux, Paris; Prof. Porter, Cambridge, U.S.A.; Prof. Stewart, Chicago; Dr. Veress, Würzburg; Prof. Verworn, Göttingen; Dr. Vaschide, Paris; Prof. Wedenskii, St. Petersburg.

The organising committee has introduced two items which it is hoped will prove of considerable interest. Prof. Atwater will give a lecture entitled "Nutrition Experiments on Man in the United States." The lecture will include an account of the laborious researches carried on at Middletown, U.S.A., under the auspices of the United States Government. The lecture will be of an entirely popular character, and Prof. Atwater will deal not only with the strictly physiological, but also with the economic aspect of the subject. He will treat of such problems as the feeding of the very poor in large cities. The second new feature will be a couple of discussions of a highly technical nature—oxidation and functional activity, and conduction and structure in the nerve-cell and nerve-arc. The discussions will be opened by Sir John Burdon-Sanderson and Prof. Langley respectively. There will also be a number of papers on physiological subjects, and on Saturday morning two sittings will take place simultaneously, one being devoted to pathology and the other to experimental psychology and the special senses.

Section K (Botany and Agriculture).

The following botanical guests are expected:—Prof. Bertrand, Lille; Prof. Borzi, Palermo; Prof. Chodat, Geneva; Prof. Czapek, Prague; M. de Candolle,

Geneva; Prof. Engler, Berlin; Prof. Errara, Brussels; Prof. Eriksson, Stockholm; Prof. Fujii, Tokio; Mlle. Goldflus; Prof. Klebs, Halle; Dr. Lotsy, Leyden; Prof. Macfarlane, Philadelphia; Dr. Overton, Würzburg; Prof. Pierce, Stanford University, California; Prof. Reinke, Kiel; Prof. Schröter, Zurich; Dr. Schoute, Wageningen; Prof. de Toni, Modena; Prof. Vöchting, Tubingen; Mme. Weber van Bosse, Amsterdam; Prof. Zacharias, Hamburg.

Mr. Francis Darwin's presidential address will deal with the statolith theory of geotropism, being a discussion of the recent work on the means by which plants "perceive" the force of gravity. The semi-popular lecture, which in recent years has become one of the features of the section, will be given on Monday afternoon, at 2.30 p.m., by Dr. D. H. Scott. Prof. H. Marshall Ward and Prof. Jakob Eriksson, of Stockholm, will discuss their recent important researches on the biology of the fungi, especially the Uredineæ. The structure of the Cyanophyceæ will be dealt with by Prof. Zacharias, of Hamburg, Prof. Chodat, of Geneva, and others. Dr. J. P. Lotsy, of Leyden, has promised to give an account of the virgin woods of Java, and Prof. S. H. Vines will read a paper on the proteases of plants. Dr. F. F. Blackman will give an account, illustrated by experiments, of his important researches on assimilation and respiration; Prof. A. G. Tansley will give an address on some problems of ecology, followed by papers on various aspects of ecological botany by Prof. Engler, of Berlin, Dr. W. G. Smith, and Messrs. T. W. Woodhead and F. T. Lewis. Papers will be contributed to this section also by Profs. Czapek, Vöchting, G. Pierce, C. E. Bertrand, Dr. Margaret Stopes, Miss Sibille Ford, Prof. Hartog, Dr. W. G. Lang, E. A. Newell Arber, J. Parkin, Dr. A. Reginald Buller, Alfred P. Maudslay, Harold A. Wager, G. Barger and others.

For the first time in the history of the Association there will be a subsection devoted to agriculture, presided over by Dr. W. Somerville.

The following communications have been promised:—A. D. Hall (Rothamsted Experimental Station), the probable error of agricultural field experiments, and analysis of the soil by means of the plant; T. S. Dymond (County Laboratories, Chelmsford), the influence of sulphate as manure upon the yield and feeding value of crops, and the determination of the availability of insoluble phosphate in manures; R. H. Biffen, the improvement of wheats and Mendel's laws; R. H. Elliot, the clover mystery— a probable solution of it; Prof. Middleton, improvement of clay pastures through the agency of clovers; T. B. Wood and R. A. Berry, chemical composition of root crops.

Section L.

The visitors to this section include Dr. Anderssen, Christiania; M. Demolins, La Guichardière; Prof. Dewey, Chicago; Dr. Gallander, Orebro; Miss Laura Drake Gill, Barnard College, Columbia University, New York; M. A. Gobert, Brussels; M. Hovelaque, Paris; Dr. Hausknecht, Kiel; Miss Hazard, president of Wellesley College, U.S.A.; Miss Irwin, Dean of Radcliffe College, Cambridge, U.S.A.; Fräulein Knittel, Breslau; Prof. Mangold, Berlin; Prof. Münch, Berlin; Mme. Dick May, Paris; Miss Oakley, Montreal; Director Trüper, Jena; Fröken Whitlock, Djursholm, Sweden; Miss M. A. Willcox, professor at Bryn Mawr, U.S.A.

One of the chief debates in Section L will be on the subject of school-leaving certificates, with special reference to the scheme proposed by the consultative committee of the Board of Education. Other important subjects selected for discussion are the national and local provision for the training of teachers, and manual instruction in its broadest sense. Afternoon semi-popular talks will probably be given by A. D. Hall, director of the Lawes Agricultural Trust, on the need of scientific method in elementary rural instruction, and by Prof. Armstrong on the research method applied to experimental teaching.

The above summary is based on the facts supplied by the recorders of the several sections.

Tickets and programmes of local arrangements may now be obtained on application to the local secretaries, Emmanuel College, Cambridge.

SIR JOHN SIMON, K.C.B., F.R.S.

BY the death of Sir John Simon, which occurred on July 23, in his eighty-eighth year, this country has lost one of the leaders in sanitary science who with Chadwick and others made the Victorian period a memorable one. Simon commenced the study of medicine in 1833, when he was seventeen years old, and attended both St. Thomas's Hospital and the recently established King's College. Here he studied under Joseph Henry Green, the first professor of surgery at the last-named college, and acted as assistant to Todd in preparation for his physiological lectures. On the foundation of King's College Hospital in 1840, Simon became senior assistant surgeon, being associated with men so well known as Fergusson, Partridge and Bowman. It was in 1848 that he turned his attention to that branch of medicine in which his name became famous. The Corporation of the City of London applied to Parliament for powers to improve the sanitary administration of the City, and as the result of the passing of the City Sewers Act he was appointed Medical Officer of Health. About this time the epidemic recurrence of cholera in this and other countries began to attract attention, and in 1855 it was decided to create a Central Board of Health, for the medical officership of which Simon was selected. In 1858 the functions of the Board were transferred to the Privy Council. This position made him adviser to the Government on all sanitary and medical matters, and he continued to act until 1876, when he resigned his appointment, and on his retirement the decoration of C.B. was conferred on him. On the occasion of Queen Victoria's Jubilee in 1887 he was created a K.C.B. In 1867 he was appointed a Crown member of the General Medical Council, and took an active part in the work of that body until 1895.

The effect of Simon's work as Medical Officer of Health was far more than local; his annual reports, which cover the years 1848 to 1855, form a landmark in the history of English sanitation; they survey the sanitary condition of the City, review the risks arising from cholera and other infective diseases, detail the evils of overcrowding, and direct attention to a condition of affairs which until then had escaped notice. In 1853 he was appointed one of the commissioners to inquire into the outbreak of cholera at Gateshead and Newcastle, and in 1856 submitted a report on the outbreaks of that disease in London in 1848–49 and in 1853–54, conclusively demonstrating the dependence of these epidemics on a polluted water supply. In 1857 he published a volume entitled "Papers on the History and Practice of Vaccination," which was followed in 1858 by the "Report on the Sanitary State of the People of England," which demonstrated for the first time the wide variations which exist in the local incidence of certain diseases and emphasised the need for skilled inquiry. During his term of office under the Privy Council the results of a number of

classical investigations were embodied in his reports, *e.g.* into diphtheria, diseases of the cotton famine, pulmonary diseases, &c. In 1862–63 an important inquiry was undertaken into dangerous industries, in 1863 a survey of the hospitals of the United Kingdom. In 1865–66 he had to establish the organisation to deal with cholera, in 1871 that to deal with the great epidemic of small-pox, and in 1870 he initiated a scheme for laboratory work in public health. He was an uncompromising opponent of the useless practice of quarantine.

Simon's resignation in 1876 was brought about by the Local Government Board Act of 1871 creating the Local Government Board. In Simon's opinion large questions of medical policy affecting the whole country could only be adequately dealt with by a Ministry of Health, a view which is widely held by the medical profession at present, and, having allowed time to see how the new Acts would work, he retired discouraged and disheartened. It is true that the Medical Officer of the Local Government Board and its staff now have duties and responsibilities far wider and more numerous than they were at the date of the creation of the Board, but still a great opportunity was missed. In 1890 he published his great work on "English Sanitary Institutions."

Simon numbered among his friends many of the greatest men of the nineteenth century—Darwin, Buckle, G. H. Lewes, Kingsley, Renan, Tennyson, Rossetti, Burne-Jones and many others. He was in 1878 president of the Royal College of Surgeons, and was the recipient of numerous other honours. He has gone to his rest honoured of all men, and his name will ever live in the annals of sanitary science.

R. T. HEWLETT.

A BANKER NATURALIST.

BY the sudden death of Mr. Henry Evans on July 23 the Midlands have lost a well-known and wealthy banker, and the West Highlands of Scotland an equally well-known deer-stalker, yachtsman and naturalist. Born in 1831, he was educated at Trinity College, Cambridge, graduated there, and was a member of the Senate of the University to the end of his life, coming up from time to time to record his vote on matters of importance. Early in his career he appears to have developed a love of natural history pursuits, for while an undergraduate he became an associate of the Ray Club, of which there are only six at a time, chosen on account of some proved zeal in these studies. He took at that time to entomology, and made a collection of British Lepidoptera. Even up to the end of his life, when he had long abandoned these early predilections, he was still proud of his insect cabinet, and especially of the numerous and fine specimens which it included of the now extinct English large copper butterfly. Being the youngest son of a banker, he naturally became a partner in his father's bank, that of Messrs. W. and S. Evans and Co., of Derby, and on its amalgamation with another firm he was made a director of the new company, Crompton Evans Union Bank. But though a shrewd and capable man of business, he never mingled in public affairs. The leisure of his younger years was largely given to rifle-shooting, in which he grew to be one of the best shots in the country. He competed at the Wimbledon meetings of the National Rifle Association until a lamentable accident occurred to him at one of the practices, when the rifle of a companion was unwittingly discharged against his leg. Three successive amputations were necessitated, and he had to go up on crutches to receive a prize which he had won. This disaster, however, was not allowed to deprive him of his favourite sport. He had become an expert shot among the red deer of the Scottish forests and the seals of the coast of Connemara, and with indomitable courage he now availed himself of the help of a pony and continued his campaigns among the mountains with more success than ever. In one season he fired fifty-two shots and killed fifty deer. After renting various tracts of ground in the Highlands, he finally, in 1875, leased the forest which comprises the extensive mountain ground in the centre of the island of Jura. Choosing a tract of bare moorland that sloped down to the sea, he built there a comfortable mansion-house, surrounding it with trees and shrubs and flowers, covering it with roses, and ingeniously devising expedients that baffled the Atlantic blasts and enabled his vegetation to bloom and spread. This charming Highland retreat became his home for some months every season for nearly thirty years, and he lingered longer there as time went on until eventually he spent more than half of each year in Jura. But though deer-stalking was the original and predominant motive for these prolonged northern sojourns, he was far more than a mere sportsman. His early love of natural history pursuits found an ample field for development in his island home, but it was to the birds that he now gave his attention. Gifted with excellent eyesight, Mr. Evans was an acute and accurate observer. The rapidity and exactness of his recognition of birds on the wing were so remarkable that to friends who accompanied him it almost seemed as if he were the happy possessor of another sense beyond the number allotted to ordinary mortals. He made his mountains and moors in Jura a perfect paradise for wild birds. No gun or trap was ever allowed to be used against them, and everything was done that would induce them to frequent the district.

But it was not only in his own forest that Mr. Evans watched the habits of wild birds. He fitted out a steam yacht, the *Aster*, of 250 tons, on which he usually spent a month or two every year, cruising around the coasts and islands of the west and north of Scotland. He was thus able to gratify his passionate love of cliff scenery and his delight in the crowded breeding haunts of the northern sea-fowl. There are few precipices and inlets in the west and north of Scotland which he had not visited and about which he had not some natural history record to tell. He used to keep jottings of these observations. But he had no ambition to be an author. The retiring disposition which kept him from taking part in public affairs prevented him also from publishing any account of what he saw. All that he observed, however, was freely communicated to those whom it would interest. Some of his observations have thus been made generally known, but his numerous unpublished notes on the distribution of birds all over the west of Scotland would doubtless furnish valuable material to zoologists interested in this subject. Besides shooting his red deer in Jura, he studied them as a four-footed community living isolated under special conditions. He embodied his observations and statistics in a little pamphlet printed some years ago, but only for private distribution, and entitled "Jura Red Deer." Before surrendering his forest to the landlord he brought the records of deer-life up to the end of his tenancy and embodied them in an interleaved copy of the pamphlet. His experience had enabled him to gather together a good number of valuable facts. It is much to be desired that the completed pamphlet should be carefully revised by a competent editor and published as a

contribution to the discussion of the struggle for life among a single species on a small island.

Three years ago Mr. Evans was stricken down by what with most men would have been a fatal illness. But his strength of constitution and marvellous determination of character enabled him to recover sufficiently to be once more able to resume his voyaging in the *Aster*. Deer-stalking, however, with all its joys among the corries of Jura was no longer possible for him. Accordingly he gave up his deer-forest and purchased the beautiful estate of Ascog, in Bute, which he immediately set about to alter and improve. At the end of June last he started with a few friends on what proved to be his longest and last cruise. Under pleasant conditions of weather he visited all his favourite haunts—the cliffs of Mingulay and Barra Head, the sea-lochs of the chain of the Outer Hebrides, the precipices of St. Kilda with their vast swarms of sea-fowl, the fjords of western Sutherland, the cliffs and inlets of Orkney, and the voes and furthest islets of Shetland. In many of these places the *Aster* was a familiar visitor, and was received with blowing of horns and other signs of welcome. At St. Kilda the villagers ran up their flag, and half the population came out in a couple of boats to see their old friend and benefactor, who never failed to bring them some token of his thoughtful interest in their welfare. The cruise was successfully completed by the return of the yacht to Oban, but before the final day, which was to include the rounding of the Mull of Cantyre and the passage up the Firth of Clyde to Bute, it was resolved to anchor opposite the old Jura home and to spend there the following Sunday (July 24). Mr. Evans had been remarkably well all the voyage, and was delighted to have successfully accomplished all that he had wished to do. On reaching Jura he went ashore for a short walk along the coast-road. He had hardly landed, however, and was in the act of conversing with an old gamekeeper who had come down to greet him when he dropped dead as he sat. His retiring modesty kept him from making many friends, but his frank and kindly nature and his vein of quaint humour endeared him to the restricted circle that was privileged with his friendship. He will be mourned by many a lowly family in the west of Scotland that has good reason to remember his cheery greeting and his generous help. He has left a benefaction to the museum of Cambridge University, which has already been enriched by valuable contributions from him in his life-time. A. G.

NOTES.

CAPTAIN ARTHUR MOSTYN FIELD, R.N., has been appointed successor to Rear-Admiral Sir W. J. L. Wharton, K.C.B., F.R.S., as hydrographer to the Navy, the retirement of Sir William Wharton having taken place on Monday last.

THE next annual meeting of the British Medical Association will take place in Leicester, the president-elect being Mr. G. C. Franklin, senior surgeon to the Leicester Infirmary. The council of the association will recommend that the meeting in 1906 be held in Toronto.

THE next session of the American Medical Association will take place from July 11 to 14, 1905, at Portland, Oregon, under the presidency of Dr. Louis S. McMurtry, of Louisville, Kentucky.

THE Board of Estimate of the City of New York has voted the sum of 2000*l.* towards an investigation by a commission of medical experts as to the contagious nature or otherwise of pneumonia.

THE FitzPatrick lectures at the Royal College of Physicians for the present year will be delivered by Dr. J. Frank Payne on November 8 and 11, the titles being respectively "Gilbertus Anglicus and Medicine in the Anglo-Norman Period," and "Ricardus Anglicus and the History of Anatomy in the Middle Ages." The Bradshaw lecture will be delivered on November 15, the lecturer—Dr. F. F. Caiger—taking as his subject "The Treatment of Enteric Fever."

THE following lecture arrangements for 1905 have been made in connection with the Royal College of Physicians:—The Goulstonian lecturer will be Dr. W. C. Bosanquet; the Milroy, Dr. T. M. Legge; the Lumleian, Dr. W. H. Allchin; the Oliver Sharpey, Dr. L. E. Hill; the Fitz-Patrick, Dr. Norman Moore

AN American Society of Tropical Medicine has been started in Philadelphia. Dr. T. H. Fenton is the first president, and a number of men of science who have made researches in the prevention of tropical diseases have been elected honorary members. Among the latter we notice the names of Sir Patrick Manson, F.R.S., Dr. C. J. Martin, F.R.S., and Prof. R. Koch.

JOHNS HOPKINS UNIVERSITY is, it is reported, about to undertake systematic work on the subject of tuberculosis. Mr. Henry Phipps, of Pittsburg, has given the sum of 4000*l.*, by the help of which a dispensary building is to be erected so arranged that the treatment of patients may be attended to and the disease investigated.

A REUTER telegram published in the *Times* states that according to a private telegram published by the *Verdens Gang* from Finaes, in Finland, the captain of a vessel from Tromsö reports having found a bottle containing a letter sent off from M. Andrée's Polar balloon expedition. The bottle, which was picked up on a small island north of Spitsbergen, contains a letter bearing a date in 1898. Particulars as to the contents of the letter will not be available for another month. A private telegram from Finaes published by the *Landsblad* says that the bottle was found on the island of Moffen, to the north of Spitsbergen.

A BOARD of Agriculture has recently been established in the Bahamas, and a botanic station is to be started in connection with it for which a curator will be required. Applications for the post should be made in the first instance to the Imperial Commissioner of Agriculture for the West Indies, Barbados.

THE Barker anatomical prize of thirty guineas has been awarded to Mr. Charles Cooper, a student in the Royal College of Surgeons, Dublin. The prize is offered annually, and is open to all students in any medical school in the United Kingdom. This is the fifth successive year the prize has been conferred on a student of a Dublin college.

THE St. Bartholomew's Hospital testimonial to Mr. Alfred Willett will, says the *Lancet*, take the form of a silver medal to be known as the "Willett medal," which will be awarded each year to the candidate obtaining the highest marks in operative surgery in the Brackenbury surgical scholarship. A gold medal of the same design will be presented to Mr. Willett.

THE death is announced of Prof. Simonds, formerly principal of the Royal Veterinary College, and consulting

veterinary surgeon to the Royal Agricultural Society. Prof. Simonds made many researches into the diseases of animals, and became professional adviser to the Privy Council in all matters relating to the regulations and supervision of the cattle trade.

ACCORDING to the *Scientific American*, the patents of the De Forest and Maskelyne wireless telegraphy systems have been amalgamated. The object of the combination is the employment of wireless telegraphy as a feeder for cable telegraphic systems. In cooperation with the cable companies, it is proposed to link isolated islands with the nearest cable stations, and to develop wireless communication between ships and shore, and between vessels at sea. This combination will, it is thought, strengthen both systems. The De Forest apparatus is a sound recorder, the messages being received on the principle of a telephone, while the Maskelyne system is a tape recorder. By this amalgamation, therefore, either system will be available according to requirements.

FALGUIÈRE'S monument to the memory of Pasteur was, as announced in NATURE of July 21, unveiled in Paris by President Loubet on July 16. The monument is the result of an

international subscription, and may be regarded as a world-wide tribute to the memory of a great man of science. The illustration, reproduced from *La Nature*, serves to convey an excellent idea of the memorial. The whole monument is about seven metres in height, of which a little more than four metres form the pedestal. Pasteur is shown seated and in deep thought. Beneath the statue round the pedestal are grouped allegorical figures which recall very naturally the successive discoveries made by Pasteur. On the front face of the pedestal occur the words "Pasteur 1822–1895," and underneath the inscription "Ce monument est dû à une souscription internationale."

A STATUE to Jan Pieter Minckelers, the reputed discoverer of coal gas, was unveiled last month in Maastricht, Holland. Minckelers was born in 1748, and became in 1772 professor of physics in the University of Louvain, where in 1784, in endeavouring to discover a substitute for hydrogen, he succeeded in obtaining from the distillation of powdered coal a gas which he called "inflammable air." It was in 1785 that he first utilised the gas for lighting purposes, when a class-room in the Louvain University was illuminated by his method. He died in 1824 at the age of seventy-six years.

THE first annual convention of the British Foundrymen's Association was begun on Tuesday last at Manchester, when the president, Mr. Buchanan, delivered his inaugural address. Papers on the structure of metal and alloys, illustrated by photomicrographs of types of cast iron, steel, brass, and bronze, used in foundry practice, by Mr. Percy Longmuir (Carnegie medallist), and strength tests of cast metals, by Mr. W. T. MacCall, were read and discussed, and on Wednesday visits were paid to some industrial centres.

SEVERAL parts of Paris being so infested with mosquitoes, the matter of their suppression has been considered by the Conseil d'Hygiène et de Salubrité de la Seine, which, according to the Paris correspondent of the *Lancet*, recently adopted certain conclusions of which the following is a summary:—In the first place stagnant water where their eggs are hatched and localities where the insects collect, such as cellars, sewers, and dark places, ought to be kept under observation. Drains and sewers of all kinds, and the openings of the pipes which supply water in the streets, should be regularly inspected to avoid collections of stagnant water, and insects assembling in numbers should be destroyed either by a burning torch or by lime-washing. Roofs and rain-water gutters ought to be examined, and water ought not to be allowed to lodge in the gutters. Nothing capable of holding water should be placed in front of windows, and places which are the haunts of mosquitoes should be well ventilated. Stagnant water should not be allowed to remain in gardens and courtyards. Fountains and basins in public places should be emptied and cleansed at least once a week, and plenty of fish should be kept in large sheets of water. In basins and casks standing on private ground there should be a layer of petroleum oil on the surface of the water (about a gram per square metre), or if the water contains fish a layer of salad oil. The public should be advised to use mosquito curtains. Mosquito bites should be treated with a drop of tincture of iodine or with a drop of a solution of guaiacol of 1 per cent. strength.

ACCORDING to the *Lancet*, Dr. W. H. Symons, medical officer of health, Bath, has completed a geological model of the City of Bath and the surrounding district covering an area of 36 square miles. The horizontal scale is six inches to the mile, and the vertical scale is six inches to 1000 feet. The model has been placed in the museum of the Royal Literary and Philosophical Institution of the city.

PROF. SCHÄFER, F.R.S., describes a simple and efficient method of performing artificial respiration in the human

subject, especially in cases of drowning (*Med. Chirurg. Trans.*, vol. lxxxvii.). Immediately the patient is recovered from the water he is placed face downwards, the head being turned sideways so that the mouth and nose are unobstructed, with a folded coat under the lower part of the chest; if respiration has ceased every instant of delay is serious. The operator then places himself athwart, or on one side of, the patient's body in a kneeling posture and facing the head. He places his hands flat over the lower part of the back (on the lowest ribs), one on each side, and gradually throws the weight of his body on to them so as to produce firm pressure—which must not be violent—on the patient's chest. This compresses the chest, and air (and water if there be any) is driven out of the patient's lungs. He then raises his body slowly so as to remove the pressure, still keeping his hands in position. This process of applying pressure and of relaxation of pressure by the forward and backward movement of the operator's body is repeated every four or five seconds without any marked pause between the movements. This course must be pursued for at least half an hour, or until the natural respirations are resumed. If the respirations after being established tend to fail, the process of artificial respiration must again be resorted to. If there be means, others may remove the wet clothing by cutting it off, and may apply hot flannels to the body and limbs and hot bottles to the feet, but nothing should be allowed to interfere with the regular and systematic application of artificial respiration. No attempt should be made to give restoratives by the mouth until natural breathing has re-commenced. In another paper Prof. Schäfer gives the results of the experiments he has performed, showing the efficiency of his system of treatment (*Proc.* Roy. Soc. Edin., xxv., part i.).

It has always been more or less tacitly assumed that the difficulties which attend respiration at great altitudes are due solely to the diminished tension of the atmospheric oxygen. Two papers by A. Mosso in the *Atti dei Lincei* for June 19 would tend to disprove this assumption. It is shown, in the first place, that when the barometric pressure of a mixture of oxygen and nitrogen is diminished to one-third of an atmosphere, whilst the proportion of oxygen is increased so that its partial pressure is the same as in ordinary circumstances, severe inconvenience is incurred by breathing the mixture, and an abnormal respiration and pulse frequency are produced. That this is due not merely to the increased proportion of oxygen is shown by a study of the effects produced by breathing pure oxygen on the summit of Monte Rosa. Analyses of the blood indicate that a diminution in the proportion of carbon dioxide, caused by the low pressure, is probably responsible for the result, and this view is upheld by the fact that a mixture of oxygen and carbon dioxide, containing 20 per cent. of the latter, which on being inhaled in Turin caused giddiness and vomiting was breathed with ease and a sense of pleasure on Monte Rosa.

In a paper by G. Gallo in the same number of the *Atti* an account is given of the conditions under which tellurium can be estimated electrolytically. Previous attempts to effect the electrolytic deposition of the element have been unsatisfactory because of the powdery nature of the product. It is now shown that the presence of sodium pyrophosphate in the electrolysed solution causes the tellurium to be deposited as a firmly adherent film; when, by saturating the solution with carbon dioxide, this film is protected from oxidation, its weight corresponds with a quantitative separation.

In the same journal for July 3 appear two papers of considerable physiological interest. In the first, by A. Mosso and G. Galeotti, it is shown that when alcohol is ingested at great altitudes, for instance at the summit of Monte Rosa, it fails altogether to produce its usual characteristic effects. There is no indication of either excitement or intoxication, and it appears that at such a height the nerve cells are no longer responsive to alcoholic stimulus. The second paper, by A. Herlitzka, deals with the self-digestion of pepsin. From the experiments described it is concluded that, as a proteid, pepsin is capable of being digested by itself to form peptone, and that this change always occurs in a warm aqueous solution of pepsin containing hydrochloric acid. A falling-off of the digestive activity with regard to other proteids is a measure of the gradual change.

In the *Memorie* of the R. Ist. Bologna (series vi., vol. i.) Prof. Augusto Righi describes a number of measurements he has made on the radio-activity of common metals. The rate of discharge, in dry carbon dioxide gas, of an especially constructed single-leaf electroscope of small capacity was observed when the leaf was hanging immediately above a disc of the metal in question. It was found that nearly all the common metals had practically the same ionising effect as glass; lead and bismuth were exceptions, their power of rendering a gas conducting being abnormally great. The observation is of significance because particularly active modifications of lead and bismuth have already been obtained by other workers.

A further contribution to the subject of Mendelian laws by Mr. C. C. Hurst appears in the *Journal* of the Royal Horticultural Society (May), wherein he describes his experiments upon heredity in peas, undertaken with the object of repeating Mendel's original observations; an important point is the consideration of the histological difference between races, as, for instance, between *round* and *wrinkled* peas. In the same volume will be found two papers devoted to the iris. In the first Miss Armitage treats of bulbous irises for the rock garden, and of rhizomatous species for the water garden, and appends a list of phenological observations which shows that by judicious selection of species it is possible to have iris flowers continuously for eight months; the variability of the flower, and the distinction between *bearded* and *beardless* irises is the subject of an article by Mr. W. J. Caparne.

It has been stated on good authority that more than half of the waste lands in Ireland are suitable for forest plantations, and Dr. Henry, in the course of a lecture on "Forests, Wild and Cultivated," delivered before the Royal Society of Dublin in February, advanced further arguments in favour of afforestation. He pointed out that Ireland possesses an ideal forest climate on account of the heavy rainfall, the mild climate, and the absence of cold winds in winter. To illustrate his remarks on forest management, the author took his descriptions from French practice, including plantations in the districts of the Jura and the Vosges, and in the Landes, where successful results have been obtained with a strict regard for economy.

The Natural History Museum recently received from Osborne House two mounted heads and one skull of Spanish draught oxen, sent by command of His Majesty the King. They have remarkably fine horns, and serve to illustrate the difference between this handsome breed and the Spanish fighting bull, of which an entire specimen has been exhibited for the past few years.

To *Naturen* for June and July Dr. L. Stejneger, of the U.S. National Museum, communicates an interesting paper on the "Celtic pony" recently described by Prof. J. C. Ewart and its relation to the now extinct tarpan of the Russian steppes, and to a Norwegian breed termed the "fjordhest." All appear to be closely related, if not, indeed, identical, the tarpan and the "fjordhest," at any rate, frequently lacking the callosity on the hind limb.

JUDGING from the fact that the one on the brain of the sheep has reached a third edition, Dr. B. G. Wilder's "Physiology Practicums," published by the author at Ithaca, U.S.A., appear to have attained the success they deserve. Seven plates illustrate the part before us.

NO interruption to the steady pursuit of science in Japan appears to be caused by the war, three parts (one of them of exceptional thickness) of the *Journal* of the College of Science of Tokyo having reached us by last mail. The first of these (vol. xviii., art. 7), which comprises no less than 307 pages of text, illustrated by 23 plates, is devoted to the fourth instalment of Dr. I. Ijima's studies on the hexactinellid sponges. In this section the author treats of the family Rossellidæ, which he divides into three subfamilies. Of the other two parts to hand, one (vol. xix., art. 14) contains a study by Mr. K. Yendo of the genicula of the calcareous algas of the group Corallinæ, while the other (vol. xix., arts. 18 and 19) is devoted to descriptions of certain low plant-organisms by Mr. K. Saito.

THE *Entomologists' Monthly Magazine* for August contains notes by Mr. J. R. Tomlin on Manx beetles, which are said to be of interest in respect to island faunas, while Mr. J. J. Walker, who has recently visited Melbourne, contributes a notice of his inspection of the Curtis collection of British insects preserved in the museum of that city. This collection, it appears, was purchased about 1864 from the widow of Mr. J. Curtis. According to Mr. Walker, it contains the types of several of Curtis's species or varieties —it is a pity that these should be in Australia.

THE *Biologisches Centralblatt* for July 15 contains the third instalment of an article by Mr. G. Klebs on the problem of development, the author in this instance discussing the evidence afforded by the lower plants. Dr. W. Petersen concludes his essay on the value of "indifferent" characters as species distinctions, and Dr. W. Volz communicates a note on the distribution of the two species of gibbon inhabiting Sumatra.

IN the *Bulletin de la Classe des Sciences* (Brussels), 1904, No. 3, M. P. Mansion directs attention to the new international language proposed by Prof. Peano in the form of "Latin without inflexions." The attempts at building up a universal language in the forms of the Volapük of Schleyer and the Esperanto of Dr. Zamenhof have both met with considerable success, but it was left for the mathematician of Turin to reduce the problem to what may be regarded as the limit of simplicity by proposing, in 1903, a modification of Latin, in which not only genders, persons, cases, and numbers are abolished, as previously suggested by Leibnitz, but even tenses and moods are no longer retained. This system would not only have the advantage of making Latin the language of the learned world, as it used to be in the middle ages, but it could be very easily introduced owing to the extent to which Latin is taught in schools all the world over.

M. E. S. LONDON has carried out a number of experiments on the physiological and pathological actions of the radium emanations derived from 10 milligrams of radium bromide dissolved in 10 cubic centimetres of water (*Arch. d'Électricité méd.*, No. 142, 1904). Frogs and mice exposed to the emanations for 5–6 days became ill and died, hæmolysis occurred in defibrinated blood exposed for two or three days, and the vitality of bacterial cultures was destroyed after an exposure of two days. The gastric and pancreatic ferments were, however, unaffected by the emanations.

THE commission consisting of Colonel Bruce, F.R.S. (chairman), Major Horrocks, Staff-Surgeon Shaw, R.N., Dr. Zammit, chemical analyst and bacteriologist to the Government of Malta, and Dr. R. Johnstone, of the Local Government Board, has begun its work of investigating the etiology and pathology of Mediterranean or Malta fever. The experimental work is being carried on at the laboratories of the Naval Hospital, of the Army Station Hospital, and at the offices of the Board of Health, Malta. The disease, says the *British Medical Journal*, is the cause not only of many deaths among sailors and soldiers, but also of much invaliding, which is all the greater owing to the prolonged course which the disease commonly runs even in cases which ultimately recover. While it is known that the disease is due to a specific microbe, the *Micrococcus melitensis*, very little has yet been certainly ascertained as to the mode in which the specific agent maintains its existence and how infection is contracted. A knowledge of these points in etiology is an essential preliminary to devising and enforcing effective prophylactic measures.

THE Röntgen Society will in future publish its proceedings in its own journal, which will appear as a bi-monthly "during the working session." The first part of the *Journal*, dated July, has just reached us, and is a well produced periodical which should be of service to radiographers. In addition to four full-page process plates, a separate photogravure portrait of Prof. Silvanus P. Thompson, F.R.S. (the first president of the Röntgen Society), is issued with the number.

MESSRS. NEWTON AND CO.'S new list of X-ray and high frequency apparatus has reached us. It contains particulars of the latest forms of apparatus made by this firm, and should be seen by all workers in this branch of science.

THE summer number of the *Chemist and Druggist* (dated July 30) contains an article on Sir William Ramsay and his work. The paper contains a full-page illustration showing Sir William Ramsay in his laboratory experimenting with radium. The *Scientific American* for July 23 also has a page illustration of Sir William Ramsay in his laboratory, the original photograph of which was specially taken for our American contemporary.

SEVERAL of the August issues of the monthly magazines that have reached us contain articles dealing with subjects of a more or less scientific character. Thus *Chambers's Journal* has a contribution entitled "A Visit to a Wild-Animal Farm," the farm in question being that belonging to Mr. R. Leadbetter in Buckinghamshire, and known as Hazlemere Park; *Good Words* contains an appreciation of Stanley and a summary of the results of his work by Sir Harry Johnston; and in *Pearson's Magazine*, under the title of "Two Thousand Photographs a Second," the electro-stereo-chromophotographic camera invented by M. Lucien Bull for the photography of insects in flight is described and graphically illustrated.

OUR ASTRONOMICAL COLUMN.

THE RED SPOT ON JUPITER.—This object exhibited a slackening motion during the years from 1878 to 1900. It then became decidedly accelerated, so that the rotation period, which in 1899 and 1900 was 9h. 55m. 41·7s., decreased in 1901 to 9h. 55m. 40·6s., and in 1902 to 9h. 55m. 39·0s. In 1903 the spot again became retarded, and the rotation period increased to 9h. 55m. 41·0s. This retardation has now in turn given way to another acceleration of speed. In January last the longitude of the spot was 35°, whereas at the present time it is only 30°, so that the rotation period during the first six months of 1904 has been about 9h. 55m. 39·5s. It is difficult to explain these curious oscillations in velocity. Some extensive disturbances have, however, affected the south temperate region of the planet in recent years, and a large dusky patch has been visible since 1901 rotating with a rate of 9h. 55m. 18·7s., or about 22 seconds less than that of the red spot. The motion of the latter may possibly have been affected by disturbances occurring in the same latitude, but this can only be fully determined by further observations. In the meantime, both the red spot and the south temperate spot are being attentively watched as to their motions and appearances. The two objects were in conjunction in July, 1902, and June, 1904, and in the spring of 1906 the event will be repeated if the south temperate spot should remain visible until that time. As to the red spot and its surroundings, they appear to form features of remarkable permanency, and are likely to continue perceptible for an indefinite period.

VARIABLE RADIAL VELOCITY OF α ANDROMEDÆ AND FOUR OTHER STARS.—Whilst engaged in line-of-sight work with the Lowell spectrograph Mr. V. M. Slipher discovered the variable radial velocities of α Andromedæ, α Libræ, σ Scorpii, X Sagittarii, and ε Capricorni.

The velocities of α Andromedæ were obtained from measurements of the Hγ and 4481 magnesium lines, the helium 4472 line also being measurable. They range from +20 (February 11) to −45 km. (March 4), but are uncertain to a few kilometres. The observations indicate a period of about 100 days and a very eccentric orbit.

The measurements of the α Libræ spectrograms give a range between −60 km. on May 24 and +20 km. on July 6, and suggest that both components are bright. The velocities of σ Scorpii range between +25 (June 25) and −25 km. (June 18). Only two plates were measured for X Sagittarii, which is a visual variable having a period of seven days, and these gave +1 and −22 km. on June 19 and 22 respectively. A range of from −45 km. (September 7, 1903) to +6 km. (July 6) was obtained for the radial velocity of ε Capricorni (Lowell Observatory *Bulletin*, No. 11).

VARIOUS CLASSES OF SILICIUM LINES AND THEIR OCCURRENCE IN STELLAR SPECTRA.—In a communication to l'Académie des Sciences (Paris), M. de Gramont describes some results he has obtained during a series of experiments on the effects of various amounts of self-induction in the spark spectrum of silicium. His observations led him to form two main classes of silicium lines:—(1) those which are not affected or are strengthened by self-induction amounting to 0·03 henry; (2) those of which the intensities are reduced by self-induction and which disappear entirely with 0·006 henry.

He further divides them into eight groups (α–η), and, in a table showing their individual characteristics in the spark and in various stellar spectra, he shows their connections with the four temperature groups (silicium i.–iv.) named by Sir Norman Lockyer in his temperature classification of the stars. From this table he draws the following conclusions:—(1) Only the spectra of the first class, *i.e.* hydrogen and helium stars, show the lines which disappear under the action of self-induction, those of helium, *e.g.* the Orion stars, exhibiting as strong lines those which are first to disappear (Lockyer's silicium iii.), whilst the hydrogen stars, *e.g.* Sirius, present the lines which are the last to disappear (silicium ii.). Stellar spectra of the second class (solar type) and the "flash spectrum" contain the lines which appear in both arc and spark, and resist self-induction, *e.g.* λ 3905·7 (silicium i.). As the lines belonging to Sir Norman Lockyer's group iv. are near oxygen and nitrogen lines, and always disappeared from the spectra with the air lines, and as oxygen and nitrogen have been shown to exist in the absorbing atmospheres of the stars the spectra of which show this group (*e.g.* β Crucis), M. Gramont suggests that these lines are attributable to air (*Comptes rendus*, No. 3, vol. cxxxix.).

LINE OF SIGHT CONSTANTS FOR SOME ORION TYPE STARS.—In No. 3, vol. xix., of the *Astrophysical Journal*, Miss E. E. Dobbin gives a list of line-of-sight constants for 112 stars of the Orion type, computed for the reduction of the Bruce spectrograph observations.

Dr. Schlesinger's formulæ, as employed in his "Line-of-Sight Constants for the Principal Stars," were used, and the name, magnitude, position, and constants are given for each star. The longitude is given for 1900, and therefore requires the 50″ precession correction for each year since then.

THE TAILS OF BORRELLY'S COMET (1903) AND LIGHT-PRESSURE.—Mr. S. A. Mitchell, of Columbia University, has calculated the value of the repulsive force due to light-pressure which acted on the several tails of Borrelly's comet. Using the values for the angle between the radius vector of the comet's path and the tail, as determined by Prof. Albrecht, he found somewhat discordant values for the principal tail, which gave, in the mean, the value for the light pressure as 18·47 times gravity. For the secondary tail the values were much more consistent, and gave a mean of 1·824 times gravity; the last four lines given in this table, which were derived from measures of the angle on August 13, 14, 15, and 18, give a mean for the repulsive force of 1·460 times gravity, and therefore appear to indicate the existence of a third tail, which the photographs obtained on August 12 and 15 corroborated.

In a second table Mr. Mitchell compares the values of the angles between the tails and the radii vectores as obtained (1) by calculation from the repulsive forces given above, (2) by direct measurement. The results agree fairly well considering the uncertainty of the measures of such ill-defined objects as the tails. The differences between the observed and calculated values for the principal tail as the comet approached the sun indicate the presence of some other repulsive force in addition to that caused by light pressure, and Mr. Mitchell believes that part of this, at least, is real. The size of the particles forming each of the three tails, as determined from the above repulsive forces, was 0·1μ, μ, and 1·33μ respectively (*Astrophysical Journal*, No. 1, vol. xx.).

SURVEY OF INDIA, 1901–2.—A volume of "Extracts from Narrative Reports of the Survey of India, 1901–2," published at Calcutta (1904), contains accounts of the work done by several parties of surveyors in connection with the triangulation of Upper Burma, latitude operations, the magnetic survey of India, tidal and levelling operations, and the topography of Upper Burma, Sind, and the Punjab.

During the latitude operations some puzzling anomalies were discovered between the observed and calculated values, the difference O–C preserving its positive character to a point much further north than might be expected.

The latitude results obtained, using stars from Newcomb's catalogue and from the Greenwich ten-year catalogue for 1880, show the same probable errors, but there is a noteworthy consistency of sign and amount (about +0·3″) in the value Newcomb-Greenwich.

An interesting account of the practical details of the magnetic survey, and of the instrumental equipments at Dehra Dun, Kodaikanal, Calcutta, and Rangoon are given in part iii., where the principles of several new and modified instruments are also fully described.

THE BRITISH MEDICAL ASSOCIATION IN OXFORD.

THE seventy-second annual meeting of the British Medical Association, which was held in Oxford last week (July 26 to 29), was beyond question one of the most successful meetings in the memory of members of the association, as it was in point of numbers much the largest yet recorded.

It was remarkable also for the persistence and enthusiasm with which, in spite of all the counter-attractions of that ancient and glorious seat of learning, and of the diversions, entertainments, and receptions arranged both by the

members of the university and by the citizens, a quite unusually large proportion of the members who were visiting Oxford steadily pursued the actual business of the meeting in the various sections.

Not only was the occasion distinguished by the presence and participation in the sectional meetings of a considerable number of eminent foreign visitors, and of an exceptionally numerous gathering of the recognised leaders of thought and investigation in medical science in our own country and the colonies, but it was also rendered memorable by the great importance and originality of the new work brought forward in many of the sections. Indeed, both in the science and the art of medicine in its widest sense, notable results of signal interest were recorded; and more than one sectional meeting witnessed the initiation of far-reaching advances, the significance of which it would be difficult to overestimate.

An academic interest was lent to the occasion by the presence of the Vice-Chancellor at a number of the meetings, and by the holding of a special convocation of the university, at which the doctorate in science, *honoris causa*, was conferred upon the following distinguished members of the association :—

Dr. T. Clifford Allbutt, F.R.S., regius professor of physic in the University of Cambridge; Mr. Andrew Clark, chairman of council, British Medical Association; Dr. T. D. Griffiths, late president of the British Medical Association; Mr. Jonathan Hutchinson, F.R.S., late president of the Royal College of Surgeons of England; Sir William Macewen, F.R.S., regius professor of surgery in the University of Glasgow; Sir Patrick Manson, F.R.S., of the London School of Tropical Medicine; Sir John W. Moore, formerly president of the Royal College of Physicians of Ireland; Prof. Osler, of Johns Hopkins University.

At the annual general meeting of the association the Vice-Chancellor of the university, Dr. Monro; the Dean of Christ Church, the Very Rev. T. B. Strong; the master of University College, Dr. Bright; and Mr. A. G. Vernon Harcourt, F.R.S., of Christ Church, were elected honorary members of the association.

The president, Dr. William Collier, took as the subject of his address "The Growth and Development of the Oxford Medical School." Starting from the period when the study of science and medicine in Oxford was at such an ebb that the school had been justly spoken of as "a lost medical school," he showed how large a part the association had played in its re-establishment.

By the action which it took in 1879 in memorialising the House of Commons, the university commissioners, and the hebdomadal council, it had afforded most material assistance to the late Sir Henry Acland and his colleagues at a critical period in the struggle which they were carrying on in Oxford. The work of Acland had been nobly carried on by his successors. Under their guidance there had gradually again grown up in Oxford a school of natural science and medicine which was already taking a prominent place among the leading schools of science in the country.

After emphasising the advantages which had thus accrued both to the profession of medicine and to the university, Dr. Collier drew a vivid picture of the brilliant past of Oxford medicine at the time when, in the sixteenth and seventeeth centuries, the university formed the centre of English scientific thought, and numbered on her roll such names as those of Willis, Boyle, Wilkins, Lower, Wren, and Harvey. To-day, he said, Oxford was again alive to the importance of science and the scientific method. Nothing save the bitter need for necessary endowments hampered her and held her back from bearing once again a noble part in the advancement of natural knowledge, and rivalling the scientific glories of her past.

Continuing, Dr. Collier said we all of us realised that the provision which has to be made for a modern scientific education is of necessity a costly undertaking. He wished more particularly to emphasise this point, because the amount of work done in the way of instruction in the scientific departments of the university for a totally inadequate remuneration was well recognised and much deplored. He would quote the words spoken recently by His Majesty the King at Cambridge :—"the older universities must receive new endowments, if education within my realms is to be kept at its proper standard of efficiency."

One could but hope that these new endowments of which the university stood in such urgent need would speedily be forthcoming; and one found a difficulty in understanding how it was that a university such as that of Oxford, with its noble traditions and its long roll of illustrious dead—a university which for many centuries had been, with the sister University of Cambridge, the acknowledged training school of the leaders of thought and action in the country—failed to appeal to those fortunate individuals who were in a position to do their country and education a service, and to enrol their names on that imperishable record of benefactors whose memories we honour and extol.

The addresses in medicine and surgery delivered by Sir William Selby Church and Sir William Macewen were of great importance, and a valuable popular lecture on disease germs, open to the public, was delivered by Dr. Bagot Ferguson.

Sir William Church dealt with the relation of medicine to the State, and with the pressing questions in public health. The national health, he urged, was a matter "of supreme importance far transcending the ordinary political issues of the day." But at the present time the administration, even of the Acts which had been secured, was ineffective.

He was afraid, from the nature of the report of the Treasury Committee appointed to consider the position and duties of the Board of Trade and the Local Government Board, that there was not much prospect of the Public Health Department of the Board receiving any increase either of power or payment. The health of the nation, on which its success and prosperity depend, was thrust into the background with the remark that the president of the board "has the advantage not only of the professional opinion of the Medical Officer of the Board, but also of the general administrative experience of the Permanent Secretary."

He thought that in pressing the necessity for the reform of the Local Government Board upon the attention of the president and the Government, three points should be especially emphasised :—first, that the central authority should act as an advisory as well as a supervising authority; secondly, that both in the Local Government Board and in the local authorities the medical element should have greater weight; and, thirdly, that the medical officers of these authorities should exercise further supervision and control over the purity and wholesomeness of articles sold for food.

In the section of anatomy Prof. D. J. Cunningham introduced a discussion upon giants and dwarfs. He regarded gigantism and acromegaly as morbid processes having many points of similarity, and stated that of the cases of gigantism on record thirteen were certainly acromegalic. Dr. Gibson and Prof. Symington also supported the view that gigantism is a pathological condition, and is associated with disease or abnormality of the pituitary body. Dr. Hastings Gilford held that giants and dwarfs may be either natural or pathological. He described three forms of dwarfism, which he illustrated by a number of living cases. He also exhibited a beautiful series of photographs bearing on atcleiosis and progeria.

In connection with this section Dr. Keith exhibited a series of hearts to demonstrate the arrangement of the auricular musculature forming the valves described by him as closing the venous orifices during normal auricular contraction. The observations which he has made have also led to the elucidation of the mechanism by which the right crus of the diaphragm, acting upon the heart, produces what is termed by physiologists "the respiratory pump." They also explain the means by which a number of the changes in the circulation taking place at birth are brought about.

Dr. Keith also had specimens proving the existence of a sphincter muscle at the ileo-cæcal valve in man.

Dr. Keibel, of Leipzig, showed an instructive series of models of the development of the urogenital system of Echidna, and Dr. Bryce detailed his observations into the origin of embryonic leucocytes, derived from a study of the histogenesis of the blood of larvæ lepidosiren.

The section of physiology held a discussion on the thalamic region in conjunction with the anatomists. The discussion was opened by Dr. Gustav Mann, who divided the central nervous system into an anterior part limited

behind by the posterior commissure, and a posterior portion which he termed collectively the cord. He described several new nuclei in the thalamus, and illustrated his conclusions by a series of models, microscopic sections, and stereoscopic photographs of the thalamus in monkeys and rabbits.

Sir Victor Horsley dwelt on the necessity for making both horizontal and sagittal sections of the thalamus, and for directing attention to cell-systems rather than to tracts of fibres. The current system of dividing the thalamus into tracts of fibres is quite untrustworthy unless checked by the degeneration method. His excitation experiments, so far as they had gone, confirmed Dr. Mann's results.

Dr. F. Griffiths and Dr. W. B. Warrington read an interesting paper on the varieties of the cells of the spinal ganglia and their relationship to axons of different distribution, and showed a useful series of illustrative microscopical sections.

Among many other valuable papers and discussions may be mentioned the important debate on chloroform anæsthesia and the demonstration given by Mr. Vernon Harcourt of his apparatus for the administration of known percentages of chloroform vapour. The apparatus is convenient and compact, and guarantees that the amount of chloroform administered is never in excess of 2 per cent. of the inspired air. An apparatus of a similar purpose by Dubois was also shown by Dr. Chapman.

In the section of pathology an unusual amount of valuable new work was published. The discussion on immunity was opened by the president, Dr. Ritchie, who began by pointing out what definite conclusions were now firmly established, and what were the problems which awaited solution. He then discussed the relation of the processes concerned in the immunity reaction to normal physiological events, and the general bearing on the question of the more important recent work. Dr. Bulloch followed, dealing in a masterly fashion with the cellular aspects of the problem of immunity, and Dr. Dreyer, of Copenhagen, read an important paper on agglutinins.

Dr. Madsen, of Copenhagen, then described the steps by which, in association with Prof. Arrhenius, he had shown that the relation of toxin and antitoxin in the living body, exemplified in what is known as "Ehrlich's phenomenon," cannot be explained, as Ehrlich holds, as being due to the presence of degenerated toxins in the crude bouillon from diphtheria or tetanus cultures. While not denying the existence of such degenerated toxins in the bouillon cultures, they maintain that the phenomenon is due to the fact that toxin possesses only a weak affinity for its corresponding antitoxin. It thus results that dissociation phenomena occur between the toxin, antitoxin, and the toxin-antitoxin molecules. In support of this view new evidence was submitted from investigations carried out upon ricin and anti-ricin, snake venom and antivenene, and saponin and its anti-body, cholesterin.

Further contributions to the study of snake venoms were communicated by Dr. C. J. Martin and Dr. Noguchi.

Dr. Wright described the experiments which led to his discovery of the bodies which he terms opsinines. These bodies have the property of enabling phagocytes to attack bacteria. They are present in the blood serum, but not in the phagocytes themselves, and they can, like anti-bodies, be transferred to foreign phagocytes, upon which they then confer a like bacteriolytic power.

At a later period of the meeting Dr. Wright gave a most lucid demonstration of the numerous brilliant modifications and new methods which he has introduced, and which have simplified and much increased the accuracy of all kinds of blood investigation and research into the mechanism of bacteriolysis.

A discussion was also held upon the *rôle* of the lymphocyte. This was opened by Dr. Lovell Gulland and Prof. Muir, and many valuable communications were contributed, notably a paper by Dr. Beattie, of Edinburgh, in which he concluded in favour of the endothelial origin of many of the mononuclear cells in inflammation. The discussion revealed the fact that a considerably greater uniformity of opinion as to the origin of the various kinds of leucocytes is coming into existence among pathologists.

The subject of the third discussion was the chemical pathology of gout. This was opened with a most able paper from Prof. von Noorden, and in the course of the discussion Dr. Walker Hall gave a demonstration of his simple apparatus for the rapid determination of the urinary purins.

In the section of tropical diseases Colonel Bruce opened the discussion on trypanosomiasis with a suggestive paper, in the course of which he stated that trypanosomal fever is in all probability the first stage of sleeping sickness, and that the *Glossina palpalis* is the medium of transmission.

A discussion was also held on the significance of the Leishman-Donovan bodies. This was introduced by Major Leishman, who pointed out the occurrence of these bodies in kala-azar, and maintained that they probably represent a stage in the life-history of a flagellate organism closely resembling a trypanosome. Dr. G. C. Low exhibited sections of the spleen from a case of kala-azar, showing these bodies *in situ*. He also exhibited a number of specimens showing the perivascular infiltration in the brain and cord in sleeping sickness.

Very instructive exhibits illustrating the conditions in ankylostomiasis and bilharzia infection were shown by Dr. Armand Ruffer and by Dr. Sandwith; and Dr. Nabarro showed specimens of trypanosoma from Uganda.

In the section of State medicine the president, Dr. J. S. Haldane, opened a discussion on standards of ventilation, discussing the effect upon the human system of poisonous gases and dust. The dust nuisances he considered could be better prevented by special measures, such as water sprays, than by a general increase of the ventilation. Subsequently he dealt with the effects of breathing air contaminated with an excess of carbonic acid gas, or containing a deficiency of oxygen or an increase of organic matter. The real pathological effects of such conditions, he held, were slight. The discussion was continued by Dr. Jones, Dr. Oliver, Dr. Hay, and others.

Dr. Newman opened a discussion on the control of the milk supply. Having reviewed the dangers to the nation which spring from the present inadequate and contaminated milk supply, he urged that the initiative for reform must come in the first place from the consumer. So far as legislation is concerned, he thought that all that could be expected was a systematic and universal enforcement of the Dairies Order. Dr. Henri de Rothschild agreed with Dr. Newman that the demand for reform must come from the consumer. The chief difficulty appeared to him to lie in the fact that the consumer wanted good milk at a price for which only bad milk could be purchased.

GEOLOGICAL NOTES.

"THE Stone Reefs of Brazil, their Geological and Geographical Relations, with a Chapter on the Coral Reefs," is the title of a memoir by Mr. J. C. Branner (*Bull.* Mus. Comp. Zool. Harvard Coll., vol. xliv., geological series, vol. vii.). These stone reefs form striking features along the Brazilian coast from near Ceará to Porto Seguro; they are formed of sandstone, in places almost a quartzite, and stand flush with the water at high tide, while at low tide they are left exposed like long, low, flat-topped walls. The ports and towns behind these reefs owe their existence to them, as they form natural breakwaters, usually standing across the mouths of streams and estuaries.

In origin they are due to the solidification of beach sands. Coral reefs are now growing over and upon the stone reefs in some places, while at other places there are stone reefs overlying dead coral reefs.

Evidences of great depression and subsequent elevation occurred in late geologic times, and the sandstone reefs were formed when the land had finally risen. The author points out that in a region of concentrated rainfall and long droughts the river mouths had become temporarily closed, and the abundant aquatic and other life in the lagoons thus formed contributed to the organic acids of the waters. These waters, upon penetrating the dam of beach sand, first dissolved the carbonate of lime in it, and re-deposited this as cement when in contact with the dense sea-water on the ocean side. In this manner some portions of the beaches have been hardened, while others have remained incoherent.

In an able article on the modes of occurrence of intrusive rocks, Mr. J. G. Goodchild discusses the question whether they displace or replace the rocks which they invade (*Proc.* Roy. Soc. Edin., xxv., No. 3). He cites and figures

numerous examples which support his views that in the main the process has been one of replacement, the intrusive rock eating its way into sedimentary rock which remains undisturbed above and below, and shows no sign of having increased the thickness of the strata. In certain cases where there is evidence of some displacement or mechanical rupture in the rocks affected by igneous intrusions, he finds that the extent of the displacement is, as a rule, by no means commensurate with the volume of the rock intruded. The subject was dealt with many years ago in an article on the Whin Sill by Mr. C. T. Clough, and that author, in referring to the fact that the dolerite maintained a uniform composition, although it replaced beds of diverse mineral constitution, pointed out that these difficulties disappeared when we regarded the molten rock as having a general circulation in its mass which would lead to a uniformity in its composition. Other observers, mentioned by Mr. Goodchild, have dealt with this interesting subject, but it has not before been so forcibly presented by an array of facts to which the author has himself largely contributed.

Figures of some notable crinoids are given in the quarterly issue of the *Smithsonian Miscellaneous Collections* (vol. xlv., June 15). These illustrate some notes made by Mr. Charles Schuchert, assistant curator of stratigraphic palæontology in the National Museum at Washington, who spent four months in Europe studying fossil faunas and their stratigraphic sequence in the field and in museums. He returned with "sixteen boxes of European fossils," which, as observed, will form "a good nucleus for comparative studies with the American faunas."

Prof. R. S. Tarr has directed attention to a series of artesian well borings which have been carried through the lacustrine delta deposits on which the main portion of the City of Ithaca, New York, is built. The superficial strata comprise clays 40 to 60 feet thick, beneath which are sands and gravels 20 to 70 feet, then glacial lake clays about 100 feet, and at base (resting on the bed-rock) a morainic series of till, sand and gravel, 80 feet or more in thickness. The greatest thickness of drift was 342 feet. Artesian water was met with in both series of gravels—that in the upper series being derived from the alluvial fans opposite the mouths of the streams that descend to the Ithaca delta. The water found in the deeper sands and gravels is believed to be derived from the moraine which occupies the Cayuga Valley, distant more than eleven miles from the sites of the wells, and at a sufficient elevation to account for a yield under pressure at one well of 300,000 gallons of water a day.

In an article on the hanging valleys in the Finger Lake region of central New York (*Amer. Geol.*, May), Prof. R. S. Tarr gives reasons for his conviction that the glacial erosion theory cannot be accepted as proved in reference to that area. The land having attained a condition of topographic maturity, represented by the hanging valleys and by the gentle slopes of the main walls above the 800-foot contour, was subjected to rejuvenation. The effects of the elevation were to increase the amount of stream erosion along the main valleys, and although a moderate amount of glacial erosion is allowed, it is not regarded as the main factor in the production of the features.

The 1902–3 eruptions of Mont Pelée, Martinique, and the Soufrière, St. Vincent, form the subject of a report by Mr. E. O. Hovey (*Comptes rendus* ix. *Congrès geol. internat. de Vienne*, 1903). This report is based on data obtained for the American Museum of Natural History, and gives almost exclusively the result of the personal observations of the author. These have been given from time to time in NATURE, especially with reference to the great "spine" which appeared on Mont Pelée. The history of the volcanoes has in the present publication been brought down to the date of printing, February 1, 1904.

To the *Proceedings* of the Geologists' Association (vol. xviii. part vii.), Miss Ethel G. Skeat contributes an article on the Jurassic rocks of east Greenland, wherein the occurrence of Rhætic-Lias and Lower Middle and Upper Oolitic fossils is noted. The finding of such definite Upper Oolitic forms as *Astarte Saemanni* and *Aucella Pallasi* is of much interest. Mr. C. D. Sherborn has prepared a useful index to the four papers on zones of the white chalk of the English coast by Dr. A. W. Rowe and himself, and this is published in the above mentioned *Proceedings*.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Mr. J. Henderson Smith, Balliol College, has been elected first Philip Walker student for three years. The studentship was only founded during the past year, and is for the furtherance of original research in pathology.

The long vacation course of lectures which has been arranged by the Oxford School of Geography was opened on Tuesday last by Mr. H. J. Mackinder, the reader in geography, who delivered an address. During the present week lectures are to be given by Mr. Mackinder on "Leading Ideas of European Geography," by Mr. J. L. Myres on "The Physical Conditions of Greek Civilisation," and by the Rev. E. C. Spicer on "The Structure of the Oxford Region." Next week the lecturers will be Mr. C. R. Beazley, who will take as his subject "The Advance of Geography—Land Travel, Oceanic Exploration and Scientific Geography," and Prof. W. W. Watts, F.R.S., who will speak on "Charnwood Forest as a Study in the Origin of Landscapes."

MISS M. STOKES, PH.D., has been appointed to a demonstratorship in botany at the University of Manchester.

DR. G. SENTER has been appointed lecturer in chemistry at the St. Mary's Hospital Medical School, Paddington.

THE University of London will be represented at the International Congress of Medicine, to be held at Lisbon in April, 1906, by Sir Thomas Barlow, K.C.V.O., M.D., and Dr. A. D. Waller, F.R.S.

A RESEARCH studentship of 100*l.* a year for two years is offered by the London School of Economics and Political Science. The examination will be held on October 11 and 12. Full particulars may be obtained on application to the director of the school, Clare Market, London, W.C.

WE have received a copy of the *Johns Hopkins University Circular* for July, which contains the programme of the courses of study for 1904–5. Next session's work will be the twenty-ninth year of instruction at this university in Baltimore, and the provision made for every class of student is remarkably complete.

PROF. W. E. DALBY has been appointed professor of civil and mechanical engineering at the Central Technical College, South Kensington, in the place of Prof. W. C. Unwin, F.R.S., resigned. Prof. Dalby has hitherto occupied the chair of mechanical engineering and applied mathematics at the City and Guilds Technical College, Finsbury. Applications for the filling of the latter post are invited.

THE Senate of the University of London has accepted the offer made by the Goldsmiths' Company to provide an additional sum of 5000*l.* in connection with the recent gift to the university of the Goldsmiths' Institute at New Cross. This further donation of the Goldsmiths' Company will enable the university to carry on during 1904–5 at the New Cross Institute the classes of a polytechnic character which have proved very popular and useful in previous sessions. The classes to be held next winter will be arranged by the Senate in consultation with the London County Council.

THE Senate of the University of London has decided that in future internal and external candidates for the Bachelor of Science honours degree in botany, chemistry, physics, physiology and zoology must produce note-books of their laboratory work, which may include a record of any research work in which they have participated. The entries in such note-books must be duly certified by the teacher if any, and will be taken into account in estimating the qualifications of candidates, provided only that the research work be not allowed to take the place of such sound general knowledge as should be required from an honours candidate.

THE Senate of the University of London and the council of University College have now agreed on the text of the Bill for the incorporation of the college in the university. The sum required before the formal transfer can actually be effected has not yet been received in full, about 18,000*l.* being still required, but steps are to be taken to deposit the Bill with the view of its introduction next session. The Drapers' Company has announced that, being satisfied with the conditions under which the incorporation is to be effected, it is prepared to pay off the debt on the college land and buildings to the extent of 30,000*l.*, on condition

that both university and college continue to use their best endeavours to raise the balance of the sum required.

THE formation of a separate day department at the Northampton Institute, Clerkenwell, dealing with technical optics has already been referred to in these columns. We have now received full particulars as to the courses of work arranged for the coming session. The chief object of the instruction provided will be so to train the students that they will be in a position on leaving the institute to deal with the numerous problems which all who aspire to take the higher positions in the optical trades must be prepared to solve. The full course as at present contemplated extends over two years, and consists of lectures, laboratory and drawing-office work, and workshop practice. To meet the case of those who cannot devote their whole time to the training, and are already engaged in some optical trade, partial courses requiring attendance on two mornings per week only, but extending over three years, will be given, covering generally the work of the first year of the complete course, but omitting those portions with which such students will be familiar. Practical optical design will be a special feature of the advanced classes.

IN his report under part ii. of the Education Act, 1902, upon the provision and promotion of higher education in Worcestershire, Dr. Rawson, the director of education, directs attention to the fact that there is not in the county for the education of which he is responsible a single technical institution which has any day work for students over sixteen years of age. Because of the impossibility of utilising existing institutions for day technical instruction, which should be their chief use, they are to be turned to account as secondary schools. After explaining that to rejoice because a technical institute is available for a secondary school is really to be glad that an expensive building cannot do the work for which it was built and equipped, Dr. Rawson goes on to show that there is another contributing cause to the lack of technical and higher education. It cannot be denied, he says, that employers of labour are within their rights in taking their "hands" at the age which suits the employer best; clearly, however, the retention of the young workman by the employer all day prevents most completely any day work at the technical school from being possible for such employee. It would be an unmixed blessing for the country, and an unqualified boon to master and man, if day technical instruction could be vouchsafed to the best of the young workmen in the employ of each firm. Many employers in England are now carrying out in their own works these innovations. Reports like this one of Dr. Rawson, giving as they do a bird's-eye view of the existing provisions for education of every grade in each part of the country, are most valuable, and will serve to make clear what deficiencies must at once be made good.

THE regulations for evening schools, technical institutions, and schools of art and art classes have now been published by the Board of Education. The regulations make provision for the promotion of higher technical education of suitable organisation and equipment. We are glad to notice that the board recognises the great advantage accruing from the concentration of interest which is possible only when the student can make study his single aim and devote his whole time to education. The board regards it as of special importance that, by the development of day teaching in technical institutions, there should be no lack of facilities for the instruction of those who, by private means or with the assistance of bursaries given by local education authorities, are able either to prolong their studies beyond the usual school age, or to return to study after a period of apprenticeship or of wage-earning experience. The value of evening classes at the present stage of development of English education is, however, not lost sight of, and regulations are laid down intended to ensure that local education authorities shall make the instruction in such classes suitable for the special needs of a given neighbourhood. The necessity of correlating the component parts of a student's instruction with a view to increase their educational value and practical utility is insisted upon, and it is prescribed that no student may be admitted to any course who is not sufficiently prepared to benefit by the instruction given in that course. The new regulations represent in their main features an amalgamation and simplification of the diverse regulations under which the schools and classes concerned have been administered in the past.

AT the annual distribution of scholarships and prizes at the Royal Indian Engineering College, Coopers Hill, on July 27, Sir William White, president of the Institution of Civil Engineers, delivered an address. Referring to the recent decision to close the college, he said they had now to accept the decision and to express the hope that the good work of Coopers Hill would continue to bear fruit. It is to be hoped that the features of the college, which have been proved to be good, will be in some way or other perpetuated, and that the connection of British engineering institutions with India and its great public works will in the future be quite as close as in the past. He believed that the energy and skill of engineers in the Indian Empire had been one of the greatest forces for consolidating the advance of British dominion, for improving the condition of the people, and for developing the resources of that great continent. After contrasting the condition of India at the present time with its state at the time of the Mutiny, Sir William said that the radical change which has taken place was largely owing to the triumphs of the engineer. We are only yet on the fringe of discovery in the matter of the resources of India. Its mines, its forests, and its other resources are waiting for the work of the engineer for proper development. On those in authority in this country who have the conduct of Indian affairs must depend how that development shall progress, and what shall be the future of the Indian Empire as affected by engineering and British financial enterprise. There must be huge demands for skilled engineers in India, and now that Coopers Hill will cease to be the chief source of supply of engineers for India, we must be sure that some other source of as fully trained and competent men will be provided to ensure that the resources of India do not want for development.

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