THURSDAY, APRIL 20, 1871

APE RESEMBLANCES TO MAN

THE Zoological Society can hardly fail to derive decided material advantage from the publication of Mr. Darwin's "Descent of Man." It has been said that already there is a perceptible increase in the visitors to the monkey-house, though an early spring has no doubt co-operated with scientific zeal in the promotion of pilgrimages to the Regent's Park, undertaken in the interest of a more than Chinese worship of ancestors. These visits would, perhaps, be considerably increased if it were very widely known that a fine specimen of a closely-related structural ally was there to be seen and heard, and one the resemblance of which to us has, I venture to think, not been generally appreciated sufficiently. I allude to the fine specimen of the Hoolock Gibbon which has been some time at the Gardens, and which appears to rejoice in good health, good temper, and good voice.

Differing so greatly and fundamentally as I do from Mr. Darwin, it is with sincere pleasure that I give my testimony to the correctness of his appreciation of the value and bearing of man's bodily structure on his zoological position. There can, I think, be no doubt that his frame is so closely related to that of the anthropoid division of the Old World apes, that to accord to it the rank of a family is to go to the extreme of maintainable distinction. Descending, however, to smaller divisions, it is generally taken for granted that the palm of resemblance to ourselves can be disputed by the Orang (Simia), or by the African genus Troglodytes (which includes both the Gorilla and Chimpanzee) alone. The third member, however, of the anthropoid Simian Graces—the genus Hylobates (long-armed apes or Gibbons)—has claims to advance for an award in its favour which I am disposed to consider not unworthy of consideration. Assuming, for argument's sake, the truth of Mr. Darwin's hypothesis that man's body was derived by natural generation from some form of ape, it may, I think, possibly be the case that we have in the existing Gibbon the representative of an ancestor more in the direct line than either the Orang or the African forms, and this in spite of the many points in which the Gibbon recedes yet further from human structure. For though it is indisputable that we can enumerate a greater number of points of resemblance between man and Simia or Troglodytes than between man and the Gibbons, while it would be easy to draw out a catalogue of details by which the last-named apes differ more from man than do Simia and Troglodytes, nevertheless there are certain points in which the Gibbon genus resembles Homo which are striking and perhaps significant. Although the enormous length of the arms disguises the resemblance, yet the proportions of the Gibbon's frame (as in some respects long ago pointed out by Professor Huxley) are singularly human. The length of the leg as compared with the trunk, and the form and proportion of the bony thorax, are points which may be mentioned. Again, a Gibbon (the Siamang) is the only ape which possesses that striking human feature—a true chin. The slight prominence of the nose too is also very remarkable, a point which has not escaped the notice of Mr. Darwin, and is to be seen in the living specimen here referred to. Again, the power, quality, and compass of the voice are qualities justly dwelt upon by the last-named author; and, finally, the gentle, yet quick and active nature of the Gibbon is eminently noteworthy.

On the other hand the Orang is a very specially organised, quite aberrant beast (as I have elsewhere endeavoured to show), and the brain in the genus Troglodytes is considered by Gratiolet to indicate altogether other relationships. Now it is not impossible, on the hypothesis assumed, that the Orang, Gorilla, and Chimpanzee may be types which have really diverged further from that anthropoid root-form which most nearly resembled man than has the Gibbon, and that adaptations to conditions may have superinduced many of those human resemblances which at present characterise them. It seems difficult, certainly, to apply this view to some details, such *e.g.* as the vaginal process of the temporal bone on the basis cranii. On the other hand, it is not in the highest but in one of the lowest of the Simiadæ that I have found an anchylosed styloid process to be occasionally present.

A very interesting fact is the great Miocene Gibbon of Europe, the Dryopithecus, which goes to confirm the view here suggested as to the dignity of Hylobates; but of course we can but speculate inconclusively till Palæontology furnishes us with the nearest extinct representatives of the Gorilla, Chimpanzee, and Orang.

To prevent misconception, I may add that fully recognising the truth of Mr. Darwin's appreciation of man's zoological position, which I have ever maintained and indeed laboured to support, I none the less completely differ from him when I include the totality of man's being. So considered, Science convinces me that a monkey and a mushroom differ less from each other than do a monkey and a man.

ST. GEORGE MIVART

THE COLLECTION OF INVERTEBRATE ANIMALS IN THE FREE PUBLIC MUSEUM, LIVERPOOL

II.

WE have mentioned in a previous article* the division of the series of Invertebrate Animals in the Liverpool Museum into 216 groups. The following is the plan of arrangement adopted in connection with each group.

Wherever circumstances permit the plan includes: (1) A printed schedule. (2) Exotic species. (3) British representatives. (4) The printed tablet. (5) Earliest fossils. (6) Diagrams and other illustrations. (7) Species and varieties on a more extended scale.

(1) The schedule, of which an example follows, is printed in large type, and is placed conspicuously at the head of the drawer; it is designed to show the derivation of the group, *e.g.*—

"Group 198.

SUB-KINGDOM—*Annulosa*, Skeleton external, ringed.
PROVINCE—*Arthropoda*, Limbs jointed.
CLASS—*Insecta*, Legs six.
SUB-CLASS—*Metabola*, Transformations complete.
ORDER—*Lepidoptera*, Wings with scales.

* See NATURE, vol. iii. p. 202.

SUB-ORDER—*Rhopalocera*, Horns clubbed at the apex.
FAMILY—*Papilionidæ*, Middle nerve of fore-wing four-branched."

The next sub-division appears on the tablet as the distinctive title of the 198th group.

"GENUS—*Ornithoptera* and allies, Bird-winged butterflies. About twenty species known."

(2) The further portion of the drawer, to the extent of three-fifths (more or less) of the whole area, accommodates from ten to sixty exotic species; such as are most distinct being preferred. A reference to the authority accompanies many of the generic, sub-generic, and specific names. The locality, when copied from a monograph, is stated simply; but when it is known where the specimen has been collected, the word "from" is added—*e.g.* "from Madagascar."

(3) The nearer right-hand corner of the drawer is occupied by representatives of the group indigenous to Britain. Some groups have no British representatives; in others—*e.g.* *Noctuæ genuinæ*, a selection from the British species fills three-fourths of the drawer. Amongst these, foreign specimens of rarities are admitted, but in all such cases the words "exotic specimen" are appended to the name on the label.

(4) The nearer left-hand corner is assigned to a few fossils showing the earliest appearance of the group in the Geological record. In one or two instances, *e.g.* *Hippurites*, the entire group is fossil, in others, of course, fossils are absent.

(5) Between these two latter sections of the drawer is placed the printed tablet, about the size of an octavo page. It exhibits an attempt to describe some of the salient points in the life-history of the group. Here, and throughout the series, some attention has been given to ensure legibility; names and descriptions being of much less value when they cannot be read easily.

(6) The upright portion of the table case over each drawer is given to miscellaneous illustrations of the group. The series includes drawings and photographs of structure and anatomy, economic products, silk in various stages, marine and freshwater pearls, cameos, from the rough medallion cut from the shell to the finished work, polished shells, and sections showing the interior of shells, eggs, preserved larvæ and pupæ, preparations in spirits, examples of mimicry, nests of *Hymenoptera*, galls and their tenants, timber and stone pierced by molluscs, crustacea and insects, distorted growths, healed fractures, coral beads, British and exotic specimens of fungi growing on pupæ, and many other objects of interest.

(7) The blocks on which some of the table cases rest are fitted with drawers suitable for receiving an extended series of species and varieties, valuable only to the student, and intended to be seen only on application to the Curator. Very little progress has been made in carrying out this portion of the plan, which has, however, the good effect of rendering it quite needless to overcrowd the groups with insignificant species.

The difficulties attending the formation of the series of specimens have not been very great. Collections have been presented to the Museum by several friends of natural science, amongst whom may be mentioned Mr. Samuel Smith, of Liverpool, the donor of a collection of shells rich in generic forms and in costly rarities of the highest beauty. Mr. Moore has been successful in establishing friendly communications with many captains of merchant vessels sailing from the port of Liverpool, some of whom have been supplied by the committee with dredges and collecting apparatus, and have become enthusiastic naturalists. In recognition of their services several of them have been received as Associate Members of the Literary and Philosophical Society of Liverpool, a distinction which seems to be highly appreciated by them. Something has also been done in the way of exchanges; but a large proportion of the whole series has been purchased specimen by specimen. No object has been purchased simply on account of its rarity, but at the same time no reasonable expense has been spared in procuring the most beautiful and perfect examples.

A few general remarks on the subject of expense may be permitted: details will gladly be communicated to inquirers connected with museums. Few collections exhibited to the public will bear comparison with corresponding series contained in private cabinets. Why should this any longer be permitted? It may arise, *in part*, from the impression that in public museums it is unnecessary to spend much on specimens. There can be no excuse for extravagance, but economy may be pushed too far. The trouble and great risk of collecting in tropical climates must often be very inadequately represented by the apparently high prices asked for the chief desiderata, and the rest of a collector's stock may remain on his hands for years. Again, if a genus or a group is illustrated in nature by a great variety of beautiful forms, this surely is a biological fact which may claim, on scientific grounds, to be fairly and appropriately represented. Even on the most severe estimate of what is necessary for an educational series, something must be allowed simply for the sake of beauty and attractiveness; that is to say, if museums are to avoid the fate of certain parochial lending libraries which contain only such books as everybody *ought* to like to read. Naturalists of the very highest scientific standing, much more ordinary observers, are greatly under the influence of beauty of form and colour. Even Mr. Wallace himself would not have been so near syncope at the sight of a new Brachelytron as he seems to have been on his first introduction to the magnificent *O. Crœsus*. Why, moreover, should the public be taught to esteem art treasures as so much more valuable than the choicest productions of nature? One hears of a pair of vases being sold for 2,000*l.*, a sum which would provide twenty first-rate table cases, and stock them with very fair illustrations of the whole of the invertebrate groups. It is a happy circumstance that a museum of common objects may, at a trifling cost, be established in almost any village, and with judicious local influence brought to bear upon it, may prove both useful and creditable; but why should not wealthy communities, possessing endless drawing-rooms ablaze with costly decorations, exercise something of a corresponding liberality towards the museum which is the representative of their appreciation of that which is higher than the highest art?

Considerable difficulty has been found in selecting appropriate materials for the printed tablets. Many of the chief continental authorities on the Invertebrata, admirable as are their works for the purpose of identifying species, afford scarcely a line of information on the life history of

the objects they so grandly figure and often so elaborately describe. Even the reports of scientific expeditions may frequently be searched in vain for this kind of information, which has to be gleaned from authorities not always trustworthy, from scattered papers, or from books of travel such as have been issued in this country on the Malay Archipelago and the River Amazon. It is mortifying to exhibit forms distinguished by extraordinary developments of structure, and to be able to say nothing on associated habits. Such strange developments were once considered to be mere freaks of nature, but no one now doubts their having a biological and even a genealogical significance. What a field is is here opened! How little of the biology of a new form has been exhausted when it has been collected, named, described, figured, and even dissected! Scientific treatises have prepared the foundation for a solid knowledge of the subject, but there would be occasion for regret if biology should ever come to be regarded by students in an aspect too exclusively histological or even physiological, if such a view operated to the prejudice of genuine out-of-door observations. The greatest advance in Natural History made in the present, or perhaps in any other generation, has been mainly accomplished by two observers who are pre-eminently life-historians.

Little need be said of the miscellaneous illustrations contained in the upright portion of the table-cases. They seem to be very successful in engaging the attention of visitors of all classes—a point which is felt to be of prominent importance where the admissions amount to about 2,000 daily. What brings them here? is a question which again and again suggests itself. Reduce the number by all the idlers and sight-seers who, no doubt, constitute a large proportion of the gathering; still, if only 100 or even 50 seek some kind of instruction, even these in the course of a year form a large and teachable class. As a firm believer in the humanising effect of an intelligent interest in Natural Science, to myself the grand museum problem seems to be, how to make such an institution most beneficial to the greatest number.

HENRY H. HIGGINS

PRE-EUCLIDIAN GEOMETRY

Die Geometrie und die Geometer vor Euklides. Von Prof. C. A. Bretschneider. (Leipzig: B. G. Teubner, 1870. London: Williams and Norgate.)

UNTIL the appearance of this book, Montucla's celebrated "History of Mathematics" contained almost all that was known about the early history of Mathematics up to the present time. Later historians, even the careful Chasles, have almost exclusively copied him, without taking the trouble of searching the Greek writings for themselves. Montucla's remarks, however, are not only meagre, they are even not always correct. For this reason Prof. Bretschneider has collected all important passages in Greek writings which refer to the state of Geometry in Greece in the time before Euclid. This author is the first of whom complete works have reached us; with him, therefore, a *History* of Geometry begins. With regard to the ante-Euclidian times we cannot advance beyond conjectures, and these will always depend more or less upon the individuality of the historian. Perfectly aware of this, Prof. Bretschneider gives in the little volume before us, of about 180 pages, not merely his conclusions, but he adds the whole material which he has collected. Instead of simply referring to an author, he quotes *in extenso* the original Greek text, and adds translations. Thus every reader is at once enabled to form his own opinion, which, we feel assured, will in most cases agree with that of our author.

In the first section Prof. Bretschneider considers the Geometry of the Ægyptians, and tries to make out how far their knowledge extended. He protests against the old opinion that they possessed only the very first notions of geometry, and that the Greeks did not obtain anything from them worthy of the name of science. He refutes equally strongly the statement of some modern writers, who maintain that the Ægyptians knew not only all that Euclid gives in his Elements, but were even acquainted with the theories of quadratic equations and of conic sections. According to him geometry originated in Ægypt, where it was cultivated for practical purposes. It was rather an *art* of mechanical drawing than a science proper. The results obtained were collected in the form of fixed rules, always ready for use, most of them probably strictly proved others perhaps resting on experience only. Those collections of rules were at an early age included in the religious canons. Any alteration, any improvement, was thus almost impossible, especially as the only cultivators of Science, the priests, would take a secondary interest only in anything not strictly connected with religion. Thus it is not to be wondered at that geometry remained for thousands of years in the same state, till the unfettered genius of the Greek nation began to cultivate it, and then the progress was a most rapid one.

It is, however, remarkable, although natural enough, that the Greeks retained to a certain extent the *form* into which Ægyptian priests had cast their propositions. For this fact there exists a testimony in a papyrus at the British Museum, formerly in the possession of the late Mr. Rhind, which contains a pretty complete treatise on Applied Mathematics, in the shape of problems which are stated in that peculiar form with which we are so well acquainted through Euclid's Elements. Dr. Birch, who has given an account of it, dates it as far back as 3400—3200 B.C. Prof. Bretschneider traces many other peculiarities in Euclid's Elements—for instance, the order of propositions—back to the same source; so that the Ægyptian priests, who lived about 6000 years ago, have, in the most direct manner, influenced the mode of teaching geometry in English schools even at the present time.

The extent of Ægyptian Geometry is estimated as follows:—the theory of angles and parallel lines; the construction of triangles, parallelograms, and trapezoids from given parts, and the determination of their areas; the elementary propositions of the circle together with the inscribed regular polygons;—this is about the sum total of Plane Geometry. In Solid Geometry their knowledge was limited to the first notions about lines perpendicular to a plane, and the theory of parallel lines and planes in space. They were acquainted with the existence of prisms, regular pyramids of four sides, of the right cone and cylinder, the sphere, and of the regular solids with the exception of the dodecahedron, which is the only one discovered by Pythagoras. Of the properties of

these solids they knew little, the theory of the sphere alone appears developed to a certain degree necessary for astronomical purposes. Of proportions and similar figures they knew nothing.

The succeeding chapters relate to Geometry in Greece. We shall only mention a few of the most striking differences between Prof. Bretschneider and his predecessors. That most of the anecdotes about Pythagoras—his long captivity in Babylon, for instance,—are rejected, need scarcely be mentioned. But many readers will be surprised to hear that Plato is not considered a very eminent mathematician as he himself did almost nothing to enrich this science, and most of the theorems usually believed to be due to Plato are his pupils'. Thus the conic sections were invented by Menaichmos. Again, the *reductio ad absurdum* is considered one of the simplest methods of demonstration and used long before Euclid thought of it.

One of the most important points in the book consists in a long passage out of Eudemos' "History of Mathematics" (about 340 B.C.), which Bretschneider was fortunate enough to discover in the commentary on Aristotle by Simplikios. It contains a critique on investigations on the problem of squaring the circle. Some of the methods here employed are exceedingly interesting, as they show what means were at the disposal of the mathematician. Antiphon, a contemporary of Socrates, inscribes a regular polygon in a circle, and then proceeds in the well-known manner to double the number of sides till these at last coincide with the circumference of the circle. He then considers the circle as a regular polygon, and says that it may be converted, like any other polygon, into a square. It appears, therefore, that Antiphon was the first who introduced infinitesimals into geometry, and thus became the forerunner of Archimedes. These methods were, however, far too much in advance of his time, and Eudemos rejects them as not exact. Hippocrates, known by his quadrature of the lunulæ, makes several attempts to extend this discovery, and to obtain similar results for other lunulæ and thence for the whole circle. Some of these attempts indicate great power, although they lead to nothing tangible.

The book contains many other important results, and all those who take an interest in the history of the development of science will feel indebted to the author for its publication.

OUR BOOK SHELF

Notes on the Natural History of the Strait of Magellan and West Coast of Patagonia, made during the Voyage of H.M.S. "Nassau," in the years 1866—1869. By Robert O. Cunningham, M.D., F.Z.S., &c., Naturalist to the Expedition. (Edinburgh: Edmonston and Douglas.)

WE regret to be obliged to find fault with the work of a naturalist, but duty to our readers compels us to say that this book should never have been published. There is perhaps no part of the world which is at once so remote and inhabited by such interesting savage tribes, with the main features of whose scenery and natural productions the public is so well informed as that which forms the subject of this book. It is therefore surprising that a gentleman who has had the opportunity of studying the natural history of this region at his leisure, should have thought himself justified in printing a volume of 500 pages of his rough journal, nine-tenths of which are occupied with a bald record of the usual monotonous incidents of sea and shore excursions, and with repetitions of facts already given us by Darwin, Hooker, and a host of other less eminent writers. There are, of course, some interesting facts and some original observations in this volume, but they are so thinly scattered amid a mass of details of weather and personal incidents, with records of the gathering of every common plant and the capture of every common as well as uncommon bird or insect, as to be not worth the search after. The book too is got up with an utter disregard of the reader's convenience. The author journalises his whole voyage, and at least one third of the volume treats of other parts of the world than those indicated by the title, yet the heading throughout is "Strait of Magellan," even when Rio Janeiro, Valparaiso, or the Azores are being described. Neither is there any indication of years or months, except when a change occurs; and if we find that something was captured on the "14th," we have to go back or forward many pages to discover whether we are in May or December. The plates too are wholly without references to the letterpress; and we find a curious plant (*Philesia buxifolia*) described at page 173, and figured at page 321, with no reference from description to figure or from figure to description. The illustrations seem thrown in at random, anything the author collected being apparently deemed worthy of a plate. On no other principle can we explain the plate devoted to an indifferent figure of the cranium of so common an animal as the puma; and another to the furcula of a condor, the picking-up of which is recorded at page 113, and figured full size, *à propos* of nothing, at page 303.

It is the more to be regretted that such a book as this has been published, because there is ample room for one of a different character, and for which Dr. Cunningham must have collected or have been able to obtain ample materials. The temperate parts of South America form a well-marked district, the productions of which are exceedingly interesting and their affinities well worthy of careful study. The relations of the fauna and flora of this district to those of Tropical America, of Europe, of Australia, and of New Zealand, require a thorough and critical examination; and this could hardly fail to throw much light on the means by which organic forms have been distributed, and on the relative importance of the various zoological regions into which the globe has been divided.

The author states in his preface that he has not yet completed the examination of his materials. Why then did he rush into print before he was able to lay before the world a single generalised result of his three years' voyage? W.

Les Houillères en 1869. Par Amédée Burat, Secrétaire du Comité des Houillères Françaises. Texte et Atlas. (Paris, 1870. London: Williams and Norgate.)

THIS is an annual publication of a semi-official character, proceeding from M. Burat, the Secretary of the very useful Association of Coal-mine Proprietors in France. We are not aware that any such committee of coal owners exists in Great Britain, although other trades or professions, such as bankers, railway companies, &c., have similar committees. The Iron and Steel Institute, which has lately been holding its meeting in London, fulfils to some extent this purpose in regard to the iron trade. Wherever such associations exist we wish that they could be persuaded to publish as complete and valuable reports on the condition of their branch of trade as we have in these annual reports on the French coal trade, now available for ten or eleven years back. The present report consists of four chapters, which treat respectively of the strikes of the coal-miners, which had greatly interfered with the trade, improvements in the machinery and modes of working coal mines, the statistical conditions of the production of coal in 1860,

and the legislation which had taken place in relation to the trade. It is impossible to avoid feeling, however, that the interest of such a complete statement is much reduced by the events which have occurred since the year to which it relates. All industrial improvement in France must be greatly retarded, if not converted into retrogression, for some time to come. The remarks on the subject of strikes form perhaps the most interesting part of the volume. England is the birth-place of trades' unions, and our capitalists feel their influence severely; but it is among an unstable and disaffected population, like that of the French manufacturing and mining districts, that they produce really evil effects. M. Burat gives emphatic testimony to the high character of British workmen, wholly uneducated as they often are. He says (p. 135), "Once again, in traversing the coal fields of England, we have been struck with their superiority, due not only to the special conditions of the coal basins, but to the aptitudes and the discipline of their working population."

W. S. J.

Jahresbericht uber die Fortschritte der Chemie, und verwandter Theile anderer Wissenschaften. Herausgegeben von Adolph Strecker, für 1868. (Giessen, 1870. London: Williams and Norgate.)

THE Jahresbericht is too well known as a trustworthy book of reference, both for chemists and physicists, to need commendation; and the care and judgment with which it is compiled have made it almost indispensable to those interested in science. In these days, when the amount of work done—both useful and useless—is so great, it is no slight convenience to have the year's labour carefully sifted and preserved for reference in a single volume. The present volume, under the editorship of Herr Adolph Strecker, is arranged with all the care which has characterised previous numbers, and contains numerous papers of unusual importance. Among the most important of these may be noted Becquerel's researches on electro-chemical action, Graham's experiments on the occlusion of hydrogen by palladium, and the existence of the metal hydrogenium. Rammelsberg's researches on the periodates are given at considerable length, and also Bunsen's process for separating the platinum metals found in the residues of the Russian mint. In the organic section of the book very important papers are given on the constitution and derivation of benzol, toluol, and napthalin, and Gräbe and Liebermann's valuable researches on the preparation of alizarin from anthracene are fully described. Perhaps the success of the Jahresbericht has caused the Chemical Society to make the changes in their journal which, we understand, are in contemplation. We believe that it is intended to reproduce in the pages of the new journal all important researches made in this country and abroad, so that it will become to us what the Jahresbericht already is to Germany. If the same care is bestowed on its production that has always characterised its German contemporary, we anticipate for it a similar and deserved success.

F. J.

Notes or Jottings about Aldeburgh, Suffolk. Relating to Matters Historical, Antiquarian, Ornithological, and Entomological. By Nicholas Fenwick Hele, Surgeon. 8vo, pp. 198. (London, 1870.)

IT is no disparagement to Mr. Hele to say that he is not a Gilbert White, and the reviewers who have compared this book with the "Natural History and Antiquities of Selborne" have certainly done its author a wrong, while they have shown their own want of discrimination. Gilbert White was in the front rank of the naturalists and antiquarians of his day; as an outdoor observer he had no equal, and perhaps never will have one. Add to this the charming and delicate simplicity of his ideas, rendered all the more striking by the slight shade of pedantry which not ungracefully tinges his style; for the old pupil of Warton never forgot his scholarly breeding, and what wonder is there that "Selborne" is an English classic? If ever there was a naturalist in whom the poetic faculty was developed, if ever there was one who wittingly or unwittingly possessed the scientific use of the imagination, Gilbert White was the man. Now, there is nothing to show that Mr. Hele is a closer observer than (happily) many of his fellows, and what he has to say he says in very plain, straightforward language. It is clear that he keeps his eyes open whene'er he takes his walks abroad, but he favours us with few inferences from his own experience. Still we must particularly praise the absence of any attempt at fine writing, and the consequence is a little volume of a kind of which we should be glad to see many more. The "matters historical and antiquarian" of which he treats are, of course, beside the path of Nature, though the old boat found in company with flint-flakes deserves the attention of the Anthropological Institute; but the topographical, ornithological, and entomological notes include much that is of interest, exception being taken perhaps to a few of the statements. However, Mr. Hele's opening assertion that "Aldeburgh, as a place of resort for the naturalist, may be fairly classed as one of the most attractive localities in the east of England," is undoubtedly true, and his sketch of the neighbourhood shows that he appreciates its advantages. We have derived great pleasure from this unpretending little volume, and are sure most of our readers will do the same.

Mineralogie der Vulcane. Von G. Landgrebe. (Cassel and Leipzig, 1870. London: Williams and Norgate.)

THIS is not a very satisfactory book. It consists of an alphabetical arrangement of minerals with a brief description of each species, the species selected being those which the author regards as volcanic minerals. In spite of his title of "member of several learned societies," we take leave to doubt whether he has any clear idea of what a volcanic mineral is. A great part of his book is devoted to minerals which, like the zeolites, are not original volcanic products, but the result of subsequent changes. Any mineral which he can discover to have been ever found in an eruptive rock, he sets down in his pages as one of the "minerals of volcanoes." There is no critical faculty shown in discriminating between the primary and secondary ingredients in volcanic rocks. A good work on volcanic minerals properly so called, with a minute and exhaustive examination of their microscopic structure, and a philosophic induction therefrom as to some of the conditions under which volcanic action must take place, would be a great boon to science. But it is not to Dr. Landgrebe that we must look for such a treatise. He tells us that perhaps he might have delayed the publication of his volume until he could take advantage of the results which the new development of mineralogy through the application of the microscope promises to furnish; but as he found the delay might prove a tedious one, he decided not to wait any longer, but to present his labour of "Lust und Liebe" to the indulgent criticism of the public. Even so; such is the history of too many books in the scientific as well as in other branches of literature.

A. G.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

The Science College at Newcastle

PERMIT me to rectify a misapprehension which appears, not through any fault or oversight on your part, in your appreciative article upon the College of Physical Science, which the University of Durham, with the co-operation of the scientific men

of the North of England, is engaged in founding at Newcastle-upon-Tyne.

The Executive Committee fully recognises the importance of Biology. The professorial chair, which was called at the public meeting that of Geology and Mineralogy, will be called, according to a subsequent decision of the committee, the Chair of Geology, Biology, and Mineralogy. It is true that this designation leaves it uncertain whether Biology is co-ordinated with Geology, and has its claim to be a distinct science allowed, or is subordinated and intended to be treated only as a component part of Geology. In the former case, it may be said, the Chair will be too capacious for one man to fill; in the latter, the rights of biology are but inadequately acknowledged.

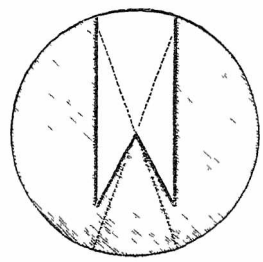
The answer to this is, that the programme of teaching is necessarily, at the present stage of affairs, initiatory. It will, no doubt, when the work of the Institution has commenced, and the scale of operations which everything seems to foreshadow has been in some measure realised, receive such expansions and modifications as are suitable to the relative value of the sciences, and the actual wants of the students. J. WAITE

University College, Durham, April 17

The Aurora Borealis

A VERY bright display of aurora was visible here last night, illuminating the greater part of the heavens at intervals with a fitful light. At 9h. 45m., when I first noticed it, broad cirrus-like brushes of white light stretched in parallel bands across the zenith, from below Corona in the north-east, across Cor Caroli, nearly overhead, to about the altitude, and 15° or 20° south of Venus, then shining dimly through clouds in the western sky. My view of the aurora was afterwards confined to an east window; but from a short examination of a clear part of the sky towards south-west, it appeared to be almost as bright, at first, in the opposite direction as in the quarter between north and east, where I had, from that time onwards, an uninterrupted view of its progress. The streamers were white, and irregular in form, rising from no distinct arch, or definite base in any quarter, but they occasionally met and formed a bright corona overhead. A rose-tint pervaded some of them, in the north-east, at 10h. 30m., and presented itself in different parts of the sky until about 11h., when the phenomenon faded, and a faint glow only remained visible in the north. At about 11h. 40m., while streamers reappeared, forming a bright corona overhead, whose arcs and beams appeared to grow more densely luminous until 12h. 15m. It then showed a well-defined central nucleus, with rays of great brightness proceeding from it, about three-sevenths of the distance from η Ursæ Majoris to Arcturus, white streamers rising to meet it all round, with the appearance of a cupola or dome. While I watched some of the brighter stars through its dense light-cloud, it rapidly assumed a vivid fiery red colour, and a similar bright appearance breaking out at the same moment at the base of a north-east streamer, the fiery glow reflected among the clouds in that direction perfectly resembled a distant conflagration. A wide expanse of brilliant orange and crimson-red light soon joined these two regions of greatest intensity together in one splendid blaze of ruddy colours. This brilliant outburst faded away at 12h. 25m., the streamers disappearing, until 12h. 40m., when they again met overhead, and formed a corona with a sharply-defined nucleus, about 3° west of the star γ Bootis. The light of the white streamers flickered considerably, as if waves of varying brightness were driven rapidly over the whole phenomenon by the wind. Until after two o'clock, when the moon rose, and their light was weakened although not extinguished, a constant succession of bright steamers occupied the north-east sky between the horizon and the zenith; towards these I directed the slit of a Browning's Student's Spectroscope, in order to determine, if possible, the position of some of the auroral lines. A single greenish line only was so faintly visible in the spectroscope that all attempts to view it simultaneously with the cross-wires of the instrument proved unsuccessful. A simple form of pointer, substituted for the use of the wires in the dark field of the telescope enabled me, however, to identify its position with considerable accuracy.

A circular card, of the figure shown in the sketch, was slipped into the forward end of the eye-piece until it reached the diaphragm upon which the cross wires are stretched. It was so disposed that the angular pointer in the middle of the card exactly filled up the lower angle of the cross-wires; and its sharp point coincides almost exactly with the place of their intersection. In a field of view almost dark it was possible to see the summit of the card-pointer with considerable distinctness; and if a great and imposing phenomenon may be compared with an object so diminutive, the appearance of its dark peak, surmounted by the narrow, flickering line of light, resembled in the dim field of view the cone of a volcano, projecting in a thin



jet from its apex frequent eruptions of varying height and brightness. By obtaining a reading of the soda-line seen in the flame of a salted spirit lamp, and referred to the pointer in the same manner, I obtained as a result of three observations of the auroral line, differing less than two minutes on the graduated position-circle of the spectroscope, a place in the spectrum twenty-four minutes more refrangible than Fraunhofer's line D. Many observations of the dark lines of the solar spectrum, compared with their positions in Kirchhoff's maps, having assured me that a minute of arc on this spectroscope corresponds between Fraunhofer's lines D and *b*, with 10·44 divisions of Kirchhoff's scale, the resulting difference of refrangibility between the green auroral line and Fraunhofer's line D is 250·6 divisions of Kirchhoff's scale; and its absolute position, assuming for that of D to be 1005 Kirchhoff, was within 10 or 20 units on either side of a place at about Kirchhoff 1255. A bright line in the spectrum of the aurora was observed by M. O. Struve at Pulkowa, in April 1868, whose position he ascertained to be within 10 or 15 units of the scale at Kirchhoff 1259, a place apparently identical with that of the bright line which was principally visible in last night's aurora. The faint and uncertain brightness of its appearance, while confining my attention principally to its observation, prevented me from searching in other parts of the spectrum for accompanying bright lines Within a space of about 400 Kirchhoff on each side of that which was recorded, I could, however, perceive no traces of any co-existing lines. The position of the bright lines which are most conspicuous in different auroras is, perhaps, a subject of interesting inquiry in connection with the yet unascertained laws which govern their appearance, and with the varying characters and peculiarities of their phases. A remarkable circumstance connected with the appearance of the single line observed on this occasion, was the flickering and frequent changes with which it rose and fell in brightness, apparently even more rapidly than the swiftly travelling waves, or pulsations of light, that repeatedly passed over the streamers, near the northern horizon, towards which the spectroscope was directed.

A. S. HERSCHEL

Andersonian University, Glasgow, April 10

THERE was a brilliant display of aurora borealis visible from this place on Sunday the 9th inst. I first noticed it about 10.45 P.M.; there was then a considerable luminosity in the N.W. with a magnificent red glow and streamers springing from the W. extending to within 20° of the eastern horizon, also radiation from other parts in the N. and N.W., but less brilliant. At about 10.55 P.M., a bright streamer made its appearance near the zenith crossing the red at right angles, and standing out clearly upon it. The aurora had nearly faded away at 11.10. When it was at its brightest through a direct-vision spectroscope with the slit rather wide and directed to the N.W., where there was scarcely any colour, the red and green bands usually seen under such circumstances were clearly defined, more particularly the red band. I then directed the spectroscope to the W., at a part where the red light was most intense, to my surprise the red band was scarcely to be discerned, and looked blurred, and spread out

towards the green, which was better defined, but not clearly so. I several times repeated the observation with the same result. This, if confirmed by other observations, would appear to point to some fluorescent property of the upper atmosphere.

W. J. B. THOMPSON

Weybridge Heath, Surrey, April 11

THERE was a magnificent auroral display last night (Sunday), which commenced at 10.45 P.M., and continued till 11.15. The streamers radiated from a point due N.W., there being no clouds in their vicinity, the colour was a deep red, and they extended far beyond the zenith. At 11.20 another display was seen, but at right angles to the previous one, and streamed across the zenith due N. and S. When the sun had set there was an accumulation of stratified clouds near the western horizon and quite horizontal, these gradually rose radially, having their centre situated a little north of that of the aurora; and at about 11.10 the uppermost radii passed into the field of the northernmost streamers, so that it became impossible for me to distinguish between them which was cloud and which was auroral. After the first appearance had faded away, the second was seen to proceed from these clouds upon the latter passing overhead, but did not last longer than fifteen minutes, by which time the radial clouds had become so dissipated as to lose their character, and, to me, were almost invisible. I may mention that this peculiarity in the clouds was noticed on Saturday evening (the 8th inst.) after sunset.

The old superstition of bloodshed taking place in a distant country, and the red colour being the sign, is still prevalent; it was asked of me, by an observer, "whether there was a war in Paris, or was it on fire, as the reflection of something like it was in the sky?" Another declared he could hear "distant noises of the clashing of weapons."* But the assertion of an old woman who was amongst my interrogators, was that it was the reflection of fire, and "showed that *mahogany* was burning." The ignorance on this subject is appalling, and when we have such absurd accounts of the aurora borealis from persons of our own time, surely the obscure mentions of this phenomenon in the old chronicles (*vide* my article on this subject in NATURE for Dec. 29, 1870) by perhaps equally ignorant observers of nature, are not so difficult of interpretation as many imagine. The experience of the present is the key to the past.

JOHN JEREMIAH

43, Red Lion Street, Clerkenwell, April 10

ON Saturday, the 15th inst., a remarkably fine aurora was to be seen here towards the N.N.W. It was first observed at 8.45, and continued from then shining brightly till 9 P.M., when it made its disappearance. At first it formed a complete rose-coloured arch, in which flickering rays of bright white light were occasionally to be seen. During its appearance its position was gradually shifted round to the north, where it remained till it disappeared. J. B. F.

Marlborough College, April 17

The Comparative Aggregate Strength of the Light from the Red Hydrogen-Stratum, and of that from the rest of the Chromosphere

I WAS a spectator of the total eclipse on December 22, and though I had no further connection with the Government expedition than that I was favoured with a passage home in H.M.S. *Urgent*, I was kindly permitted by the Rev. Mr. Perry and his party to set up my telescope at their observatory at San Antonio, near Port St. Mary, on the harbour of Cadiz.

I made an observation during the total phase, which I ought to have published sooner, but did not, partly from the distrust which an inexperienced observer naturally feels in his own results, and partly because I did not see that it might have some value. As I now think it may be of some interest, I will state what I saw.

The instrument which I used was one of Browning's direct-vision spectroscopes with seven prisms. It was not fitted to the telescope which I had with me, simply because I had not time to get them properly adapted to one another either before leaving England, or after arriving at Gibraltar by the Peninsular and Oriental steamer on December 16.

I spent the first thirty or forty seconds of totality in taking a general observation with the telescope; after that I gave it up to the friend who was travelling with me, and had fifty seconds at least during which I used the spectroscope. At first I tried to use it with the slit moderately narrow (about ·005in.); but, as there was much cloud over the moon, though not enough to prevent the corona and a slight amount of red light from the red hydrogen-stratum being seen with the naked eye, I could get no light to pass through the prisms while the slit was narrow; accordingly, I enlarged the slit to a width which would be absurd under most circumstances (about ·025in.), and then, taking a general view of the corona, saw a spectrum in which the red and green were present, but the blue and violet totally absent, and on this spectrum one line and one only: this line was strong compared with the rest of the spectrum, red, and of course broad to correspond with the width of the slit; and from its position on the continuous red part of the spectrum was either C or near it.

After I first saw this spectrum and line I had fully thirty seconds, which I employed in directing the slit as well as I could towards all parts of the corona, and in seeking for other lines; during the whole of the time I saw the same spectrum and the same red line only.

As this spectrum and line, from the nature of my instrument, must have proceeded from the mingled light of all parts of the chromosphere, I consider my observation as a humble imitation of that made by Mr. Pye, recorded in Prof. Young's article in NATURE for February 2 (p. 261). The mingled light was sufficient to give him with his delicate instrument the lines C, D, 1474; and he estimated the light of 1474 to be apparently greater than that of C, and to bear to it the ratio of 10 to 8·5; yet the light of 1474 was not sufficient to penetrate my rougher instrument, although the red line (which I can hardly doubt was C) showed conspicuously throughout the time that I turned the spectroscope upon the corona.

Whatever value my observation has it must be set in the balance against Mr. Pye's, and tends to weaken the argument by which Prof. Young attempts (in the article above-quoted) to show that the angular area of the self-luminous corona bears to that of the red hydrogen-stratum visible during totality so large a ratio as 35 or 70 to 1, and consequently extends 8′ or 16′ from the sun; in fact my observation tends to give a smaller extent of self-luminous corona than Mr. Pye's. BASIL E. HAMMOND

53, Bilton Road, Rugby, April 11

Mount Washington

TWICE recently it has been mentioned in your columns that Mount Washington in New England attains the height of 10,000 ft. If it were so its summit, for nearly 2,000 ft., would be clothed with perpetual snow. The most careful measurements—those of Prof. Guyot—give the height of the mountain as 6,288 ft. SAMUEL H. SCUDDER

Mentone, April 13

[The communications in question were received from an American correspondent.—ED.]

The Name "Britain"

THE existence in former times of other Britains than those of our own island should not be overlooked in discussing the derivation of the word. According to Dr. Karl von Spruner's maps of France and Spain for the sixth century, besides the Britannia in the north-west of France, there was a town called Britonia (the present Mondonedo) in the north-west of Spain. Unless the similarity of these names is nothing more than a strange coincidence, it does not seem probable that the name Britannia can have any connection with the tin which is found only in one of the Britannias. Carte (vol. i. p. 10, note), speaking of the Phrygians (Briges) "the first nation that entered Europe," says, "of this sort are the people known over England, Scotland, and Ireland, by the name of Brigantes; the Britanni on the sea coast of Gallia Belgica; the Brigani mentioned by Pliny as seated in the Alpes . . . . . A Brigantium, now Braganza in Portugal; and another (town) of the same name, now Britanças

* How old and persistent this belief is may be shown by quoting a remarkable passage from Pliny. In Book II. chap. lvi, he says—"In the time of the Cimbrian Wars we have been told that armour was heard to rustle and the trumpet to sound out of heaven, and this happened very often both before and after those wars. But in the third consulship of Marius the Amerines and Tudertes saw men in arms in the sky, rushing one against another, from the east and west, and those from the west were discomfited. That the very firmament itself should be on fire is no wonder, for often it hath been seen when clouds have caught any great deal of fire." This same appearance is very probably that which Josephus refers to in his narrative of the terrors sent by God previous to the siege of Jerusalem.

or Corunna, called anciently Portus Brigantinus, in Gallicia." According to this the Briges would be the common ancestors of the Britons of England, France, and Spain, and the similarity of the names in these countries could be accounted for.

A. R. H.

Faunas of Oceanic Islands

In NATURE, of February 16, I observe the reviewer of Mr. Godman's "Natural History of the Azores," makes the following statement:—"Mr. Godman appears to be the first who has, after a personal exploration of one of these oceanic groups, endeavoured to collect all that is known of its natural productions." Now, it is not with the intention of detracting from the merits of Mr. Godman's work, but merely to refresh the memory of your reviewer, that I beg to state, that I published in 1859 a small volume entitled "The Naturalist in Bermuda," which contained all that was known of the natural productions of those islands at that date. It was by no means a complete essay, but as stated in the preface "merely a prelude to a more complete publication on the same subject, which anticipated work, the result of several visits to the group, I hope to present to public notice shortly.

J. MATTHEW JONES

Institute of Natural Science, Halifax, Nova Scotia

Influence of Barometric Pressure on Ocean Currents

IN the recent discussions on the influence of barometric pressure upon ocean currents, I have not seen any allusion to the observations that have been made upon the effect of variations of barometric pressure upon the sea-level. In a memoir by M. Ch. Aimé, "Sur les variations de niveau de la Mediterranée," in the Annales de Chimie, tome xii., 1844, it is stated that a fall in the barometer is pretty uniformly accompanied by a rise in the sea-level to about thirteen times its amount. The Report of the British Association for 1841 contains a letter from my old friend, Mr. T. G. Bunt, of Bristol, stating that his observations upon the tide-gauge under his charge led him to conclude that a fall of one inch in the mercurial column was accompanied by an average rise of about 13½ inches in the high-water level. And the same industrious and careful observer, in a recent "Discussion of Tide Observations at Bristol" in the Philosophical Transactions for 1867, gives as the mean result of twenty-one years' examination of this point, "12·772 inches of tide to one inch of mercury." I referred to Mr. Bunt's observations in a discussion at the Geological Society (March 6, 1867) on a paper by the Earl of Selkirk "On some sea-water-level marks on the coast of Sweden," pointing out that some of the discrepancies in the observations as to the sea-level of the Baltic might be attributed without improbability to variations in barometric pressure. I have since learned from Admiral Key, who served in the Baltic fleet during the Russian war, that he had been led by his own observations to a like conclusion. And I find it stated in the description of the Baltic Sea, in the English Cyclopædia, that its level is sometimes observed to rise, and to remain thus elevated for a time without any obvious cause, two or three feet, of which phenomenon the explanation is probably the same.

I am sorry to find that I have not succeeded in convincing Mr. Laughton of the existence of a regular undercurrent in the Strait of Gibraltar. If he will take the trouble of carefully perusing the detailed report which I have presented to the Royal Society, he will find that he is quite in error in stating that I rest my affirmation upon "one observation after several attempts made in vain." All our observations, when rightly interpreted, tended to the same conclusion. The *reduction* of the boat's drift *almost to nothing*, in the first set of experiments, when it lay in a surface-current running nearly three miles an hour, with a breeze setting in the same direction, was just as conclusive evidence that a reverse current must have been acting on the current-drag below, as was the *reversal* of the boat's drift in the subsequent experiment, when the surface-current was less rapid and the opposing breeze dominated its action on the boat. And our observations of the Temperature and Specific Gravity of the 250 fathoms' stratum most unmistakeably indicated on both occasions its Mediterranean derivation.

I should like to know what is the precise minimum of movement which is held by Physical Geographers to constitute a *current*. There seems to me a great deal of confusion upon this point. The existence of an underflow of polar water towards the Equator cannot now be a matter of question. Commander Chimmo has recently obtained with the Miller-Casella thermometers a temperature of 33½° at a depth of 2,306 fathoms nearly under the equator. What is the rate of this movement is a point as yet undetermined. But the rate of the northerly flow of warm surface-water between Scandinavia and Iceland, which is usually attributed to the Gulf Stream, but which I regard as the complement of the southward flow of deep polar water in a vertical oceanic circulation, is estimated by Admiral Irminger at from 1½ to 2½ miles per day. Is this, in the language of physical geography, a current?

WILLIAM B. CARPENTER

University of London, April 10

The "Times" Review of Darwin's "Descent of Man"

THE British public are deeply indebted to the *Times* Reviewer for his very comforting and reassuring remarks on Mr. Darwin's "Descent of Man," in which he has so well exposed the "utterly unsupported hypotheses," the "unsubstantial presumptions," the "cursory investigations," of that "reckless" and "unscientific" writer. It is a great satisfaction to find that Mr. Darwin's odious conclusion that the genealogy of the Talbots, and the Howards, and the Percys must be traced back beyond the Conqueror to an Anthropomorphous Ape, and beyond the ape to an Acephalous Mollusk, rests on no logical foundation whatever. The Reviewer well suggests that anything so odious in idea, so immoral in its apparent tendency, and so different from what we have been accustomed to believe, cannot possibly be true. One is so glad indeed to be free once and for ever from the mischievous influence of such "unpractical," "disintegrating speculations," that it seems worth while trying, if space can be found for the experiment, to elicit from the good nature of the Reviewer, or of those who think with him, a little clearer explanation here and there, before the subject is finally consigned to a well-merited oblivion.

Mr. Darwin is invited in one passage, "if he wishes to corroborate his hypothesis, to commence by experimenting on some superior kind of Ascidian, and see whether, by patient selection, he can induce any of them to split themselves in half, and abandon their permanent support for a vagrant oceanic existence." Now, it is a fact that among Corals or Polypes, which are not far removed from Ascidians, these interesting experiments are actually exhibited; for the cæspitose Corals, by what is called fissiparity, *do* split themselves in half, thus forming two complete individuals where only one grew before, and the Corals of the genus Fungia are fixed when very young, but subsequently break their pedicels and become free. The whole group of Zoophytes, recent and fossil, connects together marvellously different forms by an almost infinite series of wonderfully minute links. The study of such a group is therefore no doubt dangerous, if not decidedly pernicious, as tending to gloss over "the enormous and painful improbability" of Mr. Darwin's speculations. For if upon examination it seemed likely, or almost certain, that different genera of Polypes were connected with one another by descent, some rash enthusiast might think a similar conclusion not impossible in the order Primates. Fortunately, one is estopped from suggesting that in fact some genera of Polypes *may be* connected by descent, for fear of incurring the sharp reproach to which Mr. Darwin has so frequently laid himself open, of "conjugating the potential mood." Hitherto in most departments of thought and inquiry, probable evidence has been allowed to count for something, and most men are content to believe themselves to be the sons of their reputed fathers upon a mixture of evidence and authority, which, by the very nature of the case, can never rise to absolute demonstration. The Reviewer has done good service to society by showing the untrustworthy character of the foundation on which all our genealogies are built. It would be well in future if some auxiliary verb, expressive of doubt and uncertainty, could be combined with our patronymics.

Mr. Darwin, it appears, has "a facile method of observing superficial resemblances." For instance he surprises the apprehension of the vulgar by exhibiting the curious likeness between the embryos of a man and a dog. As every one of course knows how he looked when he was still in his mother's womb and less than an inch long, that stage in a man's career when he is only too like an embryo puppy, might have been shrouded under a delicate reserve. If, in place of this absurd "superficial resemblance," Mr. Darwin could have pointed out similarities between man and the lower animals in regard to minute structures of bone and muscle, or in the organs of sense or speech, his argument might have been deemed a little more scientific.

Persons who have read his book say that he does dwell with considerable force upon these very matters, but it is easy to see from the Reviewer's tone that they are mistaken, and that such investigations have been sacrificed to a glance or two at things on the surface. This is the more to be grieved and wondered at, because in his monograph on the Fossil Cirripedes and in his work on the Fertilisation of Orchids, Mr. Darwin showed an uncommon aptitude at "a thoroughly scientific *clairvoyance*."

The Reviewer thinks it perfectly reasonable that the hand of a man and the foot of a horse, the flipper of a seal and the wing of a bat, should have all been formed upon the same general plan, without any connection by a common ancestry. It would be extremely gratifying to an inquiring mind, if he would explain upon this reasonable plan, the vast succession of creatures unveiled by geological research. Why have innumerable species been created and then destroyed? When did the creation begin, and when did it end? What causes, or if there were no causes properly so called, what caprice brought about the extinction of the mammoth, and led to the introduction of the modern species of elephant? Has the creative power been at last exhausted, or do sudden creations still occur, only in a shy sort of way, when no one is looking on? The Reviewer very sensibly censures Mr. Darwin and his followers for not specifying the year B.C. when the process of evolution first began. It is with the less diffidence, therefore, that a question is propounded above as to the date of the creation. The solution of this point of chronology will be awaited by many with extreme impatience, as different nations give very different accounts, and the Hebrews, who have a very ancient record, are by no means at one with themselves in the Hebrew and Greek editions of it. The number of years required for the process of evolution is confessedly indefinite, and as the whole hypothesis must, therefore, be destitute of any scientific value, it is no doubt quite fair on the Reviewer's part, to represent an indefinite number of years as equivalent to "infinite time." But the steps required for the process are also an indefinite number, and on this point he is less clear than elsewhere, for, referring to the old sophism respecting Achilles and the tortoise, he tells us, from Sir Isaac Newton, that "quantities ultimately coincide which may be proved to approach each other indefinitely, *within a finite time*." From this it would seem that, if Darwinians could be content with the boundaries of geological time, the genealogies of men and apes might ultimately coincide. To avoid this miserable and preposterous conclusion, we are told that the solution of the sophism by Diogenes, "is the only true one," *solvitur ambulando*. We are further obligingly informed that this solution is *identical* with Newton's. And as Mr. Darwin cannot transform one species into another under our eyes, the eminently unpractical character of his speculations is triumphantly exhibited. It will be very impertinent if any one suggests that the instantaneous creation of a species has never yet been witnessed, and that those who believe in such occurrences ought, on the *solvitur ambulando* principle, to favour the world with, at least, one such exhibition. Captious persons may find fault with the Reviewer's opinion that the poetic faculty has received no development since Homer, and the religious sentiment none since the book of Genesis. They may call to mind that Moses and Socrates, and St. Paul and Luther, were guilty, like Mr. Darwin, of laying before popular audiences dangerous and "disintegrating" speculations; they may fancy that truth is worth discovering, even when it seems to involve some contradiction to our pride and some loss of comfort to our finer feelings, but such persons must be very captious, and the Reviewer will, doubtless, know how to deal with them.

Torquay, April 15 THOMAS R. R. STEBBING

Sexual Selection

IN the first volume of "The Descent of Man," at page 396, Mr. Darwin says, referring to butterflies, that "the lower surface (of the wings) generally affords to entomologists the most useful character for detecting the affinities of the various species." I think, also, that this lower surface might afford another link in the chain of argument by which Mr. Darwin supports his theory of Sexual Selection. Thus, for example, to speak of British species only, in the cabbage butterflies, the under surface of the wings is alike in both sexes of *Pieris Brassicæ*. The black spots, however, which appear on both surfaces of the fore wing of the female vanish from the upper surface of that of the male, probably because the female has some dislike to them. There is no difference in food-plant, habit, or need of protection here; the only explanation seems to be a whim of the female or a whim of nature, and we have lately discarded all thought of nature being freakish. In *P. Rapæ* and *P. Napi* a similar difference prevails, though less constant and in a degree less marked. In the allied *Anthocharis Cardamines* the under surface of both sexes is alike, notwithstanding the vast difference of their upper surfaces. When these butterflies alight and close their wings, the under surfaces of the *hind wings* are alone visible, and these are, apparently, the parts of the insect modified for the sake of protection. The simple yellow in *Brassicæ* and *Rapæ*, the green-veined yellow in *Napi*, the green marbling in *Cardamines*, of the under sides of the hind wings, are well fitted to conceal those insects as they settle on the wild flowers which they prefer.

Again in *Hipparchia Janira* the light brown patch so conspicuous on the upper surface of the fore wing of the female vanishes from that of the male; and in *H. Tithonus* and *H. hyperanthus* a tendency to decrease the quantity of light colour on the upper surface of the male butterfly prevails. So is it also with one of the Hair Streaks, *Thecla Betulæ*, the under surface still remaining alike in both sexes of these different species. In this case the female butterflies would seem to wish their partners to be of a duskier hue than it is granted to themselves to be. The differences mentioned above are so slight that Mr. Darwin says at page 317, "With those (butterflies) which are plain-coloured, as the meadow-browns (*Hipparchiæ*) the sexes are alike." But it will be admitted that though these differences *are* slight they are yet important, as showing a tendency, more or less marked, to follow the rule which Mr. Darwin has laid down; and every sign of such a tendency strengthens his case.

In *Apatura Iris* the under surface of both sexes is alike, though the male has his upper surface glorified with purple for the delight of his plain brown wife. In the blues, *Polyommatus Alexis*, *P. Corydon*, *P. Adonis*, and *P. Ægon*, the under surface of both sexes is also alike, though in the males the blue and in the females the brown of the upper surface forms the background of the spotty design. The blue blood is very strong in these butterflies, and will show itself sometimes even in the females; who, if powerless over their own decoration, have at least succeeded in bringing out the innate splendour of their handsome husbands. With the blues, as with the cabbage butterflies, the under surface of the hind-wings seems specially adapted for protective purposes; every butterfly-hunter knows how difficult it is to distinguish the common blue when it is sitting, shut up, on a scabious flower. It is the same with the small copper butterfly, which has its under surface dotted very similarly. But burnished copper and dazzling blue are not colours for protection, surely. We may give the under surface to Mr. Wallace, but we must yield the upper surface to Mr. Darwin.

At page 399, speaking of the ghost moth (*Hepialus humuli*) and others of the moth kind, Mr. Darwin says, "It is difficult to conjecture what the meaning can be of these differences between the sexes of darkness or lightness; but we can hardly suppose that they are the results of mere variability, with sexually-limited inheritance, independently of any benefit thus derived." The female ghost moth follows Mr. Darwin's rule, that females are most conservative of the features of kinship. In her colouring she closely resembles the other *Hepialidæ*. And the male, notwithstanding his shining shroud, keeps to the same sober under-colouring as his mate. Now *H. humuli* is more nocturnal in its habits than any of the other species in the genus *Hepialus;* I have caught *H. hectus* and *H. lupulinus* flying in bright sunshine, but I have never seen the ghost moth until dusk was far advanced. May it not be that sexual selection has come into play here by the female preferring the *whitest* male, he being the most distinguished when all colour has faded into dimness? She could not decide between differing patterns of gold and amber at that hour, but a snow-white surface would then be quite visible. The fact mentioned at page 402, that "in the Shetland Islands males (of *H. humuli*) are frequently found which closely resemble the females" (I have seen similarly varied males in Peterhead collections), would seem to confirm this theory; for the twilight of the north, at the season when the ghost-moth abounds, is so bereft of dusk that whiteness would not be needed to render the males visible.

It is possible that those acquainted with the habits of the other moths, of which Mr. Darwin speaks, may be able to reconcile their appearance with the rules of Sexual Selection which he has laid down so clearly and illustrated so fully in his last great work.

GEORGE FRASER

169, Camden Road, London, N.W.

SCIENCE IN PARIS DURING THE SIEGE

IN a somewhat striking passage in the *De Augmentis Scientiarum* Francis Bacon contrasts the endurance of monuments of learning with that of those raised by the hand of man. The verses of Homer, he reminds us, have endured for more than twenty centuries, during which time numberless palaces, temples, and cities have disappeared from the face of the earth. Some such reflection as this may have induced the members of the *Académie des Sciences* of Paris to continue their weekly meetings with perfect regularity during the bombardment. While everything else was turned upside down, while a dynasty was passing away, while sons and brothers were perishing around them, an enemy at their gates, want within their walls, and missiles of war threatening themselves and their household gods, these men continued their usual studies. We are reminded of Archimedes at the siege of Syracuse, save that there we have but one man, while here it is a large body of the intellectual flower of the country. Some of the more active of the members are men who have attained that philosophic calm, which not even the terrors of war can dispel, nothing diverts them from the even tenour of their way—

Si fractus illabatur orbis,
Impavidum ferient ruinæ.

We frequently meet with the names of Dumas, Elie de Beaumont, and Chevreul in the *Comptes Rendus* published during the siege. The youngest of these men was born in the last year of the last century; they have seen every phase of Parisian life, are men of infinite experience and learning, the very soul of the Academy; they have held office under various Governments, have seen more than one revolution; barricades and street fighting, and the Parthian cap are no novelty to them; but with all their experience they had never beheld a bombardment of Paris; yet, all honour to them, they did not abate one jot of their Academic work. Perhaps the members may have felt it a relief to have to deal with immutable and indestructible facts, while everything around them was so mutable and perishing. Perhaps they remembered a saying of one of their countrymen :—" L'homme n'a pas de self-critérium. L'indestructibilité du fait est le critérium unique, infaillible, absolu, multiple, un, présent dans tous les ordres des connaissances."*

The papers read before the Academy during the period of the siege relate for the most part to matters connected with war and to the food resources of a besieged city. M. Payen writes on hippophagy, M. Frémy on the use of osseine as food, M. Riche on the use of black puddings of ox-blood. In the *Revue des Cours Scientifiques* we also find some important papers by M. Bouchardat on the food supply of Paris, and a paper by the same author on the sanitary condition of the city during the siege, and during the same months of the preceding year. M. Berthelot has contributed some important papers on the force of various explosive substances, both solid, liquid, and gaseous. These papers are well worthy the attention of our war authorities. There is also a paper on dynamite, by M. Champion, and on the ignition of gunpowder at a distance by means of electricity. The subject of balloons and ballooning, of course, engages a good deal of discussion. M. Marey contributes several important papers on the motions of birds during flight, accompanied by graphic representations of them, registered somewhat after the manner of the vibrations of a tuning fork, and shown by sinuous lines. The diagram representing the vertical oscillations of a wild duck during flight is very striking. Beyond these papers there is nothing of much importance.

Here, for example, are the principal papers of one number (December 5th) taken at random :—

M. Milne-Edwards discusses the nutritive value of organic substances contained in bones, and the proper rations for sustaining the human body in a perfect state of health; M. Chevreul makes observations upon M. Frémy's paper on the use of osseine as food; M. Gazeau details various experiments on the nutritive properties of cocoa leaves; M. Montier treats of the specific heat of gases under constant volume; M. Riche of the preparation of osseine and gelatine; and M. Castelhaz of the refining of crude tallow.

The future historian of science will wonder when he reads in the *Comptes Rendus* for January 9, 1871 :—

M. Chevreul donne lecture à l'Académie de la déclaration suivante :

"Le jardin des plantes médicinales, fondé à Paris par édit du Roi Louis XIII. la date du mois de janvier, 1626.

"Devenu le Muséum d'Histoire naturelle par décret de la Convention du 10 de juin 1793.

"Fut bombardé,

"Sous le règne de Guillaume Ier roi de Prusse, Comte de Bismark chancelier,

"Par l'armée Prussienne, dans la nuit du 8 au 9 de janvier, 1871.

"Jusque-là, il avait été respecté de tous les partis et de tous les pouvoirs nationaux et étrangers.

"E. CHEVREUL, *Directeur*."

He will grieve when he reads "M. Le Président annonce à l'Académie la douloureuse nouvelle, malheureusement très-probable, de la mort du . . . ." occurring too often in what should be only a record of the living and of their work. So we grieve : and yet more when we see the intellectual resources and energies of a great country paralysed, and the whole current of its active thought diverted no man knows whither; while its schools and colleges are empty, and many of those who should be in them have been killed untimely to satisfy the necessities of war. G. F. RODWELL

AMERICAN NOTES

WE learn from *Harper's Weekly* that the fourth volume of the "Report of the Geological Survey of Illinois," which has been in progress for several years past, under the direction of Prof. A. H. Worthen, has just been published. Like its predecessors, it is a handsome book, well illustrated, and containing much important matter relating to the geology and physical features of the State. This volume is occupied by a detailed account from assistants in the survey in regard to particular counties in the State, followed by systematic papers—one upon the fossil fishes by Prof. J. S. Newberry and Prof. Worthen, and the other upon fossil plants by Prof. Lesquereaux, illustrated by a number of well engraved steel plates. The economical value of such a survey to the State, conducted with the spirit and efficiency which have marked Prof. Worthen's administration from the beginning, is exceedingly great, and cannot be estimated in dollars and cents. Not merely does it furnish a fund of information to the residents of Illinois, but it supplies an official guarantee to others in regard to the resources of the State which could not be obtained in any other way.—We have, in a previous article, referred to some interesting speculations by Prof. Shaler, of Cambridge, upon the formation of the New England coast; and we find in the proceedings of the Boston Society of Natural History for February last some additional remarks by him on the same subject. He considers that the Chesapeake and Delaware bays, like many of the deep gorges in Switzerland and elsewhere, were formed by the action of ice, and that the existence of Cape Hatteras is due to the uplifting of the rocks on which Richmond is situated. The sand-bars on the coast he believes to have been formed by the material dug out of the Delaware and Chesapeake bays by this ice action, and worked southward by the united force of the floods and currents. He finds that, after we pass these

* *Philosophie Méthodique*, par J. de Strada, a work too little known in this country.

bars, south of Weldon, the sea-bottom is totally distinct in character, being purely submarine, and formed by the action of the sea. He points out the existence of a rise and fall of the coast at different portions of its extent; this, in the most recent geological period, amounting at Charleston, South Carolina, to from 50 to 60 feet, in Maine to 200 feet, and to a still greater extent on the coast of Labrador. As a general rule, he thought there was evidence to prove that, taking a line from the centre of the continent to the centre of the sea, the sea-floor was coming up and the high elevations were coming down.—Mr. Hyatt states that observations made by the Coast Survey showed that the coast of Long Island Sound, and southward to New Jersey, has been sinking, while the Florida Keys are rising; and Mr. Niles remarked that, from the earliest times, in the Adirondacks and different points southerly, there had been peninsulas corresponding in position to Florida, and that this is simply the most southern and latest of a succession from north to south.—At a meeting of the New York Lyceum of Natural History, held during last autumn, Prof. Newberry, the President, exhibited the anterior portion of the cranium of a walrus which had been found during the summer at Long Branch by a gentleman whose foot struck against it while bathing. It was strongly silicified, but exhibited no appreciable difference from modern specimens. The precise age of this fossil could not, of course, be ascertained, although it is well known that its range was formerly much south of its present habitat. It is not unfrequently brought down on floating ice off the coast of Newfoundland; and although Labrador is at present the southern limit of its residence, it was once very abundant in the Gulf of St. Lawrence, and its remains have been found in the shell heaps of the Bay of Fundy. It is probable that the specimen exhibited by Prof. Newberry is a relic of the glacial period, although it was suggested that it might have been of the tertiary age, which probably cannot be verified. Other specimens of similar character are recorded as having been found on Martha's Vineyard; in Monmouth Co., New Jersey; and in Accomac Co., Virginia.—We have already referred to the detection of an ancient bone cave near Phœnixville, Pennsylvania, and about twenty-five miles north-west of Philadelphia, and to the interest which has attached to this discovery. Since our last account Prof. Cope has been actively engaged in the investigation of the collection, and already reports the existence of about thirty species of vertebrates, together with numerous plants and insects. All of these, so far as known, are probably of extinct species, although their precise relationships have not yet been fully worked out. Among the reptiles were tortoises and serpents, and of birds there was a turkey and a snipe. The mammals, as Prof. Cope anticipated, were most numerous, these including two carnivorous animals of large size, one of them a cat, and the other a bear, previously described by Dr. Leidy, of a remarkable type, and totally distinct from the cave bear, or any living species of either Europe or America. At least three species of sloths were discovered, mostly of gigantic size, one of them a species of *Megalonyx*, and two of *Mylodon*. Besides these, there were some ruminating animals, tapirs, and a small horse. With the other remains were the teeth and tusks of the mastodon. The fissure in which the bones were found was forty feet deep and fifteen feet wide; the length as yet has not been determined. Above the deposit of bones the cave was filled with washings of the Triassic age from the neighbouring hills.

SCIENCE AT OXFORD

THE following courses of lectures in Science are announced for the ensuing term:—The Regius Professor of Medicine (Dr. Acland) will continue his clinical instruction at the Infirmary, on Tuesdays and Saturdays, beginning on Tuesday, May 2, at 11 A.M. The Linacre Professor of Anatomy and Physiology (Dr. Rolleston) proposes to form classes for practical instruction in anatomy and physiology, as in former terms. Persons are invited to come to the anatomical department in the New Museum on two mornings of the week for study and demonstration, and to lectures on Saturdays at 1 P.M., and at such other times as may be hereafter arranged. The Sedleian Professor of Natural Philosophy (the Rev. Bartholomew Price) will give a course of lectures on the Solution of Problems in Applied Mathematics. The course will begin at 1 P.M. on Thursday, April 20, in the lecture-room, upper corridor south, Museum. The Savilian Professor of Astronomy (the Rev. C. Pritchard) will give a lecture early in the present term on the recent solar eclipse. He will also be ready to assist members of the University in their astronomical studies, "*sine ullâ solennitate.*" The Savilian Professor of Geometry (Mr. Henry Smith) will continue his lectures on the Anharmonic Properties of Figures. He will also give a course of lectures on Geometry of Three Dimensions. The Professor of Geology (Mr. J. Phillips) will begin a course of lectures on Monday, April 24, at 12 o'clock, and continue them at the same hour on succeeding Wednesdays and Mondays, in the New Museum. The lectures are arranged to present a systematic view of the more remarkable groups of organic remains, especially in the extinct groups. The Professor of Experimental Philosophy (Mr. R. B. Clifton) has given notice that the Physical Laboratory of the University will be open daily for instruction in practical physics, from 10 A.M. to 4 P.M., on and after Wednesday, April 19. The fee for working three days a week during the term is 3*l.* The Professor of Chemistry (Sir B. Brodie) has given notice that the Demonstrator in Chemistry will deliver a course of lectures on Chemistry on Tuesdays and Saturdays, at 11 A.M., commencing Tuesday, April 25. These lectures will be in continuation of the course of the Professor of Chemistry last term, and will commence with the element phosphorus and its combinations. The Professor of Botany (Mr. Lawson) will give a course of lectures on Structural and Physiological Botany. The Hope Professor of Zoology (Mr. Westwood) proposes to give a short course of lectures on the Articulated Animals.

SETTLE CAVE EXPLORATION

AT the last meeting of the Settle Cave Exploration Committee, the report of the excavation of the Victoria Cave, up to December 31st, 1870, by Mr. Boyd Dawkins, was read.

The results of the exploration are full of interest, and bid fair to throw light on the social condition of the Romano-Celtic inhabitants of Ribblesdale after the withdrawal of the Roman legions. The committee placed the superintendence of their exploration in the charge of Mr. Jackson, the discoverer of the cave, and began work with the kind permission of the owner (Mr. Stackhouse), by clearing away a mass of debris, which very nearly blocked up the lower entrance and formed a horizontal plateau extending some thirty feet from the solid rock. On the surface there was a stratum of angular stones which had fallen from the weathered face of the rock above, and passed into the cave at the bottom of the Attermire ravine. Below was the layer which furnished traces of man. Mixed with charcoal there were large quantities of the bones and teeth of the Celtic short-horn (*Bos longifrons*), goat, and horse, and a few remains of red deer and roe deer, which were evidently the refuse of human food. There were also fragments of pottery, bone pins, and various nondescript articles in antler and bone, stone pot-boilers, and two perforated discs of stone which had been used as spindle-whorls. As this layer passed into the cave, it rose to the surface and continued to

furnish the same class of remains as those found outside. The personal ornaments are the most worthy of note. Besides bronze harp-shaped brooches of the common late Roman type, there were two in gilt-bronze, of a sigmoid shape, and adorned with a singularly beautiful pattern in blue, yellow, red, and green enamel. They are undoubtedly of a style purely Celtic. A harp-shaped brooch, Roman in design, is adorned with a most delicate pattern in blue and red enamel. Among the other brooches, one small oblong enamel is of a form hitherto unknown in brooches of this date, while a second consists of a small disc of bronze, with a plate soldered to it bearing a flamboyant ornament of Celtic design. There were also bronze gilt armlets. The whole evidence furnished by the personal ornaments in a word points to their Romano-Celtic origin, and it is not improbable that the principal seat of the art of enamelling was Yorkshire, the few enamels of that particular kind which have been found occurring, with one or two exceptions, in that county. The date of the occupation is shown by the coins, which range from Trajan down to the barbarous imitations of the coins of Tetricus. The latter were in circulation in the fourth and fifth centuries, and probably continued to be used in that portion of the Romano-Celtic kingdom of Strathclyde down to its final conquest by Eadberht in 756 A.D. The whole group of remains is precisely of the same character as those found around the ruins of Roman villas in Britain, and has probably been introduced by Romano-Celtic inhabitants who fled from their luxurious homes to take refuge from the ravages of the Picts or Scots, or of the Northumbrian Angles, who were pressing on that portion of the frontier of Strathclyde during the 5th, 6th, and 7th centuries. To suppose that people using articles of luxury such as those found in the cave would have chosen such an inclement abode, except under the pressure of necessity, is unreasonable.

At the entrance below the Romano-Celtic strata a layer of angular debris fallen from the cliff above, six feet thick, rested on a thick deposit of gray clay. At their point of junction a curious bone harpoon, a bone bead, the remains of red deer, horse and Celtic short-horn, and of bear, were found, which testified to the occupation of the cave by man long before the Romano-Celts used it as a refuge. The two flint flakes and two lumps of red ruddle found were probably obtained from this lower horizon, which, as the talus died away at the entrance of the cave, became confused inside with the Romano-Celtic stratum immediately above. It is probably of Neolithic age.

The grey clay underneath was homogeneous and very tenacious, and as the layer dipped away from the entrance, it must have been introduced by water flowing from the ravine into the cave. It was resolved to give up the attempt to fathom this bed of clay, after sinking a shaft twenty-five feet deep without any results.

The committee are desirous of exploring others of the many caves in the neighbourhood, if they can obtain support necessary to carry on a work which is of almost equal interest to the archæologist and to the historian.

NEW SPECIES OF MADREPORE

MR. W. SAVILLE KENT read a paper at a recent meeting of the Zoological Society on various new species of Madrepores, or Stony Corals, met with by himself while engaged upon arranging, naming, and cataloguing the fine series contained in the British Museum. Among the more interesting of these, commencing with the family of Turbinolidæ, Mr. Kent drew attention to a fine species of *Acanthocyathus* from Japan, more closely allied to a Maltese Miocene form (*A. Hastingsæ*) than to any known existing one; and also to a *Flabellum* allied to *F. Anthophyllites*, whose most remarkable feature rests in the phenomena connected with its reproduction by the process of gemmation, which invariably results in the destruction of the parent; the reproductive bud always originating within the margin of the parent calyx, which, in the course of its development, it splits to pieces. For this aberrant form Mr. Kent proposes the appropriate name of *Flabellum matricidum*. In the family of the Oculinidæ, which comprises the majority of the species introduced by Mr. Kent, are three new forms of *Allopora*, and numerous ones of *Stylaster*, *Distichopora* and *Amphihelia*, the first-named genus in particular containing a magnificent arborescent species, upwards of a foot in height, of a delicate rose colour, having a stem of such thickness and of such dense consistence that Mr. Kent is of the opinion that, if procurable in any quantity, it may eventually prove of high economic value, and even replace to some extent the well-known *Corallium rubrum*. The examination of these new varieties has enabled Mr. Kent to define more precisely the characters of *Allopora*, and its true distinctions from *Stylaster*, *Distichopora*, and other allied genera. In all, Mr. Kent introduces some twenty species as new to science.

SUBTERRANEAN ELECTRICAL DISTURBANCES

A FEW minutes before and after the earthquakes of the 17th March last powerful positive electrical currents were rushing towards England through the two Anglo-American telegraph cables, which are broken near Trinity Bay, Newfoundland. Mr. C. F. Varley, C.E., who informed us of the fact, broaches the novel speculation that some earthquakes may be due to subterranean lightning. He imagines that as the hot centre of the earth is approached, a layer of hot dried rock may be found which is an insulator, while the red hot mass lower down is a conductor. If this conjecture be true—and there is plausibility in it—then the world itself is an enormous Leyden jar, which only requires charging to a very moderate degree to be equal to the production of terrific explosive discharges.

The French Atlantic cable was disturbed at the same time, and so were many of the English land-lines, but the only observations as to the direction of the current were made by means of the Anglo-American telegraph cables.

A number of Mr. Varley's charts about earth-currents were published in the Government Blue Book of 1859-60, showing that the direction of these currents across England was in a very notable degree determined by the contour of the coast, and that the same auroral discharges would often produce currents at right angles to each other in direction, in different parts of Britain.

NOTES

A PROPOSAL has been made that certain Medical Schools on the north and south sides of the river should be amalgamated, in order that, by concentration of power, the teaching shall be made more efficient than it is at present, the teachers being able to devote themselves more unreservedly to their duties than they possibly can do under existing arrangements. The absolute necessity of some such arrangement as this is obvious.

MR. RUTHERFORD and M. Janssen, to whose labours cosmical physics owes so much, are both now in this country, the former, we regret to learn, in consequence of a peremptory order to cease work for a time. At the last meeting of the Royal Astronomical Society, Mr. Rutherford exhibited his exquisite photograph of the Pleiades, which represents the last important outcome of celestial photography. It appears that M. Janssen's observatory for solar research, which had been erected in one of the pavilions of the Palace of St. Cloud, at the cost of the Emperor, was one of the first buildings to be entirely destroyed by the German fire.

THE Royal Commission on Scientific Instruction and the Advancement of Science will resume its sittings on the 25th instant.

THE Marine Aquarium at the Crystal Palace is beginning to take form, thanks to the energy of Mr. Lloyd. About one-third of the 700 tons (= 150,000 gallons) of the sea water required is already in the tanks, but the steam engines and pumps are not yet regularly at work. When they are, and some of the marine animals of which at present the aquarium is quite destitute shall have been received, we hope to give a description of an enterprise of which great scientific use can certainly be made.

WE learn from the *Chemical News* that the Council of the Federal Swiss Polytechnic School at Zürich has appointed Dr. Emile Kopp as Professor of Technology in the room of the late lamented Dr. Bolley. Professor Kopp's merits, during the time he has held the Professorship at the Institute Superiore, at Turin, have been gracefully acknowledged by the Italian Government, it having pleased H.M. King Victor Emmanuel to grant to Dr. Kopp the dignity of Commandeur de l'Ordre Equestre de la Couronne d'Italie. We sincerely congratulate Dr. Kopp, and no less so the Government of the Helvetian Republic, on having secured the services of a man so eminently well suited as Dr. Kopp to the important Professorship vacant by the demise of Dr. Bolley.

THE French Academy of Sciences held a short sitting on April 3, M. Faye, who usually occupies the chair, being, however, absent. The principal subject of interest was a sharp passage of arms between M. Delaunay and M. St. Claire Deville respecting the Montsouris Observatory. The Commune having ordered the arrest of M. Henri St. Claire Deville, the Professor of Chemistry in the University, as a hostage, he has been compelled to make his escape to Versailles, together with his brother, the meteorologist. M. Leverrier is also now at Versailles. Dr. Bersigny, who conducted the observations during the Prussian occupation, will be the director of the meteorological observations conducted by the Government.

THE second *soirée* of the Royal Society takes place on Saturday evening next, and that of the Linnean Society on Wednesday the 26th inst.

WE understand that there is likely to be a contest for the seat in the Senate of the University of London, vacant by the death of Prof. Miller. The nomination would, in accordance with previous practice, be left this time to the Faculties of Science and Medicine, and their representative is Dr. Parkes, F.R.S., of Netley, who is also supported by many graduates in Arts.

THE course of lectures during the Easter term at the Gresham College, by Dr. E. Symes Thompson, Gresham Professor of Medicine, will be on April 21, 22, and 24, the subjects being, "On the Small-pox Epidemic," "On the Organs of Respiration," and "On the Organs of Circulation." These will be followed by two lectures on May 24 and 25, "On the Water-supply of London," and "On the Heart and Lungs in Health and Disease. As usual the lectures are free to the public.

IT is rumoured that a College for Women is to be established at Cambridge, in order to give the students the advantage of attending the lectures, &c., of the University Professors.

THE following are places of Comet I., 1871, discovered by Dr. Winnecke, for the dates named:—1871, April 7, $9^h\ 50^m\ 31^s$, M. T. Karlsruhe; AR app. $\sigma = 2^h\ 27^m\ 14^s{\cdot}59$ Decl. app. $\sigma = +53°\ 53'\ 8''{\cdot}1$. April 8, $9^h\ 39^m\ 43^s$, M. T. Altona; AR app. $= 2^h\ 32^m\ 8^s{\cdot}21$; Decl. app. $= +53°\ 24'\ 41''{\cdot}1$. April 9, $9^h\ 56^m\ 25^s$, M. T. Altona; AR app. $= 2^h\ 37^m\ 2^s{\cdot}50$ Decl. app. $= +52°,\ 55'\ 31''{\cdot}0$.

IN a recent number of Poggendorff's *Annalen*, Dr. Weinhold states that the black absorption line of sodium can be easily obtained by a simple process. The usual method has been to interpose a flame, coloured with chloride of sodium, between a strong light, such as the electric light, and the slit of a spectroscope. The source of light now proposed by M. Weinhold is an ordinary petroleum lamp; the light is allowed to pass through a slit directly on to a prism, and a spirit lamp flame, intensely coloured with chloride of sodium, interposed between the prism and the eye, so as to cover the entire spectrum;—the black absorption line will then be seen distinctly. If the flame coloured with sodium is placed in front of the slit, the bright yellow line will be seen as usual. M. Weinhold has not been successful in using this method with an ordinary spectroscope fitted with telescopes, on account of various practical difficulties.

M. GABRIEL MORTELLET, the sub-conservator of the St. Germain Museum, wishes us to correct a statement which seemed to imply that it was open during the Prussian siege. This was not the case, although the works were not interrupted.

THE temperature of February and March shows a remarkable contrast to that of the two preceding months. Mr. Glaisher's tables, published in the *Gardener's Chronicle*, show that at Blackheath on forty-seven days during these two months the temperature was above the average, while it was below the average on only twelve days, the mean being 3°·55 above that of the same period during the last fifty years. The disturbance of equilibrium caused by the low temperature of December and January has thus almost been restored. During Feburary the thermometer only fell to the freezing-point on five nights, and during March east winds prevailed to only a very moderate extent, showing a very marked contrast to the same month last year. The depression of temperature which commenced on March 28 continued to April 11, when there was a sudden rise from 4°·1 below the average to 11°·4 above the mean on April 12.

THE publication is announced of a new series of the "Messenger of Mathematics." It will be edited by Messrs. W. Allen Whitworth, C. Taylor, W. J. Lewis, R. Pendlebury, and J. W. L. Glaisher, and the first number will be published by Messrs. Macmillan on May 1st. The editors consider that the "Messenger" has, during the five years it has already existed, amply fulfilled its object of encouraging original research in the three Universities among junior graduates and others, although no inconsiderable portion of its contents has been supplied by writers of established reputation, who rank amongst the foremost mathematicians of the age; and it is this fact in particular which now induces them to appeal directly to the mathematical world at large, and to remove from their title-page any words which might be supposed to limit the sphere of usefulness of the "Messenger." They are therefore prepared to receive communications from every available source, and have already to announce papers, forwarded or promised, by Prof. Cayley, Chief Justice Cockle, Mr. Routh, Mr. Esson, and others. Besides original papers, it is intended to insert brief notices of select articles or treatises on mathematical subjects, as well as short accounts of the proceedings of societies at home or abroad.

THE second series of "Science Lectures for the People," delivered in the Hulme Town Hall, the first of which we have already had occasion to notice in terms of commendation, contains reports of lectures by Professor W. C. Williamson on "The Natural History of Paving-Stones," Dr. W. B. Carpenter on "The Temperature and Animal Life of the Deep Sea,' Mr. A. H. Green "More about Coal," and Mr. Norman Lockyer "On the Sun." It is published by Mr. John Heywood, Deansgate, Manchester, and Messrs. Simpkin, Marshall and Co, London.

THE second part of the fifth volume of the "Proceedings of the Bristol Naturalists' Society," from May to December 1870, does not contain much original matter. The longest paper, by Messrs. Sorby and Butler, "On the Structure of Rubies, Sapphires, Diamonds, and other Minerals," has already appeared in the "Proceedings of the Royal Society." The paper "On the Natural History of Filey and its Neighbourhood," however excellent in itself, hardly appears to us in place among the proceedings of a local society on the other side of England. Mr. C. F. Ravis contributes a useful paper, "On Denudation, especially as exhibited in the Valley of the Avon," and there are some good local geological and entomological notes. The zoological and botanical sections present no report.

COLONEL HAIG, R.E., of the Godavery Navigation Works, has found coal near Dumagudlom, in the Madras Presidency, 130 miles from Kokonada. It is not so good as English coal for locomotive purposes, but is good enough for welding in the Government workshops.

MR. MALLET, of the Indian Geological Survey, has been examining Aden with a view to water supply. He considers there is no hope from Artesian wells, but recommends water to be brought from wells near Mahilla at the Sheikh Othman aqueduct.

THE culture of bamboo for paper making and other purposes is being promoted by the Government of Central India. The Indian Government is buying land in the hill district of the Neilgheries for a spice plantation. Col. Boddam has proposed the cultivation of the sunflower in Mysore. It is very successful in France. Government has sent out six more Scotch gardeners for experimental cotton growing. These men have answered very well.

THE Broom (*Sarothamnus scoparius*) is extremely abundant in Madeira, but is supposed to have been originally introduced to the island. It is now sown extensively on the mountains for the purpose of being cut down for firing, or burnt on the spot every five to seven years to fertilise the ground. The twigs and more slender branches are also used commonly as withs for binding bundles of faggots, brushwood, fern, &c.; and numbers of country people, especially young girls and children, residing within reach of Funchal, gain a livelihood by bringing daily into the town bundles of broom for use in heating ovens, &c. The fine and delicate basket-work peculiar to Madeira is manufactured from the slender peeled twigs of this plant. Mr. Lowe speaks of a variety with pure white flowers which occurs on this island.

THE Apocynaceæ are noted for their poisonous properties, and one of the most interesting plants of the order is *Cerbera odollam*. It is a tree about 20ft. high, growing about Malabar and Travancore, and produces a drupe-like fruit as large as a fine mango. The inner shell of the fruit, after removing the green rind, is composed of a mass of reticulated woody fibres, and when dry is not much unlike a ball of coarse, dirty string. These fruits are said to be used by the natives in Travancore to poison dogs, for this purpose they are taken when green and covered with sugar or some sweet substance, by which the dogs are tempted to eat them. The effect of the poison is to cause the teeth of the animals to become loose or to fall out before death ensues.

A NEW kind of stuffing for mattresses appears to be coming in vogue, for we learn from the *Journal of Applied Chemistry*, "that sponge, dipped in glycerine and well pressed, remains elastic, and can be used for mattresses, cushions, and general upholstery," and we further learn that "sponge mattresses prepared in this way, are now finding great favour."

THE *Pharmaceutical Journal* draws attention to an article which originally appeared in the *American Journal of Microscopy*, on the value of the microscope to the pharmacist in the detection of parasitic animalculæ or fungi in drugs of vegetable origin. We all know that leaves, roots, and seeds deteriorate very much by being kept any length of time, therefore the remarks of the author are of the utmost importance to mankind generally. He says "that it is notorious that the most carefully prepared tinctures and extracts of certain drugs are sometimes devoid of medicinal power. It has been supposed that certain volatile constituents escape from the substances from which such tinctures are prepared, but of this we have no certain proof. Why is it that the leaves of belladonna may, in some instances, be kept for years, and at the end of that period be capable of yielding a reliable preparation, while other specimens, when kept only a few months, are worthless? It must be because of some destructive process going on in the substance, which cannot be discovered with the naked eye." The hints which follow are even worth the attention of those upon whom we depend for our medicinal preparations. "The pharmacist should first learn to recognise the natural healthy appearance, under the microscope, of all the vegetable substances he works upon; then he should subject a specimen of every substance he prepares to a careful examination, and if he discovers the presence of vegetable or animal parasites, such substances should be rejected. The world is flooded with inert medicinal preparations. Doubtless many such preparations are made worthless by improper methods of manufacture; but it is my opinion that in many instances their worthlessness is due to the fact that the substances used have been injured by certain agencies which could have been discovered by the intelligent use of the microscope."

THE *Eucalypti*, or Gum-trees of Australia, are well-known for their hard wood as well as for the oils and gums yielded by many of them. Some of the species have been introduced and successfully grown in different parts of Europe, and their products may become, ere long, recognised articles of import. At the present time large quantities of sticks of a species of *Eucalyptus* are imported into England from Algeria, and are made into walking sticks. During the Great Exhibition in Paris in 1867, the leaves of *Eucalyptus globulus* were made into cigars, and recommended as being very efficient in aiding digestion. We now learn from the *Gardeners' Chronicle* that the leaves of a species of *Eucalyptus* have been recently used on the Continent in place of lint, the leaves being merely laid on the wounds. "Their balsamic nature not only cures, but, after a few hours, all unpleasant odour ceases."

THE prickly poppy (*Argemone mexicana*), originally from the New World, has become naturalised throughout the tropics and sub-tropics of both hemispheres. In the West Indies, where it is very abundant, it is called *Fico del inferno*, the reason for this name being, according to Gerarde, "because of his fruit, which doth much resemble a figge in shape and bignesse, but so full of sharpe and venemous prickles that whosoever had one of them in his throte doubtless it would send him packing either to heaven or to hell." Barham, however, gives, as an explanation, a statement that the seeds, "being much stronger than opium," are "enough to send any that should take them wilfully to *inferno*;" but this is much exaggerated. In India it is now abundantly naturalised in the eastern part of the Punjab, and is spreading over fresh districts year by year. It is not altogether a useless addition to the Indian flora, as near Delhi an oil is extracted from the seeds which is used for burning, as well as in the treatment of chronic sores and eruptions.

ECONOMIC ENTOMOLOGY

THE Royal Horticultural Society has just offered the following prizes for collections of Economic Entomology :—

1. A prize of 10*l.* for the best collection of British insects injurious to any one plant, as the oak, pine, cabbage, wheat, &c. (the choice of the plant to be left to the competitor). The insects to be shown as much as possible in their various stages of development—eggs, larva, chrysalis, and perfect insect. In judging, a preference will be given to those collections which most successfully illustrate the life history of the insect, and exhibit the mischief done, whether shown by specimens, drawings, models, or other means. Examples of the application of drawings, models, and specimens to this purpose may be seen in the Society's collection in the South Kensington Museum.

2. A second prize of 3*l.* for the second best collection.

3. A prize of 5*l.* for the best miscellaneous collection of any branch of British Economic Entomology, similarly illustrated.

4. A second prize of 2*l.* for the second best collection.

The collections to be sent to Mr. James Richards, Assistant Secretary, Royal Horticultural Society, on or before the 1st of May, 1872, each collection bearing a motto, and a separate sealed envelope, with the motto on the outside, and the name of the competitor inside.

The Society is to be entitled to take from any of the collections sent in, whether successful or not, whatever specimens or illustrations they may choose, at a price to be fixed by the judges.

The judges to have power to refrain from awarding the prizes, should the collections seem not worthy.

SCIENCE TEACHING IN ORDINARY SCHOOLS

A PLAN for teaching the Natural Sciences in ordinary schools has been submitted to the School Board for London by Mr. J. C. Morris. The following are stated by the *Journal of the Society of Arts* to be the principal points of the proposed system :—Subjects—chemistry, heat, light, sound, electricity, magnetism, telegraphy, mechanics, hydrostatics, steam engine, &c. ; geology, metallurgy, botany, zoology, animal physiology, health, &c. A committee should be formed to select, revise, and compile a complete set of suitable text books, which should bear their sanction, and be then published in the cheapest possible form. There should be a depôt to provide apparatus at a cheap rate. a complete set of which, sufficient to illustrate the sciences mentioned, would not cost more than 100*l.*, and should be divided into ten cases of 10*l.* each, a case to be complete for one or two subjects. The teacher should be a visting one. He could attend from two to three schools per day, and give from one to two hours' instruction in each, during two days in the week. The instruction to be given in a separate apartment, if there be one ; or, if not, at such a time as would not interfere with ordinary school business. A single school teacher could thus attend from six to nine schools weekly, if sufficiently near each other, and get through at least three or four subjects annually, so that in two or three years he would have completed the full course in each school.

There should be an institution where teachers would have an opportunity of acquiring a practical knowledge of their profession, and affording a means of testing their qualifications. A more economical way, however, would be for each teacher to have an assistant, by which method a nucleus of teachers would soon multiply into a goodly number. In conclusion, Mr. Morris advocates periodical examinations, with a regular system of rewards ; and, in reference to funds, he thinks that the teachers and inspectors might be supported either by Government or subscription, the apparatus to be supplied by Government at reduced rates. Schools should fix a small fee for attending the class, which would add to its importance, and help to defray expenses. Examination fees in like manner. Evening classes for adults could be managed under somewhat similar conditions.

THE INFLUENCE OF AQUEOUS VAPOUR ON METEOROLOGY

THE remarks on Meteorology contained in your summary of the scientific advances during the last year, encourage me to offer a few observations on the subject. Where so little is determined, speculations even by unknown contributors may receive some consideration. I shall begin with the subject of aqueous vapour, to which, I think, too much importance has in some respects been attached as a meteorological agent.

I shall commence by offering a determination of the specific heat of aqueous vapour at constant volume, which has not, to my knowledge, been hitherto given. It is evident that if a given weight of water be evaporated at 0° C., and then raised to 100° C., without change of volume, the total heat absorbed by it is the same as if it had been raised to 100° C. in the condition of water, and then evaporated so as to fill the same volume. Now if this amount be one kilogramme, and c be the specific heat of vapour at constant volume, the total heat absorbed in the first case is (adopting Regnault's formula for latent heat—viz., $L = 606°{\cdot}5 - 0{\cdot}695\,t$)—

$$606°{\cdot}5 + 100\,c.$$

And in the second case the equivalent amount is

$$537° + 100{\cdot}8 = 637{\cdot}8,$$

the total amount of heat required to raise one kilo. of water from 0° to 100° C. being 100·8, according to the best determinations.

From this equation we obtain for the mean value of c between 0° C. and 100° C.

$$c = 0{\cdot}313$$

But the specific heat of aqueous vapour at constant pressure seems to be about 0·475. Hence for each kilo. of aqueous vapour raised through 1° C. at constant pressure, we have 0·313 heat units expended on internal work, and 0·162 on external work. The proportion is 1 : 0·517. In dry air the proportion in question, according to the latest determinations, seems to be 1 : 0·421. If the same amount of heat therefore be applied to produce expansion in vapour and in dry air, it produces a greater expansion in the former case. But the difference is not very material. In round numbers 30 per cent. of the absorbed heat is employed in producing expansion in one case, and 35 per cent. in the other. Apart from the different absorptive powers of air and vapour, this difference would be hardly perceptible. For equal quantities, heat absorbed by vapour has little (if any) greater effect in producing air currents or barometric depressions than heat absorbed by air. If the heat is absorbed in *producing* evaporation, the effect is still less. It is well known that less than one-eighth of the heat so absorbed goes to produce external work—a much smaller proportion than if it had been absorbed by dry air. I may observe that the result here arrived at for aqueous vapour supposes that its co-efficient of expansion between 0° C. and 100° C. is greater than that for air in the proportion of nearly 7 to 6. This would make the mean co-efficient about 0·00427 for 1° C. between these limits.

The next thing to ascertain is the quantity of aqueous vapour suspended in the air at any given time. This, of course, cannot be ascertained exactly, but it seems to me to be wholly erroneous to measure it by the tension of vapour at the earth's surface relatively to the pressure of dry air. It is generally supposed that the upper strata of the atmosphere are relatively drier than the lower ; but even if we suppose them to have an equal relative humidity, the actual vapour-tension will become less in proportion to the tension of dry air at every step of the ascent. According to Sir J. Herschel, the law by which the temperature varies with the pressure of the air at any elevation is given (in Fahrenheit degrees) by the law

$$t = -87° + 9{\cdot}0667\,p - 0{\cdot}1333\,p^2$$

Assuming this law, and supposing the relative humidity constant, we can calculate the temperature corresponding to any given pressure, and then find the corresponding vapour-tension by reference to the table. By trying this for each separate inch of pressure from 30 inches down to 0, and calculating the vapour-tension in each inch, I find (on a rough approximation) that the average proportion of the vapour-tension to the dry-air pressure will not exceed one-half of that which we find at the earth's surface. Thus, when the vapour-tension at the earth's surface is half an inch in 30 inches, or $\frac{1}{60}$, the average vapour-tension throughout the aërial column does not exceed $\frac{1}{120}$ of the whole; and when we calculate the weight of the superincumbent vapour, we must further allow for its smaller specific gravity. Making this correction, I believe that when the tension of vapour at sea-level is half an inch, the real weight of the superincumbent vapour-column seldom exceeds that of one-sixth of an inch of mercury. The proportions of course are not fixed. Those which I take from Herschel answer best for a temperature at the earth's surface of about 65° F., or 18° C.

I intend to apply these observations chiefly to the explanation of the annual and diurnal variations of the barometer by the greater or less amount of aqueous vapour in the air. It is supposed, for example, that when the vapour-tension at the earth's surface is an inch, about $\frac{1}{30}$ of the whole air-column consists of vapour. This displaces an equal bulk of air, and thus the column is lighter than a dry-air column of the same height and temperature by the difference in weight of the air and vapour occupying this space, *i.e.* about $\frac{3}{8}$ of an inch, or $\frac{1}{80}$ of the whole. But if my computation is correct, the diminution of weight owing to this cause would only be $\frac{3}{10}$ of an inch, or $\frac{1}{100}$ of the whole. Taking the standard pressure at 30 inches, this would only account for a diminution of 0·187 of an inch when the air from being absolutely dry changed to one inch of vapour-tension. In this country we never experience absolute dryness, and we seldom if ever experience so much as an inch of vapour-tension at the surface. Yet the annual variations of the barometer exceed 0·187 of an inch. Looking, for example, at the table for Greenwich Observatory at the end of Herschel's work, I find the mean monthly pressure varying between 29·923 and 29·602 inches, a difference of 0·321 inches; while the monthly means of vapour-tension vary between 0·466 and 0·195, a difference of 0·271; which, as I have endeavoured to prove, would only account for a change of 0·051 in the mean pressure. The diurnal maxima and minima at the same place exhibit a difference of 0·018, the vapour-tension giving 0·042, which only accounts for about 0·008.

The same thing is more evident in other places. At Madrid for example, the monthly barometric averages vary between 28·003 and 27·701, a difference of 0·302, while the vapour-tension varies between 0·236 and 0·076, a difference of 0·160. At Longwood, St. Helena, the diurnal variation of the barometer gives a mean of 0·067, while that of the vapour-tension is only 0·030. This would only account for a change of 0·006, or less than $\frac{1}{10}$ of the actual change. At Bombay the diurnal variation of the barometer amounts to 0·102 inches, while the corresponding variation of vapour-tension is only 0·004. This would not account for one hundredth part of the change.

The same result is confirmed by taking another view. It is pretty evident that in a country of any considerable extent the diurnal oscillation of the barometer (which is often nearly double the diurnal variation), if produced by changes of vapour-tension, must always be less than the mean diurnal rainfall and dew-fall, since rain often falls at hours when the barometer is on its diurnal descent. Now in this country the mean diurnal rainfall does not exceed $\frac{1}{15}$ of an inch, corresponding in weight to $\frac{1}{200}$ of an inch of mercury. Supposing all this to fall during the hours when the mean barometric pressure is increasing, the subtraction of that amount of aqueous vapour from the column, and the replacing of it by air, would not nearly account for the observed diurnal oscillations.

I therefore conclude that the annual and diurnal variations of the barometer are not due to changes in the amount of vapour present in the aërial column. Indeed it does not seem certain that the vapour displaces air at all. It may simply permeate that column without displacing any of it, and thus add to the weight of it. Again, if it displaced air, condensation or the formation of dense clouds ought always to be attended with a rise in the barometer, since air would rush in to fill up the space which the vapour vacated on condensing. This does not seem to be the case.

W. H. S. MONCK

THE ROYAL SOCIETY OF VICTORIA

WE owe an apology to our scientific friends at the Antipodes for having allowed the president's address, delivered last July, to have remained so long unnoticed. Mr. Ellery, after noticing the most important papers that had been read during the past two sessions (for no address was delivered in 1870 in consequence of alterations being made in the Society's buildings), including eight on physical science, seven on geology, mineralogy, and palæontology, one on natural history, three on medical science, one on social science, and four on arts and manufactures, expresses his regret that the state of their finances has for a time caused a stoppage in the printing of their Transactions which were commenced in 1868. He then proceeds to notice the present state of the chief scientific establishments in Victoria. "Botanical knowledge," he observes, "is largely indebted to the labours of our member, Dr. Von Müller, the head of the botanical department of Victoria. One of the prominent results of Dr. Müller's investigations is the publication of the *Universal Flora of Australia* (under the editorship of Mr. Bentham), to which Dr. Müller is the principal contributor; the fifth volume has, by this time, passed the press in London. This work, when completed, will be the only one extant that deals universally with the flora of a large division of the earth's surface. It will form a permanent basis of all future research with respect to the adaptability of Australian plants to medicine, the arts, or other useful purposes. You will be glad to learn that Dr. Müller is about to establish a permanent phytological collection in our new industrial museum, which will comprise objects illustrative of our natural resources in the vegetable kingdom, and of materials used in the industries obtained from plants in this country as well as other parts of the globe. Such a collection properly arranged and accessible to the public will undoubtedly prove a valuable and instructive addition to the industrial museum, more especially if at the same time Dr. Müller fulfils a project he has in contemplation of publishing in a popular form a volume on the culture of utilitarian plants in the colony not indigenous to it, as well as of plants likely to add to the resources of countries lying under similar latitudes to our own. The preservation and perpetuation of our more extensive forests has already become a question of serious import. A few years ago we thought our forests inexhaustible; but already the bad effects of the indiscriminate stripping of our mountain ranges are becoming visible. The immense and increasing draft on our forests for fuel and other purposes has already denuded the land in the vicinity of towns and other centres of population of its former covering of timber. This, unless replaced by artificial planting, will eventually leave our hills bare, and in all probability the climate will suffer in proportion. Dr. Müller, in introducing and rearing very large numbers of forest trees that will be useful in themselves for the wood and bark, has exercised a wise forethought, of which the colony will reap the fruit in years to come, when the corks, oaks, hickories, red cedars, and firs, shall have in part replaced our eucalypti, mimosæ, and other far less useful trees."

"Our observatory," he adds, "has been engaged with its usual work in astronomy, meteorology, terrestrial magnetism, and general physics. Considerable progress has been made in the Melbourne portion of the survey of the southern heavens; the sky lying between the 60th and 52nd parallels of declination has been carefully surveyed, and the positions of 38,305 stars established and catalogued, of which 29,633 have been reduced to the epoch agreed upon, namely, 1875, and their positions at that date computed. Our staff of self-registering meteorological instruments may now be considered complete, and consist of three magnetographs (that is for declination, dip, and horizontal intensity), a thermograph, a barograph, electrograph, and anemograph. With these instruments a continuous and unceasing record is obtained by the aid of photography of all the variations in the force and direction of the earth's magnetism, of the temperature of the air, and of evaporation, of the state and variations of the pressure of the air, atmospheric electricity, as well as of the direction, changes, and force of the wind."

The great Melbourne telescope, which, when the address was delivered, had been fairly at work for ten months, is then considered, and Mr. Ellery observes that while the Society is disappointed in not getting, as it was hoped, the best telescope in the world, the members may feel satisfied that they have obtained an instrument that, "if it does not exceed, quite equals every other of its sort that has been yet made."

The progress of the survey is then noticed at considerable length. "The coast line from the boundary of South Australia

to Lake Howe has been carefully measured, and, with the exception of the north-west portion of the colony, nearly every district has been emmeshed by the geodetic surveyors. The most important operation of late has been the determination of the termini of the boundary between New South Wales and Victoria." It is much to be regretted that the late retrenchments in the public expenditure have materially interfered with the progress of the survey.

After a few remarks on the commercial importance of local industries, especially the preservation of meat, the president referred to our vastly increased knowledge of the sun since the date of the eclipse of May 1869, to the nature of the sun's spots, and to the connection of the latter with the occurrence of magnificent auroras and magnetic storms, and to the spectrum of auroral light. "During the most brilliant display in April last, I was able," he observes, "to obtain a very bright spectrum of the light with a micro-spectroscope. Unfortunately the dispersion was small, but the light was so intense as to admit of a very narrow slit. The spectrum obtained from the red streamers consisted of a strong red band or line (which I estimated was rather more refrangible than C line), and bands in the green, which I believe to be the same as described by Angström. The spectrum of the green light which formed the lower arch of the aurora, however, contained no red band, and the appearance of it, as the spectroscope was passed up and down, so as to receive the light from the streamers or green arch, was very marked indeed. I am not aware of this red band or line having been noticed by any previous observers; and had it not been so clear and prominent, far brighter than the green ones—and had I not proved that it belonged to the red streamers, and not to any other, of the auroral light, by the method referred to—I might have been doubtful as to the real existence of a line not hitherto noted in the spectra of aurora." The address concludes with a few observations regarding the possibility of our ever being able to ascertain the laws which govern the weather so as to predict with certainty the atmospheric condition of to-morrow. On this point Mr. Ellery does not express himself very hopefully, but he thinks that the greater climatal events, such as dry or wet, hot or cold, seasons may be traced to varying conditions in the sun itself, and will be found to be extraneous to our globe.

G. E. D.

SCIENTIFIC SERIALS

THE *Journal of the Royal Geological Society of Ireland*, vol. xii. Part 3 (vol. ii. Part 3, new series), containing the Proceedings of the Society for the session 1869-70, has just been published. It contains among other memoirs, Prof. Traquair on *Griffithides mucronatus* (M'Coy) Plate xvi., and on *Calamoichthys calabaricus*. Rev. J. D. La Touche on Spheroidal Structure in Silurian Rocks, Plates xvii.-xx. Rev. M. Close on some Corries and their Rock Basins in Kerry, Plate xxi. Edward Hull on the Geological Age of the Ballycastle Coal-field, and its Relations to the Carboniferous Rocks of the West of Scotland, Plate xxiii. W. H. Baily on the Fossils of the Ballycastle Coal-field, Co. Antrim.

Zeitschrift für Ethnologie, 1870, Hefts 3, 4.—A paper by Bastian on the legend of the Amazons, is full of valuable information, but is written with less skill than learning. The footnotes make more than three-fourths of the whole, and the parentheses nearly half of the rest.—Hensel contributes a description of two skulls of Coroado Indians (Brazil) with figures. He agrees with many of our best ethnologists that the dimensions of the cranium afford us no safe ground for making racial or specific distinctions. On the other hand, he regards the structure of the facial bones as of great importance from this point of view.—R. Hartmann continues his studies on domestic animals by an account of the reindeer in its present condition, followed by an interesting discussion on the evidence of its domestication in prehistoric times. This number also contains a short archæological account of the Ugler See (one of the numerous lakes in the east of Holstein, situated in an enclave belonging to Oldenburg), by E. Friedel.—The last number of the same journal (1870, 4) is almost entirely devoted to American Ethnology. Prof. Strobel concludes his contributions to comparative ethnology by an account of the weapons and food of the South American Indians; Dr. Fonck has a paper on the Indians of Southern Chili; Ernst of Carácas one on the Natives of the Peninsula of Goajiro, which forms the western boundary of the entrance to the gulf and bay of Maracaybo, in Columbia; and Erman contributes an account (with a map) of the various races inhabiting what was until lately Russian America, the Aleutian Isles, and the opposite coast of N.E. Asia; he divides them into two great groups according to their system of numeration.

IN the *Journal of the Ethnological Society of London* (October 1870) is an interesting paper by Mr. David Forbes "On the Aymara Indians of the Peruvian highlands." Very full information as to their physical structure is given, together with *exact measurements*. Beside their short stature and capacious thorax (which seems to be constantly fixed in the condition of inspiration) Mr. Forbes's statistics show that the thigh is shorter than the leg, and that the heel is as much shorter than a European's as a Negro's is longer. The half-castes between these Indians and the white population are not believed by the author to be prolific, so that, as in the case of mulattos, the intermediate race would soon die out if not continually recruited by new accessions. Among many interesting details on the food of the Aymaras—especially their method of preparing potato so as to keep it from rotting—on their disposition and habits, their implements, and their language, perhaps the most remarkable is an account of a silver statuette (figured in pl. xx.) of a man in a strange headdress, who holds in one hand a mask, which he has apparently taken off in order to look through an instrument like a telescope. This tube he holds to his left eye (without shutting the other) and directs it upwards. Mr. Forbes believes this to be a unique specimen.

THE last part (Band vii. Heft 1) of the *Zeitschrift für Biologie* contains: 1. The results of an elaborate series of experiments by Gustave Meyer of Oldenburg on the effects of feeding dogs and man on bread alone, and bread mingled with meat and other articles of diet. He shows what indeed has long been known, that to feed either animals or man on bread alone is a great waste of material, and that immense quantities must be given in order that the body should lose no flesh, whilst on the other hand the addition of some, even though a small quantity, of meat is economical. He demonstrates that the tissues of the body become more watery with insufficient food, which renders the whole organism less capable of resisting injurious influences. In his experiments on man he endeavoured to ascertain which of the several kinds of bread in ordinary use (white bread, rye bread, black bread) was absorbed in greatest amount during its passage through the alimentary canal, and found that white wheaten bread occupies the first place, then leavened rye bread, then the bread (rye) prepared by the Horsford-Liebig process, and lastly the Pumpernickel (North German black bread). Nevertheless, the first is not so satisfying to the feeling of hunger as the three latter, and is more expensive in every point of view. He denies the great nutritious value often attributed to bran, since the nitrogenous compounds it contains are mingled with much non-assimilable matter, but admits that if these could be extracted and were then returned to the flour, the best results would be obtained, as the meal already contains abundance of salts. 2. A paper by MM. Ernst Schulze and Max Märcker on the determination of Nitrogen in the Urine of the Ruminants. 3. A paper by Dr. J. Bauer on the Metamorphosis of tissue in poisoning with Phosphorus; and lastly a short paper by Max von Pettenkofer on Typhus and Cholera as connected with the basal water line in Zurich.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, April 6.—Prof. Frankland, F.R.S., president, in the chair. The president, occupying the chair the first time since his election, returned his thanks to the Society for the honour conferred upon him, and expressed his readiness to discharge the duties of his office to the best of his abilities. The following gentlemen were elected fellows:—F. Coles, C. E. Groves, E. W. T. Jones, L. T. MacEwan, and J. L. Shuter. The following papers were read: "On Burnt Iron and Burnt Steel," by W. Mattieu Williams. Iron, which has been damaged by reheating, or excessively heated and exposed after balling in the puddling furnace, is designated "burnt iron" by the workmen. It is remarkable that no amount of heat applied to the iron in the blast furnace or in the early stages of the puddling process produces burnt iron. Burnt iron is brittle, its fracture is

short and what is called crystalline, it has lost the fibrous character of good iron. If steel is raised to a bright red heat and suddenly cooled, it is rendered hard and brittle, but these conditions may be modified by the process of tempering; if, however, the steel be raised to a yellow or white heat, and then be suddenly cooled, it is no longer capable of being tempered by mere reheating. It is worthless for ordinary uses of steel unless it is again raised to a welding heat and rolled or hammered while hot, and then allowed to cool gradually. The fracture of burnt steel presents a coarse grain and a crystalline appearance. Careful investigation, however, shows something more, viz., that the facets of the aggregated granules have a more or less conchoidal form. The name of "toad's eyes" has been given by practical men to these concavities. Mr. Williams found that a piece of burnt iron contained oxide of iron dispersed through its mass. A sample of burnt steel, however, investigated in the same manner as the iron, showed no indications of the presence of oxide. This, of course, was to be expected, as the carbon of the steel must, more or less completely, protect the metal from oxidation. That iron, when unprotected by combined carbon, should oxidise not merely on its surface, but through its whole substance, when exposed at a sufficiently high temperature and for a sufficient length of time to the action of the atmospheric oxygen, is not difficult to conceive, since the researches of Deville, Troost, and Graham have shown red-hot iron to be permeable by certain gases. In the case of steel, as Mr. Williams states, the burning is limited to the oxidation and consequent removal of the carbon, which takes place even at a low red heat. The permeability of red-hot steel by oxygen and carbonic oxide enables us to understand the process of the internal oxidation of the carbon. The "toad's eyes" or conchoidal facets of the so-called crystals, Mr. Williams explains by supposing a piece of steel at the temperature most favourable to the rapidest endosmosis of oxygen and the exosmosis of carbonic oxide to be suddenly cooled, and the possible occlusion of the carbonic oxide to be arrested. The results would be a certain molecular disintegration and porosity of the steel presenting those conchoidal spots. This view is further supported by the fact that burnt steel may be cured by reheating and hammering, or rolling at a welding heat.—"On the Formation of Sulpho-acids," by Dr. Armstrong. Occupied with an investigation into the constitution of sulphuric acid, the author turned his attention to chlorhydric sulphate, a body discovered some years ago by Prof. Williamson. When that substance, SO_2 HO Cl, is made to react on benzol, the chief product of the reaction is sulphobenzid; sulphobenzolic chloride and sulphobenzolic acid being also formed, but in relatively small quantity. This led Dr. Armstrong to commence a series of experiments to determine, if possible, the conditions under which the one or the other of the above reactions took place, and to arrive at a general expression for the action of chlorhydric sulphate on organic bodies. The bodies he had until now acted upon with SO_2 HO Cl are brombenzol, nitrobenzol, nitrophenol (both modifications, the volatile and the non-volatile), and naphthalin. The results of his experiments lead the author to conclude that the normal action, so to speak, of SO_2 HO Cl is to form a sulpho-acid, the Cl of the chloride removing H from the body acted upon, and replacing it by the group HSO_3; it is only under certain conditions that both Cl and HO are removed from the chloride, and a sulphobenzid-analogous compound formed. What these conditions are Dr. Armstrong hopes to establish by further experiments.—"On a Water from the Coal Measures at Westville, N.S.," by Prof. How. The contents of this paper bear upon the relation of the constitution of a water, and the nature of the geological stratum from which it takes its origin. The water above-mentioned comes from what Dr. Dawson terms the Middle Coal Formation of Nova Scotia, which includes the productive beds of coal, and which, according to the same authority, are destitute of properly marine limestone. The analysis of the water seems to bear out the latter assertion, since the water is very poor in chlorides.

Geologists' Association, April 4.—The Rev. T. Wiltshire, M.A., F.G.S., president, in the chair. A paper by Messrs. Alfred and R. Bell was read, "On the English Crags, considered in reference to the Stratigraphical Divisions indicated by their Invertebrate Fauna." In this paper the authors object to the present division of the crag series, and especially to all the beds which have hitherto been included under the term Red Crag being associated together. From palæontological and other evidence they conclude that the upper portions of the Red Crag ought to be associated with the Mammaliferous Crag, the Chillesford beds, &c., for the whole of which deposits the name Upper Crag is proposed. The Red Crag proper should then be called Middle Crag, and for the term Coralline Crag the name Lower Crag should be substituted. The authors having paid great attention to the organic remains of the crag, were able to give with their paper lists in which were enumerated a larger number of species from the Red Crag than had previously been published. Mr. Henry Woodward, F.G.S., while commending the labours of Messrs. Bell in the Red Crag, urged the systematic exploration of the Norwich Crag, which would, he thought, yield interesting and valuable results. Communications which had been received from Mr. G. Charlsworth and the Rev. Osmond Fisher on the subject of the paper were read, and after some remarks by Mr. Lobley on the nomenclature at present in use, Prof. Morris, in an interesting speech, referred to the labours of Mr. Charlsworth and others, and advised the postponement of any alteration of the crag nomenclature until the recent researches of Mr. Prestwich have been published. Several other members took part in the discussion, after which Mr. A. Bell briefly replied.—A paper on South African Diamonds was then read by Prof. Tennant, who exhibited a fine collection of specimens of these brilliants, as well as models of the largest which have been found. Amongst the interesting facts stated it was pointed out that in four years six diamonds, each weighing upwards of fifty carats, had been found in South Africa, while in the same period only one of a similar weight had been obtained from Brazil. The president expressed his belief that diamonds would ultimately be produced artificially. Prof. Morris inclined to the opinion that diamonds were of vegetable origin, and thought they might have been produced from decomposed resins. The geological formation from which diamonds are derived is very doubtful, as the stones are found in gravels and sands brought down by streams. Mr. Rabone, who has lately returned from the diamond-fields, gave a very interesting account of the discovery of diamonds in the colony, and of the operations now going on there. It appears that no less than 150,000*l.* worth of diamonds have been passed for duty, and this amount, there is reason to believe, is not more than half of the entire value of the stones found during the past four years. The diamond country is, perhaps, 20,000 square miles in extent, and there are now 13,000 persons engaged in searching for the gems. Mr. Rabone expressed his conviction that after two or three months' labour success on the part of a searcher was certain, and corroborated Prof. Tennant's statement as to the large proportion of heavy diamonds found. He considered the discovery of diamonds in South Africa was intended to further the spread of the human race, reminding the meeting that the colony of South Africa is larger than France, while the population is not greater than that of the city of Glasgow.—At the next meeting of the association on the 5th May a paper will be read by Mr. Henry Woodward, F.G.S., F.Z.S., "On the Fauna of the Carboniferous Epoch."

NORWICH

Norfolk and Norwich Naturalists' Society, March 31.—Mr. H. Stevenson was elected the President for the ensuing year, and the Rev. Joseph Crompton, who has filled the chair since the formation of the society, was elected a Vice-President. Mr. Thomas Southwell was elected secretary, and Mr. C. G. Barrett treasurer. The retiring President then read an interesting address, setting forth what had been done by the society during the past year, and what should be its objects in the future, contrasting favourably the present state of scientific inquiry and the spirit in which the search after truth is received, with that which prevailed in years that are passed, concluding with some remarks upon Darwin's last book, the "Descent of Man," which he said should rather have been called the "Ascent of Man."—After the President's address, a letter was read from Mr. Stevenson, who was unable to be present, strongly reprobating the practice of killing woodcocks in spring, when returning northwards to their accustomed breeding haunts. He deprecated the act as inexcusable, inasmuch as a March woodcock is useless for the table, and the shooting season being over, they are mostly killed by gamekeepers, whereas, if the birds were allowed to remain unmolested, many would breed in this country, every season affording fresh instances of their inclination to do so.

KILKENNY

Royal Historical and Archæological Association of Ireland, April 5.—Mr. P. Walters in the chair. The following new Associates were elected:—Rev. F. E. Hamilton, Messrs. R. O'Brien, R. W. Banks, W. F. Skene, J. H. Browne, J.

J. Cramsie, W. E. B. Wyse, T. Atkinson, J. O'Neill, and J. Martin, M.D. The following members were admitted as Fellows :— Hon. B. E. B. Fitzpatrick, Lieut.-Col. E. Cooper, Captain Langton, Messrs. E. Shine, R. R. Brash, J. Watson, N. Ennis, J. Digges, F. Coney, J. Hill, J. E. Mayler, and W. R. Molloy. An application from Mr. Justin McCarthy Brown, Hobart Town, Tasmania, "that the Journal of the Association might be given as a free grant to the Tasmania Library, Hobart Town," was considered and granted. The Secretary, Rev. James Graves, reported on the progress made with the restoration of St. Francis Abbey, Kilkenny, and pointed out the necessity for further subscriptions to preserve the beautiful old tower. A report on the present state of the ruins at Monasterboice, Co. Louth, by J. Bell, C.E., was read, and the following subscriptions, to commence forming a preservation fund, announced :— E. Fost, Bart., D. Dunlop, R. M. Bellew, C. Fortescue, M.P., and M. O'Reilly-Dease, M.P., 10*l.* each; M. Branagan, 5*l* ; Revs. Harpur and Campbell offered not only to subscribe but also to collect subscriptions. The Chairman exhibited and described some more of the ancient record of the Corporation of Kilkenny.—Papers read :—"On the exploration of Cranoges," by G. H. Kinahan, M.R.I.A., "On some iron tools and other antiquities found in the Cranoge of Cornagall," by W. F. Wakeman, M.R.I.A.

Calcutta

Asiatic Society of Bengal, January 4.—The president, the Hon. T. B. Phear, exhibited some diagrams, showing the diurnal oscillations of the barometer at Dalhousie during part of October 1870. He remarked upon these curves, and called attention to the part which the pressure of vapour in the atmosphere was supposed to have in effecting the barometric oscillations. Colonel Strachy stated that the opinion that the presence of vapour in the atmosphere had any important influence on the oscillations of the barometer was totally unfounded, and indicated the results of his own observations at various stations.—Mr. T. W. H. Tolbort communicated a paper on the history, archæology, and natural productions of the district of Dera Ismail Khan, which will be published in the Journal of the Society.—Bábu Rájendrálala Mitra read a memoir on the antiquity of Indian architecture, in which he maintained the indigenousness of the art.—Mr. Wood Mason exhibited and described a very curious instance of polydactylism in a horse from Bagdad. This horse had on each fore-foot a supernumerary digit, furnished with an asymmetrical hoof, articulated to the rudimentary metacarpals of the fourth toes; these digits consited of the usual number of phalanges. Figures of this curious malformation are given.

Philadelphia

Academy of Natural Sciences, December 6, 1870.—Dr. Ruschenberger, president, in the chair.—Professor Cope made some observations on a number of species of reptiles from the Cretaceous beds of Kansas, which he had recently studied. He tated that the specimens included parts of *Elasmosaurus Latyurus* Cope, *Polycotylus latipinnis* Cope, *Liodon proriger* Cope, and two new Liodons, which he named *L. ictericus* and *pl. mudgei*. A third new Mosasauroid of the size of the *L. Mudgei* was described under the name of *Clidastes cinerioriium*. It was stated to be much the largest species of the genus, and to differ from the three now known in having the plane of the articular extremities at right angles to the long axis of the centra, and not oblique to it. He described a third new Liodon, of gigantic size, stating it to exceed by very much the Maestricht reptile, and even the *Mosasaurus brumbzi* Gibbes, which was till now the largest known species. He pointed out the characters of the vertebræ, which were very much depressed as to the centrum, which measured 5¾ inches in diameter. It was allied to the *M. brumbzi*, but differed in having a strong emargination of the articular faces to accommodate the neural canal. He named it *Liodon dyspelor*. Prof. Cope also exhibited the humeri and femora of *Polycotylus*, which were like those of *Plesiosaurus*, and measured eighteen inches in length.—Mr. Thomas Meehan exhibited several specimens of the *Maclura aurantiaca*, the common osage orange, in which the plants were inarched together in pairs in a remarkable way. He said the osage orange was extensively grown as a hedge plant, and in digging up the one-year plants these united twins were usually found in the proportion of about one score in ten thousand. Double kernels were common occurrences in many seeds. There were double peaches, almonds, and double yolks in eggs. But these all had their separate seed coverings or membranes, and the yolks their own albuminous envelopes, consequently the separate embryos produced distinct plants. But these indicated that there had been two separate embryos under one seminal covering, and that the radicular portions of this double embryo, having no membrane to separate them, had inarched themselves together while passing to the ground. If this was the true explanation, he thought there was no such case recorded. That it was true seemed probable, from the fact that all the specimens were united in exactly the same manner, showing that time, place, and the circumstances of the union were uniformly the same. The scars showed that there were four cotyledons and two germs, and that the place of union was midway between the pairs of cotyledons. From the base of the cotyledons extending the whole length of the radicle, the union existed. The length of this united part was from half an inch to one inch, according to the vigour of the plant. Another lesson he thought was afforded by these specimens. Dr. Asa Gray had recently remarked, in *Silliman's Journal*, that European botanists still believed what American botanists had learned to doubt, that the radicle was a true root, rather than a morphologised joint of stem. Here was, he believed, an illustration of the American view. These radicles, which had evidently united together under the seed coat, had elongated after protrusion, just as a young shoot with all its parts formed in the bud elongates after the bursting of the bud scales. They comprised the half inch, or inch united portions before referred to. If these radicular portions of the seed were of the nature of root rather than of stem, we might expect to see lateral fibres push from them, as we do see from the true roots, which start out below the union. But these parts are as free from rootlets as any portion of the true stems above the cotyledon points, indicating, as had been suggested, that their properties were rather of stem than of root.

December 20.—Mr. Vaux, vice-president, in the chair.—Prof. Leidy directed attention to a preparation of the trunk of an adult male subject, from the dissecting room of the University, in which all the viscera were reversed in the order of their usual position. The heart is reversed in position with its apex directed to the right. The aorta descends on the right side; and the cavæ are placed on the left of the vertebral column. The liver is placed in the left, the spleen in the right side. The stomach is reversed, and the large intestine commencing in the left iliac region terminates in the rectum from the right side.

December 27.—Dr. Ruschenberger, president, in the chair.—Prof. Leidy called attention to an interesting geological phenomenon in the vicinity of Wayne station on the Germantown Railroad, about three miles from Philadelphia. At the point where Wayne Street cuts through a fold in the micaceous schists of this district, there occur huge imbedded boulders of very hard compact hornblende rock. The matrix of mica schist has the appearance of an altered argillaceous slate, and rapidly decays on exposure. The hornblende rocks are thus left protruding above the soil, and would be difficult to account for if attention had not previously been called to them in place. As occurring in the schist, they are rounded upon their corners and edges, and smooth upon the sides. It does not appear an improbable conjecture to suppose that they constituted a part of a primitive surface formation—perhaps the original earth crust—which was broken up before the deposition of the metamorphic rocks which make up the azoic rocks of undetermined geological age, overlying the south-eastern angle of Pennsylvania; and that by steam and current actions, perhaps in part by glacial, they were brought into the shape of boulders at a time anterior to the deposition of the sedimentary mica schists. And it is a fact of interest in this connection that the highly garnetiferous mica schists of this district, are charged with dodecahedral garnets, which have probably belonged to pre-existent rocks, inasmuch as their angles and edges are rounded off, and the crystals reduced to an almost globular form. This is true of the garnets while still firmly imbedded in the mica schists, and applies to the garnetiferous mica schists extending over a wide area.

American Philosophical Society, February 17.—Dr. Emerson read a paper on the Lunar Influence in its supposed relation to meteorological phenomena, combating views favourable to the existence of such influence.

March 3.—Prof. Cope read a paper "On the occurrence of fossil Cobitidæ in Idaho."—A paper by Thomas Bland was read

"On the geology and physical geography of the West Indies, with reference to the distribution of mollusca." He stated that the land shell faunas of Porto Rico and the Virgin Islands, Sombrero, Anguilla, St. Martin, and St. Bartholomew, are closely allied, and may be called distinct from that of Haiti on the west and the islands to the south. He came to this conclusion from the facts of distribution, and now finds corroborative evidence from the depth of water. An elevation of the bank on which Porto Rico and the Virgin Islands stand (to and including Anegada) of less than 40 fathoms would make one island of the whole. Anguilla, St. Martin and St. Bartholomew stand on one bank, and a similar elevation would unite them; there is deep waters around Sombrero. The fauna of the group is Mexican and Central American, with peculiar genera not represented in the islands south of the Anguilla bank. There are genera represented in Cuba and the Bahamas, Haiti, Porto Rico, and the islands on the Virgin and Anguilla banks, but not in the islands south. One Strophia fossil in Sombrero and in St. Croix, recent in the others. The depth of water between St. Thomas and St. Croix is 2,000 fathoms, telling of long separation. These facts point to a large island or continent, which embraced the Anguilla bank in its southern limit. Barbuda and Antigua stand on one bank, St. Eustatius, St. Kitts, and Nevis on another, with land shell fauna alliance with Guadaloupe, Dominica, Martinique, and Barbados—that group by their fauna connected (not a few species in common) with Guiana—water over 1,000 fathoms deep between Dominica and Martinique, and the latter and St. Lucia and St. Vincent. Now Trinidad and Tobago (both on soundings) Grenada (300 to 400 fathoms between it and Trinidad), the Grenadines (all on one bank with Grenada), and St. Vincent (1,300 fathoms between it and St. Lucia) have peculiarly the fauna of Venezuela. Bulimus proper (South American) is only found on those islands and St. Lucia. The greatest depth between St. Vincent and the Barbados is 1,218 fathoms, and between the latter and Tobago 1,060. These facts point to an extension of the South American continent, say from north of the Amazon River to a point west of Trinidad, and northerly to Barbuda, the west side (now Trinidad, Tobago, Grenada, Grenadines, St. Vincent, and St. Lucia), having the Venezuelean fauna, and the east side (now Barbados, Martinique, Dominica, Guadaloupe, Antigua, &c.) having the Guiana fauna — Prof. Cope read a paper entitled "Supplement to the Synopsis of Extinct Batrachia and Reptilia, &c.," in which several extinct reptiles were described. Portions of the jaws and teeth of one of these from New Jersey were exhibited. It was named *Liodon sectorius*, and was characterised by a greater amount of compression of the teeth than in any certainly known Mosasauron, the crown resembling those of some sharks.—Prof. Cope read a paper "On extinct forms of fishes of the neotropical region." Two new genera, *Prymnates* (Clupeidæ) and *Anædopogon* (? Characinidæ) were determined. He also exhibited some fossil Batrachia from the Carboniferous of Linton, Ohio, obtained by the Geological Survey under Prof. Newberry. One a specimen of *Sauropleura remex* Cope presented a well-developed hind limb. *Oestocephalus amphiuminus* was branchiferous, and probably limbless. Another fossil, representing a new genus, was referred to as *Conchiocephalus piscinus* Cope. It had two operculum-like bones on the sides of the cranium, the teeth obtuse and in brushes; the size of *Protonopsis*.—Mr. Pliny Earle Chase read a paper on American and European rain-falls, showing an opposition at different seasons of the year, analogous to that which he had pointed out at different periods of the lunar month. Comparing the quarterly rains at Lisbon and at Philadelphia for the sixteen years, 1855 to 1870 inclusive, he found that the half years which were the most rainy at one station were the least so at the other. He also found that, in ten years out of the sixteen, an annual rainfall above the average at one station was accompanied by one below the average at the other. Mr. Chase also communicated some of the results which he had obtained by a discussion of the meteorological observations of the Signal Service Bureau, United States War Department. Perhaps the most important of his deductions were the following:—(1) The greater importance of the barometric gradients than of the isobars, in making American forecasts; (2) the great frequency of anti-cyclonic storms in the United States; (3) the probable origin of a large proportion of our storms in the blending of the polar and equatorial currents, near the latitudes at which the general tendency of the winds changes its direction; (4) the greater severity and briefer duration of cyclonic commotions than of those which are primarily anti-cyclonic.

BOOKS RECEIVED

ENGLISH.—Fragments of Science for Unscientific People: J. Tyndall (Longmans).—Classical and Prehistoric Influences upon British History, pt. i.: S. Bannister (Longmans)—British Rainfall for 1870: G. J. Symons (Stanford).—Symons' Meteorological Magazine for 1870 (Stanford).—The Beginning: its When and its How: M. Ponton (Longmans).—The Poor Artist: R. H. Horne (Van Voorst).—Half-crown Saturday afternoon Rambles round London: H. Walker (Hodder, Stoughton, and Co.).—A Sketch: Romance of Motion: A. Lee (Longmans).—What is Industrial and Technical Education? two Orations by Dr. John Mill (Simpkin and Co).

FOREIGN.—(Through Williams and Norgate)—Die Elektromagnetische Telegraph: Dr. Schellen (2 vols.).

DIARY

THURSDAY, APRIL 20.

ROYAL SOCIETY, at 8.30.—Note on the Circumstances of the Transits of Venus over the Sun's Disc in the years 2004 and 2012: J. R. Hind, F.R.S.—On the Existence and Formation of Salts of Nitrous Oxide: Dr. E. Divers.—Research on a new group of Colloid Bodies containing Mercury, and certain members of the series of Fatty Ketones: Dr. J. E. Reynolds.

SOCIETY OF ANTIQUARIES, at 8.30.—On the Original Purport and Use of the Galilee of Durham Cathedral: W. White, F.S.A.

LINNEAN SOCIETY, at 8.—Notes on Mr. Murray's paper on the Geographical Relations of the chief Coleopterous Faunæ: Roland Trimen, F.L.S.

CHEMICAL SOCIETY, at 8.

ROYAL INSTITUTION, at 3.—On Sound: Prof. Tyndall.

FRIDAY, APRIL 21.

ROYAL INSTITUTION, at 9.—On the pre-Socratic Philosophy: Prof. Blackie, F.R.S.E.

SATURDAY, APRIL 22.

ROYAL SCHOOL OF MINES, at 8.—Geology: Dr. Cobbold.

ROYAL INSTITUTION, at 3.—On the Instruments Used in Modern Astronomy: Mr. Lockyer.

MONDAY, APRIL 24.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.

INSTITUTE OF ACTUARIES, at 7.—On Industrial Assurance: H. Harben.

LONDON INSTITUTION, at 4.—On Astronomy: R. A. Procter, F.R.A.S. (Educational Course.)

SOCIETY OF ANTIQUARIES, at 2.—Anniversary Meeting.

TUESDAY, APRIL 25.

ROYAL INSTITUTION, at 3.—On the Geology of Devonshire, especially of the New Red Sandstone System: William Pengelly, F.R.S.

WEDNESDAY, APRIL 26.

GEOLOGICAL SOCIETY, at 8.—On a new species of Coral from the Red Crag of Waldringfield: Prof. P. Martin Duncan, F.R.S., F.G.S.—Notes on the Minerals of Strontian, Argyllshire: R. H. Scott, F.R.S., F.G.S.—On the probable origin of Deposits of "Loess" in North China and Eastern Asia: T. W. Kingsmill, of Shanghai.

SOCIETY OF ARTS, at 8.—Photography in the Printing Press, being a Description of the Working of the Heliotype Process: Ernest Edwards.

ROYAL SOCIETY OF LITERATURE, at 8.30.—On the Classical Names of Rivers: Hyde Clarke.—On Shakespeare's Birthday: C. M. Ingleby, LL.D.

LONDON INSTITUTION, at 12.—Annual Meeting of Proprietors.

THURSDAY, APRIL 27.

ROYAL SOCIETY, at 8.30.

LONDON INSTITUTION, at 7.30.—On Economic Botany: Prof. Bentley.

ROYAL INSTITUTION, at 3.—On Sound: Prof. Tyndall.

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