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THURSDAY, JANUARY 12, 1871

THE NEW HOSPITAL OF ST. THOMAS

FEW more marvellous creations of constructive art have burst in rapidly maturing beauty upon the eye than the noble *vis-à-vis* which now faces the Palace of Westminster, and looks across the Thames at it from the opposite stretch of Embankment, rendering the site which is centred by Mr. Page's graceful bridge, one of the most remarkable that is to be found in the chief cities of the world. The Hospital may possibly be held to be subordinate to the Palace in dignity and grandeur of external form; but in two particulars it must be admitted to be in no way inferior to its rival. It is dedicated to a purpose of highest and purest beneficence, the alleviation of human suffering, and to unceasing conflict with one of the most potent of the powers of physical evil; and it is a *chef-d'œuvre* of perfection and completeness for the accomplishment of the end to which it is destined. Within thirty-one short months this vast building has been so far advanced under the hands of a staff of nearly 900 workmen, that it is now quite possible to take a comprehensive view of the purpose and plan of its designers, and fairly to contemplate in its most advanced form the idea of what a public Hospital should be in these days of scientific development and conquest.

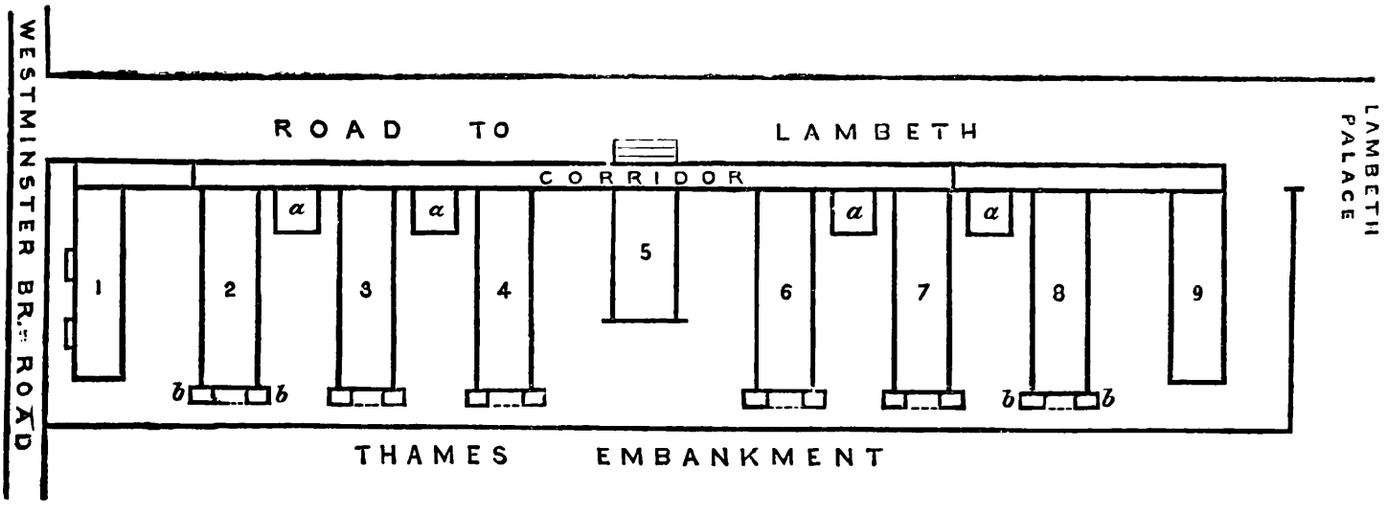
It is a matter of notoriety, that after a period of perplexity and doubt,—during which it seemed at least problematical whether the old Hospital of Edward VI., which had been ejected from its primary home near the southern end of London Bridge by the remorseless demands for increased railway access on that side of the metropolis might not be scattered into disjointed fragments for want of a sufficiently spacious central site, where its functions might be efficiently and conveniently resumed after the old fashion and upon the old scale,—it has been found practicable to give it a new habitation in Lambeth, in a position in no sense inferior in promise of direct usefulness to the one it previously occupied in the borough of Southwark, and in many particulars with a marked and unquestionable accession of advantages in the change. In accomplishing this task, it was wisely determined, after due deliberation upon all the interests involved, so to use the great opportunity as to show to the world what is required by the present conditions of sanitary and medical science in a Hospital erected for the study and cure of disease and casual injury. This, of course, could only be accomplished at some cost in the matter of money and space. But it was held that a very considerable measure of compensation might be at once effected by the adoption of very perfect organisation and very complete mechanical contrivance; and that beyond this any money outlay which establishes a model of perfection in Hospital construction and arrangements, must be admitted to be a wise and sound investment for the community on other grounds.

The most casual observer of the external aspects of this vast pile of building will at once perceive that the fundamental idea of the plan is the breaking up of the structure into a series of subordinate blocks, which must allow of the most thorough and ready permeation of fresh air to every part of the inhabited interior. The *beau ideal* of the ward of a Hospital is that it shall be a spacious room, constructed with due regard to the number of inmates it is allowed to accommodate, open on all sides to the fresh blasts of Heaven. The problem in this individual case has been to determine how several hundreds of inmates can be lodged in a building placed in a densely inhabited part of a great city, without violence being done to this fundamental necessity. In the new Hospital of St. Thomas nine distinct blocks of buildings have been spread along the immediate Embankment of the river, from the end of the bridge at Westminster to the Archbishop's Palace at Lambeth, in such a way that they have the open space overlooking the broad channel of the Thames at one side, and a roomy thoroughfare connecting the Westminster Bridge Road with Lambeth at the other. These blocks are of elongated form, their longest dimensions lying transversely to the course of the river, so that their ends look down upon the stream; their sides being severed by intermediate areas of clear space. Each block, in the main, is simply a stack of long single wards with windows at each side, placed one upon the other. But these wards are bulbous, or enlarged, at the river ends, for the sake of architectural effect, and for purposes of convenience which will be hereafter mentioned. But for almost the entire extent of their longest dimensions they are purely single long rooms pierced by spacious windows at both sides. On the ends opposite to the river these blocks are, in the lower flats, connected together by corridors contrived for the purpose of interior communication; but, throughout the upper flats the isolation of the blocks, and, therefore, the permeability to free air, is complete. Further reference will have presently to be made to the admirable way in which the work of necessary communication has been managed.

In broad outline the plan of the arrangement is, therefore, that which is presented to the eye in the sketch on the following page.

With respect to these blocks, it may be stated that No. 5 is the Central Hall, with entrance from the Lambeth Road, and the Chapel. No. 1 is the administrative block, consisting of the Governor's rooms and the Treasurer's residence, and No. 9 is the Museum and Medical School. The blocks 2, 3, 4, and 6, 7, 8, are, therefore, the Hospital proper. Each of these blocks consists of four flats, with an attic story above, and a basement story beneath. But the first floor in block 4 is appropriated to the accommodation of the linen and to the matron's use; and the corresponding floor in block 6 is absorbed by the kitchen and cooking apparatus. Block 8 is the compartment reserved apart for contagious and infectious diseases, and is differently arranged to the other Hospital blocks. There are therefore four large Hospital wards in blocks 2, 3, and 7, and three large Hospital wards in blocks 4 and 6. Each of these large wards in the three upper flats will accommodate 28 beds. The first floor wards in blocks 2, 3, and 7 are necessarily of somewhat smaller size, and are designed for 20 beds. All the patients' wards taken together, including those of block 8, and sundry small private wards scattered about the building, afford ample accommodation for six hundred indoor patients.

The principal channel of communication between the several blocks of the building is one long corridor on the ground flat or floor. This corridor runs the entire length from the administrative block (No. 1) to the block for contagious diseases (No. 8). But the portions of the corridor which lie between blocks 1 and 2, and between blocks 7 and 8, take the form of an open colonnade. For the rest of the distance, it is intrinsically an internal passage. The open, or colonnade, portion which leads to block 8, the assigned seat of infectious disorders, is carefully cut off from the rest of the corridor by closed glass doors, so that all contamination of the other blocks of the building by the infected air is simply impossible. The open air-space which intervenes is ample for the neutralisation and destruction of atmospheric infection of any kind. The marvellous extent of space covered by this hospital is perhaps best estimated by stating the actual length of this corridor. The continuous length of the spacious passage is 916 feet from end to end. A very pleasant and convenient communication between the several blocks is effected on the second floor by a casemented passage, which runs along the main corridor. The communication for the third floor is along the open flat roof of this casemented passage; and above this there is no communication at all between the blocks. The effect of the light and airy outlook, giving the impression of altogether unrestricted lightness and freshness, which is encountered in passing along these higher passages of communication, is very charming and agreeable. There is scarcely anything in the arrangements of the buildings which is more striking and pleasant to an observer upon a first visit. The open passage at the top is guarded by a balustrade, which is very profusely ornamented by large urns made of artificial stone; a material which has been largely employed in the ornamental parts of the structure. This compound, which is a special patent, is formed of dissolved flint mingled with sand, the material being then saturated with silicate of potash under exhaustion or pressure. It is expected that this artificial stone will possess very enduring qualities, but from the present aspect of these urns the



writer of these lines inclines to think that the material yet needs further evidence of endurance and success before it can be held to have established the character at which it aims.

In addition to these corridors of communication, there is a still longer passage in the basement, extending quite from the administrative block to the Museum and Schools at the farther end of the structure, and giving immediate access to the department for washing linen, and to the Anatomical Schools and mortuary receptacles which lie beyond under the shadow of the old walls of Lambeth. There is also a sunken but open-air way running from end to end of the building immediately within the parapet trenching upon the river-embankment, which gives still further facility for the transport of heavy material. This channel of communication is very ingeniously and completely masked from observation both from the building itself and from the external space.

The important and interesting details relating to the arrangements which have been made within the large wards themselves to fit them for their beneficent work, must be reserved for another article.

R. J. M.

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

IN October 1861, when the Natural History collections presented to the town of Liverpool by the grandfather of the present Earl of Derby were removed from Duke Street to the building which they now occupy, the question arose, how should the museum be made as fully as possible to answer the requirements of the population by whom it was to be supported under the provisions of the Library and Museum Act.

The Curator, Mr. Moore, whose invaluable services are too well known to require further notice on my part, having on his hands, besides the duties of general superintendence, the re-arrangement of the extensive series of Mammalia and Birds, together with preparations for the reception of a similar series of Fishes and Reptiles, availed himself of my offer of assistance in obtaining and arranging a collection of Invertebrate animals, our stock of which at that time included little beyond some corals and a few very miscellaneous specimens.

The accommodation available for the proposed collection consisted of the central areas of a suite of five rooms

27 feet in breadth, the total length being 250 feet. Space was thus provided for eighteen table-cases, each 10 feet long, set transversely. One important point was therefore settled by the shape of the building. The series had to be conformed to a linear arrangement. In some respects this was a serious disadvantage. The classes of Invertebrate animals cannot well be represented in a single ascending or descending series. Probably it would not be possible on any symmetrical plan to indicate their proper positions relatively to each other; but some palpable incongruities might be avoided by the use of table-cases on a ground-plan, resembling in form a tuning-fork. The Protozoa, as the stem, pass naturally enough on one side by the Rotiferæ and their allies to the Annelida, Echinodermata, Crustacea, and Insecta; and on the other by the Cœlenterata to the Molluscoida and Mollusca; the greater size of the specimens forming the latter prong of the fork, compensating for the vastly more numerous species in the former. The importance of a suitable ground-plan for cases in Museums seems to be much underrated. When a class of students visit a museum frequently, the localities of cases containing special groups become indelibly impressed upon the memory. Why should not this be turned to good account?

In preparing the first scheme of the collection, it seemed to me essential that plain, and moderately simple, printed descriptions of the life history of the animals should accompany the specimens, but, as it was clearly impossible to describe every species, or even every genus, it became necessary to fix on some mode of associating in groups a number of species to which the descriptions might apply. Such divisions as "classes" and "orders" were manifestly too large; whilst "families" varied from a single genus, including a solitary species, to an army of more than a thousand genera, *e.g.* the Cerambycidæ and Curculionidæ in the Coleoptera. It was with some regret that the idea of attaching a readable sketch to each division of a given rank in recent systems of classification was relinquished, but it was found to be impracticable; and the life history sketch thus became the foundation of the system eventually adopted. Whether it might be a few species, or a genus, or a family, or an order, that seemed to afford suitable scope for a paragraph of readable and instructive matter, it was decided that such a group should be segregated, so as to form the unit of the series. Eventually, in order that the sketches, which it was proposed to print for the purpose on tablets, might all be in positions where they could conveniently be read, it was found to be expedient that each group, or unit, should occupy an equal space; and as the blocks on which the table-cases rested were to be fitted up with trays or drawers, twelve of which would occupy the table-case without loss of room, these trays or drawers were adapted as the receptacles and boundaries of the groups.

The drawers measured twenty-seven inches in length by sixteen inches in breadth, and their number in the eighteen table-cases, when completed, would be 216. Then arose the problem, how best to divide the twenty classes of Invertebrate animals into 216 groups, each of which should be capable of affording materials for a biological notice, such as might be read with interest by any intelligent visitor.

The entire plan of the table-cases, and the limits of most of the groups, were committed to writing before any considerable advance had been made in procuring specimens. In one respect this circumstance was found to be very advantageous—our *desiderata* were at once well-defined. It was an object that each of the groups should be illustrated by carefully selected specimens, and until this could be attained, other acquisitions need not be sought for. In making purchases, such an object steadily kept in view exercises a powerful influence against the seductive attractions of "great bargains," which often turn out to be great misfortunes to a Museum. Moreover, in accepting donations, it is sometimes convenient to be able to refer to a fixed plan. Where room is scanty, as in most Museums, nothing is more subversive of order, or more fatal to an instructive arrangement, than the gift of a collection, coupled with a stipulation that it must be displayed in some special way. It is far better to forego the possession even of a valuable series of specimens, than to sacrifice order for their sake.

The number of groups, 216, will, no doubt, appear to have been determined simply as a matter of convenience. To a certain extent this is true. After a careful reference to the best available authorities on each of the Invertebrate classes, in which much assistance was afforded me by the many valuable scientific works in the Free Public Library of Liverpool, and by the catalogues of the collections in the British Museum, it seemed probable that most of the prominent forms in all the classes might be exhibited in pairs, with their names attached in very legible type, in an area less than a thousand square feet; and that they might appropriately be disposed in 240 groups, occupying twenty table-cases. For these, the suite of five rooms above referred to would have been sufficient, but two large circular stoves occupied the room of two table-cases, and the groups had to be reduced to 216 in number, instead of 240, as in the original design.

For constant exhibition to the public, the series may perhaps be regarded as quite sufficiently extensive. Four table-cases contain the Protozoa and the Cœlenterata. Seven are given to the Molluscoida and Mollusca, in which department the collection includes representatives of about eleven hundred out of the thirteen hundred genera and sub-genera adopted by Messrs. H. and A. Adams in their work on "The Genera of recent Mollusca." Three cases are occupied by Echinodermata, Annelida, and Crustacea. This is by no means in proportion to the other parts of the series, and here it is that the want of the two absent table-cases is most felt. Four cases hold the Arachnida, Myriapoda, and Insecta, in which all the orders are fairly illustrated, except Strepsiptera. Stylops has not yet arrived—perhaps this may meet the eye of some friend who, for love, money, or specimens, may be willing to supply the deficiency.

It is hardly necessary for me to point out the difficulties and disadvantages which must attend an attempt to form a collection in which the whole of the Invertebrate classes are divided into a given number of equal groups. If all very distinct forms are to be exhibited, some groups must be heterogeneous in composition, but not necessarily very many. Such forms as Pycnogonum, Forficula, Siphonaria, Sagitta, Cydippe, &c., may have to appear as interlopers; but the printed tablet may explain the irregularity of their position, and render the disadvantage simply a

negative one,—in such cases the plan cannot afford much help to the memory. On the other hand, the tray or drawer containing an entire group can, with the utmost facility, be moved, to be re-arranged, to illustrate a lecture, or to occupy a different position in the series.

In the present unsatisfactory condition of "classification," probably the only thoroughly scientific mode of conveying information respecting an assemblage of organic forms, is that adopted by Professor Huxley, Professor Rolleston, and others, of describing completely a single included species; but this method seems more suited for students than for a mixed company, such as have visited our institution since October 1861, during which period the admissions to the Liverpool Museum have exceeded four millions one hundred and sixty-two thousands. The mode of arrangement adopted within the groups will be described in a subsequent notice.

HENRY H. HIGGINS

UTILISATION OF SEWAGE

A Digest of Facts relating to the Treatment and Utilisation of Sewage. By W. H. Corfield, M.A., M.B. Oxon, Professor of Hygiene and Public Health at University College, London. Prepared for the Committee of the British Association. (London: Macmillan & Co. 1870.)

DR. CORFIELD, now the Professor of Hygiene and Public Health in University College, London, after having been a most distinguished student in the old University of Oxford, has put before the world in a well and large printed volume of something less than 300 pages, a clear, readable, and reliable *résumé* of the "Great Sewage Question." The labour which has been thus expended in lightening the labours of others can be adequately judged of by but few persons; but amongst those few may perhaps be reckoned individuals who, like the writer of this review, have for their sins or through their foolishness, been entrapped into serving on the drainage committees of Local Boards, and have felt themselves compelled, in the way of expiation, to purchase, if not to peruse, the hydra, or rather the medusa-brood of blue books which parliamentary commissions and privy council offices are so constantly giving off. Had Professor Corfield always given chapter and verse, page and paragraph, for his citations from the vast number of volumes to which we allude and he has referred, he would have put his claim to credit on the score of painstaking laboriousness more prominently before the eyes of his readers, though he might not thereby have made the reading of his work much the easier for them. As it stands, his book is eminently easy of comprehension, and we will, without further preface, say a few words as to the general outlines of the ground he professes to cover in it.

The first 103 of the 282 pages of which the book consists, are taken up by an account, which is partly archæological, and partly, we regret to say, as yet not so, of certain systems for dealing with refuse which all alike labour under an amenability to an objection which our author, like ourselves, would appear to judge to be fatal to them. This objection he thus states (pp. 59, 60)—"The question, in fact, to be solved would appear to be with all the methods which require hand and cart labour: how can the refuse matters be kept as long as possible without being positively dangerous to health? instead of, as it should be, how can they be got rid of as fast as possible? This consideration at once stamps all methods of removal by scavenging, and must of itself bind them to a false principle, and lead to their condemnation." They are rightly, we would suggest, called systems of Conservancy, professing, as they do, to *keep* something awhile, which it would be better to lose at once. This portion of the professor's book is closed with a quotation from the "First Report of the Rivers' Pollution Commissioners" relating to one of those methods which at the present moment would appear to enjoy a considerable popularity; and this quotation we will follow his example in reproducing, observing by the way that to the words "First Report of the Rivers' Pollution Commissioners," there should have been added the words, "appointed in 1868, published in 1870, p. 50," to save readers the trouble of referring to another Blue Book put out by another set of Commissioners appointed in 1865. The quotation is to the following effect:—"Add to those circumstances the enormous aggravation of all the difficulties of the plan, when not 50 but 5000 households have to be provided with the necessary appliances, and are induced to work them properly, and we can have no hesitation in pronouncing the dry earth system, if superior for institutions, villages, and camps, where personal or official regulations can be enforced, entirely unfitted to the circumstances of large towns."

With his fifth chapter, p. 104, Dr. Corfield begins the history of the particular sanitary apparatus which is known on the continent as the "*Cabinet Anglais*," and with the various modifications, applications, and bearings, agricultural and hygienic, of the means for the water carriage of refuse, the rest of the book is filled up. Prof. Corfield is something of a physicist and of a chemist, and, thirdly, of a biologist; and it is to be expected, and will be found, that he is not ignorant, firstly, that water-carriage is the cheapest of all modes of carriage; secondly, that ammoniacal gas is dissolved in, and most tenaciously held fast by when dissolved in, one-thousandth of its own volume of water; and that, thirdly, this same chemical element, "the valuable constituent of sewage *par excellence*," can, when thus carried to land bearing crops, be taken up by them and used by them in their synthesis of albuminates for us animals. The obvious corollary of these rudimentary truths is the acceptance of the principle of the disposal of sewage by irrigation, to the rejection, except under exceptional conditions, of all others; and this corollary our author thus states for us (p. 176), "All other systems than that of removal by water go upon the principle that it is not dangerous to leave excretal matters, either in a crude state (pail closets) or mixed with some absorbing or deodorising material (various other forms of closet) for a certain time in or about houses. The fundamental principle being obviously a wrong one, it is not to be wondered at that such systems continually fail. . . . The water carriage system, on the contrary, sends all the refuse matters at once to a distance in the cheapest manner possible by the mere action of gravity. . . . Figures are stubborn things to deal with, and the sanitary

benefits already attained by this system are so astonishing that we have a right to demand from those who would supplant it, proof of much better results of some other method, and not mere doubtful probabilities." *

In this connection we must note the omission from this valuable digest of any mention of Mr. Baldwin Latham's newly-invented, most simple, and most efficacious machinery for straining off, or rather for dredging out, of the entire mass of the sewage of a town those more coarsely divided, which are also the most grossly offensive and the least useful, of excretory products, together with the floating non-excremental rubbish, such as corks and other "properties" of the complex compound in question. Prof. Corfield, as a disciple of the late Dr. Daubeny, to whose work he refers with a very proper reverence, is too good a botanist not to be aware how hurtful it is to the vital operations of plants, in disinfecting and rebuilding up decaying organic compounds, for them to have their leaves and stems besmeared over with adherent viscosity; this non-transpirable envelope being as really injurious to them as the sight of coherent masses of filth is æsthetically disgustful to us; and both these difficulties Mr. Latham's invention has removed. Croydon, we learn from the guide-books, is not inaccessible from London; and "possesses," to quote further from the same authorities, "many objects of interest for the intelligent visitor." We trust Dr. Corfield will follow the example of the health officer of Bombay, who, in a sanitary tour, the results of which are given us in the "Report of the Measures adopted for Sanitary Improvements in India, from June 1869 to June 1870," visited Croydon, and has reported (p. 232) most favourably upon the particular "object of interest" in question, and its successful coadaptation of the turbine of the dredging machine and of the Archimedean screw.

With a few disjointed remarks we will conclude our notice of this useful work. Dr. Corfield, like most men who can calculate, is an adherent of the "separate system" as regards the rainfall and the sewage proper. Mr. Menzies' name, however, has somehow or other slipped out of his pages (159, 160), where he treats of this improvement on the older plans for sewage. We feel ouselves bound in our rate-paying capacity, to say nothing of any other, to emphasise the name of the Windsor sanitarian, knowing how much his writings have saved us in brickwork.

It is half amusing, half melancholy, to have to note how preachers of Hygiene have, like preachers of higher things, to "become all things to all men, that by any means they may save some." If Dr. Buchanan (see p. 170) is quoted in one place as telling us in a single sentence what another sanitarian professes to tell us in a whole volume (*Der Einfluss der Wohnung auf die Sittlichkeit*), viz., "that the progress made by the inhabitants of certain towns inspected, in decency, cleanliness, self-respect, and morality, was at least as striking as the improvement in their health measured by the mortality returns;" we find at another the preacher of Hygiene (see p. 25) continually pointing out that sickness is the chief cause of the non-payment of rent, and appealing to witness after witness, who assure him in voices trembling with pathos, and in language worthy of such sentiment, that "rent is the *best got* from healthy houses."

Professor Corfield's book will, we doubt not, shortly appear in a second edition. In this second edition we sha'l hope to find a bibliography such as that which Varrentrapp has appended to his work "Ueber Entwässerung der Städte." In this bibliography we shall hope to find Pettenkofer's papers duly and chronologically catalogued, it being the bounden duty of all sanitarians to help in propelling the sphere of Munich Hygiene out of the penumbra in which it is at present into full sunlight. To his bibliography our author will do well to superadd an index, and in correlation with his index should be, from page to page of his text, references given to the pages of the memoirs he quotes. It is not everybody who possesses the often Brobdignagian Blue Books of sanitary commissioners; but those who do possess them like to have these references, and those who do not, will not be much harassed by their insertion. We have suggested the making of these additions to the end of this book; they will cost their writer much, and save his readers some trouble if carried out. We will suggest the making of an addition to the beginning of his book, and that in the shape of a motto which was suggested to ourselves by one of the first of living scholars as an appropriate one for the Thames Conservancy. It may be found some seventy lines short of the end of Hesiod's "Works and Days," and runs thus :—

Μηδέ ποτ' ἐν προχοῇ ποταμῶν ἅλαδε προρεόντων
Μηδ' ἐπὶ κρηνάων οὐρεῖν, μάλα δ' ἐξαλέασθαι,
Μηδ' ἐναποψύχειν· * τὸ γὰρ οὔτοι λώϊόν ἐστιν.

OUR BOOK SHELF

Choice Stove and Greenhouse Plants. Vol. II. By B. S. Williams. (London: Williams, 1870.)

PURELY horticultural works are somewhat out of the range of this journal, but in the present book, besides the usual practical cultural instructions, the author has thrown in much valuable information on the native habitats and uses of the plants enumerated. The palms, being a large order and such general favourites, occupy a large portion of the book, and the following may be taken as an example of its style :—

"*Borassus flabelliformis.* Of this noble palm, a native poem, in describing its beneficial properties, records nearly one thousand uses to which its products may be applied. It is a gigantic tree, reaching eighty feet or more in height, and two feet in diameter; the leaves are nearly circular, and plaited like a partially open fan, and have about seventy ribs, which radiate from a common centre. As young plants (which are the only specimens of this genus existing in this country), they are exceedingly handsome, but they are very rare and of very slow growth. The sap produces a very intoxicating toddy, from which sugar of superior quality is made and imported into this country, while its leaves are used for making hats, baskets and mats, umbrellas, fans, bags, and also in the manufacture of a very nice kind of matting for floors, as well as for thatching, &c. It is found principally near the sea, on low-lying sandy tracts, widely distributed throughout Asia." An excellent but very much condensed chapter on "Palms and their Uses" is likewise appended.

* See further, p. 226 to p. 282, in which pages the detailed facts are given as verifiable at many places, from Edinburgh, where irrigation has been practised for a couple of centuries, to Milan, and in which we are told that the famous chemist, Dumas, whilst inspecting the well-known Barking Farm, exclaimed, "oui, l'eau doit être la charette de l'engrais."

* The word ἐναποψύχειν is not a common one. Its meaning is well given by Mr. Simon in his last Report (Twelfth Privy Council, Medical Department, 1870), p. 16, *à propos* of the habits of the "polite natives" of Wakefield.

We avail ourselves of the opportunity of noticing this book, because, while it is intended to circulate chiefly amongst gardeners, both professional and amateur, it seeks to convey such information on the real value of the plants, which, we think, should in all cases be a point in a gardener's education. J. R. J.

A Cyclopædia of Quantitative Chemical Analysis. By Frank H. Storer, A.M., Professor of General and Analytical Chemistry in the Massachussetts Institute of Technology. Part I., pp. 112. (Boston and Cambridge: Lever, Francis, and Co. London: E. and F. N. Spon, Charing Cross, 1870).

THIS book is a compilation of all the known methods of quantitative analysis. The processes and necessary apparatus are minutely detailed, the descriptions being reproduced from the various handbooks of chemistry and from the original memoirs. The labour entailed by such a work must necessarily have been very great, and its value is much increased by the numerous references to the original descriptions of the processes. This part extends as far as the article on carbonate of silver, from which some notion of the extent of the whole work may be obtained. The principles on which the analytical methods depend are shortly stated in each article, and under these headings are described the methods employed, and the precautions to be observed, the whole being arranged in separate paragraphs for facility of reference. This work promises to be very useful as a book of reference, and will enable the analyst to select without much labour the process most suitable to the work in which he is engaged. We recommend this book to the attention of analytical chemists, being convinced that it will be found to contain much valuable information in a very convenient form.

A Series of Chemical Problems for Use in Colleges and Schools, adapted for the Preparation of Students for the Government Science and Society of Arts' Examinations. By T. E. Thorpe, Ph.D., Professor of Chemistry in Anderson's University, Glasgow. With a Preface by Prof. Roscoe. Pp. 67. (London: Macmillan and Co.; Manchester: J. Galt and Co., 1870.)

THIS little book contains a number of useful tables and descriptions of the modes of calculation made use of in chemical science, illustrated by examples. Each section is followed by a series of questions, for the most part original, but some of which are selected from the examination papers of the Science and Art department and from the Owens College calendar. The subjects treated are Weights and Measures, Thermometric Scales, Correction of Volumes of Gases, Specific Gravity, Percentage Composition, Quantities of Reagents necessary to form certain Products, Combination and Decomposition of Gaseous Bodies, Determination of Atomic Weights, Calculation of Empirical Formulæ, and of the Results of Analysis, Specific Heat, Latent Heat, and Calorific Power. The collection of questions will doubtless be useful to students preparing for examination, and to teachers endeavouring to familiarise their pupils with the details of chemical investigation.

LETTERS TO THE EDITOR

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

Professor Max Müller and the Insulation of St. Michael's Mount, Cornwall

THOUGH very much gratified at the fact that something from my pen has prompted Prof. Max Müller to give us another "Chip from his German Workshop," I was by no means prepared for the mode of treating materials which he has adopted in the Chip to which I refer—his paper on the "Insulation of St. Michael's Mount." *

As the author states, I read a paper to the British Association in 1865, at Birmingham (not Manchester as he supposes), and in April 1867, delivered a Friday evening lecture at the Royal Institution; each having the same title as his paper just mentioned.

With the exception of fifteen lines in the Report of the Association, the first was never printed either *in extenso* or in abstract. I conclude from the Professor's paper, however, that he saw a notice or report of it in some newspaper or journal; but, if so, I can only say that it was neither written nor corrected by me, nor with my knowledge, and that I decline to be responsible for it.

The lecture in 1867 was delivered from very brief notes, but an abstract of it was subsequently written by myself for the "Proceedings of the Royal Institution," and, printer's errors excepted, contained my opinions on the question.

It is clear from Prof. Max Müller's paper that a copy of this abstract was in his possession when he wrote his article. Indeed, the "short account" of the Mount which he "quotes" from me is from it, and not from the paper of 1865. Though substantially correct, this quotation contains three errors which may as well be set right in passing. On page 330 "very high water" and "very low water" (lines 9 and 10) should be "every high water" and "every low water," and "the total isthmus" (line 13) should be the "tidal isthmus"

In the paper of 1865 the following points were assumed:—(1) that the old Cornish name of the Mount was "Cara clowse in Cowse;" (2) that it had been correctly translated as the "hoar rock in the wood;" (3) that the name was appropriate when given; and (4, on the authority of Dr. Boase and Dr. T. F. Barham) that Florence of Worcester expressly stated that "the Mount was formerly five or six miles from the sea, and enclosed with a very thick wood." Though fully aware that each of these points might be open to question, I supposed them to have, at least, a fair amount of evidence in their favour, and hence concluded that the insulation of the Mount had taken place since the introduction of the old Cornish language into the district. Now, such insulation must have been the result of the encroachment of the sea merely, or of a more or less general subsidence; and my object was to show that it was the latter. In order to do this I attempted to dispose of the first hypothesis—insulation by encroachment without subsidence. A careful personal investigation of the Mount and the mainland, and the evidence of an old intelligent native, led me to the conclusion that to take the average retrocession of the cliff at ten feet in a century would probably be an excessively high estimate, and that, even at this rate of waste, "the hypothesis of insulation by encroachment only, appeared to demand the belief that at least twenty thousand years ago Cornwall was inhabited by men who spoke a language which prevailed in the same district to within a very few centuries of our own time, and which, from its similarity to the Welsh, might be said to be spoken still by a large population within our own island." Believing this conclusion respecting the antiquity of the Cornish language to be utterly untenable, I at once rejected it, and, with it, the hypothesis of insulation by encroachment merely, remarking of it that it "squandered time most lavishly."

I am, of course, delighted to find myself supported by Prof. Max Müller in the rejection of this vast antiquity of the Cornish language, for he tells us (p. 364) that it "would completely revolutionise our received views as to the early history of language." It is strange, however, and probably only to be accounted for by his trusting to a newspaper report of my paper, that he supposes that, instead of rejecting it, I have "adduced evidence in support" of this great antiquity (p. 354). The point of my argument was that the hypothesis of "insulation by encroachment without subsidence" could not be admitted, *because it led to an untenable philological conclusion.*

Turning next to the hypothesis of insulation through subsidence—the only alternative consistent with the assumptions made at the beginning—I proceeded to show that the numerous submerged forests which skirted the western coasts of England, and of which a good example in the Mount's Bay had been described by Dr. Bouse in 1822,† were to the geologist sufficient and satisfactory proof of a general subsidence of the country; and then pointed out that whilst, on the one hand, this change of level could not have occurred within the last 1,900 years, since, about 9 B.C.,

* "Chips from a German Workshop," vol. iii. pp. 336–357 (1870).
† Trans. Roy. Geol. Soc. of Cornwall, vol. ii. p. 129 *et seq.*

the Mount was described by Diodorus Siculus in terms which apply admirably to it at present; on the other hand, it could not have taken place in times geologically remote, since the forests consisted of plants still indigenous to the district, and contained remains of beetles retaining all their beautiful colours, as well as the horns of the red deer, which man had fashioned into tools; that, in short, there was nothing compelling the belief that the subsidence happened very much before the time of Diodorus.

The paper concluded thus:—"A careful consideration of all the facts of the case, as well as of the related phenomena, points decidedly to the conclusion that, since Cornwall was inhabited by a race speaking the old British language, St. Michael's Mount was a hoar rock in a wood, and that its insulation resulted from a general subsidence of the country."

From the foregoing sketch it is obvious that, at that time, I supposed the subsidence to have taken place not much more than 2,000 years ago, and this was well understood by Sir C. Lyell and others, who took part in the discussion on the paper. Indeed, the eminent geologist just named, to whom I soon after sent the manuscript, after speaking of the attention I had given to the question (Principles, vol. i. p. 543, 1867), adds, "It is a somewhat forced hypothesis to assume that, whereas a retrospect of nineteen centuries displays to us the Mount geographically the same as it is now, yet shortly before that time, when Cornish was spoken, there was a sinking down and submergence of a wooded-tract;" thus stating his dissent from the view which, as he knew, I then held.

After reading the paper of 1865, I devoted considerable attention to the literature of the subject, and in the lecture of 186 stated that the tradition of the Mount having been five or six mile from the sea, and enclosed in a very thick wood, was first mentioned, not by *Florence* of Worcester, who died in 1118, and who nowhere alluded to the Mount, but by *William* of Worcester, who visited Cornwall about 1478, or 360 years further from th period to which the tradition was supposed to point, thus rendering the tradition itself of very much less value; that the alleged old Cornish name assumed so many forms, and there was so much uncertainty about its exact import, as to render it improbable that it had any value as evidence; and that the submerged forest in Mount's Bay was known much earlier than I had supposed, having been mentioned by Leland, 1533-40.

The object of the lecture was to show that there had been a general subsidence of the country, that this was prior to the time of Diodorus, and that the era of the cavern deposits in South Devon was much earlier still. In fact, the insulation of the Mount, which was held to synchronise with this subsidence, was used as the first, or most modern, of a series of stepping stones leading backwards towards the era of the ancient Cave-men of Devon.

The printed abstract of the lecture closes with a recapitulation, which contains the following passage:—"Nineteen centuries ago it (the Mount) possessed a safe harbour, so that its insulation must have been effected long before; it was at one time unquestionably a hoar rock in a wood, but in all probability it had ceased to be so long before any language now known to scholars was spoken in the district. Prior to its insulation was the era of the growth of the forests now *submerged* along our entire seaboard," &c.

I am not quite sure to what Prof. Max Müller refers when, speaking of this lecture, he says, "Mr. Pengelly has somewhat modified his opinion" (p. 333). If to the opinion that the insulation of the Mount was due to subsidence, he is unquestionably in error, as I have never wavered on this point. If to that of the old British language having been spoken in Cornwall 20,000 years ago, my reply has already been given—"I never held it." But if it be to the opinion that there was a fair amount of evidence in favour of the traditions of the enclosure of the Mount in a thick wood, and of its alleged old British name; instead of modifying, I had discarded it in 1867, and with it, as a matter of course, the necessity of believing, on the one hand, that the Cornish language must have had an antiquity of 20,000 years; or, on the other, that the subsidence took place but little more than 2,000 years ago. It is unnecessary to say how very much I am gratified at finding the traditions discarded also by Prof. Max Müller (see p. 355 *et seq.*)

Before concluding, I may state that in July 1867, I read a paper to the Devonshire Association, under the title of "The Antiquity of Man in the South-west of England," which was simply an amplification of the lecture of the previous April, and was printed *in extenso* in the following October.* It contained a few points of interest which had come to my knowledge after the Royal Institution lecture was delivered; such as the fact that the earliest mention of a British name was made, not by Carew in 1602, but by Norden in 1584 and Camden in 1586, who concurred in giving it as "Careg Cowse," which the first rendered the *Grey rock*, and the second *Rupis cana;* the fact that the name occurred in two different forms in Carew; and the fact that there was some error in William of Worcester's statement about Pope Gregory's grant to the Church on the Mount in the year 107c, there being no Pope Gregory at that time.

It is not my intention at present to enter on a consideration of the question, "Have geologists," as Professor Max Müller supposes, "left it doubtful whether the insulation of the Mount was due to the washing of the sea-shore, or to a general subsidence of the country?" or, "May not the Mount have always been that kind of half-island which it certainly was 2,000 years ago?" My object is simply that of correcting an error into which the Professor has fallen respecting my opinion, apparently in consequence of using an anonymous and probably incorrect report of a paper read in 1865, instead of an authorised abstract of a lecture delivered in 1867,—an error, however, which can scarcely be regretted, since to it we owe a "Chip" of great interest and value.

W. PENGELLY

Lamorna, Torquay, Dec. 26, 1870

* Trans. Devon Assoc., vol. ii. pp. 129—161. 1867.

Glycerine Solutions of Pepsin and other Substances

IN NATURE of December 29, Prof. M. Foster calls attention to the method of making glycerine extract of pepsin pursued by Von Wittich, and remarks with reason that the means hitherto adopted for preparing pepsin for medical purposes are clumsy and inefficient. There is, however, one exception, a mode of preparation which has long been in use, and which is by no means inefficient. This will be found to possess some practical advantages over the process of extracting the fresh mucous membrane with glycerine, while from it the glycerine solution can be prepared quite as pure and clear, and as strong as by maceration.

As long ago as 1858 (Archives of Medicine, vol. i. pp. 269-316) I described a method of obtaining the active digestive material from the pig's stomach, which answers perfectly, and has been employed in practice ever since. It simply consists in quickly drying the mucus expressed from the stomach glands upon glass plates.* The dried mucus is then powdered and kept in stoppered bottles. It retains its properties for years. Eight-tenths of a grain will dissolve *one hundred grains* of coagulated white of egg.

Now, from this powder is easily prepared by solution in distilled water a perfectly clear and colourless digestive fluid of great activity, which *can be readily filtered.*

Some years ago I found great advantage from subjecting tissues to the action of a very small quantity of this solution in glycerine, and keeping the whole at the temperature of 100° for some hours. By this process the elements of the tissue were softened, and could be dissected from one another readily for examination under the highest magnifying powers.

No doubt there is much to be learnt concerning the nature of the action of such substances upon tissues by the use of glycerine solutions. For microscopical work glycerine is of more use than any other medium. Not only may various substances be removed from tissues, but others may be introduced, and the tissue subjected to the action of various reagents without destroying it. In fact, the action may be regulated with the greatest nicety. Nearly all the tests required in microscopical examination may be dissolved in glycerine ("How to Work with the Microscope," p. 297, 1867) and tissues of the most delicate character may be preserved in it, and will retain their microscopic characters for years, *if care be taken to obtain the best and strongest glycerine.*

LIONEL S. BEALE

* This Pepsin is prepared for medical purposes by Messrs. Bullock and Reynolds, 3, Hanover Street, Hanover Square.

Tails of Comets, Solar Corona, and Aurora

UNDER this heading, in your issue of 5th inst., you report a paper by Prof. Osborne Reynolds, M.A., read at a meeting of the Manchester Literary and Philosophical Society, Nov. 29 last. This paper sets forth that the tails of comets, the solar corona, the aurora, and the Zodiacal lights are due to the ether which "fills" space. Comets' tails, as stated by the Professor, in his paper, are an effect due to the medium through which it

passes being heated and illuminated by the comet; and that the other phenomena are also due to the ether.

I rely that you will do me the justice to allow space for me to remind your readers that the theories which Prof. Reynolds so emphatically calls *his*, were propounded and published by me sixteen years ago, and noticed by most of the press throughout the world.

The following quotation from my pamphlet (now out of print) will enable your readers to judge of the correctness of these statements :—

"It was noticed, in reference to 'Biela's comets,' that the smaller one, which I call the *tertiary* comet, and which travelled in a separate or distinct orbit, that a kind of *rein*, or stream of light, joined the two heads, the stream of light being *larger* as it approached the head of the *larger comet*. This stream of light, I think, proves most satisfactorily that the 'tails' of comets are nothing more than the illuminated or heated *medium* through which the comets pass. The *cylindrical* appearance which these 'tails' sometimes present, I believe is occasioned by the *rotary motion* of the comets (or infant worlds) on their respective axes. *The increased number of 'tails'* to a comet is occasioned by the interposition of one or more secondary or tertiary comets, intercepting the 'tail' of the superior body, the direction of which 'tails' would be determined by the position of the said intercepting bodies, aod the variety of *appearance* in connection with the point from which they were viewed," &c.

Bayswater, Jan. 9 J. BEDFORD, Ph.D.

The Artificial Introduction of Plants

THE remarks on page 142 of your number of December 22, on the proposal of the Manchester Field Club to introduce plants foreign to the district, ought to be printed in red letters. The geographical distribution of plants is not the least interesting branch of botanical study, and is, besides, important in its bearings upon other natural sciences, such as geology and meteorology, and as such has formed the subject of laborious and intelligent research among various eminent naturalists.

Amateur botanists can carry on their favourite pursuit in two widely-different ways: they can play at science, and so amuse themselves to their own satisfaction, may be, but with little advantage to what they propose to admire, or they may patiently and conscientiously work and observe within their own sphere of research, and thus be able to render, as occasion serves, very real service to science at large, more, perhaps, than they are aware of at the time, and certainly to earn very genuine pleasure for themselves.

Not that I mean to insinuate that the Manchester Club are playing at science, but I warmly agree with your remarks that a mistake is being made by them in this respect. The instance is not a solitary one, even in my limited experience. Not long ago I found myself protesting against the notion of an amateur botanist (in England), who was endeavouring to introduce a species into a new locality. This is about as detrimental a proceeding in its way as that of the wanton eradication of a species from a neighbourhood.

I write *con amore*, for I happen to live and botanise in a part of Europe lying off the line of railways, therefore little visited, but possessing an interesting and somewhat peculiar flora, and am not unfrequently applied to by eminent botanists for information as to the real existence in the district of plants alleged with more or less of truth to be indigenous here.

Fiume, Austria AN AMATEUR BOTANIST

Science Teaching

IN an article in NATURE, December 29, 1870, on "Science at School Boards," the teaching capabilities of this country appear to me to be under-rated; I refer especially to the following passage :—"We would advise that some attempt be made to teach some quantum of Natural Science somehow. The present masters will probably be utterly ignorant of any branch of Science!"

If such is the fact, I would ask what have the training-schools been doing for years past? Most of these schools have university men as teachers, or men who have obtained a lectureship; and surely they have turned out students of two years' residence, capable of teaching one or more of the elementary branches named by the writer of the article referred to.

Does Dr. Lankester really think that the majority of the trained certificated masters of this country are incompetent to teach elementary physical geography? Many of these masters possess, I believe, a certificate for teaching Science, in virtue of having passed an examination under the Science and Art Department; and surely the examiners employed by the Department are such men as even Dr. Lankester would not ignore.

I feel confident that so far as teachers are concerned the matter is not so bad as Dr. Lankester imagines. The Revised Code checked all science teaching in elementary schools, but only let the Committee of Council accede to the appeal now made, and they will find plenty of masters able and desirous of teaching the elements of Science in our elementary schools.

There are two obstacles to be overcome before good results can be obtained. There must be better and ampler teaching power employed in our schools, so as to give the master the opportunity to carry out consecutive teaching; and then people generally must be made aware of the importance of Science to the artizan class, parents must be taught to appreciate the efforts made for their children. I will venture to say that more than half the work of the best teachers of this country is neutralised by the indifference or ignorance of parents.

Wisbech, Jan 3 SAMUEL H. MILLER

The Frost

I REMARK in the "Notes" of your last number, it is stated that "the lowest temperature at Blackheath was 15·3° F., on the night of the 24th December."

Now, assuming the correctness of the instrument from which this observation was taken, the locality must be much more protected from frost than that in which I reside. I have two good registering thermometers placed in a N.E. aspect, at about twenty-five or thirty feet from the ground—the one an upright mercury (Beck, Cornhill), the other a horizontal spirit tube (Hughes, Fenchurch Street), and the readings, which correspond exactly, were as follows :—

On the night of 23-24 Dec. 12° F., and at 7 A.M. on the 24th 14°. The maximum temperature (about noon) on the 24th was 24°, and at 11 P.M. the mercury had dropped to 16°.

On the night of the 24-25th the minimum was 9° F., at which point the register stood as late as 7 A.M. on the 25th, and even at 10 A.M. it had only risen 1° (10° F.)

I send you these observations, which I believe to be very correct, as they may be of some interest to meteorologists in our neighbourhood.

Blackheath, Jan. 9 JOHN CAREY

[It will be seen that these figures correspond very nearly with those given in our "Notes" this week.—ED.]

ON Sunday morning, 1st inst., a standard terrestrial radiation thermometer (exposed here on the previous evening) registered the unusual low temperature of 6·3 °F. or 25·7° below the freezing point.

The instrument was placed a few inches above snow covered grass on a gravelly soil, and exposed to nearly the whole sky.

JOHN JAMES HALL

Temporary Meteorological Observatory,
Fulwell, Twickenham, Jan 5

Sharks announcing their own Capture

LIEUT. C. H. TAYLOR, of H.M.S. *Cossack*, in his Remark-book for 1869-70, alludes to the following ingenious mode of making sharks announce their own capture, It appears that the island of Johanna, at the north end of the Mozambique Channel, is frequently visited by numerous sharks, whose flesh is esteemed as an article of food by the natives, who also prize the skin and oil for domestic or commercial purposes.

The Johanna men, however, being too lazy to fish in what might be termed a legitimate manner, have recourse to floating traps, with line, hook, and bait, and supporting above water a pole and basket. A bight of the line near the raft is attached to a bolt or toggle, which, when in place, keeps the pole in an upright position, but the moment a strain is brought on the line by the fish being hooked, the toggle is withdrawn, causing the pole and basket to fall, which is a signal to the people on shore that the prey awaits their coming. G. F. MCDOUGALL

Hydrographic Office, Admiralty

Extraordinary Meteor

THE following account of an extraordinary meteor occurs in a letter I received from a brother who is a missionary stationed in Agra. He does not give the exact place where he was at the time, but it must have been very near to Agra. The letter is dated Agra, 24th November, 1870. A missionary from Allahabad was with him when he saw it. ROBERT GRYSON

Mills Hill, Chadderston, near Manchester

"Agra, Nov. 24, 1870

"I recently saw a marvellous meteor. I was in camp, and had risen for an early march a few minutes before 3 A.M. on Nov. 4th. I was standing under the shade of a cluster of trees, when a sudden flash of light fell around. Two or three camp fires were blazing near, and at first I thought it might be a sudden flare up from one of them, but on casting my eyes up towards the heavens, I saw a large oval light, stationary. It appeared to be composed of a large number of irregularly-shaped, differently-sized stars, yet so closely packed as to form one light, yet giving the whole a sort of dappled appearance. At first I was struck dumb with amazement—thought it must be some mental illusion, or that my eyes were playing me false. But as I gazed it remained steadily fixed. ——— of Allahabad was with me. I roused him. He was soundly asleep, and some seconds passed in waking him up. In the interval it appeared to have been lengthened, nearly, though not quite, by a straight line, and as we gazed it assumed the shape of a large magnet, with the upper limb rather shorter than the other. It then gradually expanded, diminishing in brightness as it increased in size, assuming a wavy, serpentine form, though keeping much to a horse-shoe shape, until it became so attenuated as to be no longer visible. It must have continued in sight five minutes. It was seen by all the servants, and one of them cried out '*Bhagwauka sala hae*,'* by which he appeared to mean that in his opinion the Almighty was amusing Himself with fireworks; literally, 'It is God's sport or amusement.'"

NATURAL SCIENCE AT CAMBRIDGE

The following is a list of the Scholarships and Exhibitions for proficiency in Natural Science which are likely to be offered in Cambridge during the present year:—

TRINITY COLLEGE.—One or two of the value of about 80*l.* per annum. The Examination will be in Easter week, and will be open to all undergraduates of Cambridge and Oxford. Should one Scholarship only be assigned, preference will be given to the candidate who shows the greatest proficiency in Physiology and the allied subjects. Further information may be obtained from the Rev. E. Blore, Tutor of Trinity College.

ST. JOHN'S COLLEGE.—One of the value of 50*l.* per annum. The Examination (in Chemistry, Physics, and Physiology, with Geology, Anatomy, and Botany) will be on the 21st and 22nd of April, and will be open to all persons who are not entered at the University, as well to all who have entered and have not completed one term of residence. In this College, moreover, Natural Science is now made one of the subjects of the regular College examination of its students at the end of the academical year (in May); and Exhibitions and Foundation Scholarships will in consequence be awarded to students who show an amount of knowledge equivalent to that which in Classics or Mathematics usually gains an Exhibition or Scholarship in the College. In short, Natural Science is on the same footing as Classics and Mathematics, both as regards teaching and rewards. Further information may be obtained from the Rev. T. G. Bonney, Tutor.

CHRIST'S COLLEGE.—One or more, in value from 30*l.* to 70*l.*, according to the number and merits of the candidates, tenable for three and a half years, and for three years longer by those who reside during that period at the College. The examination will be on March 28, and wil be open to the undergraduates of this College, to non-collegiate undergraduates of Cambridge, to all undergraduates of Oxford, and to any students who are not members of either university. The candidates may select their own subjects for examination. Besides these there are three other Exhibitions perfectly open, which are distributed annually among the most deserving students of the College.

CAIUS COLLEGE.—One of the value of 60*l.* per annum. The examination will be on March 30, in Chemistry and Experimental Physics, or Zoology, with Comparative Anatomy and Physiology, or Botany, including Vegetable Anatomy and Physiology.—Scholarships of the value of 20*l.* each, or more if the candidates are unusually good, are offered, for Anatomy and Physiology, to members of the College.—Gentlemen elected to the Tancred Medical Studentships are required to enter at this College; these studentships are four in number, and the annual value of each is 113*l.* Information respecting them may be obtained from B. J. L. Frere, Esq., 28, Lincoln's Inn Fields, London; and respecting the other scholarships, from the Rev. N. M. Ferrers, Tutor of the College.

CLARE COLLEGE.—One or more of the value of 50*l.* per annum. The examination (in Chemistry, Chemical Physics, Comparative Anatomy, and Physiology, and Geology) will be on March 23, and will be open to students intending to begin residence in October.

DOWNING COLLEGE.—One or more, according to the merits of the candidates, of the value of 40*l.* per annum. The examination (in Chemistry, Comparative Anatomy, and Physiology) will be in March, and will be open to all students not members of the University, as well as to all undergraduates in their first term.

SIDNEY-SUSSEX COLLEGE.—Two of the value of 40*l.* per annum. The examination (in Heat, Electricity, Chemistry, Geology, Physiology, Botany) will be in October, and will be open to all students who may enter on the College boards before October 1.

Although several subjects for examination are in each instance given, this is rather to afford the option of one or more to the candidates than to induce them to present a superficial knowledge of several. Indeed, it is expressly stated by some of the colleges that good clear knowledge of one or two subjects will be more esteemed than a general knowledge of several.

Candidates, especially those who are not members of the University, will, in most instances, be required to show a fair knowledge of Classics and Mathematics, such, for example, as would enable them to pass the Previous Examination.

There is no restriction on the ground of religious denomination in the case of these or of any of the Scholarships or Exhibitions in the Colleges or in the University.

Further necessary information may be obtained from the Tutors of the respective Colleges.

It may be added that Trinity College will give a Fellowship for Natural Science once, at least, in three years; and that most of the colleges are understood to be willing to award Fellowships for merit in Natural Science equivalent to that for which they are in the habit of giving them for Classics and Mathematics.

EXPLORATION OF THE PERENE (AMAZONS) RIVER

ON the 28th November the Peruvian Government published the report of the expedition sent to examine the capabilities of the Perene river and neighbouring country, and the slope of their territory towards the Atlantic. This river, which is a branch from the Vcuyali, rises near Tarma, the capital of the Department of Junin,

* I cannot be quite sure of these words, not knowing the original language in which they were spoken.—R. G.

and flows through the country of the Chunchamayo Indians, a wild tribe, hostile to the Peruvians and but little known to them. The soundings were found to give from three to five fathoms in depth and the width was about 100 yards. The course of the river was east for 1,000 yards from its confluence and then north.

In the valley of Chunchamayo the forests consist of trees of extraordinary size, and the villages are numerous. According to Padres Amich and Sobrevista, the Indians belong to the tribe of the Amayos. The chief object of search of the expedition was the Cerro del Sal, or the Salt Hill, from which the Indians obtain that necessary article. The expedition consider they ascertained the region of it in a sandstone formation.

The expedition observed plantations of cocoa (coca?) and Indian corn, and on the banks of the river fishing huts, with nets and fittings for catching and salting fish. What was most striking was an iron furnace of a square form, about two yards high, and five feet each way, constructed of bricks eighteen inches long. It was worked with a double bellows, and supplied with coal, wood, and pounded ore. Water for the tanks was brought from a height in landers of bark hides. There were about twenty or thirty hundredweight of cast-iron. The whole excited the admiration of Mr. James Greg, owner of the Lima Iron Foundry, who accompanied the expedition.

The party fully ascertained the presence of salt, and considered they had found the vein of salt reputed to be ten miles in length, as they found it consisted of earth with particles of salt and quartz crystals. On digging down they found that the salt increased.

The Indians use the bow and arrow, and seemed much afraid of firearms. The commander recommends as the best mode of subduing them that the Salt Hill shall be taken possession of. It is considered that a navigable point has been found about 200 miles from the capital City of Lima, and by means of which it can obtain communication with the Atlantic. The Government is strongly urged to send a more powerful expedition.

HYDE CLARKE

BRITISH DIATOMACEÆ *

IT is now some years ago since Mr. Van Voorst published for Messrs. Smith and Beck two volumes of a "Synopsis of British Diatomaceæ," by Prof. William Smith, of Cork, which were beautifully illustrated by Mr. Tuffen West. The latter volume of this Synopsis was published in 1856, and even then the number of new forms of these minute silicious Algæ had rendered necessary the preparation of a supplement which, however, owing to the death of the author, never appeared. Since 1856 many and important works and memoirs on the diatoms have been published, and not only have the pages of the Quarterly Journal of Microscopical Science contained numerous writings on this subject, but workers like Rabenhorst, Grunow, and Cleeve have continued to add to not only the number of species, but to the amount of our knowledge of the Diatomaceæ. We venture, nevertheless, to think that the time had not quite come to write anew a history of the British Diatomaceæ. The difficulty of finding good specific characters remains just as great as it was when Smith's work was published, and the number of local lists recorded has been too few to give us anything like an idea of the geographical distribution of these forms; still we should be sorry not to welcome one of Mr. Van Voorst's series of British Natural History works, a series of which we have every reason to be proud; almost their only drawback being incidental to the method in which the works of the series are published, viz. in numbers, by which it too often happens that there is a want of uniformity between the earlier and later portions of the work.

Dr. Donkin's work is to consist of two parts, "the first will be introductory, and contain a full account of the Diatomaceæ and a new classification based on their structure and mode of development;" and the second, which is to be published first, "will be synoptical, and give an accurate and succinct description of all the known British genera and species. The synonyms of each species will be fully given *with the view of rendering the work more valuable for the purpose of reference.*" There strikes us as being something quaintly simple in the words we have italicised. Fancy an apology for giving synonyms, as if they were something or another that people did not care about!

Part one (pp. 1 to 14 and plates 1 to 4) now lies before us. The execution of the plates disappoints us. We know that the artist's right hand is very far from having lost its cunning, and yet the figures here are, to our mind, much inferior to the figures by the same hand in Smith's work. 500 diameters, too, is a large scale for the amplification, and will only unduly increase the number of plates—it does not appear either to have contributed to greater distinctness of detail. Plate 3 is open before us. Fig. 3 we should consider scarcely recognisable; and fig. 7 is greatly less true to nature in both outline and proportion than one also of the same species before us by Grunow.

The first family treated of in the text is the Naviculeæ. No synonyms are given to the genus *Navicula*, but we learn from the diagnosis and from the remarks in the text that *Pinnularia* Ehrb., as emended by Smith, is reduced to the rank of a synonym of this genus; so that Navicula will be a genus very full of species, and we venture to suggest that there will be great difficulty in many instances in determining whether to refer a species to the section with flattened or convex valves. The initials M. V. are used to express a view of the frustule, exhibiting the *median connecting zone*, and the *margins of the valves;* this we welcome as an improvement.

Perhaps this is hardly a fitting place to criticise very closely the species given in this part. Opinions may differ very widely indeed as to what is a species among these little Algæ, still we think it questionable if *N. didyma* var. Smith, Synop. vol. i. p. 53, quoted as a synonym to *N. smithii* De Breb. is not greatly nearer *N. smithii* var. *fusca* Ehrb. Again, we do not think that *N. hyperborea* Grun. is identical with *P. fusca* Ehrb.; it differs both in outline and details, and unless the difference in striæ is to be altogether given up, *Pinnularia forficula* O. M. cannot be regarded as synonym of *N. suborbicularis* Ehrb.; *N. nitescens* Ehrb., and *N. suborbicularis* Ehrb., are rightly kept as separate species, and we also approve of the separation of *N. subsalina* from *N. amphisbæna*. *N. latissima* Ehrb. is described as having striæ distinctly *granular*, how then can *Pinnularia divaricata* O.M., striæ distinctly *costate*, be regarded as a synonym? It will not do to separate some forms and bring others together exactly for the same reason. The habitats given are most meagre, and the work presents a contrast in this to the rest of Mr. Van Voorst's series. Even in cases where the author could have given Irish localities for rare and interesting forms, he has passed them over, and if we had not found a reference or two to the Lough Mourne Deposits in the County Down, we should have fancied that no Irish localities were to be given.

We have been thus candid in our notice because we believe it possible with care to remove from this work the signs of its being slightly premature. It only needs to keep to its promise and give the *synonyms* in full, and to give the *habitats* in full, at least for uncommon forms, and lastly, to make the figures more distinct, to make this "Natural History of British Diatomaceæ" a very valuable work.

W.

* "The Natural History of the British Diatomaceæ." By Arthur Scott Donkin, M.D. Part 1. Nov. 1, 1870. (London: J. Van Voorst, Illustrated with Plates by Tuffen West, F.L.S.)

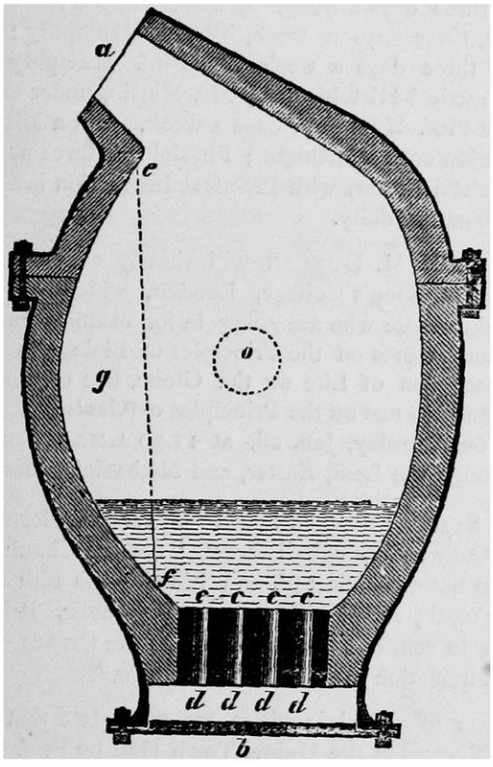
PAPERS ON IRON AND STEEL

No. II.—The Bessemer Process.

IN this paper I propose to describe the general phenomena of the Bessemer process, and then to examine the chemical actions producing these phenomena and the changes they effect in the material operated upon.

In the first place the pig-iron is melted in a suitable furnace, usually in that form of furnace known as the "cupola." The melted iron is run from this by means of moveable troughs into the "converter," which is a pear-shaped spouted vessel, lined with fire-clay, "ganister," or other refractory substance.

This pear-shaped vessel, a vertical section of which in the upright position and without mechanical details is represented in the annexed figure, is truncated at the lower end, and thus a flat circular bottom is formed. This bottom, which is readily detached and renewable, is fitted with longitudinally perforated fire-clay cylinders shown in section at *cd*, *cd*, *cd*, *cd*, each perforation or clay tube being about one-half or three-quarters of an inch in diameter,



and all communicating with the space *d d*, into which opens the blast tube from a powerful blowing engine. The number of these blast holes varies from fifty or sixty to a hundred or more, according to the size of the converter.

The converter is mounted on trunnions so arranged that it may turn on a transverse axis crossing about the middle of the vessel, as shown by the dotted circle *o*. The turning is effected by hydraulic machinery, controlled by levers readily worked by a man who stands on a platform in full view of the converter. In order to receive the charge of melted iron, the converter (the lining of which has been previously raised to a bright red heat) is turned over so that the dotted line *e f* becomes horizontal, and corresponds to the surface of a full charge. The belly *g* of the converter is so curved that it shall in this position retain the whole charge without any of it reaching the blast holes at *f*, or the mouth at *e*, and yet allow the whole charge to be readily "teemed" by turning the converter a little further down.

When the full charge is thus received in the belly of the converter, the blast is turned on, *after which* the converter is turned to the upright position, as shown in the figure, and the melted metal then stands directly over the perforated bottom. As will thus be seen, all the fluid metal above the openings is now resting upon a bed of air, and is only prevented from falling through by the blast being maintained at a pressure exceeding the falling force of the column of liquid above it. It would fall through these orifices into the blast-way and do serious mischief should the blast be stopped or slackened for an instant, or should the converter be turned upright or overcharged before the commencement of the blast. An accident of this kind but rarely happens, though it is by no means an unknown casualty.

The "blow," as it is termed, now commences; the hundred streams of air tear through the pool of melted iron, and a huge flame roars furiously from the mouth of the converter. At irregular intervals magnificent cascades of brilliant coruscating sparks are belched forth, and the dazzling spray as it dashes against the walls of the flame-shaft rebounds with redoubled splendour, each glowing globule being shattered by the shock and bursting into rescintillating fragments. The loud-bellowing blast roars on monotonously, but the flame becomes brighter and brighter continuously, and grows in length and breadth as it increases in brilliancy, until at the end of about ten minutes it attains its maximum, when its splendour is painful to the eye, and yet so fascinating that few who see it for the first time can turn their dazzled eyes away. The spark eruptions still burst upwards from time to time, and still dash against the brickwork and the ground, and still reverberate in fiery splinters, but their appearance has changed. They are now no longer red hot, or yellow hot, or white hot, but have a curious purple luminosity different from anything one has ever seen before. If it is daytime and the sun shining, the sunlight out of doors has a sickened partial-eclipse aspect when viewed directly after gazing at the flame, and at night the ordinary gas lights appear red and smoky.

After five or ten minutes' continuance of this maximum splendour, the flame is seen to contract somewhat, and presently the ponderous vessel turns a very deliberate summersault, the flame disappears, but the uninitiated spectator is startled by a new display; for as the converter rolls smoothly over, it disgorges a continuous stream of sparks which its rotation spreads out in a fan-shaped volley, extending from end to end of the building, and reaching the roof, descends in a broad sheet of fiery hail. This is the transformation scene which concludes the first part of the performance; for now the dazzle of the flame and the roar of the blast ceases, and a general lull intervenes.

The trough from the cupola is now swung round to the mouth of the converter, a red glow is seen to creep along it, and starry sparks dance above as it advances. This is the spiegelcisen coming from its cupola by the same path as conducted the main charge. The spectator should now change his position, and if possible find a standing place from which he may look into the mouth of the converter. At first he will distinguish nothing but a yellow glare, but by steadily fixing his gaze, he will presently, and rather suddenly, distinguish the surface and limits of the pool of melted metal. He will see that as the spiegeleisen pours into it, a furious ebullition takes place. At the same time a great mass of pale blue flame issues from the mouth of the converter, but with a quiet, leisurely waving that contrasts curiously with the previous roaring jet of white flame. This flame has but very little intrinsic luminosity, yet at night it lights up all the surrounding objects with a singular brilliancy, a sort of exaggerated theatrical moonlight effect, which is the most remarkable to a spectator outside, who on a misty night sees the long streams of ghostly light pouring through every opening of the building in pallid beams, that under favourable conditions may be traced for above a quarter of a mile. I have seen them projected in bright

discs upon the face of low clouds, and visible through the whole of their intermediate course.

When the flow of spiegeleisen has ceased, the trough is moved aside and a large counterpoised arm bearing the "ladle" is swung round upon an hydraulic piston, which forms at the same time its axis and lifter. The ladle, a large lined iron pot, is adjusted under the mouth of the converter, which is now tilted a little more, till the melted metal is poured out in a thick brilliant white-hot stream accompanied from time to time with great slabs of cinder of a darker colour which float upon its surface as it pours, and form a thick scum covering the contents of the ladle. When all the fluid metal is poured into the ladle, the converter is tilted over till completely inverted, and the remaining viscous mass of cinder drops out in a glowing heap upon the floor.

During these proceedings a set of workmen have been preparing the moulds in which the ingots of steel are to be cast. These moulds are of cast-iron, nearly cylindrical, being larger at bottom than top, and open at both ends. They have lugs or handles at top by which they are lifted. They stand upon a tile, and are well packed round the bottom with sand to prevent the outflow of the melted steel. While the blow was proceeding these were arranged in an arc of a circle whose radius exactly corresponds with the length of the arm bearing the ladle.

The ladle is now swung round and adjusted till it stands directly over the first of this row of iron vases, and a plug is released by which a hole in the bottom of the ladle is opened. Through this the steel is poured into the ingot. When the first is filled the plug is closed, the ladle swung round to the second mould, and so on, till all the steel is thus cast into ingots, the size of which varies with the kind of work for which the steel is required. A thin steel plate is placed on the top of each casting immediately the mould is filled, and over this a bed of sand is placed, and speedily and firmly pressed down.

As soon as the ingots have solidified, and while they are still glowing, the moulds are lifted off them by means of an hydraulic crane, and afterwards the ingots are picked up by tongs attached to the same machinery, and are carted away, all red hot, to the hammer-shops, where they are thumped and rolled or otherwise tortured into their required forms of rails, tyres, plates, &c.

The above are the leading phenomena of the Bessemer process; the chemical actions producing them, and the changes wrought in the pig-iron and spiegeleisen, will be treated in another part of this paper.

W. MATTIEU WILLIAMS

NOTES

OWING to Mr. Lockyer having been summoned to Malta to give evidence at the court-martial on the commander of the unfortunate *Psyche* (which we regret to hear has not been saved), we are unable to give a detailed report of the proceedings of the Sicilian Eclipse Expedition. We understand that Mr. Brothers, who was stationed at Syracuse, obtained five photographs of the Eclipse during totality. One of these shows the corona "as it was never seen on glass before." At Augusta very little was seen; but at Syracuse, the southernmost station of all, the clouds which concealed the earlier stages of the Eclipse, passed away from the sun about five minutes before totality, "disclosing," writes Mr. Brothers, "a scene I shall never forget." Next week we shall hope to be able to give a complete account of the results of the Expedition, and their bearings on any increase of our knowledge of Solar Physics.

PROFESSOR CARL GUSTAV BISCHOF, who died at Bonn on the 29th of November last, was equally distinguished as a chemist and a geologist. He was born in 1792, near Nüremberg, in Bavaria, and was consequently at the time of his death in his seventy-ninth year. In 1810 he entered the University of Erlangen, where the lectures of Prof. Hildebrandt induced him to devote his study to chemistry and physics. In 1816 he succeeded to his master's position, and brought to a conclusion his "Lehrbuch der Chemie." In 1822 he removed to Bonn, in which University he occupied the position of Professor of Chemistry from that time till his death. Shortly afterwards, however, he began to pay more attention to subjects connected with chemical and physical geology, publishing a large number of treatises of sterling merit, an enumeration of which is given in the *Geological Magazine* for January. In 1841 his "Physical, Chemical, and Geological Researches on the Internal Heat of the Globe," were published in London, and in 1854 an enlarged translation of his "Lehrbuch der chemischen und physikalischen Geologie," was issued by the Cavendish Society. He was a Foreign Member of the Geological Society of London, and had received from that body the gold Wollaston medal.

THE following courses on Anatomy and Physiology at Cambridge are announced for this term:—Zoology and Comparative Anatomy, three days a week, by Prof. Newton; Anatomy and Physiology, three days a week, by Prof. Humphry; Practical Anatomy, three days a week, by Prof. Humphry and Mr. Carver; Practical Histology, by Mr. Martin, under the superintendence of Prof. Humphry, once a week, with a Microscopical Demonstration once a fortnight; Physiology, three days a week, by Dr. Michael Foster, with Practical Instruction in the Physiological Laboratory daily.

PROFESSOR P. M. DUNCAN will shortly commence a course of Lectures at King's College, London, which is open to the public, and to those who are going in for examinations. It will comprise ten lectures on the Principles of Biology in its relation to the Succession of Life on the Globe, five on Astronomical Geology, and the rest on the Principles of Geology. The course will open on Saturday, Jan. 28, at 11.30 A.M., and will be continued through the Lent, Easter, and Michaelmas terms.

DR. E. SYMES THOMPSON will deliver two lectures at the Gresham College, Basinghall Street, "On the Circulation of the Blood," on Saturday the 14th and Monday the 16th of January, at seven o'clock, which will be free to the public. It is proposed next term to continue the course "On the Organs of Respiration and Circulation in Health and Disease."

IN answer to several inquiries, we may state that the penny lectures delivered at the Hulme Town Hall by Prof. Huxley and others, to which we referred last week, are published by Messrs. Heywood, of Manchester.

WE stated in our last number the lowest temperature recorded at Blackheath during the recent frost to have been 15·3° F. on the night of December 24. More recent tables published in the *Gardener's Chronicle* give the minimum as 9·8° on the 25th. From December 22nd to January 4th the temperature at Blackheath ranged between 6·9° below the mean of fifty years, on January 4th to 18·7° below the average on December 25th. The minimum above mentioned occurred at 7 A.M. on Christmas Day, being lower than any temperature since the morning of Christmas Day 1860, when it was 8°. In the midland and eastern counties, where the cold was most severe, it is feared that much injury has been done to vegetation, especially to the evergreens. In Paris the frost has been equally intense. In a paper recently read before the French Academy of Sciences, it was stated that during December the temperature only rose above the freezing point on nine days. In the fifty years from 1816 to 1866 the average temperature for the month of December has been 3·54° above zero C. or about 38° F. The average temperature of this last December has been 1·07° below zero C. or a little above 30° F.

Engineering for Jan. 6 gives a ground plan and elevation of the proposed building for the united accommodation of the Society of Arts, Statistical Society, Royal Colonial Institute, Iron and Steel Institute, Institute of Actuaries, Ethnological Society, Anthropological Society, Photographic Society, Social Science and Law Amendment Society, Juridical Society, Victoria Institute, Royal Archæological Society, Meteorological Society, East India Association, and others which will not find a home in Burlington House. The proposal is to adapt for the purposes of these Societies the block of buildings, No. 4, Westminster Chambers, Victoria Street, together with a triangular piece of vacant ground, about a fifth of an acre, now lying waste in the rear of the Westminster Chambers. With these resources it is calculated that ample room will be obtained for the needful offices, reading-rooms, &c., as well as for libraries and museums, and a large lecture theatre capable of holding 1,200 persons.

THE Meteorological Office is now issuing daily Wind Charts of the British Isles, which are published in the *Mercantile and Shipping Gazette*. The chart indicates the direction and force of the wind at a number of different stations on the coast of Great Britain and Ireland, and will be found of great value to all interested both in shipping and in meteorology.

WE have received a copy of the Inaugural Lecture delivered by Prof. M'Coy at the opening of the Industrial and Technical Museum of Victoria, at Melbourne, to which is appended a short sketch of the contents of the Museum. The most important collections are illustrations of the manufacture of glass and of pottery, a series of 1,300 specimens of Victorian rocks and minerals, and 500 specimens of New Zealand rocks; a phytological collection to illustrate the natural productions of the Australian colonies, and a series of Australian ores, slates, building-stones, &c. Courses of lectures on technical subjects are delivered at the Museum.

THE first number has been issued of a *Journal of the London Institution*, containing short reports of lectures which have been delivered and a programme of proceedings in the future. In future numbers it is proposed to devote considerable space to Notices of New Books presented to the General Library, to Bibliographic and Scientific Notes and Queries, and to Records of Laboratory Work.

WE have received the first number of *The Quarterly Journal of the Amateur Mechanical Society*, the object of which is stated by the honorary editor, the Rev. J. Lukin, to serve as a medium of mutual information upon all points connected with mechanical manipulation. The best idea of its nature will be given by a list of the contents of the first number: The Rise and Progress of the Society; Eccentric Turning; Mensuration and Enumeration of the Impalpable and Invisible; Medallion Machine; Fancy Turning in Box-wood; and Breechloading Fire-arms. Several of the articles are illustrated.

THE December number of the *American Entomologist and Botanist* completes the second volume, and the publication will now be suspended for a twelvemonth, intending to be renewed again after that period. In the meantime the botanical editor, Dr. Vasey, will conduct a botanical department in the *Journal of Agriculture*, published at St. Louis.

THE Natural History Society of Montreal has just issued its Annual Report, comprising a sketch of its proceedings for the year ending May 1870. Although the number of members has decreased during the year, the Society has, nevertheless, shown considerable activity, and many valuable papers have been read at its meetings on Geology, Zoology, and general subjects, some of which have appeared in the *Canadian Naturalist*, the organ of the Society. A very important work is now contemplated by the Society outside its immediate sphere of action, viz., the dredging of the Gulf and River St. Lawrence. Application has been made to the Dominion Government for a free passage for the dredgers in one of their ordinary cruisers. It is feared, however, that this application may not be successful, and that the Society may have to draw upon its private resources for the necessary expenses.

THE *Homeward Mail* gives reports of the earthquake that was felt in Scinde in October last. On October 28 two shocks are reported from various places. One report says "the earth quaked for fifteen minutes from east to west, and the people felt sea-sick while the pitching continued," and another ascribes it to the fact that the dwellers in Upper Scinde must have specially incurred the displeasure of the gods.

HEAVY rains, followed by severe frost, have produced their usual effect in altering the shape of the land. We have accounts of two extensive landslips, one at Whitby and one at Mevagissey in Cornwall. At the former place, "a large part of the cliffs, supporting twelve houses, has fallen into the harbour, and it is feared that more will fall." At the latter place about 500 to 600 tons of rock were precipitated to a depth of fifty feet, and much damage was done. Exactly a year ago, in December 1869, a great landslip was reported near Nantmel in Radnorshire. The mass of earth which fell was of enormous size, and did not become stationary till it had travelled half a mile. Much damage was done, though no lives were lost.

DR. HENRI VAN HEURCK publishes in French, under the title of "Observationes Botanicæ et Descriptiones Plantarum novarum Herbarii Van Heurckiani," the first fasciculus of a description of new and undescribed species contained in his herbarium. The descriptions are drawn up by several eminent botanists, and the herbarium, one of the richest in the world, containing collections from all quarters of the globe, results from a fusion of those of Sieber, Baron von Reichenbach, and Dr. Van Heurck, to which numerous important additions have been made by purchase and otherwise. The volume is offered in exchange for other botanical publications.

DR. L. PFEIFFER of Cassel, has recently published the first part of a "Synonymia Botanica locupletissima Generum Sectionum vel Subgenerum ad finem anni 1858 promulgatorum." Such a synonymy is much wanted by botanists who may be working at any particular order or genus. The value, however, for the ordinary systematist, is considerably decreased by the adoption of the singular arrangement of Endlicher in preference to those in use in Hooker and Bentham's "Genera Plantarum" or in De Candolle's "Prodromus."

MR. THOMAS MEEHAN read a paper before a recent meeting of the Academy of Natural Sciences of Philadelphia on the Compass Plant (*Silphium laciniatum*). He confirms the statement of earlier observers, that when the plant first comes up, and until the leaves become large and heavy, there is an unmistakeable tendency towards the north. When, however, winds and rains have once borne them in different directions, they have no power of regaining the points lost. Hence the statement made by some, that they have examined the plant in its native habitat, and found no such tendency.

THE *Pharmaceutical Journal* for December 31st contains an interesting article on the trade in leeches. The annual value of the leeches imported into this country decreased from 27,068*l.* in 1853 to 7,067*l.* in 1869; the largest quantity coming formerly from Hamburg, but more recently from France. These figures probably represent an import at the present time of two million leeches annually, besides the home supply. The leeches annually employed in France may be taken at thirty millions, the largest portion being produced at home. The South and West of France and North of Africa still produce enormous quantities.

A farmer in the neighbourhood of Bordeaux has recently converted waste land worth 300 francs per annum into enclosures for leeches, which now bring him in 25,000 francs annually. Besides the well-known brown and green leeches, a communication to the Société Zoölogique d'Acclimatation of Paris, by M. de Filippi, describes a new genus, *Hæmentaria*, from Mexico and the Amazon, which possesses the valuable property of leaving no mark on the skin to which they are applied; acting not by biting but by suction.

An interesting paper on the introduction of Maize into China, by Dr. Hance and Mr. W. F. Mayers, appears in a recent number of the *Pharmaceutical Journal*. The authors are inclined to believe that Asia may rank as a native country of this cereal; "the remote date assigned by Chinese records to its introduction, and the circumstance that the introducer is unknown," being, in Dr. Hance's judgment, "irreconcileable with the supposition that it was brought to this country by the Portuguese, their first arrival here under Ferdinand Perez d'Andrada being in 1517, and the earliest notice of maize in European literature dating later than 1530. Mr. Mayers gives translations of passages from Chinese authors bearing upon the subject, as well as facsimiles of early Chinese engravings of the maize and millet.

Mr. Edward Newman, in the *Field* for December 31, directs attention to the fact that during 1870 there has been an unusual immigration of quails to this country, and that a still more unusual number have stayed to breed; and desires to acquire materials for what he terms "a census of quails" during this exceptional year. The statistics particularly desired are: The number of quails bagged, and the dates; the number of nests found; the number of eggs in each nest; and especially remarks as to the period and direction of flight, both on the arrival and departure of the migrants. The occurrence of the quail in Britain in such unusual numbers is, as Mr. Newman observes, a matter of great ornithological interest.

Much good would accrue to our peasantry and working classes generally, if a better knowledge of the value of Nature's products were diffused amongst them. Blind prejudice prevents the proper application of a host of "unconsidered trifles." We in England might take a lesson from what is done in Sweden by a Public Society, who, during a time of scarcity of food, and for the purpose of diffusing a knowledge of the edible Fungi and Lichens of that country, prepared, published, and distributed to the public schools no less than 10,000 copies of a pamphlet on the Fungi illustrated with coloured figures, and 4,000 copies of one on Lichens illustrated by actual specimens.

That the *Boehmeria nivea*, or China Grass fibre, will, ere long, become a regular article of import to this country, is highly probable, both from the fact of the recent reward of the Indian Government for the invention of machinery suitable for its cleaning and preservation: and from the nature of the plant being such that the climate and soil of many of our colonies are quite suited for its culture. There is no doubt that it is well adapted for a variety of uses, and could, by careful preparation, be applied to purposes for which our present commercial fibres, though to some extent used, are nevertheless unsuited. The Chinese bestow an immense amount of care and labour upon its preparation, hence the very fine fabrics which are produced in that country. In Sumatra, also, much care is given to its cultivation and preparation: the stems are usually cut when they are about six feet high. They are sometimes allowed to dry before the fibre is taken from them, but the most common practice is to take it as soon as the stems are removed from the ground. A viscid gum is found on the stem which, in Macassar, is scraped off and used as a mild sort of arrow poison. In China three crops of the stems are usually obtained in one year, but the second crop is considered to yield the best fibre.

*ON THE GEOLOGY OF NOVA SCOTIA**

The author, in treating on the Laurentian Rocks of Arisaig, Nova Scotia, discovered by him in 1868, referred to the occurrence of pebbles of diorite, syenite, and granite in the conglomerates of the Lower Carboniferous area of the townships of Arisaig and Antigonish, and the highly micaceous character of their grits and sandstones. He had experienced difficulty in accounting for these appearances. It appeared singular, especially, that the mica seemed to increase in those strata in proportion as they became removed from known granites. The lithological character of the discovered Laurentian band appeared to account satisfactorily for the occurrence of those constituents of the Lower Carboniferous strata. There are some gneisses and porphyritic diorites; hornblendic rock in great variety; serpentines, black quartzite strata with veins of quartz, with abundance of crystals of mica (some would be disposed to call them granite veins); white syenite with stripes of green felspar and red syenite, both very sparingly hornblendic. South of these lies a Carboniferous area which seems to overlie the Laurentian band unconformably. This area is bounded on the south by a subtriangular band of metamorphic Arisaig, or middle and upper, Silurian rocks. This band is disposed in two anticlinal folds with an intermediate synclinal. The author designates it the Antigonish Sugar-loaf Band, so named from a prominent mountain of 710 feet elevation. The extreme breadth of this band, *i.e.* N. and S., is about five miles. The axes run easterly and westerly. The S. side of the Carboniferous area referred to rests unconformably on the N. side of the northern anticlinal, the strata in contact being Lower Carboniferous conglomerates. This area extends to St. George's Bay and Cape St. George on the Gulf of St. Lawrence; it is basin-shaped, and is said to contain seams of coal. This area may be called the Arisaig area. South of the Silurian area lies the Antigonish Carboniferous area. The lower part of this area consists of conglomerates, limestone, and gypsum. The conglomerate lies unconformably on the Silurian slates of the S. side of the southern anticlinal. The slates dip < 55° S. 5 E.; the Lower Carboniferous conglomerates and limestones dip < 30° S. 35 W. The observations made are at variance with two theories that have been advanced by different geologists to the effect—1st, that the Upper Silurian and Devonian formations of Nova Scotia have been thrown into a few *great* folds, synclinal and anticlinal; 2nd, that the Carboniferous and underlying Devonian or Upper Silurian formations acquired their present positions simultaneously, the mountains having had a thick Carboniferous saddle, which had been subsequently removed by denudation. This theory supposes that the Carboniferous areas of Nova Scotia had been once united with each other and those of other countries. The Nova Scotia areas that are now separated have always been so, the only connection ever existing having been merely geological.

The author discovered an interesting outcrop of Laurentian syenite in the Silurian area. This forms, in conjunction with limestone, a noticeable hill of 300 feet elevation, in the middle of the Antigonish area of Carboniferous limestone and gypsum. This syenite is seen to a large extent in direct contact with limestone of Lower Carboniferous age, having abundance of cyrtoceras, conularia, dentalium, and *Leperditia okeni*. The limestone and its fossils have not been altered by contact with the syenite, showing, as a consequence, that the syenite had its existing constitution when the limestones were formed upon it in the bottom of the sea of the Lower Carboniferous era. A specimen from the summit of the hill in the collection of rocks in the Provincial Museum is reddish, like specimens in the same collection from the Arisaig Laurentian rocks. It is more hornblendic, and shows green mica, like that of a specimen of granite from a mountain in Baddeck, Cape Breton. The author made interesting observations on supposed Laurentian rocks in the Island of Cape Breton, which lies to the N.E. of Nova Scotia, being separated from the latter by a narrow strait called the Gate of Canso. In the Nova Scotia department of the Paris Exhibition of 1867, there was a specimen of serpentine from a rock at St. Annez, Cape Breton. Prof. Wyville Thomson detected in this specimen supposed eozoönal structure. The author lately received specimens of granite from White Head, Aspy Bay, Cape Breton; and also from a position seventeen miles S., and seventy-three W. from White Head. He also referred to the existence of auriferous slates, like those of Nova Scotia, at Middle River,

* Abstract of a paper read before the Nova Scotian Institute of Natural Science by the Rev. D. Honeyman, D.C.L., F.G.S., &c., Professor of Geology in the Provincial Museum.

Cape Breton. He observes that, if a line were drawn from the granite mountain at Big Baddeck already referred to, bisecting the granite district at Aspy Bay, the Middle River gold-field would be five miles distant from the line on the one side, and the St. Anne serpentine (eozoönal ?) three miles distant from the line on the other side. Here we have what is supposed to be Laurentian serpentine, granite, and auriferous argillite in no respect different from the argillite of Wine Harbour and other gold-fields of Nova Scotia, all in close conjunction. The existence of Laurentian eozoönal serpentine in this locality is in accordance with a *forecast* of Dr. Sterry Hunt, to the effect that a line from the Arisaig Laurentian to Newfoundland will pass through Cape Breton. We may now expect, he observes, to find limestone with eozoön there; and, on the contrary, the same facts appear to be at variance with his "Terra-Novan" theory. As the local name Arisaig has been applied by Dr. Dawson to the Middle and Upper Silurian of Nova Scotia, the author would suggest that, as Cape Breton appears to be *in a manner* the meeting place of the Laurentian of Arisaig, Nova Scotia, and the granites and argillites of the Nova Scotia gold-fields, the local term "Cape-Bretonian" should be adopted as their designation, and that "Terra-Novan" should be reserved for other countries. The one term is equally euphonic with the other, and much more ancient. It was observed that there was a great gap between the Laurentian of Arisaig and its Middle and Upper Silurian and Devonian. In searching for formations to fill the gap, it was necessary to look to the gold-fields of Nova Scotia. The evidence of fossils was much desiderated in the investigation. The grits and argillites of the gold-fields were lithologically different from the Middle and Upper Silurian and Devonian (fossiliferous or metamorphic), and stratigraphical evidence showed what the author regarded as constructive unconformability. He expects in the further prosecution of investigations which are to be recorded at a subsequent meeting of the Institute, to be able to bring the evidence of fossils indirectly to his aid, and to point out direct sequence. It was observed that the upper and middle Silurian rocks of Nova Scotia had as yet failed to show gold even in the very smallest quantity—that various localities having metamorphic slates and quartz-veins of Clinton or Middle Silurian age had received a short-lived celebrity in the provincial newspapers, but the report had invariably been found incorrect. The author hailed the decisions of Prof. Hind in reference to the age of the Greneid (granite) grit and argillite of the gold-fields, and considered that he had rendered very important service in completing the Azoic (or Eozoic) and Palæozoic systems of Nova Scotia.

*LETTERS FROM CENTRAL AFRICA**

SERIBA GHATTAS IN DJUR, *July* 29, 1870

AFTER an absence of nearly eight months I have arrived here once more, considerably reduced in bulk in consequence of the privations and fatigues which I have had to undergo, but otherwise thoroughly well and active. A poultry yard and a milch cow, which I intend to provide myself with, will, in addition to a few weeks' rest, restore my lost strength completely. The journey to the Niam-Niam country, which I undertook as the guest of my friend, Mohammed Abu Tsammat, with his ivory caravan of 300 men, and whose acquaintance I made during the river journey, was successfully completed, as we had no losses to deplore, except a few female slaves who were taken away whilst fetching water; and besides the wounding of the leader, Mohammed, only one of my people was injured by an arrow, which struck him in the arm, but fortunately the wound was speedily healed.

The climate of the country traversed by us is an exceedingly salubrious one, and my people as well as myself enjoyed the best of health. I had only reason to complain, and that bitterly, of two things, viz. the numberless, excessively tedious, and disagreeable passages across the rivers, rivulets, and swamps, and the want of a sufficiency of food, which I experienced during the whole of the journey. In the southern part of my route such passages occurred every quarter of an hour, taking sometimes hours to complete. My donkey, which I have brought back in thorough good health, was consequently of little or no use to me, as I should have had to dismount continually. The waters are here, contrary to the otherwise steppe-like character of the country through which we journeyed, invariably surrounded and overshaded by dense masses of trees; a small footpath leads through the thicket; broken boughs and stems of trees from three to four feet thick lie about in all directions, over which it is necessary to clamber or stumble. Wading up to the hips in the black mud of the swamp, and at the same time passing through the prickly bushes, especially the Pandanus and Kotany (Calamus or bamboo) which fetched blood at every step, I was unfortunately not able, like Speke, to take my clothes under my arms, as the hands were as essential as the feet in helping one forward. My large hat was my only clothing. At length, when I had crossed over, clean water had to be sought for ablutions; then when I had got rid of the black tint, which made me look like a moor, I had frequently to remove leeches, of the thickness of one's finger, which had fastened themselves to my legs. How greatly I regretted not being able to dispense with my trousers, at least, to avoid the excessive annoyance which the constant dressing and undressing caused, but the sensitive epidermis of the adult European does not so easily accustom itself to the roughness of the path, and the sudden changes in temperature require to be guarded against as carefully as a Russian summer does.

Our dietary arrangements were, as I have already hinted, but of a very moderate character. Amongst the real Niam-Niam people there was, it is true, durrah corn, and upon the outward journey there was abundance of root-vegetables, such as cassavi, colocasia, and admirable yams (on the return journey, unfortunately, all these had been devoured or returned to the earth); but, on the other hand, there was an utter absence of cattle, the only flesh that could be obtained being that of fowls. At King Munsa's there were goats, but no corn. If I had not occasionally found time for hunting—in which, upon my return journey, I was successful in meeting with large numbers of antelopes—I must have starved. This want of provision was the more keenly felt, through the constant partial immersions sharpening the appetite; and on account of the difficulties of the march we were only able to have one meal a day, so that one's stomach was never thoroughly satisfied. My butter, which I had exhausted, I was compelled to substitute with goat-fat, and later on even with oil. Fortunately I always preserved a stock of tea and salt.

I travelled from here to Seriba Sjabbi, several days' journey to the south-east. After travelling for days through nothing but desert, we reached the territory of the principal chief of the Niam-Niams, called Nganji, with whom Abu Tsammat stands upon a friendly footing. Farther on, we passed through a district which is quite under the subjection of the latter, and governed by a former Niam-Niam soldier placed there by him. A Seriba and thirty warriors suffice to maintain his authority in this tolerably populous district. From here we traversed the country under the rule of the powerful chief Uando. Notwithstanding threatening rumours, we found him peaceably inclined, and he offered me as a present a large pot containing the entrails of an elephant a hundred years old, which my people, to whom I handed the delicacy, assured me was very tough and rather high. After passing through another desert for several days, we reached the territory of the Mombuttu King, Munsa, whose residence was the most southern point reached by me, situated a little beyond the third degree north latitude. The southern part of it lies on the great Uelle river, which appears to me to be the upper Chari, flowing into the Tschad lake, and which resembles the Blue Nile, near Chartum.

I could fill volumes were I to relate all my experiences at the court of this wild brown Cæsar, covered all over with red copper spangles, and looking like a well-furnished kitchen; of his numerous wives, painted in all the colours of the rainbow; of his immense palace, resembling a railway station, one of the rooms of which, and where I was first received, being 100 feet long by 50 feet broad, and 40 feet high. It would be impossible for me, however, to pass over in silence the horrible cannibalism which is here, as well as among the real Niam-Niams, everywhere in vogue. Munsa dines off human flesh every day of his life; the Mombuttu people make regular battues upon the wilder negro races in the south, where those that are killed are at once cut up, the fat is melted down, and the flesh dried. Those that are captured are driven off to be slaughtered at convenience.

The Niam-Niams are thrown more upon their own resources. If, however, there should happen to be a cessation of internecine feuds, they attack the Nubian caravans, although it should be to their interest to keep the peace, as they are well paid for their ivory and provisions with copper and glass beads, and their

* Translated from the *Cologne Gazette*.

chiefs receive rich presents. It is true the Nubians are not so philanthropic in their seribes, but in respect to the Niam-Niams, nothing can be said against them, as hostilities would destroy the object they have in view. The buried ivory cannot be discovered by any divining rod ; there are no cattle to be stolen ; and the women and children always hide themselves at once, and in time, in the impenetrable thicket of the woods, so that no booty is to be obtained in slaves. It is, therefore, however improbable it may sound, the Niam-Niams who, entirely through their horrible lust for human flesh, commence the war. "Flesh, flesh !" is their war-cry, and a few female slaves, at least, who have lost their way in fetching water, are sacrificed to their cannibalism.

The journey back was commenced by the same route. On touching upon Uando's territory once more, alarming rumours reached us. It was said that this chief had brought out the whole of his force of warriors to bar our passage ; in fact we discovered that the first villages we came to were deserted ; armed Niam-Niam warriors lurked everywhere in the tall grass, and approached within range of our guns. But they did not show themselves particularly desirous of entering into hostilities with us. At one of the next villages, where Abu Tsammat received from the head man some ivory which he had left behind him upon the outward journey, several Niam-Niam men pressed their services upon us as guides or parlementaires. I was fully convinced of the existence of treachery, and vainly endeavoured to persuade Mohammed to seize some of these spies, and hold them as hostages. He had to repent it bitterly. After a short time they proved themselves to be assassins sent out by Uando, as the chief fondly imagined that the caravan would fall into his possession upon the death of the leader. Mohammed rode in front upon his mule ; close behind him came the Niam-Niams. I followed a few paces behind them, and carried my gun myself, whilst Mohammed, according to custom, had his carried after him All at once I heard shots, and saw Abu Tsammat fall from his saddle covered with blood. One of the Niam-Niams had given him a thrust with his spear ; the assassins made off, and were lucky enough to escape, notwithstanding the shots that were sent after them, as there could be no question of pursuing them into the thicket. At the next village halt had to be made for the purpose of rest. The place was almost entirely in flames, and an entrenchment was made from the *débris* of the houses. Fortunately, the wound of the leader of the caravan, although a very severe one, it having been increased by drawing out the barbed point of the spear, was not very deep. With a number of entomologist's pins which I happily possessed, I managed to sew it up, and in three days' time the wound was nearly closed, and would have been soon completely healed if Mohammed could have kept himself quiet. During our enforced stay at this place we were frequently alarmed by demonstrations on the part of the enemy, but they could not summon up resolution to attack us seriously.

Busier times soon followed. The most serious part of the journey was the passage across the rivers, which, although we now followed a more easterly direction in order to avoid several of them, was occasionally used by the Niam-Niams for an attack upon us. The noise and shouting may well be imagined, when for instance a female slave completely disappeared with her burden in the flood, the beating of the Nubian soldiery, the clatter of the pumpkin shells and kettles ; all this increased by a hail of arrows hurled by unseen hands from the adjacent thickets. However, we passed through without any loss ; the enemy did not venture upon approaching near enough to hurl his costly iron projectiles, but contented himself with bamboo arrows with heads of hard wood. Another division that was allied to us, but which had separated itself from us on the outward journey, was not so fortunate, as whilst it was endeavouring to join us upon the return journey, it was attacked during the passage over the river by an overwhelming force. The leader and several of the soldiers were killed outright, others were severely wounded, so that the company was compelled to leave many valuable articles behind, in order to get out of the swamp as quickly as possible, and thus secure its retreat. After a very fatiguing march, I thus at length reached Seriba Tsabbo once more, where I intend resting for some weeks to recruit my strength, and to complete my collections and correspondence. Upon the road I had to cross once more the river Tondji, the passage of which I have made so frequently. As there is an utter lack of boats, all the baggage has to be conveyed on little rafts, each of which is steered by a swimming negro across the raging torrent. I can only express satisfaction with the result of my journey, although the direct distance travelled was not very great, being from here to Munsa's town about seventy-five German miles. I became acquainted with races, which, until very recently, had never come into contact with European and Oriental civilisation in the slightest degree, and who had developed for themselves a perfectly independent state of cultivation, so strange and uncommon that one imagined himself in a new world when among them. Not a scrap of European clothing, not a single glass bead remains with Mombuttu to remind one of the connection opened up by Mohammed Abu Tsammat a few years ago. Extraordinary to relate, there was no trace whatever to be found there of the great lake mentioned by Piaggia, and previously by von Heuglin, although we met with various tribes of the Niam-Niams, and were well supplied with interpreters. I have naturally laid down my route carefully, have made a collection of words of the different languages spoken by the races visited by me, and have taken the dimensions of numberless individuals, amongst others, several of the Acku dwarfs, whom I met at the court of Munsa, and one of whom I took away with me as my faithful attendant. The remains of the Mombuttu feasts furnished several skulls for my collection. The booty in plants was also a very extensive one. I have made up my mind, upon important grounds, to remain here for another year, and to make another journey into the Niam-Niam country, but this time by a westerly route, in order to clear up several remaining doubts as to the geography of this country, which was never traversed before me by a single European.

G. SCHWEINFURTH

SCIENTIFIC SERIALS

Poggendorff's Annalen, 1870, No. 8—The following are the contents of this number: (1) "Thermochemical Researches" (sixth, seventh, and eighth parts), by Julius Thomsen. This forms the conclusion of Thomsen's researches into the thermal effects of the neutralisation of acids, and ends with a collective statement of results. The experiments relating to what the author calls chemical "avidity" are likely seriously to modify commonly-received views of chemical action, showing as they do that the heat of combination between acids and bases is not a measure of their tendency to combine. (2.) "Researches relating to Electrical Discharge," by W. von Bezold. Experiments relating to the propagation of sudden electric waves in branched conductors. The author finds, among other results, that the velocity of such waves is independent of the material of the conductor ; his experiments also indicate the existence of electrical phenomena analogous to the reflexion and interference of waves. (3.) "On the Electro-motive Force of the Voltaic Arc," by W. von Bezold. Edlund has shown that the electric light plays the part, not merely of a resistance interposed in the circuit, but also of an inverse electro-motive force. Von Bezold attempts an explanation of this fact, founded on the consideration that the discharge between the carbon-points must be periodic instead of continuous, and therefore their difference of tension a variable magnitude, whose maximum exceeds the electro-motive force corresponding to the resistance of the arc and the mean strength of the current. (4.) "On the Theory of the Electrophorus Machines and of the Supernumerary Conductors," by P. Riess. (5.) "On the Specific Heat of Water in the neighbourhood of its maximum density," by L. Pfaundler and H. Platter. The authors determined the specific heat of water between 0° and 11° C. by mixing weighed quantities at known temperatures between these limits, and observing the temperature of the mixture. From their results, they calculate an empirical formula containing the fourth power of the temperature. Taking the specific heat at 0° as 1, they find that at 1°·25 it is only 0·9512, while at 6°·75 it is 1·194, and at 11° it is again as low as 1·0298. (6.) "Acoustical Studies of Flames," by E. Villari. The author found that the tone of a vibrating tuning-fork was reinforced when brought near to a large gas-flame. When the flame, which was thus thrown into sympathetic vibration, was looked at through radial slits in a rapidly revolving opaque disc, it was found that, if the rate of rotation of the disc bore the proper relation to the rate of vibration of the fork, the flame appeared to be divided by stationary bands showing alternate maxima and minima of brilliance. When the rate of vibration was changed, but all other circumstances remained unaltered, the distance between the bands was found to vary inversely as the rate of

vibration. (7.) "On the ratio of transverse contraction to longitudinal extension," by Heinrich Schneebeli. The author has applied Kundt's mode of measuring the length of stationary waves to the comparative measurement of the rates of the torsional and longitudinal vibrations of steel rods, and hence to the determination of the ratio between the transverse contraction and longitudinal extension produced by stretching forces: the mean results agree closely with those obtained by Kirchhoff and Okatow, as well as by Everett (Phil. Trans. 1867), from experiments on flexure and torsion. (8.) "On the compensation of an optical difference of path," by J. L. Sirks. An investigation of the condition under which the interference tints produced by polarised light passed through a thin plate of crystal can be achromatised by a compensating plate of selenite. (9) "Rejoinder to Dr. Most," by L. Boltzmann, relates to the second law of thermodynamics. (10.) "A contribution to the doctrine of Molecules and to the theory of Electricity," by C. Lorenz. An attempt to calculate the absolute number of molecules in a milligramme of water, founded upon Weber and Kohlrausch's absolute measurement of the electro-chemical equivalent of water and on the difference of potentials required for its electrolysis. (11.) "A contribution to the theory of Terrestrial Temperature," by O. Frölich. A discussion of Poisson's expression for the internal temperature of the earth at small depths below the surface, as a function of the time and the superficial temperature. (12.) "Remarks on the 'Bohemian Diamond,'" by Prof. V. L. von Zepharovich. The author states that only *one* diamond (not several, as has been implied in some reports) has been found in Bohemia; that this was discovered in a workshop in Dlaschkowitz, where pyropes (garnets containing chromium) are ground and bored with the help of diamonds; and that it is not yet ascertained how it came to be among the pyrope-sand in which it was found. (13.) "A remarkable stroke of Lightning," by Dr. J. G. Fischer. By examining the position of the magnetic poles in various pieces of iron and steel which were magnetised by the passage of the discharge, the author ascertained that the direction in which the negative electricity passed was downwards into the ground. (14.) "On the ratio of the specific heat of air at constant volume to its specific heat under constant pressure," by Dr. Witte. The author concludes, on experimental and theoretical grounds, that this ratio is not constant, but is a function either of the temperature, or of the pressure, or of both. (15.) "On the minimum of prismatic deviation," by A. Kurz. (16.) "An easy mode of preparing a liquid for the production of Plateau's Equilibrium-figures without weight," by Rudolph Böttger.

The *American Naturalist* for December opens with a paper on the Flora of the Prairies, by Mr. J. A. Allen, in which he gives an interesting sketch of some of the peculiarities of the primitive flora of the Upper Mississippi prairie in northern Illinois, and central and western Iowa, not inaptly termed "the Garden of the West." He remarks that the breaking and turning of the soil at once exterminates a number of the previously dominant species, and instead of lingering as troublesome weeds, the more hardy exotics that through man's influence assume an almost cosmopolitan habit, usurp their places, the cereals, the cultivated grasses, and the noxious weeds of the old world, thoroughly crowding out the original occupants of the soil. Dr. W. Stimpson follows with an article on the Distribution of the Marine Shells of Florida; and Mr. A. S. Packard with one on the Borers of certain Shade trees. Spring time on the Yuron, by Mr. W. H. Dall, gives an account of the sudden advent of summer in that territory. Mr. A. S. Collins on the Impregnation of Eggs in trout-breeding will be interesting to pisciculturists in this country, explaining the principle of a new process pursued at the trout ponds in Caledonia, N.Y. The usual space is devoted to reviews and miscellaneous intelligence, and we have some further details of papers read at the Troy meeting of the American Association.

The *Journal of Botany* for January has increased the amount of its contents by a rearrangement of its type, without any corresponding increase in price. We are glad to observe that it is intended to devote the journal more exclusively in future to British botany, thus supplying a want long felt by workers in this department. In the present number there are several articles of interest, including a description (with plate) by Mr. Worthington Smith, of a new species of fungus gathered in Messrs. Veitch's cool fernery at Chelsea; Observations on the genus *Pottia* (of Mosses), by Mr. W. Mitten; a few notes on Mr. H. C. Watson's Compendium of the "Cybele Britannica," by the Hon. J. L. Warren; and a Monograph of the genus *Xiphion*, belonging to Iridaceæ, by Mr. J. G. Baker. There is also a useful epitome of Dr. M'Nab's important paper on the "Transpiration of Aqueous vapour by Leaves," to which we have already referred; and the column of short Notes and Queries will be found interesting and valuable.

SOCIETIES AND ACADEMIES

LONDON

Zoological Society, January 3. — Professor Huxley, F.R.S., V.P., in the chair.—Prof. Flower exhibited and made remarks on a mounted skull of the Common Sturgeon (*Acipenser sturio*), from the Museum of the Royal College of Surgeons, in which the cartilaginous portions had been replaced by a wooden model. — Mr. Tegetmeier exhibited and made remarks on a specimen (in the flesh) of a female of the Great Bustard (*Otis tarda*), which had been killed on the 29th ult. near Feltham, in Middlesex.—Mr. Gould exhibited and made remarks on a skin of Lady Rosse's Touraca (*Musophaga rossiæ*), just received in a collection of birds from Loanda.—Mr. Wallace read some extracts from letters received from his brother, Mr. J. Wallace, containing remarks on the habits of a species of Lizard (*Phrynosoma*) and Rattlesnake (*Crotalus*), as observed in California.—A tenth letter was read from Mr. W. H. Hudson, on the ornithology of Buenos Ayres. — A letter was read from Mr. E. P. Ramsay, giving particulars respecting the habits of the new Australian Mud-Fish (*Ceratodus Forsteri*).—The Secretary read extracts from some correspondence between himself and Mr. G. W. des Vœux, Administrator of the Government of Santa Lucia, as to the best method of destroying the Poisonous Serpents (*Craspedocephalus lanceolatus*) found in that island.—Mr. Sclater exhibited and made remarks on the horn of the male Rhinoceros, which that animal had torn off in the Gardens on the 10th August last. —Mr. Flower read some notes on the skeleton of the Australian Cassowary (*Casuarius australis*), in which the differences between the skull of that species and *C. galeatus* were pointed out. Mr. Flower's observations were based on the skeleton of this bird, transmitted to Mr. Sclater by the Messrs. Scott, of the Valley of the Lagoons, Queensland, and now in the Museum of the Royal College of Surgeons.—A communication was read from Mr. Andrew Murray, containing some notes on the structure of the young of the Sterlit (*Acipenser ruthenus*).—A communication was read from Mr. George French Angas, containing descriptions of thirty-four new species of shells from Australia. —A joint communication was read from Dr. G. Hartlaub and Dr. O. Finsch, on two collections of birds from the islands of Savai (Navigator group) and Rarotonga (Hervey group). Several new species were described in this paper, the most remarkable of which was a new form, allied to *Gallinula*, from Savai, proposed to be called *Pareudiastes pacificus*.

Geological Society, December 21. — Mr. Joseph Prestwich, F.R.S., President, in the chair. "On Lower Tertiary Deposits recently exposed at Portsmouth," by C. J. A. Meyer, F.G.S. The author described some exposures of Lower Tertiary deposits made during excavations for the "Dockyard Extension Works" in Portsmouth Harbour. The thickness exposed, exclusive of alluvial deposits, amounted in all to 127 feet. The beds dip S.S.W., or nearly south, 2½ to 3 degrees. The author grouped them under the following divisions, in ascending order:—

1. Clays and sands with pyrites, 36 feet.
2. Argillaceous sands with *Dentalium*, 25 feet.
3. Sands with *Lingula*, 8 feet.
4. Clays with *Cyprina* and sandy clays, 55 feet.

The author indicated the fossils contained in each of these divisions, remarking upon the range of some of the species, and upon the apparent mixture of London clay forms with others usually regarded as characteristic of higher or lower beds which occurs especially in the "*Lingula* sands." He suggested that, as the species found here present some slight differences from those occurring in other deposits, the difficulty might be got over on Darwinian principles. The author considered that the fossils did not furnish any satisfactory evidence of the true position of these beds; but, from stratigraphical evidence, he regarded them as being included in group 3 and part of group 4 of Mr. Prestwich's section of the Whitecliff strata in the Isle of

Wight. He concluded with some remarks on the superficial deposits consisting of gravel and old and recent mud overlying the Tertiary beds in the section described by him. Prof. Ramsay called attention to the value attaching to such observations as those of the author on the nature of the superficial deposits.—Mr. Etheridge observed that the presence of the *Lingula* determined the position of the Bognor beds in the series, though there appeared great difficulty in fixing it stratigraphically. The commingling of species exhibited in this instance of shells hitherto supposed to be peculiar to certain horizons, he regarded as very remarkable.—Prof. Morris observed that the section seemed to show, not only the order of the beds, but their manner of deposition, the whole having formed part of a tranquil sea-bottom. He remarked on the difficulty of separating the more recent mud deposits from the beds of more ancient date. He pointed out the method of formation of septaria apparently by segregation, as they sometimes included undisturbed parts of the beds. The number of bivalves bored by carnivorous mollusks was remarkable, as was also the absence of *Pectunculus*. —Mr. Gwyn Jeffreys observed on the habits of *Lingula*, which had been by some regarded as an annelid, and not as a mollusk. It afforded a curious instance of the persistence of species, as there was no distinction that could be established between those of the Crag and of Silurian times. It lived at the present time between high and low water mark, and the *Panopæa* at a slightly lower level, and probably had done so in Tertiary times. Mr. Evans inquired whether the upper gravel, like that on the shore of Southampton Water, contained any flint implements. Mr. Meyer replied that he had not examined the gravels with that view.—"Note on some new Crustaceans from the Lower Eocene of Portsmouth, collected by Mr, C. J. A. Meyer, F.G.S." by Mr. H. Woodward, F.G.S. Mr. Woodward drew attention to the occurrence in the fossil state of pelagic forms of Crustacea armed with long spines on the latero-anterior angles of the carapace. Two Eocene forms had been described by Dr. Alphonse Milne-Edwards, namely, *Enoplonotus armatus* and *Psammocarcinus Hericartii*. Two new forms, differing generically from the above, but probably referable to the same family (the *Portunidæ*), were described, under the names of *Rhachisoma* (g. n.), *R. echinata*, and *R. bispinosa*. A third form, belonging to the Corystidæ, was then noticed. This family, represented in the fossil state by the genus *Palæocorystes*, is well known in the Gault and Upper Greensand of Folkestone and Cambridge, one species ranging up as high as the Maestricht beds. The occurrence of *Palæocorystes* in the Lower Eocene is of great interest. Mr. Woodward named this new *Palæocorystes*, *P. glabra*. 3. "On the Chalk of the Cliffs from Seaford to Eastbourne, Sussex," by W. Whitaker, F.G.S. — The author compared the chalk of the Sussex coast with that of the Kentish coast, and stated that it consisted of the following divisions in descending order :—

1. Chalk with flints of great thickness.
2. Chalk with flints and nodular layers, weathering rough.
3. Chalk without flints, but with nodular layers, weathering rough.
4. Thick-bedded massive chalk without flints.
5. More thinly-bedded chalk without flints, but with marly beds.
6. Chalk-marl, 50 or 60 feet.

The highest of these divisions stretches as far eastwards as Beachy Head, and forms the whole of the cliffs to within a short distance of that point. 4. "On the Chalk of the southern part of Dorset and Devon," by W. Whitaker, F.G.S. The divisions of the chalk were traced by the author westward from cliffs on the north side of Swanage Bay to beyond Beer Head in Devonshire. At first the succession of the beds was shown to be as in the Isle of Wight, namely :—

1. Chalk with flints, very thick.
2. Chalk with few flints.
3. Chalk-rock, very thinly developed.
4. Chalk without flints.
5. Chalk-marl.

It was shown that the lower beds became thinner westward, until, at one part of the Beer Head section, the chalk with flints rested at once on the Upper Greensand; and the following general conclusions were drawn :—That the chalk-marl thins westward, and its bottom part becomes marked by the presence of quartz-grains, showing perhaps signs of a less deep-sea character than usual. That the chalk without flints thins westward (from about 200 feet in the Isle of Wight), until, in Devonshire, it is but 30 feet thick, or even less. The consequent nearness of the chalk with flints to the Greensand helps to explain the deposits of flints on some of the Devonshire hills. Mr. Etheridge pointed out the resemblance between the series described by the author and that of the chalk of Antrim. He thought it probable that the cretaceous beds had originally extended over the whole of Western England. He called attention to the Blackdown-beds, which had been regarded as Upper Greensand, but certainly were not so, though probably Cretaceous, as well worthy of examination. Mr. Hull hoped that some Fellows of the Geological Society would extend their examination of the chalk into Ireland, and visit the Antrim district. It was the case there that the Chalk with flints rested immediately on the Upper Greensand, though there was an intermediate band known as the Mulatto-bed, which might possibly represent the Chalk-rock. Prof. Morris thought the paper afforded evidence in favour of the Chalk having been deposited in a sinking area, and during the process various alterations in the conditions took place. Mr. D. Forbes inquired as to the character of the nodules mentioned, and whether they were siliceous or not? Mr. Meyer mentioned that near Branscombe there occurred a band within eight feet of the Red Marl, containing fossils apparently the same as those of Blackdown. Mr. Whitaker had purposely avoided characterising the greater part of the Greensand-beds as either Upper or Lower. He thought the Cherty-beds of the west were stratigraphically higher than those of the Isle of Wight. The nodules inquired about were not siliceous, though probably containing some silica, but were rather phosphatic.

Anthropological Society, January 3. Dr. Charnock, V.P., in the chair.—Captain C. C. Poole, of Myansung, Pegu, was elected a Fellow. Professor Cav. Luigi Calvri, of Bologna, was elected a corresponding member.—Mr. Joseph Wilkinson exhibited and described a collection of human remains, weapons, and other works of art, found in an Anglo-Saxon cemetery near Barrington, Cambridgeshire.—Dr. Richard King read a paper on "The Manx of the Isle of Man." The author treated of the physical and psychological characteristics of the people of the isle, who, he maintained, were a pure stock of the great "Keltic" division of mankind; of their history, superstitions, language, literature, and works of art, and the statistics of population. On the latter, however, further information was required, which Dr. King hoped the census of 1871 might supply.—A paper by Dr. Beddoe, president, was read "On the Anthropology of Lancashire." The pre-historic antiquities of Lancashire are rather scanty, and the early and mediæval history of the north-west of England is remarkably barren as compared with that of the north-eastern district. The inhabitants of Salford were of Teutonic character, having been colonised during the Roman period by a cohort of Frisians, a few Danish, and other Scandinavian elements being present. The latter appear to be the strongest. The Saxon, or Angle, is in some force, as is also the Keltic, which, however, seems to have been partly Gaelic, and not wholly Kymric, as might, perhaps, have been expected. The effect of the Norman Conquest on the race elements in Lancashire would probably be inconsiderable, though there, as elsewhere, the Anglo-Danish, or Anglo-Norse, aristocracy, may have been somewhat more diminished, by slaughter and emigration, than the commonalty, whose blood may have had a larger admixture of the Keltic element.

Entomological Society.—Mr. Alfred R. Wallace, President, in the chair. Dr. Ross, of Toronto, was elected a member. The fourth part of the Transactions for 1870, published in December, was on the table. Exhibitions of British *Lepidoptera* were made by Mr. W. C. Boyd and Mr. Verrall; and of West African *Lepidoptera*, by Mr. Butler. A paper by Mr. Hewitson was read, entitled, "New Species of South American Diurnal *Lepidoptera*."

BRISTOL

The Observing Astronomical Society. — Report of observations made by the members during the period from August 6 to October 7, 1870, inclusive. (Continued from page 40.)

Aurora Borealis.—Mr. John Birmingham, of Millbrook, Tuam, writes:—"Though the night of the 24th September, when there was no moon and a densely cloudy sky, ought to have been extremely dark, it was, on the contrary, about as bright as if the moon were full, and the sky was similarly overcast. This extraordinary brightness began to decrease at eleven o'clock, and

continued diminishing up till midnight, when the clouds cleared away, and revealed an Aurora Borealis of rare splendour, though it was doubtless inferior to what, unfortunately, the state of the sky prevented from being observed previous to eleven o'clock. The auroral arch was wanting, but long beams extended up from its usual position, and brilliant coruscations were flashing almost on every side to the zenith, even at times from the south. At precisely 0^h 40^m G.M.T. there was a well-defined corona, with its centre exactly at *Beta Andromedæ*. By means of a lamp held at some distance, with the aurora as a background, I was enabled to position three spectroscope lines with a small pocket instrument. These were the usual bright band in the green, a very faint one near it on the left, and one of medium brightness near F. On the night of October 14, during another remarkable display, when the intense red of broad areas of light did not seem enfeebled by the rays of a very bright moon, there was no indication of a red line in the spectroscope. In fact, there was here no line whatever to be detected, and the white light seen in some parts of the sky gave only the one principal line in the green." Mr. H. Michell Whitley, of Truro, reports that on September 21 he observed aurora-parallel streaks of a rosy hue reached to an altitude of about 30° fading away and reappearing in fresh position. On September 24 another aurora was observed by him. "At times the streaks almost reached Polaris. On the following night a repetition of the phenomenon occurred. He observed that the streamers, after fading and disappearing, would again appear in all their beauty in fresh positions, when the sky would glow like a furnace, lighting up the surrounding scenery, as if it were illuminated by the reflection from some distant fire. About 8^h 15^m a beautiful rosy beam enveloped Capella, whilst a fiery, glowing cloud lay a little to the east of it. At this time the display was at its maximum degree of splendour." Exhibitions of aurora were also observed by the Rev. S. J. Johnson, of Crediton, Mr. William F. Denning, of Bristol, and other members of the society.

Occultation of the Planet Saturn.—Mr. E. B. Knobel writes that this phenomenon was observed exceedingly well at Burton-on-Trent. "The disappearance occupied 1^m 10^s. There was too much twilight for me to pick up Titan. The reappearance was observed to perfection, as far as atmospheric influences went, and, notwithstanding the low altitude, definition was very sharp as the planet emerged behind the bright limb of the moon. Ball's division, the shadow of the planet on the ring, and belt across the planet was quite distinct. The colour or rather the comparison between the colours of the moon and Saturn was decidedly different from that noticed at the April occultation. In consequence of low altitude, Saturn appeared of a light *liver* colour by the side of the yellow moon, whereas in April the colour of Saturn was more greenish. According to my rough observation, the time during which Saturn was *totally occulted* was 1^h 11^m 35^s." The Rev. S. J. Johnson, of Crediton, reports that at 4^h 40^m he first observed the moon, but could not make out the planet before a quarter to six. "Saturn was then visible though somewhat faint, with a power of seventy on a 2¼in. aperture; with 150 it almost faded away in the field of view. The planet appeared very dull at its emersion." Mr. George J. Walker, of Teignmouth, witnessed the disappearance of the planet with a 2in. O.G., power 32. The Moon totally obscured Saturn at 5^h 45^m 45^s, town mean time, which equals 5^h 59^m 44^s G.M.T. Mr. J. C. Lambert, of Sleaford, gives the following times of the disappearance of the planet and its ring:—First contact with ring, 6^h 4^m 2^s; first contact with globe, 6^h 4^m 14^s; disappearance of globe, 6^h 4^m 50^s; disappearance of the ring, 6^h 5^m 6^s.

Jupiter.—Mr. A. P. Holden, of London, writes: "The chief feature in the belt system of this planet has been the darkness of the permanent belt, which lies midway between the equator and the N. pole. Up till about the end of September it was so dark as to be readily visible with a very low power. Since then it appears to have brightened somewhat." Mr. H. Michell Whitley observed the planet on September 20, 11^h to 11^h 30^m: "The equatorial zone is of the same copper colour as during the last opposition, and of quite as deep a shade. The streaks N. and S. of this zone pale yellow. The narrow sharply-defined belt N. of the N. yellow streak is of a finer tint than in the spring of this year, being of a fine purple grey, with a very perceptible tint of rose colour in it – N pole, grey. The narrow band S. of S. yellow streak not as fine a colour as the belt N. of N. yellow streak, being purple grey—S. Pole, grey."

The Nebula in the Pleiades.—Under very favourable atmospheric circumstances, Mr. Albert P. Holden, of London, has had a very careful search for this object with his 3in. refractor of very fine definition. He says: "Although favoured with good eyesight, I entirely failed to pick it up. Upon comparing the image of Merope, as seen in the telescope with that of the *lucida* of this group, a very perceptible difference was observable. The rings surrounding Merope were more numerous, and had a very misty, ill-defined appearance; they were also markedly extended in a direction N. of the star. With these exceptions not the slightest traces could be found of the nebula. It has been seen with only 2in. Webb saw it readily on October 6, 1863, but found it 'very feeble' on September 25, 1865. Any member of the society, working with a large aperture, would confer a favour by searching for this object."

Coggia's Comet.—This comet has been seen on several occasions by Mr. George J. Walker, of Teignmouth. On the 29th and 30th of September it was in the field with a large number of eight and nine mag. stars. "It looked like a tolerably bright globular nebula."

MANCHESTER

Literary and Philosophical Society, December 27, 1870—E. W. Binney, F.R.S., President, in the chair. "Observation of the Eclipse of the Sun, December 22, 1870," by J. B. Dancer, F.R.A.S. The eclipse of the sun on Thursday, the 22nd of December, was favourably observed at Ardwick. Although a slight fog prevailed, all the details of the phenomenon were distinct, and tolerably well defined. A number of spots were visible on the sun's surface, two of which were of some magnitude. The nuclei of these spots were linked together by maculæ, and surrounded by a penumbra which extended to a considerable distance. Faculæ also were very numerous and distinct. The approximate times of contact taken by a chronometer corrected by the standard clock at the Town Hall were as follows:—first contact of the moon's limb with the sun 11^h 5^m 49^s; Contact of moon's limb with nucleus of the first large spot, 11^h 31^m 36^s; with the nucleus of the second large spot, 11^h 37^m 20^s; last contact of moon's limb with the sun, Greenwich mean time, 1^h 37^m 3^s. The temperature during the progress of the eclipse was taken at intervals by a mercurial thermometer with a black bulb *in vacuo*, exposed to the sun at the height of 4 feet from the ground.

TIME.			TEMP.
H.	M.	S.	DEGREES.
11	10	0	31·5
—	35	0	30·25
—	45	0	29·75
—	50	0	29·25
12	22	0	27·2
—	35	0	28·5
1	37	0	29·0

I had an impression that the moon's edge could be traced a short distance from the edge of the sun at the upper and lower points of contact, but this might be imagination. The black surface of the moon appeared very uniform in colour. I tried with powers of 80 and 180 to distinguish the moon's disc, but did not succeed. Light clouds were passing over the sun's disc at this time. The diminution in light was quite perceptible at the time of the greatest phase. Mr. Baxendell said that he observed the commencement of the Eclipse at Cheetham Hill. The first contact took place at 11^h 5^m $46{\cdot}2^s$ G.M.T. or 24·2 seconds later than the time calculated by Mr. Dickinson and Mr. Hind. The definition of the limbs of the sun and moon, and of the spots on the solar disc, was remarkably good, and he did not think his observation of the time of first contact could be in error to the extent of one second. The limb of the moon on the sun's disc appeared to be more sharply defined than the sun's limb. No distortion of the cusps was noticed. Unfortunately he was obliged to leave the observatory before the end of the eclipse, and therefore did not observe the time of last contact.

EDINBURGH

Royal Society, December 19.—Dr. Christison, the President, in the chair. The following papers were read:—1. Additional Remarks on the Theory of Capillary Attraction, by E. Sang, Esq., C.E. 2. Laboratory Notes: On Thermo-Electricity, by Prof. Tait. An endeavour to prove, experimentally, that the electric connection of heat is proportional to the absolute temperature, and an application of this result to the

measurement of high temperatures. (3 and 4.) Note on Linear Differential Equations in Quaternions, and Note on some Quaternion Integrals, by Prof. Tait. (5.) Note on an Ice Calorimeter, by Prof. Crum Brown. The author had, some years back, ordered the construction of an instrument on the same principle as that lately described by Bunsen. It is not yet completed, and he sent this note, not of course to claim priority, but to reserve to himself the right to use his own instrument.

Royal Physical Society, December 21.—Mr. R. F. Logan in the chair. The office-bearers for the session were elected as follows:—Presidents: R. F. Logan, C. W. Peach, Dr. Robert Brown. Council: James M'Bain, M.D., R.N.; Stevenson Macadam, Ph.D.; Andrew Wilson, Robert Scot Skirving, David Grieve, Professor Duns. Secretary: John Alexander Smith, M.D. Treasurer: Henry Budge, C.A. Assistant Secretary: James Boyd Davies. Honorary Librarian: Andrew Taylor. The Secretary exhibited the head of a roedeer, with the upper part of each horn bent backwards into a hook shape, or rather a complete loop; probably due to an injury when the horns were growing. He also exhibited a curious large specimen of a pigeon, with a bluish-grey head, mottled with white, and rest of plumage nearly white, the back and wings mottled wth a few darker feathers; tail large, nearly white; the breast and abdomen show traces of the reddish colour of the cushat, and the sides of the neck also showed the bright white spot, slightly bordered with green and red reflections, as in the cushat. It was shot in company with a flock of wood pigeons at Aldrught, near Elgin, in December, 1869. The bird has been supposed to be probably a hybrid between the cushat, or wood pigeon, and a fancy domestic pigeon, as a pouter, being rather larger in size than the cushat. If this were so, it is perhaps the first instance of the kind that has been observed; but probably a much more simple explanation may be given by considering it simply an albino cushat, or variety showing the plumage much changed to white. Very little variety occurs in the plumage of the cushat, so that the specimen is a rare one. The secretary also exhibited a specimen of the *Labrus mixtus*, or cuckoo wrass, taken on a long or hadock line in the Firth of Forth, in September, 1870. It is common on some rocky coasts, and specimens have been taken acording to Mr. C. W. Peach, at Wick, Iverach, and Kirkwa, in Orkney, but has apparently not before been recorded as taken in the Firth. The *Labrus trimaculatus*, or three-spotted wrass has, however, been taken oncee or twice in the Firth of Fourth; and, according to Dr. Günthr, in his valuable "Cataloge of Fishes," the latter is not a distinct species, but simply the female of the *Labrus mixtus*.—Mr. Robert Brown, Ph. D., M.A., submitted some recent observations regarding the Arctic marine currents. The author considered that there, were three main currents, which traversed th Arctic, American and European seas, exclusive of those of Asiae and Behring Straits. These were:—1. The current sweeping out of the Kara Sea to the westward, getting deflected against the Greenland coast; sweeping down that coast at the averag rate of eight knots an hour, varying according to the season, doubles Cape Farewell, and then runs north along the western shores of Greenland, decreasing in rapidity and in breadth from about 100 miles, to which it stretches at Cape Farewell, until its force is exhausted at near Disco Island. This current jams up the eastern shores of Greenland, within which it is always on the move summer and winter, and as seen rounding Cape Farewell is known to Davis Strait navigators as the "Cape Ice." It brings into Davis Straits great quantities of driftwood and Polar bears. 2. A current down Davis Strait. About Rifkol it is deflected off to the westward, and flows down the western shores of Davis Strait, carrying down great quantities of icebergs, which strand and melt on the banks of Newfoundland, there depositing their loads, others helping to form these banks. Here it meets with the Gulf Stream—the meeting of the cold and warm currents giving rise to the fogs so characteristic of that locality. At the mouth of Davis Strait there is an indraught of the Gulf Stream, which joins the Cape ice on the Greenland coast. It is also to this indraught that the drift mahogany logs, now and then picked up on the Greenland coast, are due. 3. The Gulf Stream, with the exception of the indraught already mentioned, does not enter Davis Strait, but sweeps across the Atlantic, retaining some degree of warmth as far as Novai Zemlai, and landing tropical products on the shores of Iceland and Spitzbergen. It is to this current that is due the freedom of the harbours of Norway and South-Western Iceland from ice.

BOOKS RECEIVED

ENGLISH.—The Heavens; A. Guillemin, 4th edition, edited by J. N. Lockyer (Bentley).—Travels in the Air: Jas. Glaisher, C Flammarioa, W. de Fonvielle, aud G. Tissandier (Bentley).—A Treatise on Magnetism: G. B. Airy (Macmillan).—The Student's Elements of Geology: Sir C. Lyell (Murray).—The Marvels of the Heavens: C. Flammarion, translated by Mrs. Lockyer (Bentley).—Elementary Natural Philosophy: J. Clifton Ward (Trübner).—The Duke of Edinburgh in Ceylon (Provost and Co.).

FOREIGN.—Jahrbuch der k. k. geologischen Reichsanstalt zu Wien, 1870. (Through Williams and Norgate)—Die Mineralien: J. C. Weber.—Die Fische Deutschlands und der Schweiz: J. C. Weber.

DIARY

THURSDAY, JANUARY 12.

ROYAL, at 8.30.—On Fluoride of Silver, Part II.: G. Gore, F.R.S.—Polarisation of Metallic Surfaces in Aqueous Solutions; Some Experiments on the Discharge of Electricity through Rarefied Med a: C. F. Varley.
SOCIETY OF ANTIQUARIES, at 8.30.—Election of Fellows.
LONDON MATHEMATICAL SOCIETY, at 8.—On Systems of Tangents to Plane Cubic and Quartic Curves: J. J. Walker.—On the Order and Singularities of the Parallel of an Algebraical Curve: S. Roberts.

FRIDAY, JANUARY 13.

ROYAL ASTRONOMICAL SOCIETY, at 8.
QUEKETT MICROSCOPICAL SOCIETY, at 8.

TUESDAY, JANUARY 17.

ZOOLOGICAL SOCIETY, at 9.—On a Skull of a Narwhal with two tusks, in the Cambridge University Museum: John W. Clark.—Descriptions of some new species of Australian Land Shells: Dr James C. Cox.—Notes on some points in the Osteology of *Rhea Americana* and *Rhea Darwinii*: Dr. R. O. Cunningham.
ROYAL INSTITUTION, at 3.—Nutrition of Animals: Dr. M. Foster.
STATISTICAL SOCIETY, at 7.45.—On the Comparative Taxation on Real Property, Personality, and Income: R. Dudley Baxter, M.A.
ANTHROPOLOGICAL SOCIETY, at 4.—Annual Meeting.

WEDNESDAY, JANUARY 18.

METEOROLOGICAL SOCIETY, at 7.—Heights and Velocities of August Meteors in 1870: Prof. A. S. Herschel.—Lunar Influence upon Rainfall: John C. Bloxam.—On Prof. Poey's new Classification of Clouds: Dr. R. J. Mann.
SOCIETY OF ARTS, at 8.
ROYAL SOCIETY OF LITERATURE, at 8.30.—On Prospero's Clothes-line (by A. E. Brae): Dr. C. M. Ingleby.

THURSDAY, JANUARY 19.

ROYAL SOCIETY, at 8.30.
SOCIETY OF ANTIQUARIES, at 8.30.
LINNEAN SOCIETY, at 8.—On the Vegetation of the Solomon Islands: Mr. Atkin.—Note on Byrsanthus (*Homalineæ*): Dr. M. T. Masters, F.R.S., F.L.S.—Historical Notes on the *Radix Galanga* of Pharmacy: Daniel Hanbury, F.R.S., F.L.S.
CHEMICAL SOCIETY, at 8.
ROYAL INSTITUTION, at 3.—Davy's Discoveries: Dr. Odling.

CONTENTS

ERRATUM.—Page 182, first column, line 34, for "we are justified," read "we are not justified."