THURSDAY, AUGUST 21, 1884

TECHNICAL INSTRUCTION[1]

II.

IN a former article the Report of the Royal Commissioners on Technical Education was reviewed so far as relates to the technical schools and colleges of the Continent. The present article deals only with that part of the Report which relates to the United Kingdom.

In the Report of the Royal Commissioners we have a very careful and full account of the various colleges and technical schools that are in existence at the present time. The condition and history of each of these institutions has been thoroughly looked into, and their importance has been fully estimated.

After having passed in review all the important institutions of this kind, the Commissioners devote an exceedingly important part of their Report to conclusions which they have drawn up from the facts placed before them in their various inquiries.

The early part of this chapter is devoted to comparing the development of the various industries both at home and abroad. The fact is pointed out that we were practically the sole possessors of modern appliances until the early part of the present reign, when the Continental nations, settling down to peace after troubled times, found that to compete in any way with us they must give every facility to the then rising generation to improve their position. For this purpose, as was shown in the previous article, technical or polytechnic schools were instituted in most of the Continental States. It is within this period that most of our present institutions for technical education have sprung into existence; but now, on all hands, we find that the advantages obtained from these are acknowledged both by those who directly benefit by their teaching and by manufacturers, who are able to advance the perfection of their products through the higher state of education of those serving under them.

One great aim of the Technical Commissioners has been to examine into the condition and systems of working of these institutes, and in this point they have to be congratulated upon the care and thoroughness with which they have sought and grappled with the weak points of the present system of education. Not only have the Technical Commissioners so carefully considered the defects in our system of education, but they have just as laboriously and skilfully offered suggestions and made recommendations of reform which it is only right that the nation should insist on being carried out.

One of the first weak points noticed is that almost all the colleges and technical schools stand in need of funds to enable them to cope with the demand made upon them for larger teaching staffs, greater accommodation, and better equipment in their art departments, laboratories, and workshops. Another great need that is pointed out, is the non-existence of modern secondary schools, which are necessary to give a preliminary training to students before entering one of the higher colleges or technical schools, where they can continue their study side by side with their practical work. In this case the Commissioners are of opinion that this, the greatest defect of our system, should be made a matter of legislation, and that local governing bodies should be empowered to found technical and secondary schools wherever necessary.

In discussing the value of the existing colleges the Technical Commissioners remark that "It is most praiseworthy on the part of the professors and teachers that they devote themselves to the important work of tuition for salaries so small as those which they as a rule receive, when many would, by employing their scientific and technical knowledge in private enterprise, obtain much larger pecuniary remuneration." This is of course a fact due in most cases to the lack of funds in such institutions, and in all probability would be considerably remedied if they were relieved from this trouble.

Again, in discussing this same question the Commissioners are of opinion that all colleges do not need to be of the highest type, but of those that are, they say:—"It is, however, of national importance that these few should be placed in such a position of efficiency as to enable them to carry out successfully the highest educational work in the special direction for which the circumstances, particularly of locality, have fitted them; your Commissioners believe that no portion of the national expenditure on education is of greater importance than that employed in the scientific culture of the leaders of industry." Surely the Commissioners could not have spoken plainer. They have without doubt placed on record the fact that such colleges are necessary for the increase of education; and that as yet they are not sufficiently well supported to carry on the duties intrusted to them to their fullest extent.

Two points are well worthy of note in reference to instruction in elementary schools. The Commissioners call attention to the fact that on the Continent *drawing* is an obligatory subject and is held as of equal importance with writing; this is a point which seems to have impressed them, because they are of opinion that "instruction in the rudiments of drawing should be incorporated with writing." This is a point referred to repeatedly in the Report, and great importance is attached to it, as will be seen by the recommendations quoted below.

The second point is the employment of a special science teacher, as at Liverpool and Birmingham, who devotes his time to going round to the various schools giving sound scientific instruction; each lesson being repeated during the week by the schoolmaster.

The whole Report is one mass of useful information, and the suggestions and recommendations which it contains are very valuable. The following are among the most important recommendations quoted at the close of the Report:—

I. As to public elementary schools:—(*a*) That rudimentary drawing be incorporated with writing as a single elementary subject, and that instruction in elementary drawing be continued throughout the standards. That the inspectors of the Education Department, Whitehall, be responsible for the instruction in drawing. That drawing from casts and models be required as part of the work, and that modelling be encouraged by grant. (*c*) That, after reasonable notice, a school shall not be deemed provided with proper "apparatus of elementary

[1] Continued from p. 358.

instruction," under Art. 115 of the Code, unless it have a proper supply of casts and models for drawing.

III. As to classes under the Science and Art Department, and grants by the Department:—(*a*) That school boards have power to establish, conduct, and contribute to the maintenance of classes for young persons and adults (being artisans) under the Science and Art Department. That, in localities having no school board, the local authority have analogous powers.

IV. Secondary and technical instruction:—(*a*) That steps be taken to accelerate the application of ancient endowments, under amended schemes, to secondary and technical instruction. (*b*) That provision be made by the Charity Commissioners for the establishment, in suitable localities, of schools or departments of schools in which the study of natural science, drawing, mathematics, and modern languages shall take the place of Latin and Greek. (*c*) That local authorities be empowered, if they think fit, to establish, maintain, and contribute to the establishment and maintenance of secondary and technical (including agricultural) schools and colleges.

V. Public libraries and museums:—(*b*) That museums of art and science and technological collections be open to the public on Sundays.

COTTERILL'S "APPLIED MECHANICS"

Applied Mechanics: an Elementary General Introduction to the Theory of Structures and Machines. By James H. Cotterill, F.R.S. (London: Macmillan and Co., 1884.)

AMONG the many indications of the increasing interest which technical education, in its widest extent, now calls forth, one of the most conspicuous is the production of manuals and text-books on the various subjects with which it deals. Amongst these there is none which is more important than Applied Mechanics, and, at the same time, we may add that there is none which has been more in need of a good elementary text-book. The great works on the subject by Rankine and Moseley are not adapted for elementary teaching, involving mathematical processes beyond the power of a beginner, and thus it has come to pass that a country renowned for its engineering triumphs and for the excellence of many treatises dealing with the practical applications of applied mechanics, has hitherto possessed no book devoted to an exposition of its principles and suitable for educational purposes. Those persons, therefore, who are familiar with Prof. Cotterill's work on the Steam-Engine will have looked forward with much interest to the publication of his long-advertised book on "Applied Mechanics." Its recent appearance we venture to think has in no sense disappointed their expectation, for it bears on every page evidence that its author has not only studied and become intimately acquainted with his subject, but that he possesses the rare faculty of having learned by experience in teaching, the best way of presenting a subject so as to diminish its difficulties and make rough places smooth for the footsteps of the beginner. By assuming a knowledge on the part of the reader of the elements of theoretical mechanics he has been enabled to devote the whole of this large volume to the exposition of the more complicated science, in which the principles of the former are applied to the problems of construction presented to the architect and the engineer. The treatise is strictly elementary in its methods, the mathematics used being, almost without exception, of the simplest kind, and many results, which have usually been obtained by complicated investigations, are here arrived at by neat and elegant simple processes. The style of reasoning adopted is also very successful, being neither too diffuse, nor, on the other hand, so much compressed as to puzzle and dishearten the beginner by gaps in the reasoning which his mental capacity is not able to bridge. This is particularly evident in the earlier parts of the book. Towards the end, in the section on Hydraulics and Pneumatics, we think that sufficient fulness of explanation has hardly been furnished, in dealing with the application of the principles of Energy, Momentum and Moment of Momentum, to Fluids, and especially in the case of Hydraulic Motors, to enable the student to grasp the subject without a frequent reference to some of the text-books which the author names.

Another point of supreme importance in which Prof. Cotterill's treatment leaves nothing to be desired, is the manner in which he has attained the aim he set before himself of endeavouring "to distinguish as clearly as possible between those parts of the subject which are universally and necessarily true, and those parts which rest on hypotheses more or less questionable." In Applied Mechanics it frequently, we may say usually, happens that, owing to various disturbing causes, exact investigations are either impossible to effect or useless from a practical point of view when carried out, owing to the complexity of the results, and we are therefore led either to adopt results derived from experiments conducted under the guidance of a roughly approximate theory or obliged to rely on experiment alone and, in studying the subject, it is of prime importance that the exact limitations should be stated under which the formulæ and rules given can with certainty be applied. This exact knowledge is necessary not only in the interests of science, but also in many practical applications involving the security of life or property. Many writers on this subject have slurred over or insufficiently estimated the importance of an exact statement of conditions and limitations, and consequently we are glad to recognise and point out the thorough and satisfactory way in which this has been attended to by the author.

The book is divided into five parts, of which the first is devoted to "The Statics of Structures." In this section there is not room in an elementary work for much new matter, but we may point out as specially good the manner in which the communication of stress from part to part of a compound frame is traced out. The relation and interdependence of the primary and secondary trusses of such a structure is here indicated more clearly than in any work with which we are acquainted.

The principal peculiarity of the book consists in the complete adoption of Reuleaux's Kinematic Analysis as the basis of the description and treatment of machines, both in their kinematic and kinetic aspects. In this system a machine is regarded as consisting "of a number of parts so connected together as to be capable of moving relatively to one another in a way completely defined by the nature of the machine. Each part forms an element of two consecutive pairs, and serves to connect the pairs so that the whole mechanism may be described as a chain, of which the parts form the links. Such a series of connected pieces is called a kinematic chain." It is in this mode of regarding the component parts of a machine and in the consequences that flow from it that the peculiarities of the modern system consist. A valuable feature of this work is the series of curves of velocity given for different mechanistic combinations, especially those derived from the slider-crank chain. The special use of such curves is that the varying motion of different parts is exhibited to the eye, which is thus enabled to realise its changes during the cycle in a complete way which would otherwise be difficult, if not impossible. Of the large and intricate subject of the Teeth of Wheels only a sketch is given, which a student would need to supplement by extensive reference to other books in order to understand.

In the Part on the Dynamics of Machines we find the chapter on "The Dynamics of the Steam-Engine" the best in the book. The mode of constructing curves of crank effort of two kinds is shown, and the results given in different cases for two cranks at right angles and for three cranks at angles of 120°, and these curves are used to determine the fluctuation of energy in a complete revolution. This last is expressed in terms of the total energy as a fraction which, in the case of a three-throw crank with connecting rod equal in length to six cranks is as low as ·0084. A method is afterwards given by which to obtain similar results from any indicator diagram.

The chapter on Friction contains a complete *résumé* of modern experiments on friction with an investigation by both exact and approximate methods of the efficiency of mechanism when friction is considered.

The Principle of Work is assumed throughout the book, being regarded as "a fundamental mechanical principle continually verified by experience, and a great many results are thus arrived at in the simplest way. One very interesting example is got by applying this principle (in the form known as the principle of virtual velocities) to the determination of the bending moment in the case of a loaded beam. Nowhere has the author been more successful in his simple mathematical treatment than in the chapters which deal with the strength and deflection of beams, and the power possessed by a combination of the mathematical and the graphical methods could hardly be shown more strongly than by the proof, given without the use of the calculus, of the most general form of Clapeyron's Theorem of Three Moments.

The fundamental theorems of the theory of elasticity are presented in an equally simple and elementary way. In describing the behaviour of matter strained beyond the elastic limit, a brief account is given of the mode of rupture of different classes of bodies when loaded so as to exceed that limit, and the information here furnished, as in all the other descriptive parts of the book, is brought up to the level of our present experimental knowledge.

The concluding chapters treat of the transmission and conversion of energy by fluids, and contain a brief account of the ordinary propositions in hydraulics and pneumatics, together with the outlines of the theories of hydraulic motors and of heat-engines. The flow of liquids and gases through pipes is also dealt with.

The aim of the book excludes any detailed description of machines, although the drawings of machines are, as a rule, working drawings, the desire being to elucidate the principles and theory of machines in general, but incidentally much valuable descriptive matter is introduced, and the illustrations are in all cases derived from actual machines and structures. Thus, among other valuable topics of practical interest we have an exposition of the theory of fly-wheels, centrifugal regulators, dynamometers, the balancing of machines, and of impact, this last being illustrated, amongst other examples, by the action of a gust of wind on a vessel.

At the end of each chapter we find a selection of well devised and admirable examples, most of them so framed as either by way of illustration to bring into prominence particular parts of the text or to show the influence in special cases of modifying causes. This collection, which must have taken much time and trouble to prepare, is by no means the least useful part of the book, the value of which is yet further increased by the full list of authorities for reference which is appended to each chapter, which will assist the student in extending his studies in any special direction.

This book may be recommended not only for the admirable mode of treatment of that which it contains, but also for the exclusion of that which does not find a place there. The same knowledge of the needs of a reader beginning the study of applied mechanics which has led to the selection and arrangement of the topics introduced, has led to the omission of other parts which, though useful and interesting in themselves, are not necessary to be mastered on a first approach to the subject. We could wish that the proofs had been more carefully revised, so that a number of, for the most part trifling, though tiresome, errata might have been corrected. A careful perusal of the volume leads us to express almost unqualified praise of this latest addition to the English literature of applied mechanics.

J. F. MAIN

OUR BOOK SHELF

Graphic and Analytic Statics in Theory and Comparison. By Robert Hudson Graham, C.E. (London: Crosby Lockwood and Co., 1884.)

THIS is an extensive treatise for the use of engineers, the distinguishing feature of it being that graphic and analytic methods are both employed. The first part (30 pp.) deals with the principles of graphic statics, and contains some well-chosen examples of the beautiful method of reciprocal figures. The second part (50 pp.) treats of the stresses of roofs and bridge structures, both methods being employed. The third part (290 pp.), which for some reason is called comparative statics, consists of eight chapters, the subjects of which are direct stress (elongation of bars, &c.), couples, composition of forces, centre of gravity, moments, straight beams and girders, solid girders in equilibrium, and wind pressures. Throughout the book there are interspersed collections of valuable exercises with their results.

The most manifest defect of the work is a prevailing inaccuracy of expression. With such a subject this is quite inexcusable, and is sure to be found excessively trying to the patience of a student. It is not at all due to want of mathematical knowledge on the author's part, so that, as might be expected, he is perfectly unconscious of it. Ludicrously so indeed; for in the preface he tells us that "the language used has been carefully studied with a view to simplicity and clearness," and explains how there came to be in his eye such a mote as "*angular*-point," without making the most distant reference to a store of *beams* sufficient for a rather massive engineering structure.

The choice and arrangement of the matter, too, cannot be commended. Elementary integrations are performed at full length, which may be done by the reader himself if he knows anything of integration, and which are useless if he does not. The expression for the radius of curvature in terms of dy/dx and d^2y/dx^2 is used at p. 252, and it is not until forty pages farther on that we find the usual elementary explanation of rectangular co-ordinates, the construction of a curve from knowing simultaneous values of x and y, and the meaning of dy/dx. This defect is really not distinct from the other: both are the consequence of a certain logical haziness of mind which may not, and we believe does not, detract from the author's skill as an engineer, but which is certain to be fatal to his success as an exponent of engineering science.

Had the main matter of the book been worthless or commonplace it could have been summarily dismissed; but there is so much evidence in it of ability and power of work that one eagerly wishes to see the style and structure of it improved. We trust a second edition may be called for, and that for the preparation of it the author may be induced to associate himself with some one having the necessary logical clearness and pædagogic skill to make it what it might easily be—an admirable text-book.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

School Museums

WHILE the very valuable display of educational appliances is still on view at the Health Exhibition, I should like to draw attention to the school museums which are becoming now an important element in the teaching of science. In Mr. Lant Carpenter's papers they were only slightly alluded to, though he did full justice to the technical exhibits. In the recent Instructions to Her Majesty's Inspectors it is laid down that an infant school which deserves to be considered "excellent" and to receive a corresponding merit grant should have a cabinet of objects which it is suggested should be partly collected by the children themselves. This of course is making teachers anxious to form such collections, and the London School Board supplies a cabinet wherever there is a promising nucleus for such a museum; it also supplies to any teacher that desires it a small box of chemical apparatus for making simple experiments on these objects, with instructions for the use of the different pieces of apparatus. One of these sets of apparatus forms part of the exhibit of the London Board. Of course the collection of the infants' department will be of a miscellaneous character, but in the museums that are now being formed in many of the boys' and girls' departments something better may be aimed at. The School Cabinet in Room No. 4 is filled principally from the schools in the neighbourhood of South Kensington. There are stuffed birds and a small crocodile, together with neatly-mounted skulls of animals, and specimens of corals, shells, and sponges, all from the collections at Park Walk, Chelsea. From other schools there are the skeleton of a rabbit dissected by a boy of eleven years of age, insects, reptiles, and other objects. There is also a collection from the Silver Street School at Kensington, contributed by scholars, teachers, and managers, comprising colonial products of various descriptions, specimens of different kinds of wood, many of them cut from the trees blown down by the great storm that was so destructive in Kensington Gardens in the autumn of 1881. There are also specimens of horseshoes with their appropriate nails, and illustrations of the successive processes in the manufacture of iron, cotton, and jute. These are all properly named and labelled by the schoolmaster. The lowest shelf of the cabinet contains illustrations of the geology of Peckham, ranging from the sands and gravels of the ancient Thames, the London Clay, the Woolwich and Reading beds, and the Thanet Sands, down to the Chalk. These form part of a fine collection at the Nunhead Passage Board School, Peckham. From the same school also there is a separate cabinet of minerals, which is displayed in the corridor. Some of the training colleges have formed good museums, as is evidenced by the collection from the Wesleyan College in Westminster.

In the further development of these museums two things may well be borne in mind:—(1) In addition to the more miscellaneous collections got together by the children and friends of the school, there should be supplied typical specimens for more systematic instruction. The Japanese exhibit such a collection of zoological types. (2) The special industries of the neighbourhood should be well illustrated in these museums. That this is well carried out in France and Belgium is shown by the contributions to the Exhibition from these countries, and especially by that of the Brothers of the Écoles Chrétiennes.

At the Educational Conference an afternoon was devoted to this subject. Dr. Jex-Blake described a Museum of Science and Art which has been formed at Rugby School, and in the discussion which followed particulars were also given of the loan collections for schools now being organised by the Liverpool School Board, of the Communal Museums, which are an important development of the French School Museums, and of a large Educational Museum which has lately been organised at Madrid. All these show the gradual, but sure, advance which is being made all along the line in the objective teaching of natural science.

August 14 J. H. GLADSTONE

The Red Glows

I HAVE recently been staying at Zermatt and have observed the great corona or circle round the sun mentioned by your correspondent, Mr. T. W. Backhouse, in NATURE for August 14 (p. 359). It was very distinct on July 29, both at Zermatt and on the Garnergrat, and likewise on the four following days. On August 3 rain fell in the evening, but the night became cloudless; on the 4th the corona had gone. I noted the following points:—(1) The colour of the circle was like the red of clean copper when it has become coated with suboxide; this faded away into what appeared brown against the blue sky. (2) Immediately surrounding the sun and between it and the circle the sky was blue. (3) The spectroscope directed towards the blue sky or a white cloud showed a complete absence of the bands lying near B, C, and D, which indicate the presence of water vapour. (4) A band appearing like a broad line was observed between D and E, distinct, but of lesser density than it usually appears at lower elevations. (5) There did not appear to be any marked difference in the intensity of the colour of the corona when viewed on the same day at altitudes varying between 6000 and 10,000 feet. (6) After rain had fallen on the evening of August 3 the almost cloudless sky altered in appearance; in that part close to the sun it appeared whitish, and the whiteness diminished as the distance from the sun increased, until it had faded away into blue. (7) On occasions when there were fleecy clouds in the sky during the visibility of the corona, the clouds as they approached the corona appeared of a pale but very vivid green. This colour effect was due to contrast.

Savile Club, August 15 W. N. HARTLEY

Remarkable Raised Sea-Bed near Lattakia, Syria

IN reference to the changes which have taken place along the coast of Syria and Palestine in recent times, the following letter from Dr. Post, of the Syrian Protestant College, Beirût, descriptive of beds of shells now living in the Mediterranean may prove of interest. EDWARD HULL

Geological Survey Office, Dublin

On a Deposit of Marine Shells in the Alluvium of the Lattakia Plain, in Syria

The Plain of Lattakia extends from Jeblah, a few hours south, to the chalky ridge which forms the southernmost of the roots of Mount Cassius, and separates it from the first of the valleys of that chain, the Wadi Kondîl; and from the Mediterranean on the west to the Nusairy Mountains on the east. A little to the north of Lattakia the plain juts out into the sea, in the Ras Ibn Hani. The portion of the plain north of Lattakia is low, flat, and separated from that lying east and south-east of the town by a low ridge which divides it from the valley of the Nahr-el-Kebîr. The eastern and south-eastern portion of the plain is traversed by three streams, flowing south-south-west from the Nusairy Mountains, and emptying into the Mediterranean east of the meridian of Lattakia. The first of these is the Nahr-el-Kebîr, the second the Nahr-el-Snowbar, and the third the Nahr-el-Beidha. The surface line of the plain rises gradually from the western limiting ridge of the Nahr-el-Kebîr to the base of the mountains, about five hours (by camel) east of Lattakia. The plain, however, in this portion is so channelled by the deep valleys of the above-mentioned streams and their affluents that it can only be called a plain with reference to an ideal surface tangent to the tops of its hills, or rather ridges, which occupy but a small portion of the total area. The height of the ridges near the centre of the table-land is about 350 feet, and increases gradually, with each successive ridge, until the foot of the mountain is reached. The flanks of these ridges are steep, often at an angle of 45°, and the bottoms of the main streams on the parallel of Lattakia are about 100 feet above the sea.

The soil of this table-land is a tenacious clayey loam, the product of alluvial deposit from the streams which now flow through its valleys. The deposits of marine shells are found at various points in the valleys of all three of the streams flowing through this plain. In my recent visit to some of these localities with Dr. Dodds of Lattakia, my aim was rather to survey the general character of the sites and the nature of the deposits than to make an exhaustive collection of the species, which would require much time and labour.

The nearest locality is in the basin of the Nahr-el-Kebîr, about an hour and a half north-east of Lattakia. Dr. Dodds has visited it, and found it less productive than that which we chose for our search. Our route lay nearly due east from Lattakia to a village called el-Qutrûjeh, three hours away from the town. At a distance of about an hour and a half from Lattakia we came upon a detached mass of conglomerate, the clay of which was barely solidified, containing many of the species of shells and corals which we afterwards found loose in the soil. The mass was about two feet long by a foot broad and six inches thick. It was the only one we found, and the only one found by Dr. Dodds in all his journeys through this plain. Near it were many detached shells, but of two or three species only. The most productive locality is the sides of the ridges east of el-Qutrûjeh. What seems most curious is that the shells are almost all found between the levels of 150 and 250 feet (measured by the aneroid). We found few above 250 feet, and those below that level were manifestly carried down by water.

The shells are found loose on the surface of the soil, or projecting from the steep slope of the hillside, associated with recent snail-shells. In a subsequent article I hope to give the names of the species found.

So far as I know, no similar deposit has been found in the alluvium of Syria. In a recent journey through Northern Syria we searched in vain for any traces of marine shells in the western portion of the Lattakia Plain and the valley of the Orontes. I have never seen them in the plains of Akkar, or Esdraelon, or Sharon.

GEORGE E. POST

Syrian Protestant College, Beirût, Syria

A Carnivorous Wasp

A FEW days ago a wasp, which had created some mild excitement by sailing over our luncheon-table, was observed to seize a fly which was on the back of an arm-chair. It settled on the fly, and when I came to look at the butchery—for I cannot call it a fight—the poor fly was minus its head, and I was in time to see one of its wings fluttering down to the ground. The wasp was stretching over its victim and holding him as a spider might do, and on my approach he spread his wings and carried off the body to the other end of the room, presumably to eat it. Both the wasp and the hou efly seemed to be of the common sort which have given so much trouble to the Queen's lieges in this hot weather. I never heard before of a wasp that imitated the habits of a spider. Could you tell me if this is an ordinary thing, or whether it was merely an individual eccentricity of this wasp?

F. N.

August 16

Intelligence of a Frog

LAST night I rescued a frog from the claws of a cat, and, to my great surprise, it turned, and, after gazing at me for a few seconds, jumped slightly towards me, halting after each leap and looking up into my face. It thus gradually approached, and in about two or three minutes had actually climbed upon one of my feet. Its mute appeal for protection was most remarkable, and could not possibly be misunderstood.

R. R.

Lawton, August 15

Meteor

LAST night, about 10.20 p.m., I happened to see a meteor worth recording. It moved horizontally, from south to north, across the middle of the western sky) about half way down from the zenith. The sky was cloudless: had that sky not been flooded by the light of a moon that was scarce on the wane, and that extinguished all but very few stars, the meteor would, no doubt, have been a brilliant phenomenon; under the circumstances its splendour was much dimmed. Its course was indicated by a series of small sparkling spangles, which flashed forth beautifully amid the gold-gray glow; the intermission of its lustre is a noteworthy fact.

J. HOSKYNS-ABRAHALL

Combe Vicarage, near Woodstock, August 8

Podalirius minutus

IN Prof. Mayer's recent work on the Caprellidæ ("Fauna u. Flora des Golfes Neapal") there is a species figured and described as *Podalirius minutus*, in which the anterior of the three posterior pairs of thoracic appendages are very minute, contain only two joints, and are attached about midway between the two ends of the segment which bears them. With this marked exception this species agrees very closely on all points with *Caprella lobata* and *C. linearis*. My object in drawing attention to it is to ascertain if it has been recorded as a member of the British fauna.

H. C. CHADWICK

SCALES

SCALES, as used by the architect and surveyor, may be roughly divided into two classes. In the first we have scales of equal parts, in the second scales of unequal parts, by means of which results may be obtained which otherwise would require more or less calculation. The fundamental idea of a scale of equal parts is that any assigned magnitude may be represented by a line of determinate length, and that thus any relation between magnitudes of the same kind may be indicated by a relation between lines in the same ratio. The simplest form in which they can be used is to represent in an enlarged or diminished size the magnitude of a length, as when, for instance, a mile is represented by an inch. By altering in two rectangular directions the magnitude of an area, we obtain a plan of it in which the scales used may be different for the two directions, as when the cross-section of a stretch of country has one scale for horizontal distances, and a different scale for vertical heights.

By introducing the system of coordinates, and representing, according to selected scales, the magnitudes of two or three related and dependent quantities, by lengths measured in two or three perpendicular directions, we are able to represent by geometry the connection between those quantities. This is done in innumerable cases in which the *plotting* of a quantity is effected and is the basis of the methods employed for obtaining continuous records of charging magnitudes. The important subject of graphical arithmetic and statics, curves of velocity, indicator diagrams, curves of bending moment, &c., as well as working drawings for machinery and plans for building, all depend for their usefulness on the representation of magnitudes by lines of proportional length. In the widest application of plain scales we may say that the relations between material things are represented by relations between magnitudes in space, and they have in this way been of the utmost service in scientific discovery, presenting to the eye the general nature of the relation between two associated quantities, and suggesting to the mind the probable law of their connection in cases when the law is unknown.

A convenient form in which to use ordinary scales is to have a foot-rule divided into inches, and into the half, quarter, and eighth of an inch, like plotting scales, and then subdivided on the one side decimally and on the other side duodecimally, the edges of the rule being bevelled off so as to enable distances to be immediately pricked off from the scale on to the drawing. Frequently scales are required different from those which are usually made, and it is then necessary to make a scale of the required size on the drawing. This is also required when measurement has to be made on the drawing itself. The scale must then be put on the paper at the same time that the drawing is made, so that if the paper should alter its dimensions, the scale will alter in the same proportion. A valuable adjunct to a scale of this kind is a vernier scale, which enables us to take off small distances with far more accuracy than the ordinary diagonal scales.

Of the scales in the construction of which numbers found by calculation are used, the commonest are those found on the ordinary sector, which contains a scale of chords by means of which an angle may be more accurately set out than by the ordinary plain scale protractor. By it we are enabled also to set off lines proportional to the trigonometrical functions, to solve all questions in proportion, to reduce or enlarge drawings in a required ratio, to describe a polygon of a given number of sides, and to perform calculations by means of the logarithmic line. This last is a line numbered from 1 to 100, the distance from 1 to any number being made proportional to the logarithm of that number. Thus, since the logarithm of 10 is 1 and of 100 is 2, the scale consists of two parts, the part from 10 to 100 being a repetition of that from 1 to 10, since the logarithm of a number between 10 and 100, say 40, is equal to the logarithm of 10 added to the logarithm of the same number divided by 10, such as 4. Thus by the compasses alone we are able to perform, with a certain degree of accuracy, the operations of multiplication, division, finding a third or fourth proportional, and evolution and involution. For instance, to multiply 35 by 27 we should first multiply 3·5 by 27, or of 35 by 2·7, in order that the product might be less than 100, and afterwards multiply the result by 10. Taking in the compasses the distance on the scale from 1 to 3·5 we should set that interval beyond the 27 on the scale. We should then find the leg of the compass furthest from the beginning of the scale pointing to 94·5, so that the product required would be 945. A similar process obviously enables us to perform division. There is, however, some inconvenience in using the compasses, and this may be avoided by the use of the slide-rule. This rule consists of two parts, one fixed, which we shall call A, the other sliding, which we shall call B; on each of these parts a logarithmic line of numbers is placed. Hence by the sliding of the rule we can perform the same operations which would otherwise require the use of compasses. For instance, to divide x by y, place the number on B denoting y against the number on A denoting x, then the number on A which is opposite to the beginning of B will give the quotient required. Similarly the square root of a number may be extracted by so sliding B that the number on A opposite to 1 on B may be the same as the number on B which is opposite the number on A, the square root of which is required. The rule may be arranged in other ways so as to give at once the squares of numbers, the lengths of the spaces being made proportional to the logarithms of the squares of the numbers indicated. This is used, for instance, in finding the content of timber.

A slide-rule which has lately been devised by Major General Hannyngton, whilst remaining very compact in size, is capable of much greater accuracy. Here instead of one very long rule, the rule is divided into a number of parts which are placed under each other, each part being a continuation of the part above it; the slide also consists of a number of parts arranged under each other, consisting of a set of bars with spaces between, which are united at the extremities by cross pieces. The bars on the slide fit into grooves in the fixed part or stock, and are so arranged that the numbers on the stock and on the slide both begin together, although the former is longer than the latter, in order that in every position the slide may have a part of the stock opposite to it. The use of this "extended slide-rule" is the same as that of the ordinary rule, but in the case of the largest which is made, it is as exact as a rule ten feet long, whilst it is compactly arranged, so as to be only one foot long. By this rule all the operations performed by the ordinary slide-rule may be effected, but with much greater accuracy. On account of this it would seem as if this rule ought to become very popular when its merits become known.

The graduating of a scale so that the distances from the end of it may be proportional to the logarithms of the numbers which are marked on it, which is the principle of the slide-rule, is evidently capable of a greatly extended application, and different scales may be devised intended for different purposes. Thus a set of three scales has been devised by Mr. Lala Ganga Ram, intended for the use of engineers, architects, and builders. The first of these is intended to show at a glance the scantlings of timber in beams and joists, and to obtain the stresses in trusses. The principle employed is correct, and the results obtained are very approximate. The depth and breadth of a beam sufficient either for strength or stiffness, can be found by the same rule. It has on the reverse side a scale, by means of which the stresses in the principal rafter and the beam of a king post truss may be found, and then the same quantities may be determined for trusses of different form by multiplying by a certain coefficient marked on the edge of the scale. This gives without any difficulty the maximum stresses coming on the principal rafter and tie-beam, and is all that is usually required, since the scantlings or minor components of a truss are generally determined from practical rather than from theoretical considerations. The second scale is designed to give the thickness of retaining walls. By means of information contained on the back of it the thickness may be found for various forms of wall and kinds of loading. Here again the method of using the scales could not be simpler, and the results are such as agree with calculation. The third of the set enables us to find the stresses (or, as they are called by the inventor, in accordance with ancient custom, strains) on girders. When we state that this scale enables us to ascertain the stress on the flanges at any point of a beam up to 200 feet span, and also the shearing stress at any point of beams with different systems of bracing under both uniform and travelling loads, and that this is effected by merely sliding the scale, it is evident that we have here a means of obtaining at sight results which would otherwise require a considerable amount of calculation. The results are such as, for all practical purposes, seem to be abundantly accurate.

The principle of the slide-rule is thus one which is susceptible of almost indefinite application. It may be used in all cases when the results we wish to attain depend on calculations for which logarithms are ordinarily used

—in just those cases, in fact, in which calculation is laborious. It has the defect of logarithmic calculation in a very exaggerated degree, inasmuch as it is not accurate, but in very many cases this is of no great importance, since the degree of accuracy attainable is abundantly sufficient for all practical requirements. Scales possess one great advantage over methods of calculation, in that it is not possible to make the mistakes which so easily enter into arithmetical calculations. If they be accurately constructed, the modes of using them are so simple that there is scarcely a possibility of making a mistake, and we can predict beforehand the degree of accuracy which may be relied on. For engineering and other simple calculations we believe that these scales, and others like them, will be more and more used as they become more widely known.

THE FISHERY BOARD FOR SCOTLAND

THE second Annual Report of the Fishery Board for Scotland has just been issued, and contains much of scientific as well as economic interest.

The first Royal Commission on British Fisheries was founded in 1630. Immediately after the Union the fishing industry almost ceased to exist, owing apparently to the enactment of salt duties. In 1727 an Act was passed, by which the Board of Trustees for Manufactures and Fisheries was created, which, besides encouraging and superintending the fisheries, was empowered to pay certain "bounties" to the herring "busses," and offer premiums to the fishermen who first discovered herrings during each season at the different parts of the coast. In 1808 "An Act for the further encouragement and better regulation of the British White Herring Fishery" was passed. The Commission appointed to carry it into effect had charge of the whole fisheries of the British coasts, and later of the Isle of Man, and, in addition to granting bounties, had 3000*l.* placed at their disposal for encouraging the fishermen to use larger boats, so that they might go further out to sea. The Commissioners stationed officers at the chief coast fishing centres both in England and Scotland, and later two officers to the port of London, from whence large consignments of herring were sent abroad. The Admiralty provided a ship of war to assist in the work of superintending, and in 1815 a cutter was obtained for use in the Firth of Forth, and afterwards at other parts of the coast. Whatever influence the Commissioners had in improving the supply of fish and in developing the fisheries cannot now be estimated, but there can be no doubt that they rendered immense service in collecting statistics, which were till recently the only reliable fishery statistics extant, and of sufficient value to have justified the existence of the Board of Fisheries, even though all other work done were left out of consideration. From the statistics so collected, a valuable chart (Appendix A, Table VIII.) has been prepared by Mr. Robertson, one of the clerks of the Board, which shows at once the take of herring from 1809 to 1882; while Appendix C gives fresh statistics of the quantities and values of white fish and shell-fish. In 1820 the officers were instructed to take the cod and ling fishery under their charge; in 1821 the bounty for encouraging deep-sea fishing was withdrawn; in 1830 all bounties were repealed, and part of the money set aside for the erection of piers and harbours. In 1839 the Secretary of the Board of Manufactures was appointed Secretary of the Fishery Commissioners, and soon after this the Commissioners began to direct their attention to some of the hitherto neglected problems connected with the fisheries. In 1836 the question arose whether or not sprats were young herring, which Dr. Knox, who was appealed to, decided in the negative. This question having led the Commissioners to take an interest in the young herring, and to see the necessity of gaining some definite information as to the growth, food, and habits of the fish, Mr. Henry Goodsir carried on investigations in the Firth of Forth during 1843-44, from which it was ascertained that the food of the herring consists chiefly of young Crustacea. From the Report of 1846 it is evident that the Commissioners were acquainted with the fact that the herring ova sink and adhere to whatever they come in contact with. In 1850 the English stations were discontinued, and in 1856 another step in the right direction was taken, at the request of Dr. Buys Ballot, who invited those engaged in the great herring fishery to make observations in order to ascertain the circumstances likely to lead to the most profitable fishing and to enable them to make a herring chart. According to instructions issued by the Board of Trade, samples of herring collected on various parts of the coast of Scotland were forwarded to it, but no record is made of their examination. In 1860 complaints of the effects of trawling for white fish in the spawning grounds having led to another inquiry, Prof. Allmann decided that there was no evidence to show that trawling was likely to do injury to the spawning ground. No continuous investigations were, however, carried on by the Board, a new complaint being merely followed by a new inquiry or new Commission. Had the Board been provided with funds necessary to carry on continuous investigations as to growth, food, and habits of the herring and other useful fishes, much valuable information might have been obtained and great expense of Commissions of Inquiry avoided. It is therefore a matter of surprise and regret that, notwithstanding the example of other States, the influence of the Fisheries Exhibitions, and the demand for more information, the Treasury has not yet provided the new Board with sufficient funds. Another agitation arose in 1860, which led to the appointment of Prof. Allmann and Dr. Lyon Playfair, C.B., to inquire into the effects of trawling at the Fluke Hole, Pittenweem, and about the same time Dr. Playfair and Vice-Admiral Henry Dundas were requested to inquire into the claims of the sprat fishermen of the Firth of Forth. The agitation continuing, a Royal Commission, consisting of Dr. Lyon Playfair, C.B., Prof. Huxley, F.R.S., and Lieut.-Col. Francis Maxwell, was appointed in 1862 to inquire as to "the operation of the Acts relating to trawling for Herring on the Coasts of Scotland." The Report of this Commission is especially interesting, because it contains the results of the inquiries made by Prof. Allmann during the winter and spring of 1862 as to the nature of herring ova. The investigations made by him proved that the spawn of the herring "was deposited on the surface of stones, shingle, and gravel, on old shells and coarse sea-sand, and even on the shells of small living crabs and other Crustacea," and that it "adhered tenaciously to whatever matter it happened to be deposited on." The Report also contained a valuable chapter on the natural history of the herring, in which it is pointed out for the first time that there are two principal spawning periods, an autumn period with August and September as the two principal months, and a spring period with February and March as the principal months.

In 1873 the Scottish Meteorological Society began a series of inquiries with a view of determining how far the temperature of the sea and other meteorological conditions affect the migration of the herrings. From information obtained it was concluded (1) that the catch of herrings is less during any season with a high temperature than during a corresponding season with a low temperature; (2) that if the catch of herrings is higher in one district than in the other, the catch is greatest in the district with the lowest temperature; (3) that when the surface temperature is higher than the temperature lower down, the herrings seek the deeper water. It will be seen from the foregoing statement that the officers of the old Board were not utilised for making investigations. Important facts were however established as to (1) the nature of the spawn; (2) the periods of spawning; (3) the food of the herring. In 1882 the Board of British White Herring Fishery having been dissolved, the present Fishery Board for Scotland was established, to carry on the work of superintending the fisheries, and also to "take such measures for their improvement as the funds under their ministration may admit of." The Board soon recognised the absolute necessity of obtaining accurate scientific information as to the habits and life-history of the food fishes, and therefore appointed a Committee consisting of Prof. Cossar Ewart (convener), Sir James R. Gibson Maitland, Sheriff Forbes Irvine, and J. Maxtone Graham, to carry on scientific investigations.

The preliminary report of work done in the autumn of 1883 and at Ballantrae has been already given in NATURE. The Admiralty has been pleased to provide a gunboat, H.M.S. *Jackal*, Lieut. Prichett, R.N., commander, to help in the investigations and inspect the spawning grounds, and the Board has also at its service the cruiser *Vigilant*, both of which vessels have done excellent work, though it is desirable that they should be replaced by others more capable of sea-going service. The Board is fortunate in having in its service a large staff of intelligent officers not only familiar with all the practical aspects of the fishing industry but deeply interested in the scientific work of the Board, which they aid to their utmost power. The future lines of inquiry which the Board hope to undertake include (1) the examination of the spawning beds round the Scottish coast; (2) the determination of the food of useful fishes; (3) the investigation of percentage of young herring, &c., destroyed by present modes of fishing; (4) the influence of sea-birds, &c., on supply of fishes; (5) study of spawning, nature of the eggs, and general life and development of herring, &c.; (6) best means of restocking deserted fishing grounds; (7) of increasing artificially the supply of shell-fish; and (8) of inquiry into fungi, &c., hurtful to fish life. The Board is fitting up a marine station at St. Andrew's, where Prof. McIntosh will make investigations for the Board, whilst similar work will be carried on in the Moray Firth. We trust that the impetus given to and the interest excited in the work of the Board may produce most favourable results, both economic and scientific.

We hope to return in a future number to some of the papers of specially scientific interest contained in this Report.

THE HISTORY OF A TYPHOON

PÈRE DECHEVRENS, the indefatigable head of the Meteorological and Magnetic Observatory at Zikawei near Shanghai, has just published the first part of a work dealing with the typhoons of 1882. The present instalment is confined to those of the months of July and August in that year. The various plans and maps showing the course of the typhoons, and the height of the barometer at various times during their progress in different places, are so "fabulously complicated," to use the writer's phrase, that he fears more than one reader will regard his pamphlet as a work of imagination. Père Dechevrens, however, has had the advantage of observations made in China, Japan, and the Philippines by captains of vessels, lighthouse keepers, Customs officers, &c., such as have never before been made of any cyclone. Chinese typhoons, as he points out, fortunately for the meteorologist, though unfortunately for the navigator, ravage places visited by the ships of all nationalities, and hence with a little arrangement and organisation these phenomena may be easily studied in these regions. The Shanghai Chamber of Commerce and Sir Robert Hart have arranged for a regular supply to Père Dechevrens of a regular series of meteorological observations, and one of the earliest results is the pamphlet now before us. As a consequence of these wide and varied observations, the writer, while acknowledging the work of his predecessors, such as Spindler in Russia, Knipping in Japan, and Faura in Manila, claims that, while they were only able to give the history, as it were, of incidents in the life of a typhoon, he, thanks to the vast number and extent of the documents placed in his hands, has been able to connect these various fragments, and to trace the history of several typhoons from their cradle in equatorial maritime regions to their grave in the North Pacific Ocean. This, in his own words, is what Père Dechevrens has now done in his pamphlet. The first section deals with July 1882, and it is divided into several sub-sections, dealing with the formation of a typhoon on July 5, its progress in the China Sea, and a first separation or offshoot from the main storm, its progress on the mainland of China, the second typhoon of July 10 in the China Sea, and before Hong Kong, in the Formosa Channel, "its flight towards India, and its disappearance in the north of China," and finally an account of a typhoon in Hong Kong and Indo-China. The typhoons of August are discussed in a similar manner in detail, the conclusions being supported by observations made in all parts of the China seas and coasts. There are also a large number of diagrams. In his recapitulation the writer points out that, though he has been speaking of various typhoons, such as that in the Formosa Channel, in Hong Kong, &c., he has really been dealing with only one widespread storm, which, during its life of fifteen days, visited every coast from the equator to Siberia, and from the extreme east of Japan to the western frontier of India. The character which Père Dechevrens gives the phenomenon he has so carefully studied is this:—"It allows itself to stray with the greatest ease outside the straight path. In a truly headlong way it throws itself against all obstacles, gets into difficulties from which it can scarcely extricate itself, wastes its energies in whirlwinds, often powerless, which it abandons readily, goes, returns, hastens, stops still, in a word revolving always in the same circle, until, having expended all its strength, it disappears miserably at that part of the Pacific which in a short time would have been able to give it the necessary vigour to sustain a longer career, and, like many others, to reach the shores of North America, or at least, if retarded by the violence of the North Pacific, as far as Behring Straits." Three facts which this study renders prominent are:—

1. The extreme facility with which these typhoons divide and subdivide.
2. The mutual attraction and repulsion of atmospheric disturbances (whirlwinds).
3. The absence of the south-west monsoon in the Philippine Islands.

In his recapitulation these three points are discussed at some length in the summary, and we merely indicate them here to show the student what he may expect in this painstaking and learned publication.

HEALTHY SCHOOLS[1]

THERE can be no more appropriate product of an exhibition which seeks to illustrate the two problems of health and education than a handbook on healthy schools. Within the brief space of 72 pages Mr. Paget has brought together here some of the most important counsels which experience has suggested on structure, drainage, fitting, food, recreation, ventilation, and other conditions on which the health of children in schools depends. No school manager or teacher can read it without much profit; and the executive of the Exhibition has done the community a service by placing within its reach in a succinct and readable form so much practical knowledge and fruitful suggestion.

[1] "Healthy Schools." By Charles E. Paget, Medical Officer of Health for the Westmoreland Combined Sanitary District; Honorary Secretary of the Epidemiological Society of London. International Health Exhibition Handbook Series. (Clowes and Sons.)

Mr. Paget divides his handbook into two parts, the first relating to the right construction of schools, and the second to their right administration. Under the former head he discusses in succession the questions of the site, soil, and aspect best suited for the erection of schools; the due provision of light and of air, and the importance of a good supply of water both for drinking and for cleanliness. His estimate of the space required for each child appears to be excessive, and to be almost the only feature of his work which betokens a lack of practical experience, and a striving after an unattainable ideal. It is well known that the minimum space recognised by the Education Department under any conditions as sufficient is eight square feet of area, or eighty cubic feet of internal space for each child; but in schools built by Boards, or out of funds levied by rates, the Department insists on a larger provision, *i.e.* ten square feet of area and 120 cubic feet. Any one familiar with well-planned Board Schools of a modern type knows well that this space suffices to secure ample room for movement, for change of position for the arrangement and supervision of classes, and for a due supply of air. It will, therefore, be somewhat startling to school managers to learn that in Mr. Paget's opinion this provision is absurdly insufficient, and that 800 or even 1,000 cubic feet per scholar would not be too much. Perhaps it is wrong in such a connection to dwell on the question of expense. But when it is considered that the building of a good school, apart from the cost of the site, requires an expenditure of 10*l.* per head—a great London Board School for, say, 500 boys, 500 girls, and 600 infants, in three stories costing about 16,000*l.*—it will be easy to compute what would be the charge on the rates if each of the 1,600 children were to be furnished with an area of forty or fifty square feet in a room twenty feet high. The estimate is clearly enormous, and can certainly not have been founded on an observation of the actual dimensions of any school, whether elementary or secondary. Apart, however, from the consideration of expense, it may well be doubted whether such vast space would in any circumstances be needed. For the purposes of teaching and organisation a certain compactness of arrangement is clearly desirable, and the supervision of the head teacher becomes more difficult and less complete in proportion to the size of the area over which the work of the school is spread. These are considerations, however, which it would be right to overrule, if on sanitary grounds there were any necessity for such large spaces. But when the ordinary precautions which Mr. Paget suggests for insuring light cheerfulness and ventilation are taken, it is scarcely credible that any such necessity actually exists. Mr. Paget's estimate of the amount of cubic space needed in boarding schools, in cubicles, and dormitories, is not so large in proportion, and is indeed not wholly consistent with the demands he makes for space in a purely day school. Nevertheless, by placing it at 1,200 cubic feet per scholar, he practically condemns the arrangements in almost every boarding school in England; for the usual requirements are thought to be well fulfilled with exactly half that amount.

On the extent of the window-space, the provision of fresh air, the right construction and care of offices, the colouring of walls, the admission of light, the right attitude of the scholar, and the distance of his book in reading or writing, and the form of desks, the handbook abounds in judicious and definite suggestion. It is much less full and useful, however, in regard to the fitting of playgrounds, the organisation of games, and recreations generally. Teachers will be disappointed to find how little of practical guidance the book affords as to the best and healthiest forms of recreation, and the proportion which should exist between regulated gymnastics and the free spontaneous exercises which all boys and many girls can readily discover for themselves. On diet, bathing, sanatoria, and many details which specially concern boarding schools, Mr. Paget's advice is especially valuable and complete. His estimate of the time per day which may with full regard to all considerations of health be given to intellectual pursuits, will surprise some of his medical brethren who have been complaining of late of the ordinary school hours as excessive, and have been denouncing little home-tasks of half an hour long in the elder classes as a "burden too grievous to be borne." He computes that between the ages of seven and ten five hours a day is probably sufficient, and between the ages of ten and fifteen seven hours. When it is considered that even the elder and more diligent pupils in an elementary school are never under instruction more than five and a half hours a day for five days in the week, and that the hardest home-lessons ever given in such a school do not occupy nearly an hour a day; and when it is also considered that even in the girls' high school—in which the justest complaints have been made of excessive home-tasks lasting sometimes two hours—the actual attendance in the school itself is generally limited to four hours, it will be seen that the absurdly exaggerated modern outcry about over-strain receives no countenance from Mr. Paget. His own good sense and experience, in short, lead him to recognise the fact that after all the chief business of the boy's or girl's life is training and instruction; and that provided all needful precautions are taken for right distribution and variety of work, and for securing all the conditions of healthy and cheerful life, the hours usually devoted to education in England do not exceed a reasonable amount, but rather fall short of them.

It is not the least of the merits of the book that its suggestions are put forth modestly, and with a remarkable absence of dogmatism. When the writer is not quite sure of his ground he is careful to say that his remarks are tentative and suggestive only, intended to awaken interest in the subject rather than to exhaust it; and to lead the way to a fuller and more careful study of the whole theory of school hygiene with the aid of the numerous appliances now on view at the Exhibition. This reticence on points not yet finally settled tends greatly to increase the confidence of the reader in Mr. Paget's judgment on those topics on which he expresses a decided opinion.

NOTES FROM THE LEYDEN MUSEUM

IT was a very happy thought of the late Prof. Schlegel to publish under the above title a quarterly record of the work done in the Royal Zoological Museum of the Netherlands at Leyden. The publication commenced in 1879, and the five yearly volumes before us, edited by Prof. Schlegel, will be one of the several enduring monuments to his memory. To all those interested in zoological research, the important treasures of the Leyden Museum are of necessity known. However indebted the Museum was to the well-known labours of Temminck, it is to the zeal and knowledge of Schlegel that it occupies its present high position among the museums of Europe. A very few words will show the importance from a zoological standpoint of these volumes, which contain on an average 250 pages each. The first volume contains descriptions of new species of mammals, birds, reptiles, insects, crustacea, and worms. These descriptions are for the most part by the director of the Museum and his Assistants, but help seems also welcomed from every hand, and the well-known names of R. B. Sharpe, P. Herbert Carpenter, Dr. D. Sharpe, Rev. H. S. Gorham, Prof. J. O. Westwood, occur among the British contributors. Besides containing numerous diagnoses of new species, these notes also from time to time present us with very important critical essays. Thus, in vol. i. Dr. A. A. W. Hubrecht's "Genera of European Nemerteans critically revised, with Descriptions of New Species," with a first appendix in vol. ii., is of great interest. It gives, so far as European forms are concerned, a classification of the genera and details of the species found at Naples. With regard to a genus of De Blainville, Lobilabrum, which was founded on a single specimen of the species *L. ostrearum*, and which has never been again met with, the following instructive facts are recorded. This genus was easily distinguished from all others by the possession of a blunt snout with two horizontal lips at the extremity, both of them bilobed, and apparently with tentacles. The slit between the lips was described as being a continuation of the lateral fissures of both sides of the head. In other respects the genus bore a strong resemblance to species of Lineüs or Cerebratulus living in the same localities. One day at Naples Dr. Hubrecht was fortunate enough to come across a second specimen of this rare worm, which, like De Blainville's specimen, was dredged from a bottom covered with bivalve shells. It was duly figured and preserved, and longitudinal sections were made of its curious snout. Soon after he was struck by the extraordinary resemblance in habitat which existed between another Nemertean (whose anterior extremity exactly answered to that of a Lineüs or Cerebratulus, and carried two well-pronounced fissures), and this single specimen of Lobilabrum. Once the doubt was raised, Dr. Hubrecht pursued the investigation by purposely cutting off the tip of the snout in one of the last-mentioned species, in a direction vertical to the body axis. Immediately the curious arrangement of the lobed and tentaculated lips which had hitherto been limited to the genus Lobilabrum appeared, the animal operated on lived for several weeks, and afterwards longitudinal sections showed that an epidermal covering had made its appearance identical with what had been found in the Lobilabrum specimen. Considering these results with the fact of the habitat amongst bivalve shells, Dr. Hubrecht concluded that the genus of De Blainville had been founded on a specimen the tip of whose snout had been severed by an oyster into whose open shell it was stealthily trying to penetrate.

Amidst the many contributions to vol. ii. of especial importance is a memoir by G. C. J. Vosmaër, on the sponges belonging to the family of the Desmacidinæ; siliceous forms known by bow, anchor, and bihamate spicules with some criticisms on the works of Bowerbank and others. It is a well-known fact that the late Mr. Bowerbank did "not sufficiently understand the German language," and his remarks on Oscar Schmidt's important works in the preface in vol. iii. of the "Monograph of the British Spongidæ" were rendered still more negligent by the many typographical errors. Surely Vosmaër is wrong in the assertion that "only one man in England, Sir Wyville Thomson, has declared himself in favour of Schmidt's views" on classification, and we would venture to assert that of the classifications of the siliceous sponges invented by Bowerbank, Gray, or Carter, none have replaced that of Oscar Schmidt as recently modified. While promising to publish a more extensive memoir on the Desmacidinæ, with the indispensable illustrations of the new species, Vosmaër's present enumeration of the species is of very great value. As most of Bowerbank's type species are in existence, we trust that Vosmaër may consult these ere publishing his final memoir, as while we acknowledge as a fact that Dr. Bowerbank was a most accurate and painstaking observer, and a fairly good recorder of what he saw, experience has proved that he often, from one cause or another, overlooked even quite easily recognised characters. Vosmaër accepts 16 genera and enumerates 162 species. Of these he naively remarks:—"As the result of my study of them, plenty of synonyms have been described, but I have never felt the necessity of making two species from one!" F. E. Schulze has given many examples in his splendid studies on the Ceraospongiæ, especially in his "Die Familie der Spongidæ." Both Schmidt and Schulze have demonstrated that the word "species is to be used in a very wide sense" as regards the sponges. The scientific zoologist will hardly mind how wide, provided the definition thereof is such that, while it embraces all the forms it excludes none; and, despite their heteromorphism—their plasticness, so to say—the sponges are, as a result of good honest work, getting arranged into species and genera that may satisfy the most fastidious critic.

In the same volume of these "Notes" we find a paper by Prof. K. Martin, on a revision of the fossil Echini from the Tertiary strata of Java, which, working anew over the species described some thirty years ago by J. A. Herklots, quite reverses the conclusions of that author; and, instead of all or almost all of the species being different from existing forms, as insisted on by Herklots, Martin has succeeded in "demonstrating that by far the majority of all the well-preserved individuals could be identified with species still living in the Indian Ocean;" and he further mentions, citing the species found, and in addition the Mollusca, Crustacea, and Corals, that these Tertiary strata of Java contain no fossils which have also been found in extra-tropical Tertiary deposits, so that even in the Tertiary period the separation of the fauna of the tropical oceans appears to have been quite as distinct as we find it in the present day.

Vol. iii. contains a very charming account of the habits of the harvest mouse (*Mus minutus*) and of its winter nest, by Prof. Schlegel. It is written—as indeed are very many of the contributions to these "Notes"—in English, but the language of this little history is worthy of the author's name. There are also by Prof. Schlegel some interesting notes on the zoological researches in West Africa, which were carried on under his directions; and an important contribution to our knowledge of the Comatulæ in a memoir on the species to be found in the Leyden Museum, by P. Herbert Carpenter. The collection at Leyden is one of considerable importance, owing to its containing a large proportion of the types of the species described by Johannes Müller in his classical memoir, "Ueber die Gattung Comatula, Lamk., und ihre Arten." It is noteworthy that the whole of the Leyden collection of Comatulidæ were forwarded to Eton for study. For a possible trifling loss that a public museum may now and then sustain in a loan like this, there is sure to be an immense preponderance of gain.

A monograph of the African squirrels, with an enumeration of the specimens in the Leyden Museum by Dr. F. A. Jentink, commences vol. iv. While fairly and equitably reviewing the work on this group by Gray and Temminck he admits but two genera—Sciurus and Xerus, enumerating sixteen species of the former and three species of the latter genus. The synonymic lists appear to have been made out with the greatest care, of which care a very interesting example will be found in tracing the authority for the species *Xerus capensis* to Robert Kerr, who published his "Animal Kingdom, or Zoological System of the celebrated Sir Charles Linnæus" in 1792. Another contribution of Dr. Jentink which we find space to allude to is a revision of the Manidæ in the Museum. Seven species are described in detail. Under *Manis aurita*, Hodg., we read that it is still questionable whether a Manis occurs in Japan. Temminck mentions that Von Siebold sent over to the Leyden Museum two pieces of the skin of a manis from Japan, but as these fragments are not now to be found in the collection, it is of course impossible to say to what species they may have belonged. Mr. Serrurier, the director of the Ethnographical Museum at Leyden, informs Dr. Jentink that in the Japanese books at his disposal he finds nothing to justify the conclusion that the anteaters are inhabitants of Japan; but it would appear that the Japanese do introduce them for medical purposes from China. The Japanese also relate that the anteaters catch ants in the following way:—The manis erects its scales and feigns to be dead; the ants creep in between the erected scales, after which the anteater again closes its scales and enters the water. He now again erects the scales, the ants are set floating, and are then swallowed by the anteater.

From a list of the Holothurians in the collection of the Leyden Museum, drawn up by Prof. Dr. Hubert Ludwig of Giessen, we find that the majority of the specimens in the Museum were incorrectly named, which is somewhat surprising; it seems also strange that of the species not so very long since described by Prof. Selenka the specimens are either *sine patria* or have the rather indefinite habitat of "Indian Ocean." The collection contains fifty-two species, two being new; most of them were obtained from the Oriental and Moluccan regions.

In vol. v. Dr. Jentink continues his very useful researches on the squirrels in the Museum. This time he treats of the American, European, and Asiatic squirrels; he acknowledges that the profound and extensive studies upon the American squirrels by Allen and Alston have made this group one of the best known among the Mammals; he enumerates ten species from America, forty from Europe and Asia. All the former are represented generally by numerous examples in the Museum, and of the latter only six species are among the desiderata.

The same volume contains "Notes of new species of the genus Megascolex, Templeton," by Dr. R. Horst. Very satisfactory evidence is given to show that Schmarda's genus Perichæta is but a synonym of Templeton's. Nine new species are described, chiefly from Sumatra, Java, and Japan; one, *M. musicus*, is described as living in the high mountain forests at Java, and is said to make a sharp interrupted noise during the night. The natives call it "tjatjing sondarie."

If in calling attention to these important contributions to our knowledge of the treasures of the Leyden Museum we have passed over the very numerous contributions to entomology, it is simply because our space forbids us referring to the immense number of new genera and species herein described; indeed these notes form a perfect magazine of entomology, and we feel sure are long ere this quite well known to all our entomological readers.

PRZEVALSKY'S WILD HORSE

GREAT interest is attached to the question of the origin of our domestic animals, and especially to that of the horse—which is generally supposed not now to exist in an aboriginally wild state. Every fact bearing upon this subject is of importance, and the discovery by the great Russian traveller, Przevalsky, of a new wild horse, more nearly allied to the domestic horse than any previously known species, is certainly well worthy of attention.

The horses, which constitute the genera *Equus* of Linnæus, and are the sole recent representatives of the family *Equidæ*, fall naturally into two sub-genera, as was first shown by Gray in 1825 (*Zool. Journ.* i. p. 241)—*Equus* and *Asinus*.

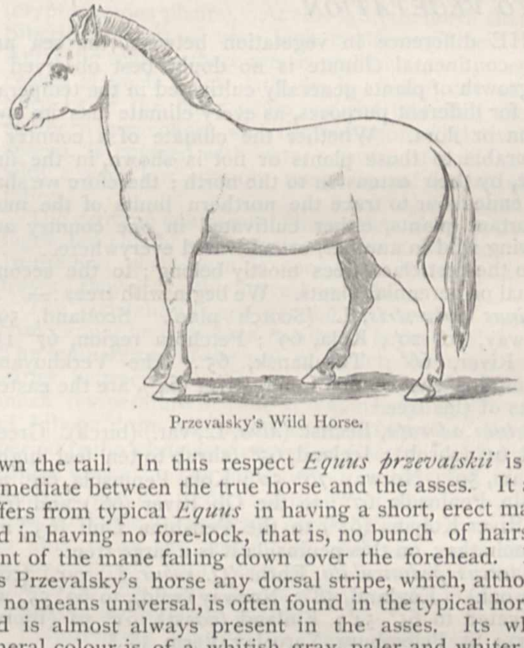
The typical horses (*Equus*) are distinguishable from the asses (*Asinus*) by the presence of warts upon the hind-legs as well as upon the fore-legs, by their broad rounded hoofs, and by their tails beginning to throw off long hairs from the base, instead of having these hairs confined, as a sort of pencil, to the extremity of the tail. Up to a recent period all the wild species of *Equus* known to science were referable to the second of these sections, that is, to the sub-genus *Asinus*, known from *Equus* by the absence of warts or callosities on the hind-legs, by the contracted hoofs, and by the long hairs of the tail being restricted to the extremity of that organ. Of this group the best known species, commonly called wild asses and zebras, are (1) the wild ass of Upper Nubia (*Equus tæniopus*), probably the origin of the domestic ass; (2) the wild ass of Persia and Kutch (*E. onager*); (3) the hemippe or wild ass of the Syrian Desert (*E. hemippus*); (4) the kiang or wild ass of Tibet (*E. hemionus*); (5) the quagga (*E. quagga*) of South Africa; (6) the Burchell's zebra (*E. burchelli*) of Southern and Eastern Africa; (7) the zebra (*E. zebra*) of Southern Africa. As already stated, these seven animals all possess the characters of the second sub-genus *Asinus* as above given, and no recent species of horse referable to the first sub-genus (*Equus*) was hitherto known to exist on the earth's surface, except the descendants of such as had been formerly in captivity.

Under the circumstances great interest was manifested when it was known that Przevalsky, on his return from his third great journey into Central Asia, had brought back with him to St. Petersburg an example of a new species of wild horse, which belonged, in some of its characters at least, to true *Equus*.

This new animal was described in 1881 in a Russian journal by Mr. J. S. Poliatow, and dedicated to its discoverer as *Equus przevalskii*.

The recently issued German translation of Przevalsky's third journey[1] enables us to give further particulars of this interesting discovery.

Przevalsky's wild horse has warts on its hind-legs as well as on its fore-legs, and has broad hoofs like the true horse. But the long hairs of the tail, instead of commencing at the base, do not begin until about half-way



Przevalsky's Wild Horse.

down the tail. In this respect *Equus przevalskii* is intermediate between the true horse and the asses. It also differs from typical *Equus* in having a short, erect mane, and in having no fore-lock, that is, no bunch of hairs in front of the mane falling down over the forehead. Nor has Przevalsky's horse any dorsal stripe, which, although by no means universal, is often found in the typical horses, and is almost always present in the asses. Its whole general colour is of a whitish gray, paler and whiter beneath, and reddish on the head. The legs are reddish to the knees, and thence blackish down to the hoofs. It is of small stature, but the legs are very thick and strong, and the head is large and heavy. The ears are smaller than those of the asses.

Przevalsky's wild horse inhabits the great Dsungarian Desert between the Altai and Tianschan Mountains, where it is called by the Tartars "Kertag," and by the Mongols "Statur." It is met with in troops of from five to fifteen individuals, led by an old stallion. Apparently the rest of these troops consist of mares, which all belong to the single stallion. They are lively animals, very shy, and with highly-developed organs of sight, hearing, and smelling.

They keep to the wildest parts of the desert, and are

[1] "Reisen in Tibet und am oberen Laut des Gelben Flusses in den Jahren 1879 bis 1880," von N. von Prschewalski. Aus den Russischen frei in das Deutsche übertragen von Stein-Nordheim. (Jena, 1884.)

very hard to approach. They seem to prefer especially the saline districts, and to be able to do long without water.

The pursuit of this wild horse can only be carried on in winter, because the hunter must live in the waterless districts, and must depend upon a supply of water from melted snow. As may well be believed, such an expedition during the severest cold of winter into the most remote part of the desert, must take at least a month. During the whole time of his stay in the Dsungarian Desert, Przevalsky met with only two herds of this wild horse.

In vain he and his companions fired at these animals. With outstretched head and uplifted tail the stallion disappeared like lightning, with the rest of the herd after him. Prezevalsky and his companions could not keep near them, and soon lost their tracks. On the second occasion they came upon them from one side, yet one of the herd discovered their presence, and they were all gone in an instant.

The single specimen of Przevalsky's horse subsequently procured is now in the Museum of the Academy of Sciences of St. Petersburg, and is the only example of this species in Europe.

THE DIFFERENCE BETWEEN THE SEA AND CONTINENTAL CLIMATE WITH REGARD TO VEGETATION

THE difference in vegetation between the sea and continental climate is no doubt best observed in the growth of plants generally cultivated in the temperate zone for different purposes, as every climate has its own region or flora. Whether the climate of a country is favourable to those plants or not is shown, in the first place, by their extension to the north; therefore we shall first endeavour to trace the northern limits of the most important plants, either cultivated in one country and growing wild in another, or cultivated everywhere.

To the first class trees mostly belong; to the second, annual or perennial plants. We begin with trees:—

Pinus sylvestris, L. (Scotch pine). Scotland, 59°; Norway, 70° 20′; Kola, 69°; Petchora region, 67° 15′; Ob River, 66°; Turukansk, 65°. The Verkhoyansk Mountains, east of the Lena River (64°), are the eastern limits of this tree.[1]

Betula odorata, Bechst. (*alba*, L., var.) (birch). Greenland, 61° (shrub); Iceland, 65° (shrub to ten feet high); Britain, 59°; Norway, 70° 50′; Kola Peninsula, 69° 30′; Kanin Peninsula, 67°; to the Ob River (66°), and from the River Kolyma (68°) to the Penshina Gulf (63°) and Kamchatka; on this peninsula it is a large tree.

Quercus pedunculata, Ehrh. (*Q. robur*, L., var.) (common oak). England, 58°; Norway (wild), to 62° 55′, and cultivated to 65° 54′; Finland (coast), 61° 30′ (Bjorneborg); St. Petersburg, Yaroslav, Perm, 58°.[2]

Larix europæa, Dec. (including *L. sibirien.* Ledeb., and *L. dahurica*, Turcz) (common larch). Norway (*europæa*, Dec.), 66° 5′, (*dahurica*, Turcz), 59° 55′, both cultivated; Onega River, White Sea, south-western shore of Onega Lake, Mesen (Kanin Peninsula), 67°; Petchora River, 67° 30′; Ural Mountains, 67° 15′; Kara River, 68° (northern limit in Europe); Yenisei River, 70°; Boganida River, 71° 15′; Chatanga River, 72° 30′ (most northern limit of trees on the globe); Anabar, 71°; Olenek and Lena, 72°; Yana, 71°; Indigirka, 70° 45′; Kolyma, 69°; Anadyr, 65°; between Okotsk and Gishiga, 61°; Sakalin Peninsula, 49°; to Jeddo and the island of Kunaschir, 43° 45′. On the shores of Kamchatka the larch is nowhere to be found; in the valleys of this peninsula, however, protected from sea winds, it is a very large tree.[3]

[1] Middendorff, "Sibirische Reise," Bd. iv. Th. 1, p. 556.
[2] *Ib.* p. 567.
[3] *Ib.* p. 536.

Pyrus Malus, L. (apple-tree). Shetland Isles (cultivated); Britain, 57°; Norway, cultivated, 65° 28′, wild, 63° 40′; Gulf of Bothnia, 63° 45′ (cultivated); Finland, 63° (cultivated), 60° (wild); northern shore of Onega Lake (wild); Narva, 59° 30′ (wild); Tver, 56° 45′ (wild); Nijni Novgorod, 56° (wild); Kasan, 56° (wild); south-west of Orenburg, 50°; Kopal, Asia, 45°.

Fagus sylvatica, L. (common beech). Britain, 58°; Norway, 59°, cultivated, 67° 56′; Sweden, 57°; Königsberg, Poland, South-West Russia, Crimea, Caucasus, Persia.

Castanea vesca, Grtn. (chestnut). South Britain, Germany (to the island of Rügen), Austria, Caucasus.

Populus alba, L. (abele tree). Britain (wild and cultivated), 56°; Norway (cultivated), 67° 56′; Germany (wild and cultivated), Austria, Russia: Volhynia, Kieff, Charkoff, Tambov, Kasan, Ufa, Altai Mountains.

Populus tremula, L. (aspen). Britain, 59°; Norway, 70° 37′; Russia: Kola Peninsula, 69° 30′; eastern shores of the White Sea, 66°; Yenisei, 66°; Kolyma River, 67° 30′;[1] Amur River.

Alnus incana, W. (hoary-leaved elder). Canada, Norway, 70° 30′; Kola, 69° 30′; Yenisei, 67°; Amur region, Petropaulovsk on Kamchatka.

Ulmus campestris, L. (common elm-tree). Britain, 57°; Norway (cultivated), 63° 26′; Russia: Ilmen Lake, south of Moscow, Riazan, south of Kazan and Ufa to the Ural Mountains.

Tilia europæa, L. (including *parvifolia*, *grandifolia*, and *intermedia*) (lime-tree). Britain, 57° (*parvifolia*); Norway (wild), 62° 9′, (cultivated) 67° 56′; St. Petersburg, Kargopol, Ust Süssolsk, about 62°; Solikamsk, Ural Mountains, about 58° 50′; Verkhoturgi.

Vitis vinifera, L. (common grape). Bretagne, 47° 30′; Liége, 50° 45′; Thuringia to Silesia, 51° 55′; South Galicia, South Russia, between about 48° and 49°; Astrakan, Bokhara in Turkestan, 40° (here the vine is cultivated in the open fields[2]); Khiva, 42°; China, 40°; California. This plant cannot stand the extreme continental climate on account of the frost in winter, but wants a very warm or a very long summer (as in California), therefore it cannot be cultivated generally in Britain. California is warmer in summer than some latitudes in Europe.

Triticum vulgare, Vill., var. *æstivum* (summer wheat). Britain; Norway, in the fields, 64° 40′, in gardens, 69° 28′; Finland, 65°;[3] Dwina River, 63°; Yakutsk, western shores of North America, 55°; Fort Liard, 60° 5′ (North-West Territory of Canada);[4] Peace River, 56° 6′; Ontario, East Canada.

Hordeum vulgare, L. (including *hexastichum*) (barley). Färoe Isles, 62° 15′ (grain seldom ripens); Norway, 70°; western shores of the White Sea, 67°; Ob River, 61°; Yakutsk, 62°; Udskoi Ostrog, near the Okotsk Sea, 54° 30′; Kamchatka (inland), 53° to 54°; North-West American shore, south of Sitka, 57°; Fort Norman, Mackenzie River, 65°;[5] east of Winnipeg, 50°; St. Lawrence Bay, 50°.

Avena sativa, L. (oat). Scotland; Norway, 69° 28′; Finland, 69°; Asia, the same latitude as *Hordeum vulgare*; Yenisei, 61°; Yakutsk, Kamchatka (inland); North America, the same latitude as *Hordeum vulgare*.

Secale cereale, L. (common rye). Britain; Norway, 69° 30′; Finland, 67°; Mesen River, 65° 45′; Petchora region, 65° 45′; Ural Mountains, 57°; Ob River, 60°; Yenisei, 59° 30′; Yakutsk, Kamchatka (inland); North America, a little south of the latitude of the barley, eastern shores, 50°.

Solanum tuberosum, L. (potato). Britain; Norway, 71° 7′; Russia, Pinega River, 65°; Turukansk, 65°; Yakutsk, shores of the Okotsk Sea, Kamchatka, Kadjah Island,

[1] Middendorff, p. 573.
[2] Grisebach, "Die Vegetation der Erde," vol. i. p. 407.
[3] Middendorff, p. 709.
[4] Richardson, "Searching Expedition through Rupert's Land," vol. ii. p. 267. Fort Liard has an altitude between 400 and 500 feet above sea-level.
[5] Richardson, p. 269.

Sitka Island; Mackenzie River, 65°; Canada; Labrador, 58° 45′;[1] Greenland.

Zea mays, L. (Indian corn). This plant requires also a very warm summer to ripen its seeds. In England it can only be cultivated as a green vegetable; on the western shores of Europe we can say that the cultivation is only profitable to the 46th degree N. lat., and in the valley of the Rhine it reaches to 49°. In North Germany the grain usually does not ripen. In North America, however, it is cultivated in certain regions with profitable returns up to 51° N. lat.[2] The period of vegetation varies there between seven and three months. To cultivate the varieties of such a short period in Europe is tried, but without result; they were transformed after a few generations into the common corn.

Thus we see that, of the plants just named, the larch, the pine, the birch, and the aspen grow in Siberia, with its excessive continental climate, farthest to the north; yet many of the cultivated plants mentioned above, and almost all those of the temperate zone, are either cultivated or grow wild in the sea climate of Norway, to very high latitudes.

On the north-western shores of America the pine attains a considerable size (island of Sitka), in a climate with continual rain, but partly the same size is observed on the Rocky Mountains (eastern slope), where the climate is wholly changed.

In British Columbia the climate is continental, very cold in winter; yet the same gigantic trees as on the coast are to be found here; precipitation takes place in spring, but the amount is very great.

In California, with its largest coniferous trees of the world (*Wellingtonia gigantea*), rain falls chiefly in winter (November to April). The enormous differences of coast and inland climates of California are not apparently known.

In the southern parts of the Amur region in Asia there is in summer a luxuriant vegetation; the annual precipitation amounts to 27·56 inches (about the same amount as in Germany), the plants much resembling those of Central Europe,[3] and this notwithstanding a winter temperature much lower than observed in the most northern parts of Lapland; but the summer here is much warmer than in Europe under the same latitude, and precipitation *occurs only in summer*.

In the interior of Siberia the vegetation consists chiefly of coniferous trees; thus the luxurious growth in the region just named must be caused by the influence of the sea climate, as Middendorff suggests,[4] though there is a mountain chain on the east coast. The extensive forests of Russia and Siberia prove that an extreme continental climate is resisted by some coniferous and other trees, but it is evident that in general a sea climate with mild winters, and thus a long period of vegetation, suits them best.

As we have seen, the northern limit of the cultivation of corn reaches on the continent a much higher latitude than on the shores. On the north-west coast of North America the island of Sitka (57° N. lat.) and Kadjak are on the extreme limit. On the Färoe Isles, barley (this can only be the coarse variety) is cultivated, but the grain very seldom ripens;[5] the cause is absence of sunlight on account of the continual cloudy sky, storms and precipitation, causing low temperature in summer (mean temperature at Thorshaven, July, 49°·8), for corn wants a sunny climate, and to be under the direct influence of the sun's rays. This explains why it can be cultivated within the Polar Circle (Norway), where the sun in the summer season remains constantly above the horizon.

In North America, on the shores of Hudson's Bay, the tree limit goes down to 59°, the corn limit to 50° (Ontario).

[1] Petermann, *Geogr. Mittheilungen*, 1859, p. 124.
[2] Richardson, vol. ii. p. 267.
[3] Kittlitz, "Vierundzwansig Vegetationsansichten von Küstenländern und Irseln des Stillen Oceans," p. 53.
[4] Middendorff, p. 763.
[5] Martins, "Sur la Végétation de l'Archipel des Féroé."

On the shores of the Okotsk Sea corn cannot be cultivated at all, even on the south coast, under 50° N. lat. In Greenland the culture of corn is also impossible. The causes are the same as said above: the sea winds, wet climate, and fog in summer—thus want of sunlight.

Of all the cultivated vegetables, *Raphanus sativus*, L., et var. (radish), *Brassica rapa*, L., et var. (turnip), and *Brassica Napus*, L., et var. (rape), grow as far north as there are settlements—in Norway beyond 70° N. lat.; in Siberia to the Polar Circle; on the north-west coast of America to 64° 45′ (Nulato), and Redoute St. Michael, 63° 30′, in the interior to 67° (Fort Good Hope).[1] In Greenland rapes, turnips, cabbage, and salad are cultivated under 70° N. lat. (Island Disko).

The potato follows the above-named plants in their distribution to the north, and belongs also to the sea climate; at its northern limit in Siberia, however, as well as in North America, it is the size of a walnut.[2] In Greenland only the most careful treatment can produce eatable ones. The plant never blossoms here.[3]

When comparing the vegetation of the extreme continental climate with that of the extreme sea climate on the globe, the continental has the advantage; the South Shetland Isles, in 60°-63° S. lat., are at the most southern limit of phanerogamous plants (only a grass, *Aira antarctica*, Forst., is found here), and on Cockburn Island (64° S. lat.) the last trace of vegetation is found (cryptogamous plants). At this latitude north there is in Siberia a forest of very high coniferous trees. In the Antarctic regions there are several causes why vegetation ceases at such a low latitude, but these are all consequences of the chief cause, viz. the fact that the whole southern hemisphere, with the exception of relatively small spaces, is covered with water; severe storms[4] combined with a very low summer temperature[5] banish all vegetation.

The extreme continental climate has also its disadvantages, but chiefly with relation to the cultivation of corn. In the first place corn is very often destroyed by night frosts; they make the harvest uncertain.

The constantly frozen ground is the chief cause why corn cannot be cultivated in Siberia beyond 62° (Yakutsk). The temperature of the soil in which the roots vegetate varies between 36° and 41°. Thus notwithstanding the mean temperature of June at Yakutsk being 57° and that of July 62°,[6] the vegetation is relatively slow, though its period is the same as observed in Central Europe (ten to twelve weeks).[7] The same period is observed in North America, at 63° (Fort Simpson), of the barley (wheat does not come to maturity here). But harvests of thirty to forty times the amount of what was sown alternate in this climate with years of no harvest at all.[8] It is known that the native plants withstand the lowest temperatures of the Siberian winter.

Returning to Europe, we have seen that even the climate of the northern parts of the British Isles is not suited for many vegetables and other cultivated plants. It is Germany which has a climate where we can find almost all the plants of the temperate zone and those commonly cultivated; we see the vine in this country ascend farthest to the north, while corn and all vegetables ripen their seeds perfectly. It is clear that the climate is best suited for the vegetation of this latitude.

Now if we compare the mean temperature of July in Germany with the mean for the latitude (for 50° N. lat. 62°) calculated by Dove, we find that even in this country

[1] Richardson, vol. i. p. 214.
[2] Middendorff, p. 700.
[3] Von Etzel, "Grönland geographisch und statistisch beschrieben," p. 282 (Stuttgart, 1860).
[4] Lowest reading of the barometer by the United States Exploring Expedition under Wilkes in lat. 65° 15′, 27·50 (see "Narrative of the Expedition," vol. ii. p. 281 (London, 1852).
[5] In lat. 64° 5′ mean temperature of January 1843, 31°; in 62°-66° in February, 31° (see Ross, "Voyage in the Southern and Antarctic Regions," vol. ii. pp. 352, 360.
[6] Middendorff, p. 772.
[7] *Ib.* p. 718.
[8] *Ib.* p. 720.

the summer temperature in general is only *a few degrees above the calculated;* Germany is crossed in July by the isotherm of 68°, and Britain by that of 59° ; but the difference in vegetation is not caused by a difference in mean temperature of 9°, but by the difference in the *amount of sunshine.*

Thus we come to the conclusion that a mixed climate, with relatively mild winters (the anomaly of temperature for January is for Germany about 19° on the 50th parallel of latitude) and *warm sunny* summers, is the best suited for the vegetation of the temperate zone.

Flushing M. BERGSMAN

NOTES

THE International Congress of Hygiene will sit at the Hague from to-day till the 27th inst. Papers will be read by Messrs. Pasteur of Paris, Finkelberg of Bonn, Stephen Smith of New York, Marcy of Paris, W. H. Corfield of London, Emile Tiélat of Paris, J. Crocq of Brussels, and A. Corradi of Pavia.

THE International Medical Congress at Copenhagen has been a great success. The next meeting will be held at Washington in September 1887. On behalf of the Collective Investigation Committee of the British Medical Association, Sir William Gull delivered an interesting lecture on the International Collective Investigation of Disease. A resolution for the establishment of a Permanent International Committee for the Collective Investigation of Disease was received with acclamation.

IN an interesting descriptive article in the *Times* of yesterday on the Health Exhibition Biological Laboratory, the writer makes some forcible remarks on the position of research in this country. "Just as the advantages of such an institution as the projected Marine Biological Laboratory were illustrated and brought home to the mind by the International Fisheries Exhibition of 1883, so the present Health Exhibition should, as one outcome of its usefulness, lead to the foundation of some such institution for the extended and systematic study of the minute organisms which there is reason to believe are the causes of many forms of disease in plants, in animals, and in man. In Germany the State, recognising the value of the labours of Dr. Koch, contributes, though not very largely, to the prosecution of researches which give promise of invaluable results to all mankind. France, too, has acknowledged the practical character of the benefits which have in some measure already resulted from the experiments of M. Pasteur. In this country, where the State endowment of research is hardly admitted in principle, and where we have, perhaps too long, been content to leave all scientific research which was not directly remunerative to be pursued, with few attempts at organisation, by the few private individuals who, having the means, care to devote time and money to such objects, students of biological science are wondering whether the Royal College of Surgeons will apply some portion of the splendid bequest of Sir Erasmus Wilson to the purposes of research in this comparatively little-known but interesting field of inquiry. Without entering upon debatable ground, it may be said that in the small model laboratory for biological research, fitted up under the direction and now under the charge of Mr. Watson Cheyne at the Health Exhibition, the public may see and learn enough to convince the most sceptical of the vital importance of the knowledge which it is the purpose of such observations and experiments as are there exemplified to obtain."

PROF. G. F. ARMSTRONG, of the Yorkshire College, Leeds, and formerly of Montreal University, writes to the *Times* of Monday last, drawing attention to the liberal provision made for technical education in America. The Americans, he maintains, are a generation ahead of us in this respect. At the same time he draws attention to the danger of neglecting the preliminary general culture which is absolutely necessary as a sound foundation for any special training.

IT is worthy of note that the Roman Catholic Church of St. John, built by the Marquis of Bute, at Old Cumnock, Ayrshire, has recently been fitted throughout with the electric light under the personal superintendence of Mr. William Massey, of Twyford. There are in all about seventy glow lamps of twenty candles each, and the effect is very perfect, the architectural features of the building having been carefully studied and the lamps arranged with due regard to the religious character of the place. The necessary current is supplied by means of a dynamo and steam-engine placed in a small house hidden among the trees of the churchyard, where it is also intended to generate electricity for working the organ bellows.

THE inauguration of the Jouffroy statue at Besançon took place on Aug. 17. According to the French notion the Marquis de Jouffroy is believed to have been the real inventor of steam navigation, and the precursor of Fulton. M. de Lesseps was present at the ceremony.

THE effect of cheap interior telegraphy has been felt most happily in France, where the number of telegrams has multiplied in the most extraordinary manner. Last year there were 58 telegrams for each 100 inhabitants.

A FRENCH surveying vessel, the *Henri Rivière*, so called after the great explorer who lost his life in Tonquin, is to be sent to the higher waters of the Songkoi or Red River, not only to keep order among the pirates there, but also to survey the districts adjoining, and correct the inexactness of existing maps of the course of the river. As the ancient Khmer kingdom, Cambodia, has now been practically annexed to France, we may soon expect that the centre and eastern coast of the Indo-Chinese peninsula will be as well known to us as British India now is, for the French spare no money or pains to study their colonial possessions thoroughly.

AT the last meeting of the Paris Academy of Sciences, M. F. A. Forel described some peculiar luminous phenomena frequently observed by him and others during the spring and summer of this year at Morges on the Lake of Geneva, and especially on the Alps. When the sun was half veiled in white vapours, the clouds at Morges presented a reddish appearance at a distance of 20° or 25° from the solar disk. But the light effects were far more vivid when seen in the pure atmosphere of the Alpine regions; and in clear weather, that is to say, almost every day during the last fortnight, they were distinctly observed in the upland valley of Saas-Fée, Canton of Valais. The sun appeared as if encircled by a silvery white halo, very bright and lustrous, somewhat similar in appearance to the weird glow noted in the first phase of the crepuscular displays so frequently observed during last winter. This halo, whose radius may perhaps have measured some 12°, was itself surrounded by a broad, reddish corona with badly defined limits, whose orange or violet tints blended on the inner side with the silver halo, and outwardly with the azure sky. In breadth this corona was about equal to the radius of the halo. For a considerable distance from the sun the sky beyond these effects was of a deeper blue than usual, as was evident especially in the evening, when the setting sun disappearing behind the snowy Alpine crests seemed to impart to the western regions the shifting hues of a stormy sky. One might fancy the sun visited by a great dust-cloud, but for the fact that, beyond these displays of colour, it was as luminous as ever, the firmament itself as serene, with deep azure tints, the transparency of which nothing seemed to impair. The phenomenon attained its greatest intensity on July 23, a lovely midsummer day, when it was also observed at Sand-Alp in the

Canton of Glaris, at Kandersteg in the Canton of Berne, and at Charmey in the lower Valais. On the same day M. Auguste Arcimis noted crepuscular glows at Madrid analogous to those of last winter. He remarked in particular a bright corona around the sun, of a silvery white and with a diameter of about 48°. On the Alps the display remained more or less visible every day; but since his return to the plains on August 8, M. Forel lost all traces of it. He was assured by several observers that the phenomenon had been constantly noticed in Valais during the spring and summer of the present year. M. Forel asks whether it is to be regarded as a sequel to the surprising series of optical effects successively observed in the various regions of the globe since the tremendous eruption of Krakatoa on August 27, 1883, effects which in Europe reached their culminating point in the crepuscular glows and auroral displays of last November, December, and January. In connection with the same subject M. Jamin remarked that similar phenomena have been observed at Paris and in various parts of France during the exceptional heats of the last few weeks.

LIEUTENANT GREELY has published further details respecting his three years' residence in the Arctic regions. He says the extremes of temperature at the camp on Discovery Bay, which they had named Fort Conger, was from 52° above freezing-point to 66° below. In February 1883 the mercury was frozen into a solid mass, and continued in that state for fifteen days. The ordinary outdoor clothing of heavy flannels was found to be quite sufficient even on the coldest days. The extreme range of the barometer was from 29 in. to 31 in. The electrometer registered nothing. The aurora was noiseless, which is contrary to Sir George Nares's experience in 1876, but it was sufficiently bright to cast a shadow. The tide at their most northern settlement flowed from the north; that at Cape Sabine came from the south. The northern tide was two degrees warmer than that from the south. In Lady Franklin Bay it rose eight feet, and the Cape Sabine tide twelve feet. Surf was seen twice. The temperature of the water at the earlier camp averaged three degrees below freezing-point. During two years only two small sea fish were caught; but in Lake Alexander fine salmon were taken. Between Capes Bryant and Britannia Lieut. Lockwood found no bottom with a line of 155 fathoms. At the furthest point north which Lieut. Lockwood reached there was no Polar current, nor did he discover any open sea. The only sea animals met with were the walrus and different species of seal. The vegetation was similar to that seen all over the extreme north. At Lady Franklin Bay the deflection of the magnetic needle was 104 west. The coast of Greenland trended in a north-easterly direction as far as it could be traced. Lieut. Greely thinks the Pole will never be reached, unless every condition which has hitherto been unfavourable should be simultaneously favourable. The only route at all likely to prove successful is, he thinks, by Franz Josef Land. The Polar pack generally, which was reported by Dr. Pavy and Lieut. Lockwood to have been seen by them, almost certainly, Greely considers, proves the existence of an open Polar sea. No hardship was experienced by the explorers while they remained at Fort Conger; and if their physical condition had not degenerated the survivors believe they could have remained there ten years.

UNDER the title of "Bosquejos Ethnologicos," S. Carlos von Koseritz has just published in collective form a series of papers contributed by him during the last three years to the *Gazeta de Porto Alegre* on anthropological subjects in the province of Rio Grande do Sul and other parts of Brazil. A chief object of these papers is to place on permanent record the general conclusions based on a comparative study of the extensive ethnological collection to the formation of which the writer had devoted fifteen years' patient labour, but which was unfortunately completely destroyed in the disastrous fire at the Brazilian German Exhibition of Porto Alegre last year. The collection comprised over 2000 objects of all sorts, but chiefly rude and polished stone implements brought together from various parts of Rio Grande, and generally corresponding to those of the stone epochs in Europe. But those of a strictly Palæolithic type appear to be very rare, and as they occur promiscuously with Neolithic objects, the author infers that it is impossible to determine a Palæolithic antecedent to a Neolithic age in Brazil. A few rudely wrought diorite or nephrite weapons occur, as well as some quartz arrow-heads fashioned with great labour. But the great majority of the arms and utensils are of more or less polished diorite. Many were found associated with the remains of the Megatherium, of the *Rhinoceros tichorrhinus*, and the cave bear, thus confirming the conclusions already deduced from the discovery of the fossil man of Lagôa Santa in Minas Geraes, and arguing as great an antiquity for the *homo Americanus* as for the River Drift men of the Old World. At the same time the writer considers that the earliest inhabitants of South Brazil were quite distinct from, and of a much lower type than, the Charruas and other tribes in possession of that region during the historic period. This conclusion is based especially on the evidence afforded by the skeleton recently found in a shell-mound on the banks of a fresh-water lagoon near Cidreira, within three miles of the present coast of Rio Grande. During its removal to Porto Alegre, this skeleton, which must have been many thousand years old, got broken, but the skull has been carefully restored by Theodore Bischoff, and presents the same remarkable characteristics as two others of uncertain origin preserved in the National Museum of Porto Alegre. It is even of a more decidedly bestial type, with excessive prognathism of the upper jaw, extremely long and high cranium (hypsistenocephaly), depressed brow, prominent superciliary arches, imparting altogether a most ferocious expression to this specimen, which from the worn state of the teeth seems to have belonged to a very old man. Altogether the Cidreira skull completely confirms the views of Lacerda regarding the prehistoric race associated with the shell-mounds of South Brazil, a race which appears to be at present best represented, at least in some of its salient features, by the fierce Botocudos of the Aimores Mountains further north. It seems to have come originally from those highlands, and the author thinks it probable that the men of the Santa Catharina and Rio Grande refuse-heaps all belonged to the same aboriginal stock.

THE glaciers of the province of Terek, in the Caucasus, are the subject of a vivid description by M. Dinnik, in the last number of the *Memoirs* of the Caucasian Geographical Society (vol. xiii.) With the exception of the Adyl glacier, all those visited by M. Dinnik have been rapidly decreasing during this century. The great glacier of Bizinghi, one of the largest in the Caucasus (it is nine miles long, and one mile wide about the middle), has two great terminal moraines, one mile below its present end, and several lateral moraines, some 500 yards distant from its present borders, some of which still conceal masses of ice under the boulders and mud. On its western border an old moraine rises at least 200 feet above its surface. The same is true with regard to the great Azaou glacier of the Elbrus. Even the inhabitants have witnessed the retreat of glaciers, and they remember the time when the Bizinghi and Mijirghi glaciers, now one mile distant from one another, were connected together at their ends. Besides these relatively recent moraines, there are around the glaciers several others the boulders of which are much more worn out and more rounded, which testify to a former still greater extension of glaciers. As to the Adyl glacier, it was also decreasing when a formidable mass of mountain above it fell into the valley some eighteen years ago. It was broken to pieces, and its debris thickly covered the glacier for some five miles. The debris, which have still at many places a thickness of several yards, have protected the ice from melting, and have made it advance down the valley.

THE last number of the *Memoirs* of the Caucasian Geographical Society (vol. xiii. part 1) contains a series of very interesting papers. M. Dinnik contributes three papers, in which he describes his wanderings through "the mountains and gorges" of the provinces of Terek and Kuban in Ossetia and about the sources of the Rion. The author devoted his attention especially to the glaciers of the tracts he visited, but his descriptions give a very striking picture of the general characters of the region, of its flora, and especially of its fauna. His remarks on this last will be most welcome to the zoologist and geographer. M. Weidenbaum gives an historical sketch of the different ascents of Ararat, and of the scientific conquest of its summit, so boldly denied each time by the Armenians, who do not admit that human feet may step on the virgin snow of the holy summit. The ascents of Tournefor, Parrot, Abich, Khodzko, Messrs. Freshfield and Tucker, and Bryce are described by the author. M. Lessar contributes a paper on his journeys to South Turcomania, Merv, Chardjui, and Khiva (already known from what has appeared in the St. Petersburg *Izvestia*). M. Rossikov gives a narrative of his journeys to the Upper Daghestan and Chechnia, and describes also two villages, Konhidatl and Enheli, situated in the gorge of the Andian Koyson, the inhabitants of which are engaged in salt-mining. Two lithographs give an excellent idea of this crow's nest in the mountains, the flat-roofed houses of which are built upon one another, offering at the same time a means of defence and an economy of the poorly-allotted space on the slopes of stony crags.

IN a former paper to the Russian Chemical Society, Prof. Mendeléeff had arrived at the conclusion that the dilatation of liquids can be expressed by the formula $V = \frac{1}{1 - kt}$, where k is a module which varies for different liquids, and increases with their volatility. The researches of M. Van der Vaals, combined with the above, have enabled Messrs. Thorpe and Rücker, in the April number of the *Journal* of the London Chemical Society, to establish the remarkable relation between the absolute temperature of boiling t_1, reckoned from the absolute zero ($-273°$), the volume V_t, measured at a temperature t, and a constant a, which seems to be near to 1·995 or 2. Now, in a communication to the Russian Chemical Society (vol. xvi. fasc. 5), Prof. Mendeléeff shows that, if the dilatation of gases and that of liquids be expressed by the formulæ—

$$V_t = 1 + at \text{ and } V_t = \frac{1}{1 - kt},$$

which would give $2t_1 = \frac{1}{k} - \frac{1}{a}$, and the constant a be taken equal to 2, we receive—

$$\frac{1}{k} = 2t_1 + 273,$$

where k and t_1 are determining one another. This deduction is confirmed, in fact, by direct measurements. The further progress in the mechanics of liquids, he says, must be expected from new experimental and theoretical researches into the compressibility of liquids at different temperatures and into its relations to the modulus of dilatation; the fundamental equation of liquids must express the relations between their volume, temperature, and pressure, as is the case for gases. As to a complete conception of the ideal state of bodies, it must contain also the relations to their molecular weight and composition.

THE "Handbook of the St. Nicholas Agassiz Association," issued by the President, Mr. Haslan H. Ballard of Lenox, Mass., is a little work of great interest, and should also be of much utility to those who desire to train up the young with a love for Nature, and a desire to study her products and ways. The Association had a very modest beginning. Mr. Ballard was teaching in a school in Lenox, and in 1875 got his pupils to band together for the observation and study of natural objects. "It was the outgrowth of a life-long love for Nature, and a belief that education is incomplete unless it include some practical knowledge of the common objects that surround us." The idea was actually derived from a similar association in Switzerland, took root and flourished in Lenox, and after a few years the President thought that it might be extended to other places. The assistance of the editors of the well-known *St. Nicholas* magazine for the young was then invoked, and in 1880 a general invitation to others to join in the work appeared in that periodical. The response was very gratifying. Classes have been formed in various towns under the direction of the central organisation, and now 650 local scientific societies are at work with over 7000 students. Nor is it confined to the youth of both sexes, although originally intended for them, for the parents in many instances join, and there are some "chapters," or classes, wholly composed of adults. Still the work is principally among the young, and Mr. Ballard notes that the Association has found a wide field of usefulness in connection with public and private schools. Many teachers, he says, who have not been able to find a place for natural science in the ordinary school curriculum, and who have yet felt that their pupils should not grow up strangers to the flowers, trees, birds, and butterflies, have been glad to devote an hour once a fortnight to the guidance of a meeting devoted to these studies. The "Handbook," after describing somewhat enthusiastically and picturesquely the advantages of the Association, proceeds to give directions as to the formation and conduct of a class. Then follow chapters on the plan of work, how to make a cabinet, to collect specimens, what to do in winter and in the city, and so on—in fact, directions for the young student in every department of natural history to which he could turn his attention. A list of books recommended and of the various branches of the Association conclude the little book. Almost every State in the Union is represented among the branches, some of them very numerously, while foreign countries are represented by Canada, Chili, England, and Scotland. On the whole Mr. Ballard has a very gratifying story to tell of successful and voluntary effort, and we have no doubt that his little book will lead to a large increase in the Agassiz or similar associations by showing how easy it is to organise and work a "chapter," and the benefit derived from study carried on in this way.

IN the Report of the Bureau of Education of the United States for 1881 (see NATURE, vol. xxix. p. 506) the increase of a class of illiterate population recorded in the census of 1880 was touched upon. A Circular recently issued by the Bureau goes more thoroughly into the subject, and carefully compares the numbers of all the different classes of the population which came under this head at the last census with those of the census of 1870. It is satisfactory to find, from the safe ground of such statistics, that the late alarmist assertions of the terrible growth of an uneducated *proportion* of population is true only of five States out of forty-seven, viz. Maine, New Hampshire, California, Montana, and Nevada. In other States, and on the whole, the ratios of ignorance to education were diminished, even in the Southern States, where so large a proportion of the inhabitants have a tendency to "helpless over-production." Nevertheless, it is true that the *absolute number* of illiterates has increased, in spite of philanthropic as well as Government efforts, by over half a million in these States, and not among the coloured population only. There were 46,000 more in the Pacific States; and thirteen white children out of a hundred throughout the whole States "escaped the combined influences of church, day school, Sunday school, and family teaching." The objection raised in England to the franchise being given to an uneducated class is urged most strongly in an appendix to this Circular, as being far more dangerous in the United States, where custom exerts no check. Since the danger is equal to the whole Union, while the burden of meeting it falls so heavily on certain States, it is again strongly urged that a part of the expense should be met by national taxation.

THE writer of the second Circular of Information published this year by the United States Bureau of Education trusts that the Shorthand Society of London will throw light upon the history of their art, as the material is quite inaccessible to the American student. Yet his industrious researches there enable him, after speaking of the shorthand invented by Cicero's freedman, and of its revival by Dr. Timothe Bright in Queen Elizabeth's time, to append the names and dates of more than 400 authors of English systems; a catalogue, 100 pages long, of writers and their works on the subject, and 112 alphabets of various dates, from 1602 to 1882. He is able also to quote thirteen monthly publications in the United States and Canada on this subject. It is to be hoped that, in this art as in nature, the result will be the survival of the fittest (Mr. J. Pitman's system already counts its 810th thousand of copies issued), and one is inclined to wonder whether some full and skilful system of denoting sounds might not be worked out, which would render unnecessary the more partial working of phonetic spelling.

THE culture of the tea-tree in Transcaucasia, which has been recently advocated by Dr. Woeikoff, has already been successfully carried out on a small scale for several years—as we learn from a recent communication of M. Zeidlitz to a Russian newspaper. It was an Englishman, Mr. Marr, who has inhabited Transcaucasia since 1822, who brought to a flourishing state the Crown garden at Ozurghety, and embellished it with a number of lemon, orange, and tea trees, these last numbering more than two hundred. After the Crimean war only twenty-five tea-trees were growing in this garden, and according to Mr. Marr's advice they were transplanted to a private estate at Gora, close to Tchakhataour. Since the estate has changed its proprietor, only two tea-trees have remained, but still they continue every year to flower and to give fruit, and M. Zeidlitz is sure that if the culture be seriously tried it might be successful in the valleys of the Koura and Rion.

THE additions to the Zoological Society's Gardens during the past week include a Ring-tailed Coati (*Nasua rufa* ♂) from South America, presented by Miss K. M. Battam; two Patagonian Cavies (*Dolichotis patachonica*) from Patagonia, a Hairy-rumped Agouti (*Dasyprocta prymnolopha*) from Guiana, a Ring-tailed Coati (*Nasua rufa*) from South America, two Rufous Tinamous (*Rhynchotus rufescens*) from Brazil, two Tuberculated Iguanas (*Iguana tuberculata*) from the West Indies, two Huanacos (*Lama huanacos* ♂ ♀) from Bolivia, presented by Mr. Frank Parish, C.M.Z.S.; a Gray Parrot (*Psittacus erithacus*) from West Africa, presented by Mr. E. T. Holloway; a Vulpine Phalanger (*Phalangista vulpina*) from Australia, presented by Mr. H. Livermore; two Smooth Snakes (*Coronella lævis*), European, presented by Mr. W. H. B. Pain; a Two-streaked Python (*Python bivittatus*), a Reticulated Python (*Python reticulata*), a Two-banded Monitor (*Varanus salvator*), a Fringed Tree Gecko (*Ptychozoon homalocephala*), a Javan Porcupine (*Hystrix javanica*) from Java, presented by Dr. F. H. Bauer, C.M.Z.S.; two Mountain Ka-Kas (*Nestor notabilis*) from New Zealand, a Three-coloured Lory (*Lorius tricolor*) from New Guinea, a Severe Macaw (*Ara severa*) from Brazil, deposited; ten Common Chameleons (*Chamæleon vulgaris*) from North Africa, two Brazilian Cariamas (*Cariama cristata*) from Brazil, purchased; a Somali Wild Ass (*Equus somalicus* ♂) from Somali Land, received in exchange.

OUR ASTRONOMICAL COLUMN

SCHMIDT'S VARIABLE-STAR IN VIRGO.—Prof. Schjellerup, writing from the Observatory, Copenhagen, on August 9, thus expresses himself with reference to a note which appeared in this column on his identification of the above object:—"On the article that is to be found in NATURE, July 31 last, about this star, allow me to make some essential remarks. The author entirely misconceives the sense of my note in Sûfi. It does not at all concern No. 19 Ptol., but only sets out that Lalande 25086 takes that place where must have been the star which Sûfi saw; and I may yet maintain the correctness of the note. I only ask the author to look at Bremicker's map, Hora XIII.; he will find there that Lalande 25086 has just equal distances from Spica and from *h* Virginis (Ptol. 17), and, what is more, that this distance is nearly one and a half times the distance between Spica and *h* Virginis, very conformably to Sûfi's remark in the text: 'Entre elle (19) et al-simâk (α Virginis) vers le sud-est, il y a environ une coudée et demie, et entre elle et la 17ᵉ il y a la même distance. Avec al-simâk et la 17ᵉ elle forme un triangle isoscèle, cette étoile étant au sommet.' It is also to be remarked that Sûfi has before declared the distance between No. 17 and Spica as 'environ une coudée,' that is, nearly 2° 20′. What is here said about 19 (Sûfi) does not at all agree with the position of No. 19 by Ptolemy, which is also pointed out by Sûfi himself as follows: 'La latitude de cette étoile, indiquée dans le livre de Ptolémée, se trouve erronée, parce que, au ciel, elle se fait voir autrement qu'elle ne tombe sur le globe.'" We are glad to print Prof. Schjellerup's explanation of the purport of his note; it is quite possible that others may have interpreted it as we did.

THE NEW COMET.—Several orbits for this comet have been published in the *Astronomische Nachrichten*, founded for the most part upon the position obtained on the night of discovery, July 16, and on M. Trépied's observations on July 23 and 29, where there appears to have been at first some doubt as to the comparison-star. The middle observation is not well represented by any of these parabolic orbits, and Prof. Weiss conjectures that there is considerable ellipticity, at the same time remarking that a certain general resemblance exists between the elements of the present comet and those of the lost short-period comet of De Vico, observed in 1844, but not found since that year. In the uncertainty which seems to have attached to the observations at Algiers, it would not be safe to speak confidently as to the nature of the orbit, though it may be decided in a very short time.

Prof. Tacchini has kindly communicated the following observation made at the Observatory of the Collegio Romano:—

	Rome M.T. h. m. s.		Right Ascension h. m. s.		Declination ° ′ ″
August 9, at	8 31 56	...	16 51 20·14	..	−36 56 25·5

The comet was very faint, and the observations, by Prof. Millosevich, are a little uncertain.

The best parabola, according to Prof. Weiss, has the following elements:—

Perihelion passage, August 17·5109 G.M.T.

	° ′ ″	
Longitude of perihelion	301 57 24	M.Eq. 1884·0
,, ascending node ...	357 45 51	
Inclination	7 2 31	
Logarithm of perihelion distance	0·147982	

Motion—direct.

The most reliable elements of De Vico's comet of 1844 are those given by Brünnow in the Ann Arbor *Astronomical Notices*.

BRORSEN'S COMET.—From a note of Prof. Krueger's in the *Astronomische Nachrichten*, it seems that Dr. Schulze has not been able to undertake the calculation of the perturbations of this comet since its last appearance in 1879, and accordingly the rough ephemeris lately given in NATURE is transferred to that journal.

THE FORESTS OF NORTHERN EUROPE

A VERY recent report has appeared on this subject in the shape of a small Blue-Book which deals with the various aspects of the forestry question in certain of the more northerly States of Europe, such as Germany, Russia, Norway, Sweden, Coburg, and Gotha. The Report, which contains matter of great interest in many ways, is the outcome of the proposals of Dr. Lyon, M.P., to rehabilitate the ancient forest system in Ireland; and although the greater part of it deals with the administrative and commercial results, in themselves of great value, many facts are elucidated which bear upon the natural history of the countries under discussion. The Duchy of Gotha contains a forest area of 32,054 hectares, of which at least 94 per cent. are massed together in the Thuringian Forest, whilst the remainder cover the height above the plains, at an elevation of about 900 metres above the sea. The geological formation of these heights is for the most part Lower New Red interspersed with thick veins of porphyry, while that on which the plain forests are situated is limestone. At least 85 per cent. of the Gotha trees are pine, the remainder consisting of larch, oak, maple, ash, birch, and elm. The Duchy of Coburg does not possess half the forest area of Gotha, there being only 15,718 hectares altogether, of which 86 per cent. is pine. Considering the minuteness of information which is gathered together by most of the German Departmental Bureaus, it is surprising how difficult it is to obtain statistical knowledge on the subject of forests, the reason being that each State has its own Department of Agriculture, quite irrespective of the Imperial Administration. Prussia, however, seems to have been more awake than the others, to the desirability of attempting to cultivate other than indigenous trees in the kingdom; and in the Budget for 1880, no less than 50,000 marks (2500*l.*) was set aside for the purpose. The following list was made out of new trees, but as there has not been any further mention of their introduction in subsequent Reports, it is uncertain how far the proposal was really carried out. The trees were as follows:—

Name	Habitat
Pinus rigida	North America, eastern portion.
Thuja gigantea	
Juglans nigra	
Carya alba	
C. amara	
C. aquatica	
C. tomentosa	
C. porcina	
Quercus rubra	
Populus monilifera	
Abies Douglasii	North America, western portion.
Pinus ponderosa	
Cupressus Lawsoniana	
Juniperus Virginiana	
Acer Negundo	
A. saccharinus	
A. dasycarpum	
Betula lenta	
Abies Nordmanniana	Caucasus.
Pinus Laricio	Southern Europe.
Picea sitchensis	Japan.

The estimated area of forest land in European Russia is about 146,460,000 dessiatines (1 dess. = 2·69 acres), or 33 per cent. of the total area of the country, compared with which Austria has 29 per cent., Germany 26, France 19, Italy 18, and Turkey 14. It is a drawback to Russia that her forests are so unevenly concentrated, at least three-fifths being situated in four Governments, leaving but two-fifths to the other forty-five. As a rule, the further one travels south in Russia the less forest is met with, the Governments of Archangel, Wolgoda, Olonetz, and Perm possessing 60 per cent., while in those of Poltawa, Bessarabia, and the country of the Don Cossacks, there is not more than 4 per cent. It is an undoubted fact that Russian timber is on the decrease; and ten years ago M. Aschakow in his evidence before a Commission to inquire into the condition of the forests in the Ufa, stated that the whole of that part of the country was threatened with an absolute want of wood, hundreds of thousands of trees being stripped for the sake of the bark and the roots. Naturally the evil does not stop here; but the climate also shows a considerable change—the rivers, such as the Bielaia, showing each year a smaller volume of water. Floods are more frequent, property is destroyed to an alarming extent, the beds of the rivers silt up, and the navigation becomes annually more and more uncertain. From observations made at Kieff, the winter lasts longer, and the harvests are not so productive as of yore; while Dr. Grimm notes that rivers which once had a reputation for abundance of fish, the banks of their rivers being well covered with timber, are now as deficient as formerly they were rich, and he attributes the change to the dearth of insects, whose larva furnish food for the fish. Another evil arising from the destruction of the forests is the much greater liability to hailstorms; and in this respect the same complaint comes from France, Germany, and Switzerland. Indeed, districts that were once wooded, rarely, if ever, suffered from hailstorms; and the converse has been noted that, where new trees have grown up, the storms have been less and less severe.

So general has been the conviction that this forest destruction is causing serious damage to the country, that a society has been formed at Moscow to consider the question, and engineers have been sent with a view of ascertaining the height of the water in the rivers during the spring, the changes in the number and size of the lakes, the changes which have taken place in the character of the summer and winter seasons, particularly as affecting the vegetation and the growth of plants. M. Wagner, in an article in the *Novoe Vremya*, 1882, considers that the systematic forest waste will lay Western Russia open to the action of the south-east wind, and thus bring undue dryness and contagion from Central Asia; and according to the latest accounts of the advance of the Siberian plague, M. Wagner's prognostications seem in a fair way of fulfilment.

The climatic conditions of Russia are such as to allow a great variety of trees to flourish. If a line be drawn from Orenburg towards the west, through the Governments of Samara, Pensa, and Tamboff, as far as Tula, and thence to Charkoff, Kieff, and Volhynia, the deciduous trees will be found to predominate to the south, and the coniferous trees to the north. As far as 67° N. lat. *Pinus sylvestris* is the most universal tree, being found in the south, indeed, only in isolated patches. It extends northwards as far as 70° N. lat., and eastwards as far as the Petchora, its southern boundary being at 44½°, though, passing over the steppes, it is again seen in the Caucasus at from 41½° to 43°. *Abies excelsa* is the next common, being found in Finland as far north as 68¾°, while in the east the predominating tree is *A. obovata*. *A. sibirica* extends to 64°, and not further south than Nijni Novgorod. The larch (*Larix europæa*) is only met with in Poland, though *L. sibirica* inhabits the Government of Olonetz, Nijni Novgorod, and the Ural as far as the river Sakmara (51¾°), and is in high repute for ship-building purposes. The cedar (*Pinus cembra*) extends north-east to 64½°, and also in the northern part of Orenburg to 51°. There are large forests of this pine in Perm and Volgoda, and an extensive trade is carried on in the exportation of cones. As to the deciduous trees, the birches (*Betula alba*, *B. pubescens*, *B. verrucosa*, *B. fruticosa*, and *B. nana*) are very general throughout Russia, being found on the Petchora in 67° N. lat., as well as in the Crimea and the Caucasus. The oaks (*Quercus pedunculata*) have the same range southward, but are not met with on the north further than St. Petersburgh and Southern Finland, and not at all east of the watershed of the Ural. The variety known as *Q. pedunculata tardiflora* grows in the Governments of Kieff, Poltava, Charkow, and Voronetz, and is the only oak that flourishes in the Crimea. *Q. robur* and the beech (*Fagus sylvatica*) have their homes in Poland, Podolia, Volhynia, Bessarabia, the Crimea, and the Caucasus. The aspen (*Populus tremula*) is found all over the land as far as 66°, and is a valuable industrial tree, being used in paper-making. The lime-tree also (*Tilia parvifolia*) is valuable in the bast manufactories and for making matting, and is found from 64° as far as Volgoda and Perm and in the Governments of Kostroma, Kazan, and Simbrisk. The red beech flourishes at heights varying from 1500 to 4000 feet above the sea-level, and, with the white beech (*Carpinus betulus*), is chiefly found in the south-west of the Empire, and also in the Caucasus and Crimea. There are large forests in the neighbourhood of Kieff and Poltava, entirely composed of this tree. The elms (*Ulmus effusa*, *U. campestris*, and *U. suberosa*) usually frequent the south, though not in profusion; but the ash (*Fraxinus excelsior*) is much more plentiful, and is particularly valuable, as affording shelter for the Spanish fly, the exporting of which is a somewhat extensive industry. The maples (*Acer platanoides* and *A. tataricum*) are tolerably plentiful in all parts, though not as forest trees. The same may be said of the alder (*Alnus incana*), the willow, wild apple, pear, and plum.

The average annual produce of the Russian forests is about 600,000,000 cubic feet, at which rate the yield of a dessiatine is not more than six cubic feet, a poor result when compared with other countries, Prussia giving at the rate of 84·7 cubic feet a year, Bavaria 131, and Saxony 165. It is singular, however, that where the extent of productive forest in Russia is smaller, the yield per dessiatine is greater, the average of the central provinces being 60 cubic feet, and in the south 37, while in the north it scarcely amounts to 3 cubic feet. Nor is the return very satisfactory from a pecuniary point of view, most of the Governments being far under one rouble per dessiatine, though a few can show better results, those of Moscow, Kursk, and Voronetz being 3½ roubles, of Charkow 5½, Tula 6·16. But the general value is not as satisfactory as in other countries, Prussia showing an equivalent of 2½ roubles, Bavaria 4½, Saxony 10, and France 9. One of the most useful developments of tree cultivation in Russia has been the formation of plantations along the railway tracks, about 2000 dessiatines having been already covered in this way on the Kursk-Charkoff-Azov, the Kozloff-Voronetz-Rostoff, the Orel-Griasi and Fastovo lines, the object being of course the protecting of the rails from snowdrift. M. Sredinsky, the inventor of this very successful system, considers that seven rows of trees are sufficient for this purpose, and on this calculation one verst would require 33,000 plants, of which 9000 must be trees, and the remaining 24,000 shrubs. The trees which he finds best adapted for this purpose are elm, ash, oak, white and yellow acacia, maple, white thorn, hazel (*Corylus avellana*), wild plum, gleditschia, mulberry, elder, &c., but along the Sumi Railway in the Government of Charkoff, *Pinus sylvestris* has been planted, and does well. Tree-planting has also proved invaluable for fixing the sand plains at Aleschki on the Dnieper, the best for this purpose being *Salix acutifolia*, *Genista tinctoria*, *Ulex europæus*, *Prunus spinosa*, and *Pinus maritima*. When Russia first got possession of the Crimea, the banks of the Dnieper were wooded for at least seventy versts; but, as colonisation extended and population increased, the herds and flocks destroyed the roots of the trees, and thus allowed the formation of these sand plains, which comprise 139,000 dessiatines. Of these, some 20,000 are fairly covered with *Salix viminalis*. Birch are found on about 10,000 dessiatines, while at least 34,000 are of the pure sand.

THE AMERICAN INITIATIVE IN METHODS OF DEEP-SEA DREDGING[1]

THE published records respecting the use of dredges for natural history purposes carry us back to scarcely more than a century and a quarter ago, when Otho Frederick Müller, a prominent Danish naturalist, began his studies of the aquatic life inhabiting the coasts of Norway and Denmark below the shore-level. The dredge he used, a very simple affair, was, so far as we know, the first one ever devised for the special needs of the naturalist; and yet, with only a single important modification as to the shape of the frame, it has been handed down to our time as the most efficient appliance for the ordinary purposes of dredging.

As described and figured in 1779, it consisted of a plain, rectangular iron frame, with all four sides of equal length, and bevelled to sharp edges in front, forming the mouthpiece to a large and open net. Four handles extended forward from the angles, and met in a single ring for the attachment of the drag-rope. The principle defect of this dredge consisted in its very wide mouth, permitting the easy escape of specimens both while dragging and during the hauling in.

Although Müller's researches were confined to shallow water, apparently not exceeding a depth of thirty fathoms, they established a precedent for subsequent operations, and afforded proof of the value of submarine collecting.

This new field of exploration did not, however, begin to enlist the active services of working naturalists to any extent until about the third or fourth decade of the present century, since which time the interest in marine zoological research has rapidly increased, and our knowledge of the sea-bottom has been extended to the deepest-known areas. For the first thirty or forty years the improvement in methods of work scarcely kept pace with the progress of knowledge regarding the inhabitants of the sea; and it is only within the past fifteen years that the methods of deep-sea dredging have been at all perfected.

To Dr. Robert Ball of Dublin, who was afterwards associated with Prof. Edward Forbes in his memorable explorations, has generally been given the credit of having devised, about 1838, the improved form of naturalists' dredge, in nearly the same shape in which it is used to-day. However that may be, it was about the year last mentioned that both European and American naturalists entered actively into the study of the sea-bottom; and the history of their various exploits down to the present time affords an exceedingly interesting chapter, upon which the subject of our paper permits us to touch but slightly.

It may be well to remark, however, that the character and results of European, and especially British, exploration are much more widely and popularly known than are those of our own country. The reason is obvious. The active mercantile pursuits of a young and progressive people have naturally made them less appreciative of scientific facts and results than the inhabitants of many older countries, where business interests have fewer claims upon all classes. There has been but a slight demand for popular writings upon such an unpractical subject, and the plodding naturalist has generally been content to record his observations and methods where they were accessible only to his brother-workers. For this reason American naturalists have not received the credit which is their due, either at home or abroad; and much of the honour that justly belongs to them has passed into other hands.

So far as concerns the general public, this is not to be wondered at, when we consider that the only popular accounts of deep-sea dredging explorations obtainable in this country are of English origin. But the same excuse does not hold good for the working naturalists of any country, including our own; as the progress of American deep-sea research, and the improvements in methods for carrying it on, have in nearly all instances been duly and promptly recorded in the proper channels to insure wide and timely distribution.

Since the very beginning of activity in this branch of investigation, American workers have not been far behind those of any European country; and their record is as creditable. Dredging was carried on by the Wilkes U.S. Exploring Expedition during the early part of its cruise, beginning in 1838; and at about this same time a few of our most earnest naturalists were using the dredge at home. The late Dr. William Stimpson, one of the most intelligent observers in this branch, and whose name is closely linked with several important explorations, began his career in Boston Harbour between 1848 and 1850; his first instructions having been received from Dr. W. O. Ayres, who began dredging fully ten years before. Stimpson's researches were largely conducted under Government auspices; and the collection of submarine specimens resulting from his labours, distributed over many portions of the Atlantic and Pacific Oceans, was probably one of the very largest of its kind that had been made, up to the time of its unfortunate destruction by fire at Chicago, in 1871. The loss of these collections, and of all the voluminous manuscript reports treating of them, followed by the sad death of the author, has deprived our country of a most important chapter in the history of submarine exploration.

The sixth decade of this century, however, brought out many additional investigators, and a fresh impetus was given to the work, which has since been expanded and developed to such an extent as to establish beyond all question American precedence in the methods of deep-sea research at least, both as regards dredging and sounding.

From among the more energetic and successful of our modern dredgers may be mentioned Prof. A. E. Verrill of Yale College, whose dredging studies began in 1864, on the coast of Maine, and who, since the organisation of the U.S. Fish Commission, has been its main helper and adviser in all matters pertaining to submarine research, the special direction of the dredging operations having been intrusted to him from the beginning. His earlier experiences gave him a clear insight into the requirements of the new project, and enabled him to devise many valuable appliances, and improve upon those which had been in use. To his zealous and untiring efforts is due much of the perfection in present methods of work.

In 1867 Mr. L. F. de Pourtalès, of the U.S. Coast Survey, began the extensive series of deep-sea explorations off the southern coast of the United States, which were carried on for several years, and subsequently led to the eventful cruises of the steamer *Blake* between 1877 and 1880, resulting in an entire revolution in the methods of deep-sea dredging and sounding. The investigations of Mr. Pourtalès anticipated by a year those of the English steamers *Lightning* and *Porcupine*, which have been so widely described, and were preceded by only one series of systematic dredgings in equal depths of water—those of the Professors Sars, father and son, of Norway. But little credit for this fact has been received from naturalists abroad, the date of Mr. Pourtalès' first cruise being generally regarded by them as 1868, although his first paper, descriptive of the character of his work and of many new forms of deep-sea animals, appeared in

[1] From *Science*.

December 1867.[1] His collections, representing principally the fauna of the Gulf Stream off Florida, gave new and interesting results, going farther to prove the existence of a rich and diversified deep-sea fauna, different from that of the shore regions, than any previously obtained.

That these dredgings were not undertaken to please the passing whim of some over-enthusiastic naturalist, but were as deliberately planned and carried out, and as successful in their results, as those of the English steamers which followed them in conception, a reference to the official publications of the Coast Survey will sufficiently prove. As substantiating this statement, we may be pardoned for quoting a short paragraph from the report of Mr. Pourtalès, above referred to (December 1867), in which the plans and objects of the new explorations are briefly stated. This would not be called for, were it not that it is this identical report which has been so utterly ignored by European writers, and equally overlooked by many Americans. Had it only been written in popular language, and been published with copious illustrations, it might have received the credit which has been denied it; but such channels of publication are seldom deemed necessary to establish priority in scientific research.

The plan of operations, according to Mr. Pourtalès, was as follows:—

"The present Superintendent of the Coast Survey, Prof. B. Peirce, has lately directed the resumption of the investigations of the Gulf Stream, so successfully inaugurated by his predecessor, but interrupted for several years by the war. Besides observations of the depth, velocity, and direction of that current, and the temperature and density of the water at different depths, the researches will be extended to the fauna of the bottom, of the surface, and of the intervening depths. Not only will an insight be thus obtained into a world scarcely known heretofore, but that knowledge will have a direct bearing on many of the phenomena of that great current. Thus a new light may be thrown on its powers of transportation from shallow to deeper water or along its bed, on its action of forming deposits in particular localities, or on its possible influence on the growth of coral-reefs on its shores."

In a subsequent passage he summarises his first season's results in the following terse remarks, the italics being his own:—

"However, short as the season's work was, and few as were the casts of the dredge, the highly interesting fact was disclosed, that *animal life exists at great depths, in as great a diversity and as great an abundance as in shallow water.*"

Early in the following year (1868) the same explorations were resumed, and they were continued through 1869.

It may be thought that we have departed too widely from our subject in discussing with so much detail the progress of American research during a period in which no great improvements were made in methods of work on this side of the Atlantic; but how could we have better furnished proof of the rapid growth of interest in such matters, and of the maturing of ideas which prepared the way for the important changes marking the next decade.

There is, however, one noteworthy addition to the collector's outfit made in this period, which deserves special mention. On one of the dredging cruises of the English exploring steamer *Porcupine*, between 1868 and 1870, Capt. Calver, the naval officer in charge, attached several of the common deck-swabs to the end of the dredge-net, with the expectation that, in sweeping the ocean-bottom, they would securely entangle all the rough and spiny objects lying loose within their path. His fondest hopes were realised, and the novel experiment, suggested by often finding such objects as sea-urchins, corals, and sponges, adhering to the exterior of the dredge-net, and even to the lower part of the drag-rope, gave origin to one of the most efficient implements of modern deep-sea research.

When the beam-trawl, a well-known English appliance for the capture of bottom-fish, was first adopted into the outfit of the marine zoologist, we are unable to state; but it does not appear to have ever been extensively and systematically employed in scientific research until so used by the U.S. Fish Commission, beginning in 1872. It was afterwards used by the *Challenger* from 1873 to 1878, and now greatly excels the dredge in the extent and value of its results, wherever the ground is suited to its use.

The year 1871 was signalised by the organisation of the U.S. Fish Commission, one of the most important scientific establishments of modern times for marine zoological work. Although instituted primarily for the investigation of fishery matters, it has, through the wise and liberal policy of its Director, Prof. Baird, accomplished most valuable results for marine biology. The latter department has been sedulously fostered, in the belief that its results would have an important bearing upon the practical questions at issue. No pains have been spared to perfect the methods of research, and many valuable contributions have already been made to the marine collector's outfit. These are briefly described below, and, as the history of the Commission is already well known to most readers, we need refer here to only a few points which have marked its progress.

The earlier explorations were carried on mainly by means of sail-boats, and were confined to comparatively shallow water. From 1873 to 1879 a naval tug was placed at the disposal of the Commission every year; but in 1880 the steamer *Fish Hawk*, a twin-screw propeller of 205 tons (n.m), was built expressly for the combined purposes of fish-hatching and dredging. Its small size and light draught prevented long trips at sea, but it was well adapted for deep-sea work, and was supplied with all the improved appliances, as well as those which had originated with the Commission, including wire rope, then recently introduced by the Coast Survey. In 1883 the steamer *Albatross*, described in vol. ii. of *Science* (pp. 6, 66), was completed, and made her first successful cruise in the spring of that year. Her log for the summer of 1883 records the deepest trawling yet made in the Atlantic Ocean, the depth having been 2949 fathoms, and the results successful. Brief accounts of her dredging cruises under Lieut.-Commander Tanner, U.S.N., have appeared from time to time in late numbers of *Science*.

While the Fish Commission claims priority for many improvements in apparatus primarily intended for depths under a thousand fathoms, it willingly yields the palm for deep-sea improvements to the U.S. Coast Survey, especially in the persons of Commander Sigsbee, U.S.N., and Mr. Agassiz. The explorations of the steamer *Blake* from 1877 to 1880, in which the methods of deep-sea dredging and sounding were completely revolutionised, mark one of the most important stages in the progress of marine research. Wire rope was substituted for hemp, the dredge was altered to adapt it to the soft bottoms of deep water, on which dredging results had always been uncertain, and the beam-trawl was made reversible. The methods of handling and reeling the rope were also perfected. These changes and additions were briefly described and figured from time to time as work progressed in the *Bulletin* of the Museum of Comparative Zoology, at Cambridge, by Mr. Agassiz and Mr. Sigsbee, and were afterwards fully discussed by the latter in one of the most elaborate and instructive reports ever dedicated to the methods of deep-sea research.[1] It is a quarto volume of 208 pages and 41 plates, describing the sounding and dredging appliances used by the *Blake*, and which, for the greater part, were devised or improved during her dredging cruise. So far as her dredging appliances are concerned, the credit for changes made belongs mostly to Mr. Sigsbee and Mr. Agassiz, the former having been in command of the expedition, and the latter in charge of the natural history operations.

During the seventh decade, European explorers were not idle, and numerous deep-sea expeditions were fitted out. Most notable among these was the cruise of the British ship *Challenger* around the world between 1873 and 1878. Her scientific results were most interesting; but the older methods of deep-sea work were not greatly altered, although the practicability of using the beam-trawl successfully in the deepest water was fully demonstrated.

In 1881 the French Government inaugurated a series of submarine explorations in the Atlantic Ocean and Mediterranean Sea; for that purpose fitting out a small naval vessel, the *Travailleur*, and placing the management of affairs in the hands of a competent scientific staff, under the directorship of Prof. A. Milne-Edwards. These investigations were continued by the same vessel during 1882, the appliances and methods of work having apparently been patterned after those generally recognised in Europe. In 1883 a larger vessel, the *Talisman*, was assigned to the work, and operations were established on a much grander scale than before.

For an account of these explorations, descriptive of the methods of work and general results, we are indebted to the last volume of *La Nature*, a French journal of the character of

[1] *Bulletin* Mus. Comp. Zool., Cambridge, vol. i., 1863-69, pp. 103-120.

[1] "Deep-Sea Sounding and Dredging: a Description and Discussion of the Methods and Appliances used on Board the Coast and Geodetic Survey Steamer *Blake*." By Charles D. Sigsbee, Lieut.-Commander U.S. Navy Assistant on the Coast and Geodetic Survey. (Washington, 1880.)

Science, which began in a January number the publication of a series of articles by one of the naturalists who accompanied the steamer.[1] Coming from such an authoritative source, we are led to regard these papers almost in the light of a semi-official report, and look to them for at least a correct statement regarding the origin of their methods of work, inasmuch as these matters are discussed in some detail, and with evident pride at the completeness of the outfit. That the outfit was complete no one who is at all posted on the subject can deny; for nearly all of the many improvements introduced by the Coast Survey and Fish Commission prior to 1880 are most faithfully copied, and most heartily praised for their perfect adaptation to the requirements of research.

We glance through the several pages of the report for at least some slight acknowledgment on behalf of American inventive skill; but beyond a brief statement to the effect that the hoisting-engine "was of the same type as that employed by Mr. Agassiz," and that he also "used with good results the common form of beam-trawl," we are left to infer that the entire outfit was of French origin; and such must be the impression of every one who reads these papers. In fact, in several instances, credit is explicitly bestowed on French inventors for certain of the appliances which do not differ in any essential features from the corresponding American patterns.

What is to be gained by thus appropriating to the credit of a nation what properly belongs to another and a friendly one, by all the rights of international courtesy, it is difficult to understand, and especially so in this age of supposed enlightenment, when every important discovery is carried with lightning rapidity to all parts of the civilised world. The field of marine research is sufficiently broad to engage the entire attention of all the naturalists who have yet entered it; and the frequent manifestations of jealousy on the part of foreign, and especially French, investigators, which often result in wholly ignoring the works of an able American author, can but retard progress instead of aiding it.

Proofs of the superior excellence of American methods of deep-sea research may be found in every important scientific library of Europe as well as this country; and at the two most prominent International Fisheries Exhibitions of the world—those of Berlin in 1880, and London in 1883—all of the American appliances were displayed, and received the highest awards. They have therefore been made sufficiently well known to establish their merits before the scientific world; but, as no descriptions of them have yet been published for the benefit of the general public, we propose in future numbers of *Science* to give accounts of their construction, and of the causes which lead to their introduction. RICHARD RATHBUN

[1] For an abstract of the portion relating to the apparatus employed, see *Science*, No. 62.

WHY TROPICAL MAN IS BLACK

THERE are few subjects the explanation of which has taxed the ingenuity of man more than the existence of extremes of colour in different sections of the human race. Tradition has attributed the dark race to one of three brothers, the other two being progenitors of the opposite hue, without at the same time offering any solution of the variation from a common stock.

Physiologists have vaguely asserted that a black skin is best suited to a hot climate, but do not attempt to reconcile the fact that a black coat is certainly the least adapted to the same condition. Evolutionists would doubtless say that in those early days when man in the dense forests of the time was fighting his brave struggle of brain against fangs and claws, the dark skin mingling with the shadows of the overhanging foliage gave him a chance of survival; but this reaches the conclusion that the first men were black, and that all white men proceeded out from these.

Yet even if this be so, and if the dark skin served only for concealment, why on the burning tablelands and treeless undulations of Central and Southern Africa, where there is scarce a bough to shelter him, has man for so many thousand years preserved a colour which has become the standard of all blackness? Surely there must be some other explanation of the fact that man beneath the vertical rays of a tropic sun has persisted in maintaining a hue of skin which would appear to have the effect only of absorbing and accumulating the intense heat of his surroundings. Some reason why the ryot of India can labour in the plains clad only in the scantiest loin-cloth, and why the African can limit his full dress to a few inches of monkey-tails.

The rapidly accumulating evidence of the practical utility of every peculiarity, and the proofs that nature, by hoarding up a little of each individual advantage through countless generations, has arrived at the best condition for each environment, compel us to realise the fact that in the tropics darkness of skin contributes to survival.

That this colour will absorb heat more than any other is as true of the skin of a man as of the roof of a house; therefore the anomaly is reached that in the tropics he is fittest who is hottest, so long as heat is regarded as the only factor in the consideration. But that one cannot live by heat alone is as true of the animal kingdom as of the whole vegetable world. Light, the twin stimulant of life, because perceptible to our consciousness by its action on a specialised nerve, has been too much limited in our conceptions of its influence to that duty only.

The gigantic processes of nature by which the great vegetable world, past and present, has been built up, the oxygen of water divorced from its hydrogen in the leaves of plants, and carbonic acid resolved into its constituents, were and are accomplished by the light-waves of the sun; and yet in the animal kingdom the action of these waves upon the eye is held to be almost their sole effect.

The craning offshoot of a window-plant, the twisted leaves of an indoor flower are sufficient evidence of the resistless power of light, and the proofs of its effect on man are as numerous as those of its action on plants; the mode only of that action is the mystery, and yet if this can be even partially explained, enough may be attained to show why those in whom a portion of the rays of the glaring tropic sun are blocked at the surface are best adapted for survival beneath its vertical beams.

As has been expressed by Prof. Tyndall ("Atoms, Molecules, and Ether Waves," *Longman's Magazine*, Nov. 1882), "We know that all organic matter is composed of ultimate molecules made up of atoms, and that these constituent atoms can vibrate to and fro millions and millions of times in a second." Nerve is organic matter, and "whether we meet with nerve tissue in a jelly fish, an oyster, an insect, a bird or a man, we have no difficulty in recognising its structural units as everywhere more or less similar. These structural units are microscopic cells and microscopic fibres, the function of the fibres is that of conducting impressions (represented by molecular movements) to and from the nerve cells, while the function of the cells is that of originating those of the impressions which are conducted by the fibres outwards," (*vide* "Mental Evolution in Animals," Romanes).

We can conceive then that the way in which a nerve-fibre conveys to a more central nerve-cell an impression from the surface is by rapid vibration of its component molecules. Such vibrations can be rudely originated by contact, pressure, or such like stimuli, till they give rise to feeling, or, if severe, to pain, but they can be not only improvised, they can be communicated. The simplest illustration of vibrations being communicated is when a piano is opened and sung into; whereupon the string whose tension coincides with the uttered note will take it up and pass it on in sound. If then vibrations were taking place in the immediate vicinity of the sentient extremities of nerves all over the surface of the body, the same would be expected to occur.

The waves of light and heat follow each other at similar rates through the luminiferous ether.

Man lives at the bottom of a measureless ocean of this subtle medium, and is, in common with all else in the universe, permeated by it. "When, therefore, light or radiant heat impinge, like the waves of sound just adverted to, their waves select those atoms whose periods of vibration synchronise with their own periods of recurrence, and to such atoms deliver up their motion. It is thus that light and radiant heat are absorbed." (Tyndall).

Is it not from this easily intelligible how heat-waves notify their existence and intensity along the surface fibre to the central nerve cell, and so enable the animal to avoid their action, if excessive, or seek their increase, when deficient. And shall it be said that while the heat-waves are thus received, and responded to, through every instant of existence, their fellow-workers, the waves of light, are practically inert except for the stimulation of the one specialised nerve of the eye?

By going from the complicated and compound to the structureless and simple, the question can be answered in no uncertain way.

In some of his recently published experiments, Engelmann found that many of the protoplasmic and unicellular organisms are affected by light, and when the first animals possessed of organs of special sense, viz., the jelly-fish, (Medusæ), are reached it is found that one particular Medusa (*Tiaropsis polybiademata*) always responds to strong luminous stimulation by going into a spasm or cramp (Romanes).

But there is a still stronger argument in favour of the powerful action of light on the nerves of the skin in the fact that, as Prof. Heeckel says, "the general conclusion has been reached that in man, and in all other animals, the sense organs as a whole arise in essentially the same way, viz. as parts of the external integument, or epidermis." In fact, that nerves which now see could once but feel. That the highly sensitive optic nerves are but nerves of the skin, whose molecules once could vibrate only in consonance with the large ultra-red waves of heat, whereas now their molecules have become attuned to the shorter waves of the visible part of the spectrum.

Surely, then, if any one of the nerve-endings of the skin indiscriminately can be specialised for the recognition of light, whether at the margin of the swimming disk in the jelly-fish, at the point of the ray in the star-fish, on the fringe of the mantle in the shell-fish, or on the back in some species of snail, it must be conceded that in the first instance all surface nerves must feel the influence of that agent by which they are to be hereafter exalted. And this has been reduced to a demonstration by Mr. Darwin in his investigations on earthworms, which, although destitute of eyes, are able to distinguish with much rapidity between light and darkness, and as only the anterior extremity of the animal displays this power he concludes that the light affects the anterior nerve-cells immediately, or without the intervention of a sense-organ. But a yet more wondrous lesson is to be learned from the steps which Nature takes for the exaltation of a heat-responding nerve into one capable of vibrating in harmony with the shorter waves of light.

The only external agents available are heat and light, and by these, with such local adaptations as are possible, the conversion must be brought about.

Seeking again from the lowest organisms the secrets of the highest, it has been found by Engelmann that the simplest creature which responded to luminous stimulation was the protoplasmic *Englena viridis*; moreover, that it would only do so if the light were allowed to fall upon the anterior part of the body. Here there is a pigment spot, but careful experiment showed that this was not the point most sensitive to light, *a colourless and transparent area of protoplasm lying in front of it being found to be so.*

From this, the most rudimentary, through the pigmental bodies round the margin of the swimming disk of medusæ, and the pigmented ocelli at the tips of the rays in star-fish, to the lowest vermes, in which Prof. Haeckel finds the *usual cells sensitive to light separated by a layer of pigment cells from the outer expansion of the optic nerve*, we meet with the same arrangement ever progressing upwards, viz., transparency immediately in front of the part to be exalted, and pigment immediately behind it, and are left to infer from the object ultimately attained what is the reason of this primary adaptation.

Nature has made the most of her two factors, by exposing the selected tissue to the continued impinging upon it of the waves of light, while at the same time securing not only the transmission through it of the waves of heat, but their constant accumulation behind it, thereby causing the molecular constituents of the protoplasm to be thrown into the highest rates of vibration possibly obtainable with the means at disposal, and undoubtedly more rapid than those of any protoplasm not so situated; till little by little, by the survival here and there of individuals who had derived some benefit from inherited increase of sensitiveness in the exposed parts, the time arrived when the advantage became permanent in the species, and the foundation was laid in a transparent atom of protoplasm lying in front of a speck of pigment, of those wondrous organs which in æons of ages afterwards were to enable man to look upon the universe and to behold that it was good.

Such is what light and heat in unison have wrought, and is it to be supposed that their action on the surface nerves is less powerful now than ever? Is it not more reasonable to think that a larger number of specialised nerves not being an advantage have not been developed, and that though we are unconscious of the power of light upon our bodies, yet that analogy points to the fact that to it, when combined with heat, we owe the highest exaltation of our keenest sense?

Recognising thus the effects of simultaneous light and heat when their influence is concentrated by a local peculiarity on a particular part, must it not be evident that in an individual unprotected by hair and unscreened by clothes, living beneath the vertical rays of an equatorial sun, the action of these two forces playing through a transparent skin upon the nerve-endings over the entire surface of the body, must be productive of intense, but at the same time disadvantageous, nerve vibrations, and that presumably such individuals as were least subject thereto would be best adapted to the surroundings?

Nature, therefore, having learned in ages past that pigment placed behind a transparent nerve will exalt its vibrations to the highest pitch, now proceeds upon the converse reasoning, and placing the pigment in front of the endangered nerve reduces its vibrations by so much as the interrupted light would have excited, a quantity which, though apparently trifling, would, when multiplied by the whole area of body-surface, represent a total of nervous action that if continued would soon exhaust the individual and degrade the species.

Thus it is that man, though so many generations have come and gone since the days of his weaponless struggles with the beasts of the forest, still retains in its full strength that colour of skin which, while it aided him materially in his early escapes, is now continued because it has a more important office to fulfil in warding off the millions of vibrations a second which would otherwise be poured in an uninterrupted stream upon his exposed nervous system.

Again, the chemical power of light expressed in degree is, according to Professor Bunsen in Berlin, on the 21st of June at 12 o'clock, 38°, while at the same place and time on the 21st of December it is but 20°, that is, that the difference in the angle at which light strikes the same spot in December and in June causes its chemical effect to be almost doubled. What then must be its potential difference all the year round in the latitude of London and in that of Sierra Leone?

If, therefore, light be a necessary factor in the development of animal life, and be of sufficient intensity to attain the required end in the northern position of England, it must of necessity be at the equator immensely in excess, all other things being equal of what is needed, and it would be a reasonable expectation that could unclothed man be traced through the parallels of latitude northwards in distinct tribes that never intermingled with those beyond, the colour of the various sections would lessen in direct proportion to their distance from the equator, modified only by such local conditions as materially influenced the effect of light, or the action of light and heat combined.

And this is forcibly corroborated by the facts put forward in Carpenter's "Physiology," p. 985: "It may be freely admitted that among European colonists settled in hot climates such changes do not present themselves within a few generations; but in many well-known instances of earlier colonisation they are very clearly manifested."

"Thus the wide dispersion of the Jewish nation and their remarkable isolation, maintained by their religious observances from the people among whom they live, render them peculiarly appropriate subjects for such observations, and we accordingly find that the brunette complexion and dark hair which are usually regarded as characteristic of that race are frequently superseded in the Jews of Northern Europe by red or brown hair and fair complexion, whilst the Jews who settled in India some centuries ago have become as dark as the Hindoos around them."

Finally, there is in a footnote to the same page an extraordinary physiological demonstration of the truth of the proposition that skin colour is in direct proportion to light-rays, which is as follows:—

"A very curious example of change of colour in a negro has been recorded on unquestionable authority. The subject of it was a negro slave in Kentucky, æt. forty-five, who was born of black parents, and was himself black until twelve years of age. At that time a portion of the skin an inch wide encircling the cranium just within the edge of the hair gradually changed to white, also the hair occupying that locality; a white spot next appeared near the inner canthus of the left eye, and from this the white colour gradually extended over the face, trunk, and extremities until it covered the entire surface. The complete change from black to white occupied about ten years, and but for his hair, which was crisp and woolly, no one would have supposed at this time that his progenitors had offered any of the characteristics of the negro—his skin presenting the healthy vascular appearance of a fair-complexioned European. When he was about twenty-two years of age, however, dark copper-coloured or brown spots began to appear on the face and hands, but *these remained limited to the portions of the surface exposed to light.*"

May it not therefore be claimed that there is much foundation for the suggestion that the black skin of the negro is but the smoked glass through which alone his widespread sentient nerve-endings could be enabled to regard the sun?

NATHANIEL ALCOCK,
Surgeon-Major, Army Medical Department.

Since the foregoing was written there has appeared in the *British Medical Journal*, July 26, a most valuable paper by Dr. Gresswell on "Some Effects of Variations of Light," which sums up in these words, "We are tempted to conclude that light and heat impose each its own effects upon plants, as they do upon animals," and that "light is a stimulus direct as well as indirect."

SCIENTIFIC SERIALS

Atti della R. Accademia dei Lincei, May 18.—On the molybdate of didymium, by Alfonso Cossa.—On the geological constitution of the Maritime Alps, by D. Zaccagna.—On some psychological difficulties that may be solved by means of the idea of the infinite, by Francesco Bonatelli.—Remarks on the Oriental manuscripts of the Marsigli Collection at Bologna, with a complete list of the Arabic manuscripts in the same collection, by Baron Victor Rosen.—The Ligurians associated with the barrows of the first Iron Age found in the district of Golasecca, Lombardy, by Luigi Pigorini.—Note on Bartolomeo da Parma, an astronomer of the thirteenth century, and on a treatise by him on the sphere preserved in the Victor Emmanuel Library, by Enrico Narducci.—Report on the antiquities discovered in various parts of Italy during the month of April, by S. Fiorelli.—Meteorological observations made at the Observatory of the Campidoglio during the month of April.

June 1.—Obituary notice of A. Wurtz, by S. Camizzaro.—On the expansion of sulphuric ether under various pressures, by G. Pietro Grimaldi.—On the physiology and pathology of the supra-renal capsules, by Guido Tizzoni.—Analysis of a silicated hydrate of baryta, by Alfonso Cossa and Guiseppe La Valle.—On the observations of atmospheric electricity made at the Central Meteorological Office, Rome, by Pietro Tacchini.—Meteorological observations made at the Observatory of the Campidoglio during the month of May.

June 15.—Description of a Buddhist Codex in the Pali language, forwarded to the Academy by L. Nocentini, Italian Vice-Consul at Shanghai.—Obituary notice of Hermann Ulrici, by S. Ferri.—Reports on the influence of heat and magnetism on the electric resistance of bismuth, by Prof. Augusto Righi; on the constants of refraction, by Dr. R. Nasini; on the capillary equivalents of simple bodies, by Prof. R. Schiff.—Note on a problem in electrostatics, by Vito Volterra.—A method of determining the ohm in absolute measure, by Guglielmo Mengarini.—Experimental researches on the variation in the density of water between 0° and 10°, by Filippo Bonetti.—On the spectrum of absorption of the vapour of iodine, by Arnolfo Morghen.—Remarks on Shelford Bidwell's new explanation of Hall's phenomenon, by Augusto Righi.—On the electric conductivity of the combinations of carbon, by Adolfo Bartoli.—On the penetrability of glass by gases under pressure, by Adolfo Bartoli.—On the coexistence of different empirical formulas, and especially on those containing the capillary constant of liquids or the cohesion of solids, by Adolfo Bartoli.—On the atmospheric waves produced by the Krakatoa eruption, and observed at Palermo, by Gaetano Cacciatore.—Remarks on the dynamics of storms, by Ciro Ferrari.—On the intestinal canals and branchial tubes of the Salpidæ, by Francesco Todaro.—Report on the antiquities found in various parts of Italy during the month of May, by S. Fiorelli.

Revue d'Anthropologie, tome viii., fasc. 3, Paris, 1884.—The contents are:—An unfinished paper of Paul Broca, on his mode of preparing the cerebral hemispheres, which, with another chapter on the best methods of casting the required moulds, was to have formed part of the treatise on the circonvolutions of the schematic brain, on which he was engaged at the time of his death. The present paper breaks off in the middle of his explanation of the process of mummifying the brain.—An essay on the ethnology of North Africa, by M. Camille Sabatier. This paper is entirely devoted to the consideration and recapitulation of the geographical descriptions given by Herodotus, Sallust, and other ancient writers of Lybia, under which designation most of the then known African continent was included. It also treats of the great invasions from Asia, and of the differences between the various African races. As distinct from the Lybians or mountaineers, and the Getulæ or pastoral occupants of the plains, the author believes we may recognise a separate branch, which bore the name of Escs or Oscs, and which probably have given origin to the modern Basque Escualdunacs and other kindred western races.—A continuation of M. Deniker's observations on the Kalmuks. This paper is devoted specially to the sociology of the people, the condition of the women, and the practices observed at betrothals, marriages, &c., being fully treated of. The Lamas, who exercise a great influence on the people—intervening in all the great events of life from the cradle to the grave—are employed in several of the steppes by the Russian Government to keep the civil registers of the various hordes.—On various skulls of Arizona and New Mexico, by M. Ten Kate. From a comparative study of these and other crania collected by the author in his extensive travels in the Far West and in the Mexican territories, he is inclined to regard the constructors of the *casas grandes* of Arizona and the "cliff-dwellers" as closely allied to the Indian tribes of the Pueblos, or so-called "towns" of New Mexico. He found the same brachycephalic characteristics and the same evidence of artificial deformity in skulls of the ancient Pueblos of Quarra as in the modern Mexican Indians.—On the circumference of the thorax, and its relation to the dimensions of the rest of the body, by M. Ed. Goldstein. This paper is based on the data supplied by Dr. Snigerev in his great work on the recruiting of the Russian army, more especially in the districts of the Vistula and the north-west of the empire. The great ethnological fact established by these determinations appears to be that, as compared with Poles, Germans, Lithuanians, Russians, and Samogitians, the Jews are distinguished by relative smallness of stature, and by the generally inferior dimensions of the chest, in both of which particulars they would appear to fall considerably below the mean of all the other races brought under the notice of the authorities at the head of the department for recruiting the Russian army.

Rendiconti del Reale Istituto Lombardo, July 17.—Note on the present conditions of the agricultural interests in Europe and America (continued), by Prof. Gaetano Cantoni.—Memoir on cellules and parasites in their pathological relations (concluded), by Prof. G. Sangalli.—Mental affection of Torquato Tasso; his detention in the Hospital of Sant' Anna, according to some recently-discovered documents, by Prof. A. Corradi.—On the equilibrium of elastic and rigid surfaces, by Dr. Gian Antonio Maggi.

SOCIETIES AND ACADEMIES

EDINBURGH

Royal Society, July 21.—The Right Hon. Lord Moncreiff, President, in the chair.—Mr. John Murray communicated, with remarks, a paper by Dr. Guppy of H.M.S. *Lark*, on the coral reefs and calcareous formations of the Solomon Group Islands. Dr. Guppy showed that the coral rocks were merely superficial, thus confirming Mr. Murray's theory that coral atolls and barrier reefs were formed without subsidence. A chalk, like the white chalk of England, had been discovered on one of the islands.—Prof. Tait gave an approximate empirical formula representing, for certain ranges, the compressibility of water in terms of the temperature and pressure.—Mr. J. T. Cunningham read a critical note on the latest theory in vertebrate morphology.—Mr. Milne Home submitted the tenth and final report of the Boulder Committee. At some period, geologically recent in the earth's history, an Arctic climate prevailed in the part of Northern Europe considered. As an effect, local glaciers occurred in Scotland, of some of which there were traces still visible. Subsequently Scotland was entirely submerged beneath the sea, and most of the valleys were filled with sand, gravel, and mud. A north-westerly oceanic current prevailed, carrying masses of floating ice with boulders, which were deposited on the hills.—Mr. H. R. Mill gave a paper on the periodic variation of temperature in tidal basins.—Mr. W. Peddie gave a communication on the isothermals and adiabatics of water near the maximum density point.—The meeting, which was the last for the session, was brought to a close by remarks from the Chairman on the work of the past session.

SYDNEY

Linnean Society of New South Wales, June 25.—The vice-president, Dr. James C. Cox, F.L.S., &c., in the chair.—The following papers were read:—Occasional notes on plants indigenous in the immediate neighbourhood of Sydney, No. 7, by E. Haviland.—On the new Australian fishes in the Queensland Museum, Part II., by Charles W. De Vis, M.A.—Sixteen species are here described, viz.:—Seven of the family Squamipinnes, two of the Mullidæ, one of the Sparidæ, four of Scorpænidæ, and two of the Teuthididæ.—On a marine species of *Philongria*, by Charles Chilton, M.A. The Isopod described in this paper was obtained at Coogee Bay last December. The specific name "*marina*" is given to it, as it is the only marine species of the genus known to the author.—The Australian Hydromedusæ (continued), Part iv., by R. von Lendenfeld, Ph.D. In this paper the numerous Australian species of Graptolithes, described by Prof. McCoy, of Plumularidæ described by Allman, Bale, Kirchenpauer and Busk, and of the Dicoryuidæ, are sifted and catalogued with references, and a large number of new and interesting species, and one new genus discovered by the author are described and figured. The Australian Plumularidæ exceed in the number of species the Plumularidæ of all the rest of the world put together.—On the flesh spicules of certain sponges, by R. von Lendenfeld, Ph.D. In a former paper the author expressed his opinion that flesh-spicules in sponges do not, as it was hitherto supposed, only occur in such species as possess a fibreous siliceous skeleton, but that they may make their appearance in any species, so that their existence cannot be considered of sufficient import to allow of a separate family being formed, comprising such sponges only which possess flesh-spicules. The author had based this hypothesis partly on general conclusions and partly on the observation of a true horn-sponge, a *Hircinia*, with flesh-spicules. Now the author is enabled to prove his hypothesis by further discoveries, which he made during the investigation of the numerous and valuable sponges of Port Jackson. He found, namely, three species possessing flesh-spicules, which, according to the structure of their fibrous skeleton, should be placed in the families of the horn-sponges.—Note on the slimy coating of certain Boltenias in Port Jackson, by R. von Lendenfeld, Ph.D. Some solitary Ascidians, similar to the ordinary *Boltenia australis*, which grows close to low tide mark, but which are found in deep water exclusively, are covered with a very slippery slime, an occurrence without precedence in Ascidians. This slime was investigated by the author, and found to consist of a thick layer of ova in their follicula-capsules. The slime is supposed to be formed by the cylindrical cells of the Folliculæ.—Report on the Australian Echinodermata exhibited at the Fisheries Exhibition, London, by F. Jeffery Bell, M.A., &c. This paper was communicated and read by E. P. Ramsay, F.L.S., &c. It contains a list of all the named species in the collection sent to London, viz. 10 species of the class *Crinoidea*, 12 of the *Asteroidea*, 19 of the *Ophiurioidea*, and 30 of the *Echinioidea*, with critical notes, &c.—Mr. Macleay exhibited for Mr. Wilkinson a very peculiar conical stone implement, found by Mr. A. G. Brook of Gondoblui Station, embedded in the soil on the plains near the Queensland border, between the Narran and Barwon Rivers. The note accompanying the exhibit states that there are no rocks near that locality, and that the old aboriginals of the district know nothing about it. The stone is composed of a soft, fine, white sandstone, is of conical form, nineteen inches in length and four inches in diameter in the middle: the surface presents a smooth, worn appearance. Dr. Cox suggested that it had probably been used for grinding nardoo, and that view seemed to receive most favour, though a number of different opinions were expressed. Mr. Macleay also exhibited for Mr. Wilkinson a number of helix-like shells, wound spirally round the leaf-stalks of a species of Eucalyptus, at Branxton on the Hunter. These shells, though calcareous, were pronounced not to be the production of any molluscous animal, and the general opinion was that they must be egg cases of some insect.—A large collection of shells and echinodermata from Cossack, Western Australia, sent by Mr. J. F. Bailey of Melbourne for exhibition, were on the table. Among the rarities *Conus trigonus* (Reeve), *Conus Victoriæ* (Reeve), *Ancillaria cingulata* (Sowb.), *Ancillaria elongata* (Gray), *Oliva Caldania* (Duclos), *Spondylus Wrightianus* (Cross).

PARIS

Academy of Sciences, August 11.—M. Rolland, President, in the chair.—Note on the disposition of the fœtal envelopes in the aye-aye (*Chiromys madagascariensis*), by M. Alphonse Milne-Edwards. The author finds that there is nothing abnormal in the fœtal membranes of the aye-aye, and that they correspond in every respect with those of the typical lemurians, with which they must be definitely classified.—Observations in connection with a recent communication of General Menabrea on Charles Babbage's analytical calculating-machine, by M. Léon Lalanne. From an interview with Mr. Babbage at London in 1851 the author is led to believe that a document is still in existence either among the papers of M. Binet or among those of Mr. Babbage himself, in which he gives his final views on the subject of calculating-machines in general. M. Lalanne here publishes two original letters of Mr. Babbage referring to that document, and dated June 19, 1851.—Examination of two theorems connected with the rule of Newton; conclusions, by M. E. de Jonquières.—Remarks on the volcanic debris collected on the east coast of the island of Mayotte, at the north-west end of Madagascar, by M. E. de Jonquières. These debris, which were thrown up in considerable quantities on May 16, 1884, consisted of fine pumice, probably from Krakatoa. Amongst them was a large specimen already incrusted with shells. They appear to have traversed a distance of about 3840 nautical miles in 259 days at a mean velocity of 14·8 miles a day.—Note on the phenomenon of globular electric bolts, two illustrations, by M. Gaston Planté. The author produces artificially effects analogous to those of the fire-balls so often witnessed in the atmosphere.—Researches on some combinations formed by haloid salts with the oxygenated salts of the same metal, by M. H. de Chatelier.—Note on the influence of heat on the respiratory organs, by M. Ch. Richet.—Note on the influence of intellectual work on the elimination of phosphoric acid by the urine, by M. A. Mairet.—Anatomy of the maxillary apparatus in the locust, grasshopper, cricket, and other members of the family of grinding insects, by M. J. Chatin.—Contributions to the history of the Pliocene flora of Java, by M. L. Crié.—On some peculiar luminous phenomena observed about the sun at Morges, on the Lake of Geneva, by M. F. A. Forel.—Notes were received from M. Ch. W. Zenger on the possible existence of still undiscovered planetary bodies; from M. L. Jaubert on an aërolite seen on July 10; and from M. L. Favre on a classification of the sciences.

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