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THURSDAY, MARCH 25, 1875

LUBBOCK'S "ORIGIN OF CIVILISATION"

The Origin of Civilisation, and the Primitive Condition of Man: Mental and Social Condition of Savages. By Sir John Lubbock, Bart., M.P., F.R.S., &c. Third Edition. (London: Longmans, Green, and Co.)

THE third edition of Sir John Lubbock's well-known book has followed so close upon the second, that the author, busy man as he is, might have been excused had he given us a mere reprint; but he has included in it additional matter which adds very considerably to its value. Nearly every chapter has been enlarged, and a chapter on the Development of Relationships has been added, which appears to us to be at least as good and useful a bit of work as Sir John Lubbock has hitherto done. To show the changes which have been made at points throughout the book is out of our power, nor does this seem to be necessary, as the changes do not, we think, in any case affect his previous conclusions otherwise than by adding to the evidence on which they rest. The new chapter is what calls for notice, and to it this notice shall for the most part be confined. The facts with which he deals in this chapter have been taken from the voluminous work of the American author, Mr. Morgan; but Sir John Lubbock, putting aside Mr. Morgan's theorising, has submitted a view of them of his own. This, in the main, and so far as it goes, we think, he has made out.

The facts collected by Mr. Morgan (though he had the assistance of the United States Government, the collection must have cost him an infinity of trouble) show the existence, widespread, among the lower races of mankind, of systems of relationships strangely different from that which exists in Europe, transmitted without material change from the Aryan nations from whom we claim descent. In these systems (to describe them, so far as can be done, by the incidents which are common to the greatest number of them) all the brothers of a family are each called father, and regarded as a father, by the children of the whole brotherhood; and all the sisters of a family are each called mother, and regarded as a mother, by the children of the whole sisterhood; while the children of brothers regard each other, and also the children of sisters of their respective mothers, as brothers and sisters, and are acknowledged as children equally by their true father and his brothers and their true mother and her sisters. This holds good of all putative brothers and sisters, and accordingly a man regards the children of a male cousin through his father's brother or his mother's sister as his children, and is by them called father; he regards the grandchildren through a male of such a cousin as his grandchildren, and is by them called grandfather. Similarly a woman regards the children of a female cousin through her father's brother or her mother's sister as her children, and is by them called mother; and the grandchildren through a female of such a cousin are her grandchildren, and call her grandmother. All the brothers of a grandfather are grandfathers, and all the sisters of a grandmother are grandmothers. In nearly all the cases in which this curious nomenclature—and it is much more than mere nomenclature, though, strictly speaking, it is not a description of *relationships*—is in use, a special term is applied to a mother's brother by her children, and a special term applied to children by their mother's brother. These terms are inadequately represented by our words uncle and nephew, for they denote what the terms father and son do not in these cases usually involve—relationship being counted through females only—a recognised blood-relationship, which carries to the uncle the right and duty of exercising on behalf of his nephew such care and supervision as in more advanced communities are exercised by a father, and gives the nephew, on the other hand, the right of succession to his uncle's property. In cases not quite so numerous a special term is applied also to a father's sister, who then in turn calls her brother's children by the term applied by the brother to her children; she is an aunt, and her brother's son is her nephew. In a still more limited number of systems the terms devised for real brother and sister and their children are applied to all putative brothers and sisters and their children. Where these special terms are all in use, brother's and sister's children are in some cases considered brothers and sisters; and then the rules applicable to all putative brothers and sisters and their offspring being applied, the cousins are regarded as the fathers, mothers, or uncles, aunts of each other's children, according as the relationship arises through two male cousins, two female cousins, or a male and female cousin. In more numerous cases, the children of a brother and sister, or of a putative brother and sister, are distinguished by a special term, *i.e.*, they are called cousins. In a considerable number of these, however, a cousin's son is addressed as if he were the son of a brother or sister—that is, either as son or nephew; and, in nearly all, a cousin's son's son is, as if he were a brother's son's son, termed a grandson. A very few of the systems of relationship, particulars of which have been collected by Mr. Morgan, fall below the description given above; in these a mother's brother is considered as a father, a father's sister as a mother, and terms for cousinry are unknown. There are others, the number of which is considerable, which are of a higher kind, which are nearer, that is, by one or more steps to our own system of relationship—applying, *e.g.*, special terms as little father or stepfather to a father's brother, special terms as little mother or stepmother to a mother's sister, and special terms to the relationship of the children of two brothers or two sisters. All the systems which have been brought under notice, however, in whatever respects they differ, agree in considering a grandfather's brother to be a grandfather, a grandfather's sister to be a grandmother, and, on the other hand, a grandson of a cousin—whether called cousin, step-brother, or brother—to be a grandson.

In these points of agreement is found the explanation of the relation between the various systems. Sir John Lubbock's conclusion that these, in the higher systems, are relics of previous lower stages of development, which it has perhaps not been thought worth while to get rid of, appears to be irresistible. They suggest a time in the history of each system, be it now what it may, when all brothers were equally the fathers of each other's children, when all cousins, even the children of brother and sister, were

equally brothers and sisters, and, therefore, a time when a mother's brother was a father, and a father's sister was a mother. The systems can be ranged in a series which makes the truth of this view almost self-evident. In the rudest systems noticed by Mr. Morgan the mother's brother *is* a father, and the father's sister is a mother; brother and sister's children are brothers and sisters, fathers or mothers of each other's children, grandfathers or grandmothers of each other's grandchildren. Above these are the systems in which special terms have been devised for the peculiar relationship between children and their mother's brother, and (in most cases) for the father's sister also—in which, as has been seen, the children of brother and sister are in some cases called brother and sister, but more commonly cousin, while the children of one of such cousins are in many instances regarded by the other cousins as their children, and his grandchildren in every case are regarded by them as their grandchildren. So far there is unmistakable evidence of a progress made through dint of thinking over social facts. Extension of our survey to more advanced systems simply shows that in them a similar progress has been carried further. Such terms as little father or stepfather applied to a father's brother, for example, are not hard to reconcile with the view that a father's brother was at a former stage regarded as a father; and when it is considered that a grandfather's brother is in such cases a grandfather, no shadow of doubt on the subject can remain. That there are some facts of which Sir John Lubbock cannot give the solution must be admitted, and these are not unimportant; but they in no way affect the validity of his argument that there has been a development of relationships from a very rude germ, and that what may be called the modern system of relationships has been arrived at by a long and very gradual progress. The explanation of them must be sought in a more careful examination of the marriage customs of the races in which they occur. Moreover, there are not wanting eccentricities of terminology, the key to which cannot in all cases be had; but usually these are obviously the result of the over-rigid application of general rules following upon a false start. The Crow Indians, for example, call their mother's brother an elder brother, which is not so very wrong in itself; but they go on to call his son (as being the son of one called brother) by the name of son. Departures from the normal type of this kind are, of course, to be looked for wherever a system has been independently developed by many bodies of men.

It is among what Mr. Morgan calls the Turanian, American Indian, and Malayan families of men that the systems of relationship above considered are known to prevail. The lowest forms are found in the Sandwich Islands and their neighbourhood, and among one or two of the American Indian tribes; the middle systems among the Tamil races of India, the American Indians, the Fijians, and the Tongans; while the Karens and the Esquimaux supply the most advanced. One of Mr. Morgan's theories (for he has, or seems to have, two which it is no business of ours to reconcile with each other) is, that these systems are, to use the words of Sir John Lubbock, "arbitrary, artificial, and intentional." Mr. Morgan holds that ethnological affinities can be traced by their aid, and accordingly he is disposed to believe in the common origin of the Tamil and Red-skin races. The same reasoning would identify the Fijians and the Tongans with both these races, and with one another—if it would not also show that the Two-mountain Iroquois of North America are of the same descent as the Malayan races, and no relatives of their Red-skin neighbours. This looks like a *reductio ad absurdum;* but it really is not necessary to consider the hypothesis that the systems of relationship under notice are purely factitious—a wildly improbable hypothesis—when a sufficient explanation of their relation to each other, which traces them all to a comparatively simple low form, is forthcoming. Of the origin of this lowest known system of relationships Sir John Lubbock wisely offers no theory, content with suggesting that the right which a husband among the American Indians is said to possess, of marrying his wife's sisters as they successively come to maturity, may explain why a woman's sisters are considered the mothers of her children. The so-called "communal marriage" clearly cannot be the explanation. Supposing that "communal marriage" could give rise to a system of relationships, all the full-grown men of a tribe must have been equally considered fathers of all the children of the tribe. But the facts collected by Mr. Morgan all point to a more limited amount of fatherhood than this; and to account, from the communal marriage point of view, for the Hawaiian limitation, is about as difficult as it is, from the European point of view, to understand the Hawaiian extension, of fatherhood. The influence of the custom of counting kindred through females only on the development of systems of relationship has been indicated; it is by means of it that the departure from the simplicity of the Hawaiian system was made. This Sir John Lubbock has clearly pointed out. It is only fair to Mr. Morgan to state that, notwithstanding his theory above referred to, he has not neglected to do the same.

After so much exposition a little criticism may be not out of season, and to begin with a phrase which has just been mentioned, "communal marriage," we cannot help regretting that Sir John Lubbock, in his chapter on Marriage, has made so much use of it, since beyond question it is unprecise and misleading. Sir John exhibits a number of facts, all of which, with one doubtful exception, point to the entire absence among certain tribes of the very germ of a marriage law, and to this he gives the name of communal marriage. If this were a mere matter of phraseology, it would be hypercritical to say anything about it; but Sir John goes on to argue as if he had shown that, in a tribe without any law of marriage, every man was the lawful husband of every woman—as if, in fact, there were a defined, though unusually free system of marriage *right*, while what the evidence goes to show is that such a thing never was even thought of. The view just noticed has had no inconsiderable influence over his opinions about Marriage; and it seems, to say the least, unsafe to allow it any weight whatever. Of tribes which have had no marriage law, all we really know is, that in the intercourse of the sexes nothing was deemed by them wrong, and this state of feeling seems to involve the non-existence of *any idea* of marriage right. Without evidence, at any rate, we are unable to believe that this idea, as postulated

by Sir John Lubbock, could have been generated in the circumstances, and of evidence, so far as we know, there is not a trace. Sir John Lubbock's theory of the origin of monandric marriage, exogamy, and the form of capture, also seems open to observation. He ascribes monandric marriage to the appropriation, in tribes without any marriage law, of captured women by individual captors; supposing that a captured woman, as she did not belong to the tribe, would be readily left with the man who took her; that envy of the superior felicity attained by captors would lead to a frequency of capture, until, at length, the possession of a captured woman became the ambition and hope of every man of a tribe; and that, there being no other way than capture of getting a wife of one's own, the custom of exogamy was in fact established, becoming a defined tribal law as capture, and therewith monandric marriage, became frequent, and thereafter surviving, as such customs do survive, when wives were got by purchase or exchange, with the capture symbolised. Among savages, however, women are no unconsidered trifles; and the proposition that, when captured, they would be freely left to their captors is so far from being self-evident that it might reasonably be deemed improbable, and certainly requires an amount of support which Sir J. Lubbock has failed to give it. But apart from this, it is, we are disposed to think, fatal to Sir J. Lubbock's hypothesis, that it overlooks the fact that captures of women are usually made by *parties*, not by single persons, and that it is a conflict between *parties* which, as a rule, is symbolised in the form of capture. In ascribing to the prevalence of the capture of wives the curious custom which forbids a father-in-law and mother-in-law to speak to their son-in-law—indignation at the capture being presumed to be the foundation of this rule of non-intercourse—Sir John, we venture to think, has certainly been hasty. At the time when the capture was real and the indignation of the father-in-law and mother-in-law real, their new relative would not have been much in the way of meeting them. He, with his wife, would have been in another tribe than theirs, and that a hostile tribe. Moreover, the same custom prevents a woman from speaking to her father-in-law, and operates, if we mistake not, in other cases also; and these Sir John's suggestion would not explain.

Our criticism shall extend to only one point more, and that is, the explanation offered by Sir John Lubbock of the origin of Totem worship. We notice it the more readily because, in this edition, he puts it forward with some appearance of hesitation. He thinks that the worship of animals may have arisen out of a practice of "naming first individuals, and then their families," after particular animals. "A family which was called after the bear would look on that animal first with interest, then with respect, and at length with a sort of awe." But does not this sound as if Sir J. Lubbock believed that the world began with the patriarchal family system? With it the transmission of a name through an individual, first to a family and then to a tribe, would offer no difficulty. It is necessary, however, to explain the worship of animals in tribes which acknowledge kinship through females only; in tribes in which children take the tribal name, not of their father but of their mother; and in which the family, still in an extremely undeveloped state, was probably altogether unknown at the distant time when animal worship arose. In such tribes a man's personal name dies with him. Though he has his "medicine," it goes to no successor. It is the women, who, by the way, are without the "medicine," who transmit the totem. That names given to individuals, especially if the individuals were men, should diffuse themselves through tribes of this kind, and this in the case of an endless number of such tribes, appears altogether impossible. This, however, after all, only means that *we* cannot see how the thing can have happened; and, on the other hand, if Sir John Lubbock should find that in his theorising he has overlooked some of the most perplexing of the facts to be accounted for, he need not greatly grieve. He is entitled to reflect that, allowing for all shortcomings, his book has a sterling value and has done a most useful work.

KINAHAN'S "VALLEYS, FISSURES, FRACTURES, AND FAULTS"

Valleys, and their Relation to Fissures, Fractures, and Faults. By G. H. Kinahan, M.R.I.A., F.R.G.S.I. (London: Trübner and Co.)

WHENEVER a new explanation of natural phenomena is offered to the public, its advocates, assuming that due importance will be still assigned to the forces to which formerly all had been attributed, frequently seem to ignore them altogether, and therefore other inquirers are generally found who take up the defence of the old view, though they often admit practically as much as is required by the new theory. Mr. Kinahan thinks that sub-aërialists, in explaining the present configuration of the country, have been in the habit of attaching too great importance to surface wear and tear, and of ignoring the effect of fractures produced by earth movements.

Any contribution of facts, well observed and clearly recorded and reasoned upon, is of value, whether or not we accept the deductions of the author. We are, however, unable to satisfy ourselves from the perusal of the work before us that the facts would have appeared to us as they appeared to the author—the references to localities where the evidence for faults and other phenomena may be seen are too vague, and the inferences seem very doubtful.

There are few who would not be prepared to agree with the statement "that the present valleys are not solely due to rain and rivers, but rather to that action combined with glacial and marine denudation, and that all were generally led by the breaks and faults in the rocks" (p. 181), if it means that we must not refer all valleys to rain and rivers exclusively, that denudation of any kind is apt to be directed by the greater or less resisting power of the material to be denuded, and that fractured work is more easily acted upon and denuded than solid work.

What we really have to do is to inquire in each special case which of the various agents have had most to do with the formation of the particular valley, lake, or other earth feature before us; and therefore, in discussing the relation between faults and valleys, we require something more definite than a reference to places, where, as the author says (p. 102), "some of what are here considered faults might possibly only be Silurian cliffs, at the base of which the Old Red Sandstone and limestones were

deposited, as the rocks strike with the line of fault ;" or a map, in which many of the faults upon which the form of a lake is said to depend are drawn altogether below the waters of the lake, and the direct evidence of their direction or even existence is not given in the text (p. 123, and pl. ii. p. 15). Again, anyone who wished to see for himself whether it was possible that "streams have run over polished, scratched, and etched surfaces of rock for ages without having been able to obliterate the ice-marks" (p. 87), could hardly be sure of finding the places referred to by the author from the vague description that they were "among the ice-dressed hills of Galway, Kerry, and Cork" (*ib.*)

We cannot see what right our author has to assume because the "outlines—river-valleys, lake-basins, and bays—occur in systems, the general bearing of which may be indicated by lines," that "if such systems are not caused by breaks in the subjacent rocks, they must be due to chance" (p. 99), when we know that other authors have appealed to this very same fact in support of the theory that the leading features of the country referred to are due to a body of ice moving from the N.E.

It does not seem unreasonable to suppose that valleys which appear to have been shifted (p. 175) may have been formed along lines of fracture or of softer rock which had been previously shifted, or were for any reason not opposite to one another.

That an unfinished plain of marine denudation should have an irregular margin (p. 177) does not prevent our believing that the sea can in time cut back most of the hard promontories as well as the softer rock, or arrest at a uniform level the sub-aërial action which is reducing both hard and soft. That a river should deposit sediment on a slope at any part of its course, even out into the estuary (p. 187), seems to present fewer difficulties than the supposition that the rock débris resulting from the denudation of Loch Lomond was carried out through a hole in the bottom of the lake (p. 215).

Although, however, such statements lead us to distrust somewhat the author's judgment, we must allow that the work contains much that is useful and suggestive, and should be read by all who are engaged in the study of earth-sculpture.

OUR BOOK SHELF

The Cone and its Sections treated Geometrically. By S. A. Renshaw. Pp. 148. (London : Hamilton, Adams, and Co., 1875.)

"WHAT so intricate and pleasing withal, as to peruse and practise Apollonius's Conics?" The author of the present work has evidently the same admiration for this Old World writer that Burton had. He remarks of him that his work has apparently maintained its superiority over every subsequent treatise on the subject. Like Apollonius in one respect, Mr. Renshaw derives the sections from the Scalene Cone, and rebuts the possible charge of "considerable prolixity" by affirming his belief that "the reader will be well repaid for the time and patience expended in the investigation." Upon this point opinions will most likely differ. The subject, though of considerable interest to all minds of a geometrical cast, is yet only a subordinate one, and we question if many can find time in these days of "high pressure" for the extra time and patience demanded. However, the student need not so occupy his time, for our author has also derived the principal well-known properties from the right cone independently. Further, he establishes a proposition by means of which the scalene-cone properties may be derived from the right cone.

We have, in former numbers of NATURE, given in our adhesion to the principle of deriving the properties of these curves from the cone, and so are glad to see that the latest work on the subject is grounded on this principle. Robertson (1802), following Hamilton (1758), takes as his fundamental proposition the following :—If there be four lines in the plane of a conic which are parallel, two and two, then the ratio of the rectangles under the segments from one point of section to the rectangles under the segments from the other point of section is constant. Mr. Renshaw builds upon the proposition that in the ellipse and the hyperbola the tangent at any point on the curve makes equal angles with the focal distances of the point (with modification for the special case of the parabola). These and the other primary properties are, as we have said, proved from the cone, and this "it is believed to a greater extent than in any previous treatise." A great portion of the work, however, is taken up with the treatment of the curves *in plano*, and here a fundamental proposition is that of the generating circle. The properties are neatly derived by this means. We should mention that the generating circle (which in a particular case becomes the auxiliary circle of modern treatises) is said to have been first employed in Walker's work on Conics (1794), and is thus defined : If we have a focus and corresponding directrix of a conic, and in the same plane take any point and from it let fall a perpendicular on the directrix, then the circle required is that described from the above point as centre with a radius equal e times the above perpendicular (e being the eccentricity of the curve). We have been thus explicit, as this circle appears to have dropped out of recent text-books. We must refer for application to the work under review. The subject is ably treated, and the book copiously illustrated by well-drawn figures (in most cases); these latter, however, have been sadly marred in the engraving. Indeed, it is matter of regret that the paper, the ink, and the engraving are of an inferior character. The work was printed at Nottingham.

A Whaling Cruise to Baffin's Bay and the Gulf of Boothia. By A. H. Markham, F.R.G.S., Commander R.N. With an Introduction by Rear-Admiral Osborn, C.B., F.R.S. Second Edition. (London : Sampson Low and Co., 1875.)

COMMANDER MARKHAM has done well to issue a cheap edition of his attractive narrative at the present time. The author, in the summer of 1873, went out to Baffin's Bay in the whaler *Arctic*, with the deliberate intention of acquiring experience in ice-navigation ; consequently from his book a reader is likely to obtain a better idea of the real nature of the dangers attendant on pushing through the frozen ocean, than from a book whose chief aim is to narrate discoveries. Commander Markham, it is evident from the work before us, took such excellent advantage of the opportunities afforded him while cruising about in the *Arctic* seeking for whales, and finding them plentifully, that his knowledge of the "ways" of the ice must be of great advantage to the expedition of which he is second in command.

To those who wish to have a full and accurate idea of how the whale-fishing is prosecuted at the present day, we recommend this delightful narrative, which we should think is likely to become an established favourite with boys. There is a wonderful amount of information packed into the small volume concerning the regions visited, the nature of the ice and icebergs, currents, coasts, natives, fauna, flora, &c. He visited some of the spots rendered classical by former explorers, and actually

corrected the delineation of part of the coast-line in Prince Regent's Inlet. Altogether the book is full of instruction and healthy entertainment; the map and illustrations add to its value in both respects.

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.*]

Antares

IN reference to the apparent change in the angle of the companion to α Scorpii as shown by the recent measures of Mr. Wilson (NATURE, vol. xi. p. 274), an arrangement of the following, which, so far as I am aware, are all the measures that have been made of this beautiful pair since its discovery by Mitchel in 1845, may prove interesting. From a comparison of these earlier results it is evident that no sensible variation has taken place; and it is probable that in the last, either a slight error has been made in reading the position circle, or the observation was taken under too unfavourable conditions to admit of a high degree of accuracy. The details of these measures will be found in the several publications mentioned below.*

		P = °	D = ″
1. Mitchel	1846·7	270	2·51
2. Dawes	1848·0	273·2	3·46
3. Bond	1848·3	275·3	3·8
4. Mädler	1849·7	276·2	3·69
5. Powell	1855·7	274·6	—
6. Secchi	1856·4	273·5	3·00
7. Jacob	1857·2	275·1	3·44
8. Wrottesley ...	1858·3	275·9	3·30
9. Powell	1861·1	271·9	—
10. Dawes	1864·4	275·7	3·67
11. Dembowski ...	1865·6	270·4	2·99
12. Secchi	1866·0	272·9	2·92
13. Wilson	1873·4	268·7	3·46

Dawes, in connection with his last measures, says, "there is very little, if any, ground for supposing change has occurred in this splendid but difficult object." The difficulty of seeing the small star in this latitude, as in the case of Sirius and its companion, arises not from its closeness or faintness, but from atmospheric causes due to its southern declination. Mitchel called the small star 11·12 magnitude, but Dawes, Secchi, and others rate it at about 8 m., which is more nearly what it appears to be at the present time. With a very steady air I have several times seen it perfectly with a 6-inch Clark refractor contracted to $3\frac{3}{4}$ inch, and on one or two occasions with $3\frac{1}{4}$ inch.

Chicago, March 2 S. W. BURNHAM

Storm Warnings from the United States

ALLUSION has recently been made in NATURE to a proposal for the transmission of weather telegrams from the United States to Europe, as likely to afford valuable data for forecasting the weather on our coasts. Some misconception appears to me to attach to this subject.

Having worked for a considerable time at the comparison of United States with European weather charts and reports, I would express my opinion that the project referred to would be undesirable, on the following grounds:—

1. Only a small proportion of the storms experienced on the American side of the Atlantic can subsequently be distinctly traced in Europe at all.

2. Of those thus traceable, the majority are felt severely only in the extreme north of Europe, and are not productive of serious results on the coasts of Great Britain, France, or Denmark.

1. Sidereal Messenger, Sept. 1846.
2. Memoirs of the R.A.S., vol. xxxv.
4. Communicated to Dawes.
5. Memoirs of the R.A.S., vol. xxxii.
6. Memorie dell' Osservatorio del Collegio Romano, 1859.
7. Memoirs of the R.A.S., vol. xxviii.
8. Memoirs of the R.A.S., vol. xxix.
9. Memoirs of the R.A.S., vol. xxxii.
10. Memoirs of the R.A.S., vol. xxxv.
11. Astronomische Nachrichten, 1574.
12. Astronomische Nachrichten, 1614.

3. The rapidity of their progress varies indefinitely, and could not be deduced, *pace* Mr. Draper, from the velocity of the currents experienced in them, even if the latter were not variable also.

4. Many of our most destructive European storms occur when pressures over the Eastern States are tolerably high and steady, and appear to be developed on the Atlantic near the eastern limits of the area of high pressure. In such instances attention to the telegrams would in all probability mislead (at least until the relations of areas of high pressures to those of low pressures be better understood), and thus lead to unfortunate consequences.

For these reasons I believe that the utility of a system of weather telegrams from North America to Europe would be by no means commensurate with the serious expense involved in it.

The connection between the weather periods on this and on the other side of the Atlantic is one of the problems which the progress of research is steadily, though slowly, attacking. But such research can be carried on without embarking on a system of weather telegraphy which is unlikely to be practically beneficial, and the failure of which might rather tend to bring this branch of the science into disrepute. W. CLEMENT LEY

Ashby Parva, Lutterworth, March 12

Meteorological Observations in the Pacific

IN the leader on "Meteorology—Present and Future" which appeared in NATURE, vol. x. p. 99, it is said: "In order to complete the preliminary meteorological survey of the earth's atmosphere and surface it is indispensable that measures be taken to obtain observations from the less frequented regions of the ocean, from Arctic and Antarctic regions, large portions of British America, South America, Africa, and Polynesia." It is also very correctly observed that "in working out the great question of *local climates* it is absolutely indispensable that uniformity as regards instruments and methods of observation be secured at the different stations."

The meteorology of the Pacific has often occupied my attention, and I have regretted that no systematic effort was made to secure regular observations upon some uniform plan throughout the islands occupied by missionaries. The principal islands in Eastern, Central, and Western Polynesia (as far as the New Hebrides) have gentlemen residing on them, many of whom would (I have good reason to believe) be willing to render assistance in this work. Indeed, many of them are accustomed, already, to make more or less meteorological observations, so far as the reading of the barometer and thermometer goes. But these observations, if collected, would at present be comparatively useless, owing to the want of "uniformity as regards instruments and methods of observation."

Should measures be taken to secure such observations as those suggested in the article above mentioned, and should means be found for supplying (say *lending*, under certain conditions) instruments to those who are willing to become observers, I believe the co-operation of missionaries in most, if not all, of the following islands may be secured, viz, Society Islands, Hervey or Cook's Islands, Niuë or Savage Island, Friendly or Tongan Islands, Samoa or Navigators' Islands, Fiji Islands, Loyalty Islands, the New Hebrides, and the south-east peninsula of New Guinea.

I shall be happy to do what I can to bring about such a result. I am willing to correspond with any gentleman representing the "Central Department," or with the secretary of any society which may undertake the work, with regard to details.

Upolu, Samoa, Nov. 16, 1874 S. J. WHITMEE

Struck by Lightning

THE following is offered you for publication in the hope that the facts were observed accurately enough to be of value, and in the belief that reliable accounts of similar experiences are rare.

The house, in which with my family I have spent the winter, stands in the centre of Torbay and close to the sea. In the garden, which gives access to the shore, is a flagstaff (once belonging to the Coast Guard) 50 feet high, with a metal vane at the top, and having the mast steadied at about 25 feet from the ground in the usual way with iron wire guys. About a foot above ground each wire rope terminates in a $\frac{1}{2}$-inch chain which is anchored a few feet in the soil. These chains are much

corroded, their original diameter being reduced here and there to ⅛ inch.

February 25th was a rainy day during the forenoon, with heavy wind from the south-east, but in the afternoon the sky cleared. There had been no sign of thunder all day. At 5 P.M. my wife, my son, and myself were standing under the flagstaff and within 10 feet of a mooring chain, watching the bay, when the vane was suddenly struck by lightning, which broke the mast short off in two places, tearing and splitting the wood between the vane and the iron guy ropes. Through these the discharge then passed to the ground, but three out of the four mooring chains were broken. Not only one, but many links in each of these chains were snapped, both above and below ground, and several of the links were broken in two places at once. The fractures were crystalline and showed no signs of heat. On the garden path, and within a yard of myself, stood an iron roller, towards which the discharge ploughed two shallow furrows in the gravel; one of these is 8 feet long and terminates in a splash of gravel upon the roller.

The broken mast and vane fell to the ground close to us. The former was blackened from end to end around half its circumference, and the edges of the discoloration form ragged splashes. The brass tube forming the vane was ripped open, and all solder about the vane melted. Below the point where the wire ropes were attached to it the mast was uninjured. Shivered fragments of the staff were found on the ground as far as 150 feet to windward. Heavy hail followed the flash, the wind falling instantly to a dead calm; a second but distant flash was seen twenty minutes later, after which there was no more lightning. The discharge startled the whole village of Paignton; the coast guard officer compares the explosion to that of a 300-pounder gun; and at Torquay, 3½ miles distant, a scientific friend speaks of both flash and crash as most terrific.

I must now attempt to describe the effects on ourselves and the impressions on our senses, though I am conscious of difficulty in avoiding subjective matter here. Of the three, my wife only was "struck," and fell to the ground, my son and myself remaining erect, and all three retaining consciousness. For more than half an hour my wife lost the use of her lower limbs and left hand, both of which became rigid. From the feet to the knees she was splashed with rose-coloured tree-like marks, branching upwards, while a large tree-like mark, with six principal branches diverging from a common centre, thirteen inches in its largest diameter, and bright rose red, covered the body. None of us are certain of having seen the flash, and my wife is sure she saw nothing. As to the noise, my wife heard a "bellowing" sound and a "squish," recalling fireworks; my son also heard a "bellow," while I seemed conscious of a sharp explosion. My wife describes her feeling as that of "dying away gently into darkness," and being roused by a tremendous blow on the body, where the chief mark was afterwards found. My son and myself were conscious of a sudden and terrific general disturbance, and he affirms that he received a severe and distinctly electrical shock in both legs. My left arm, shoulder, and throat especially suffered violent disturbance, but I did not think it was electrical. As I turned to help my wife, who was on the ground, I shouted, as I thought, that I was unhurt, and hoped they were also, but it seems I only uttered inarticulate sounds, and my son, in his first attempt to answer, did the same. This, however, was only momentary; in an instant we both spoke plainly.

Neither of us referred the occurrence immediately to its true cause, but the idea of being fired at was present to all our minds, my wife indeed remained of opinion that she was shot through the body, until she heard me speak of lightning. An infinitesimal lapse of time enabled my son and myself to recognise lightning; but I cannot say whether I did so before or after my first glimpse of the wreck on the ground. Neither of us heard or saw the mast fall, though it descended fifty feet, and fell on hard gravel close to us. My son and myself both experienced a momentary feeling of intense anger against some "person or persons unknown," further showing that we primarily referred the shock to some conscious agency. I ought perhaps to add, that neither of us felt any sensation of fear at the time; but we were all very nervous for several days after.

I have endeavoured to keep to fact throughout, but I venture to add a remark made by my wife as we raised her from the ground: "I feel quite sure that death from lightning must be absolutely painless;" and I offer it as an unconscious corroboration of views on this subject which our experience seems to strengthen.

Though no electrician, I conclude from the splash of gravel on the garden roller that the discharge was from cloud to earth, and the oxidised mooring-chains being inadequate to carry it all to ground, my wife formed a conductor for one of many sprays flying in all directions from the broken links.

Paignton, March 10 D. PIDGEON

Mr. G. Darwin's Paper on Cousin Marriages

THE report in the *Times* of my paper on Cousin Marriages, read before the Statistical Society on Tuesday, the 16th inst., contains an important error. It is there made to appear that out of 8,170 lunatics and idiots in England and Wales, 4,308 were offspring of first cousins. This should have run:—Answers with respect to the parentage of 4,308 out of the 8,170 patients were obtained; 142 to 149 of these were stated to be offspring of first cousins, that is to say, nearly 3½ per cent. Similarly, out of 514 patients in Scotland, 5¹ per cent. were found to be offspring of first cousins.

I had hoped that the monstrous nature of the mistake would have shown it to be a misreport; but although the error was pointed out in the next day's *Times*, I have already had my attention drawn to it several times, and you would therefore be conferring a great favour on me by giving further publicity to the correction in your columns. GEORGE DARWIN

Down, March 21

Mounting Acari for the Microscope

I HAVE much pleasure in detailing, for the benefit of your correspondent Mr. R. C. Fisher, a method I practised extensively some years since, and with the best possible results, in preparing Acari for the cabinet. The section then occupying my attention was the group of the *Hydrachnidæ*, or "Water Mites," and to illustrate which I possess some hundred slides representing twenty or thirty species in various conditions of development. In first attempting to preserve these as permanent objects for the microscope I encountered difficulties similar to those of Mr. Fisher; the little animals being hard to kill, and their limbs in death doubling beneath to the great detriment of their personal appearance. As an experiment, I tried immersing them in boiling water, and was rewarded by finding this treatment to achieve everything that could be desired, death being instantaneous and with the limbs rigidly extended in perfect symmetry. This method proved equally efficacious with various earth mites, such as *Trombidium*. A watch-glass, spirit lamp, and camel's hair brush is all the apparatus necessary. The occupation of other and larger "fish to fry" has unfortunately prevented my prosecuting the study of this most interesting group of the Arachnida so far as I first proposed.

Manchester Aquarium W. SAVILLE-KENT

The "Wolf" in the Violoncello

CAN any of your readers explain the reason of the unpleasant jarring noise which is sometimes found in certain notes of the violoncello, termed by musicians the *wolf*?

In an instrument in my possession the *wolf* exists on one note only, viz., the F of the bass clef (). This is not due to a defect in the string, as the same note stopped on the G string still produces the *wolf*.

It seems, therefore, that from some defect in the instrument itself, it is unable to vibrate in conjunction with a string having a certain rate of vibration, though it will take up the vibrations of every other but this particular note. HERBERT F. FRYER

Coloured Shadows

SIX Grove's cells were connected with one of Ladd's large induction coils, and the secondary current, condensed by two large Leyden jars, was sent, in the usual way, between two pairs of metallic electrodes, in order to examine their spark spectra.

Two of the electrodes were of platinum: these may be called pair A.

Of the other pair, B, one electrode was of platinum, and the other of the metal to be examined.

Place a piece of white paper equidistant from, and on one side of, the two sparks. Hold the finger so that a shadow of it may

be cast by each spark. The two shadows will be seen to be most beautifully tinted with different delicate colours, varying according to the metal inserted in B.

It will be seen that the shadow thrown by A is lighted by B, and is seen on a ground jointly illuminated by A and B; whilst B's shadow, lighted by A, is seen on the same common coloured ground as before.

Without these considerations, it might have been supposed that the shadow thrown by B, and lighted by the unchanging spark A, would itself have remained unaltered. I saw it of the colours, pink, light pink, dim pink, light green, nearly white, and yellow-green; corresponding to the introduction into B of Bi, Ag, Sn, In, Al, and Mg respectively.

I was indebted for the apparatus to Prof. Liveing, in whose laboratory last November, at Cambridge, I made these observations.

C. T. L. WHITMELL

Nottingham, March 16

OUR ASTRONOMICAL COLUMN

ANTHELM'S STAR OF 1670 (11 VULPECULÆ).—In the catalogue of stars observed at the Royal Observatory, Greenwich, in the year 1872, in the volume lately circulated, will be found the position of the small star near the place of Anthelm's star of 1670, which was for some time of the third magnitude. It is No. 816 in the above-named catalogue, and for 1875·0 its R.A. is 19h. 42m. 32s·78., and N.P.D. 62° 59′ 15″·4. This is only about one minute of arc from the place given by Picard's observations published in Lemonnier's "Histoire Céleste," and there is an uncertainty in the R.A. deduced from those observations amounting to one or two seconds of time. The star deserves attention, and the more so as there has been a suspicion of sensible variation about an average minimum for some years past. It may be advantageously compared with a star of pretty nearly the same magnitude following 12s·5 in R.A., and 4′·9 to the north, and also with one which follows 22s·5, about 0′·7 to the north. Occasional slight variations are perceptible in Nova (Ophiuchi), 1848, usually of 12·13 magnitude, and, according to Schönfeld's observations in Nova (Coronæ), 1866, also, as we have lately stated, in the star close upon the position of Nova (Cassiopeæ), 1572. We follow the example of the Manheim astronomer in applying the term Nova to these objects, though it would probably be more correct in each case to consider them as belonging to a class of irregular variables of great extremes of brightness. Mr. Tebbutt, of Windsor, N.S.W., was satisfied from his own observations that η Argûs had been "alternately above and below a mean magnitude" for several years previous to 1870.

METEOR-SHOWER OF OCTOBER A.D. 855.—This shower of meteors does not fall in with the thirty-three year period indicated by Prof. H. A. Newton; but from the description in "Annales Fuldenses," it was evidently one of similar character, and indicated a great accumulation of meteors in a part of their orbit far distant from the mass encountered by the earth in 1799, 1833, and 1866. We read: "Mense vero Octobris xvj. Kal. Novemb. (*i.e.* October 17, O. S.), per totam noctem igniculi, instar spiculorum, occidentem versus per aerem densissime ferebantur." It was from a comparison of this date with that of the great display in 1366, witnessed in Bohemia and in Portugal, that Boguslawski suspected an advance in the nodes of the meteor-orbit at a time when its real form had not been detected. Quetelet, in his "Nouveau Catalogue des Principales Apparitions des Etoiles Filantes," refers to an Arabic account of the same shower (855), and on the same date, Oct. 17, in the following year, he mentions the occurrence "des feux semblables à des pointes parcourent le ciel pendant toute la nuit," on the authority of a chronicler whose history is found in Bouquet's Collection; suspecting, however, its identity with the shower recorded by the Fulda annalist. We know that there are recent cases of considerable numbers of meteors on or about November 12, which are also divergent from the thirty-three year period for maximum, as on Nov. 12, 1820 and 1822; but the shower of October 17, 855, appears a remarkable instance. The dense stream *towards the west* brings to recollection the grand display of November 1866.

COMET 1840, III.—This comet, discovered by Dr. Galle, at Berlin, on March 6, and observed at Pulkova till the 27th of the same month, affords a curious instance where one of these bodies, after apparently encountering the powerful influence of the planet Jupiter, has presented itself in these parts of space moving in an orbit which is undistinguishable from a parabola. Definitive elements have been lately calculated by Kowalczyk and Doberck, and if we trace the path backward thereby, to the beginning of 1839, we find the distance between the comet and planet about January 20 would be less than a third of our mean distance from the sun. It is true the interval over which the observations extend is only three weeks, but the residual errors of the parabola are so very small, that it is evident no very sensible ellipticity was produced by the near approach to Jupiter, as would appear to have been the case with many other comets. There is a suspicion that something similar took place with the third comet of 1759, which passed so near the earth in January 1760, but the elements of that body may perhaps admit of better determination. Lacaille's orbit shows a pretty close approach to Jupiter on the comet's journey towards the sun, a circumstance first referred to by Pingré.

THE BIRDS OF BORNEO *

THE fifth volume of the annals of the "Museo Civico" of Genoa (for the establishment of which science is indebted to the liberality and exertions of the Marchese Giacomo Doria) is devoted to an elaborate memoir on the birds of Borneo, prepared by the well-known ornithologist, Tommaso Salvadori, of the Museum of Turin. The work is based upon the rich collections made by Doria and his companion, Dr. Beccari, during a scientific expedition to Borneo in 1865 and the following years. Whilst the latter naturalist devoted himself principally to plants, and obtained an enormous series of them which has enriched many of the herbaria of Europe, the former occupied himself in general zoological collections. Among the results of his activity were upwards of eight hundred specimens of birds, obtained chiefly near Kutchin, the capital of Sarawak, which was the head-quarters of the travellers. Dr. Salvadori having had this fine collection placed in his hands for examination, thought the opportunity was favourable for attempting a complete account of the birds hitherto known to have been obtained in Borneo, on which, up to the present time, there has been no authority. In the present memoir we have the results of his labours, forming altogether a volume of 430 pages.

Considering the large extent of the island of Borneo, the published works of naturalists upon its fauna are few, and a large portion of its varied surface remains still unexplored. As regards its ornithology, we are indebted to the naturalists formerly employed by the Dutch National Museum at Leyden for the greater part of our knowledge. Schwaner, Diard, Salomon Müller, and others, made rich collections in the territories of Pontianak and Banjermassing, fifty years ago, and supplied many of the types figured by Temminck in his "Planches Coloriées." Our Mr. Wallace was the first ornithological explorer of Sarawak, but never published any complete account of his collections made there. Another English naturalist, James Mottley, also made several collections in the island of Labuan and in Banjermassing. These were partly described in 1855, in a work commenced by Mr. Mottley

* "Catalogo sistematico degli uccelli di Borneo," di Tommaso Salvadori con note ed osservazioni di G. Doria ed D. Beccari, intorno alle specie da essi raccolte nel Ragiato di Sarawak.

in conjunction with Mr. Dillwyn. But Mr. Mottley's untimely death in the Malay insurrection of 1860 put a stop to the publication, though his Banjermassing collection was subsequently catalogued by Mr. Sclater in the Zoological Society's "Proceedings."

From these and various other authorities, of which a complete account is given in the introduction to the work, and from the study of Doria's numerous series, Dr. Salvadori has compiled his list of 392 species of Bornean birds. Their synonymy is very fully stated, and the localities are completely given, whilst descriptions and remarks of various characters are added when necessary. Of the 392 species of Bornean birds, fifty-eight, Dr. Salvadori tells us, are peculiar to the island, whilst the remainder are found also in Malacca and Sumatra, or have a still wider distribution. With these last-named countries it is, as already pointed out by Lord Walden,* that Borneo has a most intimate relation, upwards of 250 species being common to these three localities. These and many other facts relating to the ornithology of Borneo are well put together by our author in this excellent memoir, on which it is obvious great labour has been bestowed. The volume is rendered still more complete by an outline map of Borneo and the adjacent islands, and by several coloured plates of the rarer species of birds, amongst which the extraordinary shrike-like form called *Pityriasis gymnocephala* forms a conspicuous object. Dr. Salvadori's work is thus an indispensable addition to a naturalist's library.

PHENOLOGICAL PHENOMENA†

UNDER the title given below a pamphlet has just been issued containing instructions for the correct observation of the first appearance of insects, birds, and plants in flower in any locality. We recommend it to the attention of all who have opportunities of making such observations, and there are thousands who have. If a host of observers could be enlisted in this work, and if they adhered faithfully to the instructions given in the pamphlet, they would not only find a new source of real pleasure and instruction, but would certainly make large contributions to our knowledge of natural history.

A list is given of ninety-seven plants, insects, and birds to be observed, with a set of general rules, approximate phenological dates, and special remarks and suggestions in connection with the various divisions. Those in botany are drawn up by the Rev. T. A. Preston, F.M.S.; in entomology, by Mr. R. McLachlan, F.L.S; and in ornithology, by Prof. A. Newton, F.R.S. Each of them presents a series of notes on various individual plants and animals, and Prof. Newton has some general remarks in his own department, from which we make the following extracts:—

"It constantly happens, especially among the earlier birds of passage in spring, that they will for some days haunt one particular spot before appearing in others or generally throughout the district. I myself knew a particular reach of a river which was yearly frequented by the Sand-Martin for nearly a week or ten days before examples of that species were to be seen elsewhere in the vicinity. I also knew a parish in which the Chiffchaff always bred, but not for a month or six weeks after it had arrived in many of the neighbouring parishes was its note to be heard within the limits of that particular parish. I could easily cite other cases of like nature, but many if not most observers of birds from their own experience will bear me out in this. It follows, therefore, that to render the proposed observations trustworthy, an observer of any fact connected with birds should set down the exact locality at which it occurred, even if it be but a few miles' distance from his own station, and if possible again record the fact when it recurs there; or *vice versâ*. Otherwise there will naturally be a risk of considerable error, but an attentive observer will probably soon come to find out the localities in his neighbourhood which are first visited by any particular kind of bird, and after a few years' experience the double observation will very likely prove unnecessary."

After giving some notes on a number of individual birds, Prof. Newton goes on:—

"Nearly all the observations above suggested can be made or collected by most residents in the country generally, and even by some who live in towns; but such observers as dwell at or near the seaside—and especially not far from the stations chosen by various sea-fowls for their breeding quarters—are recommended to keep watch for their arrival and departure. It has been frequently asserted that many of these birds, as the Guillemot, Puffin, Razorbill, and certain Gulls, resort to and quit their stations punctually on a particular day, regardless of the state of the weather; and if such statements are correct, the facts which render the birds independent of meteorological conditions seem to deserve attention. In some cases the assistance of lighthouse-keepers, if sought, would probably conduce to the success of the inquiry, as they almost always take an interest in the doings of their feathered neighbours. Lighthouse-keepers, it is believed, could also furnish valuable information as to the extraordinary flocks of migrant birds which occur by night at uncertain intervals. These flocks consist of a very heterogeneous assemblage, and it is seldom that the particular kinds can be identified except by the victims that may be found next morning lying dead beneath the glasses against which they have dashed themselves. Similar flocks are occasionally observed inland, and chiefly over or near large towns, whither it may be supposed they have been attracted by the glare of the street lamps. In these latter cases it is seldom that examples are procured to show of what species the flock was composed, but the mere fact of its occurrence is always worthy of record, with the precise hour at which the birds were heard, in a weather report. The cries, whistling, and screams of the birds, sometimes even the sound of their wings, are often enough to attract the attention of the most unobservant; and, as far as I know, these miscellaneous flocks only occur on perfectly still pitch-dark nights, with a comparatively high temperature and a falling barometer—circumstances that point to an atmospheric cause of the wonderful concourse.

"A connection between the habits of birds and meteorological conditions is popularly believed to exist in the case of the Green Woodpecker, the frequent cry of which is said to presage rain; but I have failed to find that this is so. The Redbreast, on the other hand, when singing from an elevated perch at evening, is said to be an unfailing prophet of a fine day on the morrow, while if its parting song be uttered from a lower station bad weather is supposed to follow. As far as my own experience goes, the only connection between changes of weather and the habits of birds (omitting of course hard frost and deep snow, the effects of which are obvious) is, that many birds seem to be more alert, or 'wilder,' as the sportsmen say, for a day or two before a heavy downfall; I have observed this with partridges, plovers, and snipes."

We recommend all our readers to procure these "Instructions."

INSTITUTION OF NAVAL ARCHITECTS

AT the annual meeting of this Institution last week, three papers of interest to the scientific world were read and discussed. All three of these papers bore upon

* Ibis, 1872, p. 361.

† Instructions for the Observation of Phenological Phenomena, prepared at the request of the Council of the Meteorological Society by a Conference consisting of Delegates from the following Societies, viz.: Royal Agricultural Society, Royal Botanic Society, Royal Dublin Society, Royal Horticultural Society, Marlborough College Natural History Society, Meteorological Society.

the subject of waves, which is at present occupying so much the attention of all those who, both in this country and abroad, are endeavouring, by researches into their forms and habits, to improve the theory of Naval Architecture.

The first paper was on a proposed method of obtaining the outlines of deep-sea waves, by Mr. W. W. Rundell, the secretary of the Liverpool Underwriters' Association. The important part which photography has recently played in the observations on the Transit of Venus, and the assistance which it has thus rendered to astronomy, led Mr. Rundell to consider whether it might not also be employed to determine the forms of waves and so supply data for obtaining their chief components. The application which Mr. Rundell proposes consists of a system of poles about 36 feet in length, painted with alternate bands of red and blue, each band being a foot wide. These poles are spaced 15 feet apart and loosely coupled at one end to yards or spare spars extending to a length of about 600 feet. A similar system of poles intersects the first system at intervals of 90 feet, the different parts being connected together, in moderate weather, while floating on the surface of the water. Weights being attached to the spars would cause the poles to sink until only about 12 feet of their length was visible above the water. Mr. Rundell proposes, by the aid of photography, to take pictures of the outlines of waves seen against this system, the photographs being taken either from the crosstrees of a man-of-war or from some elevated position such as the Fastnet, or Skellig Lighthouses. Mr. Rundell thinks that thus the complete history of a gale might be photographically recorded. Mr. Froude, however, seemed to think that there would be greater difficulties to encounter than Mr. Rundell imagined.

The next paper, by Mr. Froude, was a description of the graphic integration on the equation of a ship's rolling, including the effect of resistance. Mr. Froude first pointed out that the commonly employed methods of graphic integration, *i.e.* the semi-geometrical processes by which the solution of intractable mathematical problems is effected, do not readily lend themselves to the treatment of a problem in which the forces which govern the movements of the body arise afresh at each instant, as the direct and indirect effects of the very movements they are creating, but that his method is perfectly capable of dealing with this circumstance.

The two principal forces taken account of in this method are the ship's "righting force" or "moment" as dependent on her inclination relatively to the wave slope at each instant, taking into consideration any speciality in her curve of stability; and the resistance she experiences while in motion, as dependent on her angular velocity. Taking the equation of rolling motion to be integrated is, in its most complete form, as follows :—

$$-\frac{d^2\theta}{dt^2} = \frac{\pi^2}{T^2}\left\{ f(\theta - \theta') + R \right\}$$

Here θ is the ship's absolute inclination, θ' the inclination of the wave, and $\therefore (\theta - \theta')$ is her inclination relatively to the wave slope, or the ship's "relative inclination;" the term $f(\theta - \theta')$ signifies that function of the relative inclination which in the curve of stability is assigned to the particular inclination, and expresses the righting moment of the ship when so inclined.

T is the time, in seconds, occupied by the ship in performing a single swing when rolling to moderate angles in still water, being half of what is commonly called the "metacentric period."

R is the effective "moment of resistance" which the ship is at the instant experiencing when rolling with her existing angular velocity, its elementary signification being homogeneous with that in the ship's curve of stability, in which $f(\theta - \theta')$ stands for the righting moment. In both terms, alike, these elements consist in effect of "so many foot-tons $\times \frac{g}{W \rho^2}$," where W is the ship's weight in tons, ρ her radius of gyration expressed in feet, as g also usually is. The abstract value of R is

$$k_1 \frac{d\theta}{dt} \pm k_2 \frac{d\theta^2}{dt^2}$$

where k_1 and k_2 will have values appropriate to the particular ship in question; and observe that the $\pm$ sign must be understood to mean that the sign of the second term, which, being a square, would in itself be always positive, must change signs in company with the first term.

A base line being taken to represent time, and divided into equal spaces representing small unit-intervals of time, $\Delta_1 t$, $\Delta_2 t$, &c., the inclination at each instant, whether of the ship or of the wave, are to be expressed as ordinates to a scale of degrees; those above the base line being positive, and those below it negative. A "curve of wave slopes" being drawn, the ship's absolute inclinations, which grow out of the circumstances, as time (and the varying wave slopes which time brings) proceeds, by Mr. Froude's method of graphic integration, are represented by a curve analogous to the "curve of wave slopes" in general character. This curve which gradually grows out of the integration Mr. Froude calls the "curve of rolling" or the "curve of inclinations." The difference between the ordinates of these two curves, at any instant, gives the ship's relative inclination at that instant on which the righting force depends. The angular velocity of the ship's change of inclination is obviously expressed by the tangential direction of the curve, and this circumstance is of essential importance in the process by which the curve is deduced.

To carry out the process two auxiliary curves have to be introduced :—

1. The "ship's curve of stability," which supplies, as has been explained, her righting moment, as due to her relative inclination at any instant. In this, the base is formed of a scale of angles, this scale being the same as in the "curve of wave slopes" and the "curve of inclinations." The ordinates corresponding with given inclinations express the righting moments at those inclinations to the scale which is employed in the graphic process.

2. The "curve of resistance," which supplies the moment of resistance experienced by the ship when moving with any given angular velocity.

As has been already stated, the conditions are—

$$R = k_1 \frac{d\theta}{dt} + k_2 \frac{d\theta^2}{at}$$

The first of these terms is expressed by a straight line, and the second by a parabola which takes that straight line as its base.

Turning to the employment of these data in the geometrical solution of the dynamical equation, by grouping the force terms under the single symbol ϕ, we may write the equation thus :—

$$d(d\theta) : dt = \phi : \frac{T^2}{\pi^2 dt}$$

Substituting for the differential terms, small quantities virtually infinitesimal—

$$\Delta(\Delta\theta) : \Delta t = \phi : \frac{T^2}{\pi^2 \Delta t}$$

where Δt is the unit of space taken in the curve of wave slopes.

By a simple geometrical contrivance this ratio is utilised by drawing a base line each way from the foot of the vertical axis in the "curve of resistance," which measured by the time scale $= \frac{T^2}{\pi^2 dt}$, ending at + P and − P.

Through the end of this line the inclination θ_0 is set off with a parallel ruler from the "curve of wave slopes." The height p at which this line cuts the directrix is proportional to the angular velocity.

Now, $\Delta(\Delta\theta)$, the difference of inclination which we wish to find, as has been shown,

$$= \Delta t . \phi \frac{\pi^2 \Delta t}{T^2}$$

and ϕ consists of $f(\theta - \theta') + R$, of which the former is the ship's righting moment, and the second her moment of resistance.

Thus we can find R from the angular velocity, θ from the "curve of wave slopes," and θ' absolutely at the beginning of the first interval and approximately at the end of the subsequent time intervals.

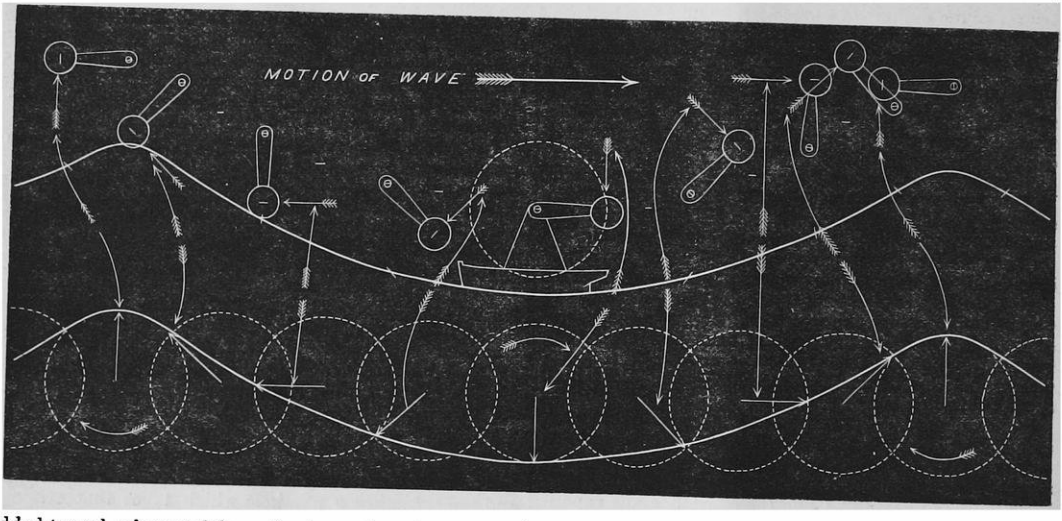
The difference between the exact ordinate length of the two curves at t_0 and approximately estimated length at t_1 is applied by dividers to the line of abscissæ, and hence is obtained the value of $\theta - \theta'$ and therefore the corresponding ordinate gives $f(\theta - \theta')$.

The sum of $(\theta - \theta')$ and of R is taken as an ordinate of the "force curve" at each point, and by connecting the tops of these ordinates we have a close approximation to the first segment of the force curve. The ordinate length of ϕ being now obtained, some necessary correction being made, if the line $P_1 p$ be now drawn, the difference of its tangential inclination from that of $P_0 p$ represents with close approximation (indeed, exactly, if the provisional estimate has been judiciously made) the change of velocity which has ensued during $\Delta_1 t$, and a line parallel to $P_0 p$ will be the tangent to the curve of inclination at t_1. Draw, therefrom, $b\,b$ as the tangent across the ordinate t_1 at such a height that it shall intersect the previous tangent at the middle part of $\Delta_1 t$. This height is the first approximate value of the ordinate to the curve of inclinations at that point.

By carrying out this method the whole curve of inclinations is obtained.

This description of Mr. Froude's paper is necessarily very imperfect, through our being obliged to leave out the small corrections, which without figures would be unintelligible. But it is sufficient to show his extremely neat and simple way of drawing a curve which shall determine a ship's absolute inclinations.

The third paper was by Mr. B. Tower, on a method of obtaining motive power from wave motion. He said that this inquiry originated with Mr. Deverell, who came home from the antipodes for the purpose of promulgating it. Mr. Deverell's proposition was to suspend a heavy weight on board a ship by means of springs, and to obtain motive power by the oscillation of this weight through a distance not more than the height of the waves. It however appeared to Mr. Tower that since the centrifugal force of wave motion in a vertical direction is alternately



added to and subtracted from, the force of gravity thereby causing a virtual variation of the intensity of that force, the question might be broadly stated as follows :—

Supposing the force of gravity to vary in intensity at regular intervals, that is, to become alternately greater and less than its normal amount, what is the best means to obtain the maximum amount of energy from a given weight oscillating under the influence of these variations? For example, supposing the force of gravity to be for three seconds one-fifth greater, and for the next three seconds one-fifth less than its natural intensity, and suppose that we have a weight of five tons suspended by a spring, with an infinitely open scale, so that the spring will continue to exert a uniform upward force of five tons, no matter how far the weight moves up and down, it is clear that during the three seconds' interval, during which gravity is one-fifth more than its normal intensity, the five-ton weight will virtually weigh six tons, and will thus exceed the upward force of the spring by a downward force of one ton; in the same way, when the force of gravity is one-fifth less, the weight will only weigh four tons, and the spring will then exert an unbalanced upward force of one ton. Now, as energy or power is defined as force moving through distance, it is clear that the quantity of energy or power to be obtained by this system will depend on the distance through which this weight is caused to move during each successive variation of gravity. Thus, supposing that during the *plus* interval it moves downwards through one foot, and during the *minus* interval it moves upwards through one foot, it is clear that during each of these intervals it will exert a force of one ton moved through one foot—that is, one foot-ton; but if, instead of one foot, it moves through ten feet, it will exert ten times the power—that is, ten foot-tons; or if it moved through 100 feet, it would exert 100 foot-tons during each interval of three seconds.

The first experiments Mr. Tower made with a model apparatus constructed on these principles showed him that the best arrangement would be to put a weight on the end of a revolving arm, whereby the centrifugal force of the wave motion might be utilised as well as the rising and falling motion.

The diagram shows the position of the vessel and of its revolving arm at all parts of a wave; the arrows show

the direction of the centrifugal force of the wave motion according to the generally received theory. This force is upwards at the crests, downwards in the hollows, and horizontal midway between the crests and hollows. If the weighted arm is compelled to assume successive angular positions, so that it is always at right angles to the force, it is evident that the force will be continually acting to cause the arm to rotate. It is easy to see how the work is taken out of the waves, for when the vessel is descending, the weight is performing the upper half of its revolution, and is consequently exerting an upward centrifugal force; and when the vessel is ascending, the centrifugal force is pushing down and resisting the vessel's ascent, so that the revolving weight affords a resistance against which the vessel can push just as if it were a fixed point in space. The shaft of the revolving weight can be made to turn a screw in the stern of the vessel by means of a proper system of gearing, and by a delicate arrangement of electric brakes and hydraulic accumulators, Mr. Tower proposes to regulate the revolving arm so as always to keep it at right angles to the centrifugal force of the waves.

THE FARADAY LECTURE

LAST Thursday, as our readers know, Dr. A. W. Hofmann, of Berlin, delivered at the Royal Institution the Faraday Lecture of the Chemical Society, his subject being "Liebig's Contributions to Experimental Chemistry." The audience included the Prince of Wales. Dr. Odling occupied the chair. The dinner on Friday at Willis's Rooms was probably one of the most remarkable scientific dinners that have taken place for some years, there being about 180 present, nearly all of them well-known men of science. Dr. Hofmann made a noble appeal on behalf of the recognition of the high value of pure scientific research; and Prof. Huxley acknowledged that while in scientific ideas we might be abreast of the Germans, yet the latter undoubtedly excelled us in the amount of their scientific work.

Dr. Hofmann in his lecture began by pointing out that Faraday belonged by the universality of his genius to all civilised countries, and the council of the Chemical Society had ordained that all countries should be asked to join in rendering homage to the greatest experimental thinker among mankind. On the present occasion Germany had been invited to take part in this international tribute, and it was a great honour for him to interpret his country's homage. His illustrious teacher and lamented friend Justus von Liebig was a master mind like Faraday, and Liebig's is the name and figure alone fitted to stand on equal terms beside Faraday. But to speak of Liebig only we must proclaim him one of the greatest contributors to chemistry at large, while of organic chemistry he was the founder. It is not only by the discovery of new facts that he was distinguished, but by the conception of general laws which illustrate both organic and inorganic chemistry. By the great types of composition which under the name of "radicles" he first spoke of, and by the researches to which these led, he guided not only his contemporaries, but will guide succeeding ages. He was also the first to found in Europe the great system of practical education. It was at Giessen he organised the first great laboratory of experimental instruction; and if we now admire magnificent temples of science, let us not forget that we owe them to him as their originator. He called around him distinguished students, many of whom were raised now to exalted positions by their talents and learning, and many of whom the lecturer saw before him; they would not be wanting in the tribute of heartfelt reverence to their great master. By his keen insight into chemical analogy he marked out the way of chemical research, and he also showed how to keep up the supply of human hearts and minds to prosecute his work. He provided arms, and soldiers to wield them.

There is no greater proof of the fecundity of genius than that it enriches the storehouse of science with its discoveries, and at the same time provides the means of ulterior conquest in ages yet to come. Which of us returning to-morrow to his lonely post in the laboratory could not feel cheered by the example of such men as Liebig and Faraday? It was the habit of Liebig to trace laws in their furthest results, and their applicability to promoting the practical welfare of mankind. No one has in this way more enriched us. Liebig's labours in abstract science bore fruit in the useful arts. He materially elucidated great industries, the manufacture of fulminating compounds and prussiate of potash, for instance, together with materials of the most important use in the manufacture of the precious metals, and silver-coated mirrors, so preferable for purposes of science and adornment to the old mercury-backed glasses. *Illustrans commoda vitae*, he never let slip any occasion of promoting the good of his fellow-creatures. His penetrating philosophy could not remain a stranger to the profound secrets of life based upon chemical change. He revealed the dependence of plants upon the chemical composition of the soil and air. He studied also the laws of nutrition and development of the animal body. In the former of these branches he was crowned with the greatest success. He began in 1840 by his work on agriculture and zoology, written in compliance with the request of the British Association at their 1837 meeting at Liverpool, and he followed it up by his work on husbandry. His labours resulted in the establishment of the philosophy of agriculture, and ranked him with Lavoisier, who showed in the last century how the vegetable stands between the mineral and the animal, and collects from the former world food for the latter. Lavoisier was followed by Humphry Davy, and after him came Liebig. They are the three great lawgivers of modern agriculture.

It was in 1842 that Liebig, passing onward from food-producers to animals, brought out his work on the subject, and it may be taken as a result of his work that the superabundant animal food of thinly-peopled parts of the earth has been, by a fast developing industry, brought over to guard Europe against the pinch of want. Those who are engaged in the curative art must bear him gratitude for the discovery of chloroform; nor will they forget chloral, the benign influences of which will even induce sleep, and rank it among the most sublime agencies placed at the disposal of therapeutics by chemical art.

He had, the lecturer said, selected but a few illustrations, which would give them a better idea than any long explanations by him of Liebig's voluminous life-work, and he asked them to accompany him in a rapid view of Liebig's memorable contributions to chemistry proper. But Liebig's contributions to the Royal Society's library were, in 1863, 317 in number, and 283 were entirely by himself. When the lecturer's pupils in Berlin heard that he had been entrusted with this lecture, they produced all the substances which Liebig at any period of his career more particularly illustrated; these preparations now crowded the table.

The first achievement he would allude to was that which, whether or not his most brilliant discovery, contributed most to facilitate the labours of chemists, and was the main source of the marvellous development of organic chemistry—analysis by combustion of organic bodies and the determination of their carbon by his form of measurement. Not one there but had determined the molecular weight of bodies, but they might not be aware that we are indebted for the process to Liebig. He never published any particular paper on the subject, but merely communicated his method in a paper on another chemist's researches. Its merit is simplicity, like that of his air analysis. That an alkaline solution of pyrogenic acid

takes up oxygen and becomes more and more blackened by its action had long been known. But it was reserved for Liebig to found on the fact the measurement of oxygen. By treating the gas to be examined first with potash and then with pyrogenic acid, he combined the investigation for oxygen with that of carbonic acid.

Passing to the researches he effected by the instrumentality of his inventions, there came the fulminating compounds. At a remote period Liebig compared fulminic with picric acid. There was no satisfactory analysis of the method of fusing substances with prussiate of potash, and he first showed how iron is taken up by ferrocyanides, and his experiments are the foundation of the modern manufacture. Another valuable point was his simple process of obtaining cyanide of potassium. It is now manufactured on a large scale on his process, and is thus extensively used in electrotyping. This discovery led him to others. Liebig and Wöhler furnish us with the group of aromatic compounds which stream forth from benzol in infinite variety. At the conclusion of the description of their experiments they say their inquiries arrange themselves round a group of acids. This analogy induced them to consider the group as a kind of compound element, to which they gave the name of benzol.

When a chemist is fortunate enough to encounter some such guide in the midst of unknown nature, he has good cause to congratulate himself. If even now after forty years the results of this research have such fascination, what were the feelings of contemporaries? One of them "discerns the dawn of a new day," and suggests orthrine for the name of the new compound element from ὄρθρος, "day-break." Now, the lecturer should by rights unfold before their eyes the chain from oil of almonds to benzolic acid. But time reminded him to hasten on. The uric acid group furnished a path which had not yet conducted us to the goal. Uric acid was not all unknown in 1834, when Liebig established its formula. It had been known in 1734, but it was not till 1850 that a youth in his 19th year discovered the most fertile source of the compound. Liebig and Wöhler soon showed that its mutability, its liability to chemical change, entitled them to reap rich harvests from it. Sixteen new and most remarkable bodies were at a single stroke incorporated into the history of chemistry. Only one has since disappeared and called for rectification, and no better proof could be given of their scrupulous accuracy. They showed how clearly they discerned the synthetic direction which organic chemistry was about to take. Sugar, silicine, morphine would be, they say, synthetically prepared. One more illustration must suffice—the remarkable results in the investigation of alcohol. His first experiments were in 1832, when his inquiry, undertaken for purely scientific and abstract ends, led to the discovery of chloral and chloroform. He discovered hydrate of chloral and its beautiful crystalline form. In 1847, fifteen years after its discovery, chloroform was used for the first time as an anæsthetic, and twenty years more elapsed before Liebreich found a similar use for chloral. At the present day the chemical factories of Berlin alone produce 100 kilos. a day of the principal anæsthetic.

Liebig denied the presence of the olefiant gas previously ascribed to alcohols, and gave their chief constituent the name of ether, and although according to our present view the relation between alcohol and ether has changed, no one now speaks of the olefiant theory. The new system of chemical notation introduced by two French chemists was nowhere earlier championed than here, and by Faraday. To that England owes the honour of being foremost to recognise the truth of the new doctrine. Its modification of Liebig's formulæ extends also to his ether. Williamson elucidated the question with striking success, but Williamson owed to Liebig the very agents he so successfully employed. Liebig "had no doubt we should succeed in the analysis of ether." Liebig's dream was realised by Frankland.

Our respect and our admiration are due to Liebig not for his scientific labour alone: we learn from him that anxiety to discover abstract laws is not to be dissociated from efforts for the well-being of our race. The lecturer remembered a little incident so illustrative of Liebig's goodness of heart that he ventured to relate it. He then told the story of a broken soldier, whom, during a tour in the Tyrol, Liebig not only helped with florins, but procured quinine for by a toilsome walk over mountains. Of Faraday's kindness he had a touching example. A gentleman had handed him a letter of 1834, in which Faraday wrote to a student who had engaged, like many others, in a dream about matter and atoms, and was anxious to submit his ramblings in philosophic dreamland to the greatest chemist of the day. He forwarded it with the suggestion that it was worth while to test it. Overwhelmed, as Faraday then was, with work, he answered not with neglect or with cheap flattery; he wrote to the unknown youth as follows:—

"I have no hesitation in advising you to experiment in support of your views, because, whether you confirm or confute them, good must come out of your experiments. With regard to the views themselves, I can say nothing of them except that they are useful in exciting the mind to inquiry. A very brief consideration of the progress of experimental philosophy will show you that it is a great disturber of preconceived theories. I have thought long and closely on the theories of attraction and of particles and atoms of matter, and the more I think, in association with experiments, the less distinct does my idea of an atom or a particle of matter become."

In whatever epoch, continued the lecturer, we shall seek for models of human existence, we can find no two examples more conspicuous for their intellectual worth, more admirable for their lofty views of duty, than Michael Faraday and Justus von Liebig.

NOTES

THE *Enterprise*, with the eclipse party for Camorta (Nicobar Islands), left Galle on the 18th inst. The *Baroda* with the Siam party should arrive at Singapore to-day, and a telegram has been received at the Admiralty that the Colonial steamer will replace the *Charybdis* in the journey to Bangkok, as the former is faster and possesses more accommodation. Letters have been received from the expedition at Aden. Drs. Vogel and Schuster have been engaged on board in photographically determining the chemical intensity of different parts of the solar spectrum at different times of the day, and most important results have already been secured.

HER Majesty the Queen has been graciously pleased to confer upon Mr. Henry Cole, C.B., the distinction of a Commandership of the Bath, in recognition of his eminent public services. The Executive Committee of the Cole Testimonial Fund have authorised the preparation of a decorative memorial tablet, with portrait of Mr. Cole in mosaic, as well as a marble bust. It is intended to offer these to public institutions, and the balance of the amount subscribed will be placed at the disposal of Mr. Cole.

THE Royal Irish Academy has given its sanction to the following grants from the fund placed at its disposal for aiding scientific researches by providing suitable instruments and materials:—25*l.* to Mr. Edward T. Hardman, for "Chemico-Geological Researches;" 30*l.* to Mr. W. H. Mackintosh, for "Researches as to the Structure of the Echinoidea;" 25*l.* to Mr. G. Porte, for "Micro-Photographic Experiments;" 40*l.* to Dr. Leith Adams, for "Explorations in the Caves of Shandon;"

25*l.* to Dr. Hansdel Griffiths, for "Experiments on the Effects of Certain Drugs on the Circulation;" 25*l.* to Dr. Reuben Harvey, for "Researches on Staining Reagents used in Histology;" and 30*l.* to Prof. A. H. Church, Cirencester, for report on the analysis of some rare mineral arseniates and phosphates.

AT the meeting of the Academy held on the 16th March, the following were elected honorary members in the department of Science:—Joseph Bertrand, Paris; Bernard von Cotta, Freiburg; and Asa Gray, Cambridge, U.S.

THE following parts of vol. xxv. of the Transactions of the Royal Irish Academy have just been published:—Part 10, Researches in Chemical Optics, by the Rev. J. H. Jellett, B.D. Part 11, Report on the Strength of single-riveted Lap Joints, by Bindon B. Stoney, A.M.; with plate and tables. And the following are in the press:—Parts 12 and 13, On the First Comet in 1845; and On the Binary Star μ^2 Bootis, by Dr. Doberck. Part 14, On the Anatomy of Insectivorous Edentates, by A. Macalister, M.B.; with two plates. Part 15, On the Fern Flora of the Seychelles, by J. G. Baker, F.L.S.; with Notes on some of the Species, by E. P. Wright, M.D.; with four plates. Part 16, On the Structure of the Spines of the Diadematidæ, by H. W. Mackintosh, A.B.; with three plates.

TWO prizes of 30*l.* and 20*l.* each, the gift of Mr. J. T. Mackenzie, of Kintail, are offered by Aberdeen University for the best and second-best essays on "The Conservation of Energy, considered especially with reference to the Mechanical Theory of Heat." The essays must be sent in on or before the 1st of November next.

THE Vice-Chancellor of Cambridge University has announced that the election of a Jacksonian Professor of Natural Experimental Philosophy will be held in the Senate House on Tuesday, the 13th of April. The Rev. J. Clough Williams Ellis, M.A., Fellow of Sidney, who acted as Deputy Jacksonian Professor for two years, and Mr. James Stuart, M.A., Fellow of Trinity, are candidates for the vacant appointment.

DR. VON MICLUCHO MACLAY, the Russian traveller, has recently returned to Singapore from a journey into the interior of Tabore. The object of his expedition was to gather information about wild and almost unknown races inhabiting the Tabore jungles. These tribes are named Jakuns, Oran Rajet, and Oran Utan. As these races always withdraw deeper into the interior, seeking shelter in the forest and mountains on the approach of strangers, Dr. Maclay had to extend his explorations into places never yet visited by Europeans, and rarely even by the Malays. His travels occupied fifty days, proceeding sometimes by boat, but performing the greater part of the journey on foot. Dr. Maclay has, it is stated, succeeded in obtaining much valuable information regarding the habits and dispositions of these unknown tribes.

THE Agassiz Memorial Fund of 300,000 dollars is said to be nearly raised. The "teachers' and pupils' fund" alone exceeds 9,000 dollars.

AN International Horticultural Exhibition is to be held at Cologne from the 25th August till 26th September. All communications must be addressed, post paid, to the Horticultural Society "Flora," Cologne, from whence all necessary information can be obtained.

THE Council of the Royal Dublin Society advertise for candidates to fill the post of Keeper of the Minerals in their museum. The salary is 100*l.* a year, paid by a Government grant, and the keeper acts the part to a certain extent of assistant to Dr. Carte, the director. The gentleman appointed Keeper of the Minerals will also be elected Analyst to the Society and have charge of their Chemical Laboratory, at an additional salary of 50*l.* per annum, with fees for analysis, the scale of fees chargeable to members of the Society being regulated from time to time by the Council. The interests of the mineralogical collection of the Society would appear to be perhaps unavoidably overlooked by the above arrangements, as the person elected must look for a livelihood to the fees for analysis.

LETTERS from Nordenskjold, the celebrated Swedish polar explorer, intimate that he will very shortly leave Tromsöe for Novaja Semlja. He will spend only a few months on that island, and try a land journey from the mouth of the Lena or Obi throughout Northern Russia, travelling southwards, if possible, by boat. The funds are supplied by Mr. Oscar Dickson, the well-known Gottenburg merchant.

A SHOCK of earthquake was felt on the night of March 17 at several places in the province of Ravenna.

A NUMBER of large meteors were observed in several parts of France on the 9th and 10th of March. The meteor of Feb. 10 was seen in an immense number of localities, and additional notices are daily arriving at the Observatory.

M. DUMAS, Perpetual Secretary of the Academy of Sciences, is a candidate for the French Academy as well as M. Jules Simon, the ex-Minister for Public Instruction, who is an influential member of the department of Moral and Political Sciences. According to the rules enacted when the Institute was created, no member of one class could become a member of another. The rule was abolished when the academical constitution was remodelled by Napoleon I., but many academicians adhered to it. Arago refused several times to become a candidate in the French Academy.

AN edition of Laplace's works was published by the French Government about thirty years ago, and is now almost out of print. A new edition is preparing; it will be edited by the Academy under the superintendence of M. Dumas, assisted by a member of the Section of Geometry. A copy of the work will be presented by the Institute, at the anniversary meeting, to the pupil of the Polytechnic School who has obtained the first place.

M. WALLON, the new Minister of Public Instruction, has declined to appoint as his general secretary a member of the Versailles Assembly who desired the appointment, and has nominated M. Jourdain, a general inspector of the University and a member of the Institute. He has appointed as his *chef du cabinet*, not as is usually the case, a private friend or a member of his family, but M. Delfour, who is one of the ablest teachers in the Paris College. He has appointed M. G. Pouchet, the son of the celebrated advocate of spontaneous generation, to fill the room of M. Paul Bert, Professor of Physiology to the Sorbonne, as the latter, being a member of the National Assembly, cannot attend to his professorial duties.

DR. FORBES WATSON, director of the India Museum, has published in a separate form the paper he read at the Oriental Congress in September last, and of which, at the time, we gave a report. It is entitled, "On the establishment in connection with the Indian Museum and Library of an Indian Institute for Lecture, Inquiry, and Teaching; its influence on the promotion of Oriental studies in England, on the progress of the higher education among the natives of India, and on the training of candidates for the Civil Service of India." The unsatisfactory state of the museum and library in the attics of the India Office is notorious. The collections in the museum are to be housed for three years in the eastern galleries of the International Exhibition building. But this is only temporary; and in the

interests both of science and of the commercial and political welfare of India, a special permanent building for the purposes so ably advocated by Dr. Watson is urgently required. We hope the recent memorials of the Chambers of Commerce of the United Kingdom, added to the long-continued exertions of the Asiatic and other learned societies, will have some success with her Majesty's Government. The site proposed by Dr. Watson for an Indian Institute is close by the India Office. Allen and Co. are the publishers of Dr. Watson's paper.

A BILL to reform the Gregorian year has been recently introduced into the American House of Representatives. Its essential provisions are that the beginning of the year shall correspond to the winter solstice, and its principal divisions to the summer solstice and the equinoxes, the latter provision being intended to take the place of the intercalary rule of the Gregorian calendar, thus regulating the divisions by the astronomical conditions of the earth's orbit.

THE report of Capt. Elton on the Zanzibar copal trees (*Trachylobium Hornemannianum*) has become so well known, owing to its republication in many English journals, that it will be interesting to the botanical readers of NATURE to know that seeds taken from fruits collected by Capt. Elton and sent to the museum at Kew, through the Foreign Office, have not only germinated, but are growing into strong healthy plants; some of them are six or more inches high, and have six or seven pairs of leaflets. They are interesting, not only on account of the valuable fossil resin yielded by the old trees, but also on account of their being the first plants grown in Europe. Though there is always a steady demand for good copal in England, there can be no doubt that large quantities are still to be found beneath the African soil. In Loanda, on the opposite side of the African continent, large deposits of copal are known to exist, but owing to a superstition among the natives the resin is not allowed to be touched.

THE discovery of new medicinal products appears to be on the increase just now. Within the space of a few months we have heard of the extraordinary tonic effects of Boldo (*Boldoa fragrans*), which, however, seems destined to pass into oblivion. This was succeeded by Jaborandi, which is still occupying the attention of the medical profession, and which, unlike Boldo, is being reported upon very favourably. Two bales of another new product, under the name of Carnauba Root, are reported to have recently arrived at Liverpool. It is the root of the Brazilian Wax Palm (*Copernicia cerifera*), and is described as an excellent medicine for purifying the blood; equal, indeed, to sarsaparilla. It is a question, however, whether the latter has any real medicinal properties. The Carnauba Root as imported is said to be in pieces several feet in length, of an average thickness of three-eighths of an inch, of a mixed greyish and reddish brown colour, giving off here and there small rootlets. The cost is said to be not more than half that of sarsaparilla.

ONE of the chief products of Auckland, New Zealand, is Kauri gum, the semi-fossil resin of *Dammara australis*. It is specially a product of this province of New Zealand, being found in no other part of the world. The resin is found at a depth of from two to three feet from the surface over a large area of land once covered by Kauri forests, but now barren and almost unfit for cultivation. In these waste lands there is no restriction enforced by Government as to the right of digging for the resin, and it is calculated that in various parts of Auckland as many as 2,000 men have found employment at one time digging up the Kauri resin. This number, however, is now considerably reduced, owing to the demand for labour in other directions; nevertheless, large quantities of the resin are required by varnish-makers in this country, and consequently many persons still find employment in digging it. The Maoris bring a considerable quantity to market. The best quality fetches in the market at Auckland from 30*l.* to 33*l.* per ton. At this price the gum diggers are able to earn from 1*l.* 10*s.* to 4*l.* per week; the average earnings, however, are about 2*l.* per week. In the three years from 1870 to 1872, there were exported from Auckland 14,276 tons of Kauri resin, valued at 497,199*l.*

UNDER the title of "Note sur les Tremblements de Terre en 1871, avec Suppléments pour les Années antérieure de 1843 à 1870," M. Alexis Perrey, of the Belgian Academy, publishes a continuous list of earthquakes and of volcanic eruptions which have occurred from 1843 to 1871, one-half of the volume being occupied with those of the latter year. M. Perrey's object is simply to present as complete a list as possible of these phenomena, and he is therefore anxious to receive information of any omissions, so that future editions may be made still more complete. The list will no doubt be found of great use to those who are investigating seismic phenomena. It is published by Hayez, of Brussels.

A NEW phase in the archæology of the United States is shown by the researches of Mr. Putnam in the caves of Kentucky, as he has found that many of the caverns there were used for burial, as in Europe, and that others were used for habitations. Many relics and skeletons have been brought to light by his investigations; and further research, which will be carried on this year in connection with the Geological Survey of the State, will undoubtedly add much of importance to the archæology of that country. Enough evidence has already been obtained to prove that the caves were very extensively used by an early race of men, but the race to which the remains should be referred is not yet determined. In his investigations in the vicinity of a group of mounds in Monroe County, Kentucky, Mr. Putnam was also quite fortunate in finding a peculiar mode of burial that has not before been noticed, inasmuch as the bodies, in one grave ten in number, were buried in a circular grave, made by placing erect slabs of limestone around a floor laid with thin stones. The bodies had all been placed in the grave at the same time, and evidently in a sitting posture, with their backs against the slabs. The skulls show a race remarkable for the shortness of their heads, and in one case at least exhibited a posterior flattening. The bones of the skeletons were quite thick and massive, and the shin-bones were remarkably flat.

WE have to record the recent publication of another portion of the important work upon the economical and natural history of the insects of the United States, undertaken by Prof. T. Glover, of the Agricultural Department at Washington, and upon which he has been engaged for many years. Many years ago Prof. Glover commenced illustrating the entomology of the country by engraving figures of the various species of insects directly upon copper plates, and he has now several hundred such plates completed, containing illustrations of thousands of species, among them nearly all of the various orders that are in any way interesting or important, either from their general prominence or from their relations to man, as being destructive or beneficial. For the purpose of putting his labours before the public he has commenced issuing monographs of particular orders and families, and has already published one volume on the Orthoptera. He has recently sent forth a second volume, entitled "Manuscript Notes from my Journal of Illustrations of Insects, Native and Foreign; Diptera, or Two-winged Flies." The one thing to be regretted is the smallness of the edition of this valuable work by Prof. Glover, only forty-five copies having been issued.

SOME recent numbers of the *Montreal Gazette* contain a detailed account of the progress of scientific research in Canada during 1874. From this we learn that Mr. James Richardson (of the Geological Survey) spent the months of May, June, and July in a topographical and geological examination of the inlets on the coast of British Columbia, between the 52nd and 55th degrees north latitude. Mr. George M. Dawson, geologist and botan-

to the Boundary Commission, has been engaged in continuing the examination of the region in the vicinity of the 49th parallel. Prof. Bell has been again engaged during the past summer in the North-west Territories. Mr. Henry G. Vennor spent the greater part of the summer in extending his researches through the rear portion of Lanark County, Ont., and towards the end of the season had succeeded in working out the geological structure of the whole of it. Further details are given concerning laboratory and other work done during the year by various scientific workers, all showing considerable activity in science on the part of the Canadians.

THE following are the probable arrangements for the Friday Evening Lectures at the Royal Institution after Easter:—April 9, Sir William Thomson, LL.D., F.R.S.: "Tides." April 16, Prof. Gladstone, F.R.S., M.R.I.: "Progress of Science in Elementary Schools." April 23, Prof. Ramsay, LL.D., F.R.S.: "The Pre-Miocene Alps, and their subsequent Waste and Degradation." April 30, Walter Noel Hartley: "Action of Heat on Coloured Liquid." May 7, M. Cornu (École Polytechnique): "Velocity of Light." May 14, John Evans, F.R.S.: "Coinage of the Ancient Britons and Natural Selection." May 21, J. Baillie Hamilton: "Application of Wind to Stringed Instruments." May 28, Col. Lane Fox, M.R.I.: "Evolution of Culture."

THE additions to the Zoological Society's Gardens during the past week include a Lesser Sulphur-crested Cockatoo (*Cacatua sulphurea*) from Moluccas, presented by Mr. H. W. Wood; an Annilated Snake (*Leptodira annulata*) from Jamaica, presented by Mr. H. B. Whitmarsh; a Diana Monkey (*Cercopithecus diana*) from West Africa; a Common Rhea (*Rhea americana*), three Snowy Egrets (*Ardea candidissima*), a Common Boa (*Boa constrictor*) from South America, purchased.

SCIENTIFIC REPORT OF THE AUSTRO-HUNGARIAN NORTH POLAR EXPEDITION OF 1872–74 *

III.

DURING winter the air seemed always to contain particles of ice; this was seen not only by parhelia and parselenæ when the sky was clear, but also in astronomical observations. The images of celestial objects were hardly ever as clear and well defined as they are at home, although the actual moisture in the atmosphere was far less. It happened very often that with a perfectly clear sky needles of ice were deposited in great quantities upon all objects. It was quite impossible to determine the quantity of atmospheric deposits, as during the snowstorms no distinction could be made between the snow actually falling and that raised from the ground by the storm; it was remarkable, however, that during the first winter the quantity of snow was small compared with that of the second winter, when the snow almost completely buried the ship (this happened near Franz-Joseph's Land). The same proportion was repeated in the quantity of rain during the first and second summer; in the first only a little rain fell late in the year, while in July 1874 it rained in torrents for days.

Clouds are naturally of a very different character from those seen at home; nimbus and cumulus are never seen. The form of cloud is either that uniform melancholy grey of an elevated fog, or cirrhus; the latter consists of round but undefined masses of fog at but a small elevation, therefore somewhat different from the cirrhus of the temperate zone. Instead of clouds, fogs are prevalent, now higher, now lower, and twenty-four hours of clear weather rarely occur during the summer; generally the sun is seen for a few hours, then to disappear again behind the thick fogs. Melancholy and depressing as the effect of these eternal fogs may be, they are nevertheless necessary for the general conditions of the ice; they form the binding media for the heat of the sun's rays, and melt more ice than the direct rays.

Parhelia and parselenæ were often observed; they always were certain indications of snowstorms that followed them. A new phenomenon was only observed once, when, besides the double system of parhelia, two other mock suns appeared on the same altitude with the real sun.

On the whole path which the vessel described soundings were made constantly, and the depth of the sea was found to increase towards the east; on the easternmost point, 73° E. long., there were 400 metres of water, and the depth steadily decreased towards the west. In front of Franz-Joseph's Land there is a bank which seems to reach as far as Nowaja Semlja; beyond it the depth increases again. The whole area east of Spitzbergen rarely exceeds 300 metres in depth. Lieut. Hopfgarten specially constructed an instrument to fetch up dredgings, which was frequently done. The deep-sea temperatures were measured with Casella's minimum and maximum thermometer, and these measurements were continued throughout the winter. They showed a slight increase in the temperature at the bottom. The percentage of salt in the sea-water at different depths was also determined. Until the ship was blocked up the surface temperatures of the sea were also measured. Lieut. Weyprecht thinks that, as a rule, too much importance is attached to these, as the state of the weather is not taken into account, and it is just that which has the greatest influence upon the surface temperature; it is quite wrong to imagine the existence of currents from observations of this kind.

During their drift the explorers made good use of the dredging net; it was generally kept on the bottom during half a day, and thus areas of several miles' extent were examined. The collection obtained in this way no doubt completely represents the fauna on the bottom of the sea which the explorers visited. At places animal life was so plentiful that the net came to the surface completely filled. Crustaceæ were particularly plentiful; unfortunately the larger specimens remained in the ship, as they could not be transported. Dr. Kepes has handed the valuable collection to the Imperial Academy of Sciences (Vienna), and specialists are now busily engaged upon it. Other collections had to remain behind, but were not very valuable, as the explorers only touched land during winter, when everything was covered with snow; they certainly possessed a rather complete collection of birds, but these were all known species, with the sole exception of a Lestris, which Dr. Kepes could not define. Of great value, however, were sixty-seven bearskins, which had already been prepared and well packed; there were some splendid skins amongst them, most of them winter skins, which are rarely obtained in trade and are much finer than the summer skins.

Higher animal life is rather limited in those regions; the principal representatives are the polar bear and the seal, the former in such numbers that the explorers could never leave the ship without weapons; he caused them many a disagreeable surprise, but was always a welcome guest, as he provided them with a fresh and strengthening repast. The seal, in two species, *Phoca barbata* and *Phoca grœnlandica*, is everywhere where open water appears between the ice, although not in such quantities that seal-hunting would pay. The walrus was only seen once, not far from Franz-Joseph's Land, although the explorers often passed over good walrus-ground. Of whales they only saw one species in the vicinity of coasts, where it was very frequent.

Birds were very numerous near the land, but the further the ship drifted away the scarcer they became, and during the last part of the explorers' retreat in the ice the appearance of a bird was a rare phenomenon.

Interesting as all these observations doubtless may be, and in spite of the numerous and long tables they contain, they yet do not possess that high scientific value which might be reached under different circumstances. They only give us a picture of the extreme *effects* of natural forces in the Arctic districts, but on their *causes*, the *why*, we are just as much in the dark as before; and the reason of this lies in the fact that there are no simultaneous observations in another district for comparison. Only when we possess those shall we be enabled to make correct conclusions as to the causes, the origin, and the nature of the abnormal phenomena in the Arctic Zone. The keys to many enigmas in nature, which for centuries it has in vain been tried to solve—such as those in terrestrial magnetism, electricity, and the best part of meteorology, &c.—are doubtless hidden near the poles of the earth; but as long as polar expeditions are nothing more than an international race in honour of one or another flag, having as principal object only to get a few miles nearer to the pole than the last explorers, so long these enigmas will most decidedly remain unsolved.

Pure geographical research, *i.e.* Arctic topography, which until

* Die z. Oesterr.-Ungarische Nord Polar Expedition, unter Weyprecht und Payer, 1872–74. (Petermann's Geogr. Mittheilungen, 1875; heft ii.)

(Continued from p. 398.)

now was foremost with all polar expeditions, must recede before the far more important scientific questions. But these questions cannot be answered before all nations that claim a place at the head of civilisation leave aside all national rivalry, and resolve to make progress together in this direction. To obtain decisive scientific results, a number of simultaneous expeditions are absolutely necessary, and their object must be to collect or construct tables of yearly observations at different points round the pole, but their instruments and method of observation should be exactly alike. Only when this is done will the materials be furnished for the solution of those great problems of nature which are now mysteriously enwrapped by Arctic ice; only then will we reap the benefit of that enormous capital of labour, efforts, sufferings, and money which until now have been wasted in the polar district.

With regard to the means to reach the highest latitude, the camp of explorers is divided into two; some are in favour of ships, others expect everything from sledges. As long as it is the *principal* object of an expedition to reach high latitudes, sledges are doubtless preferable, but when higher results are aimed at, only ships can give the necessary basis to work upon. It is a great illusion to imagine that both can be perfectly united; on the contrary, one will always have to be subservient to the other, and they will generally be hindrances to each other.

Finally, Lieut. Weyprecht tenders his thanks to the officers of the expedition, whose untiring efforts and energy, frequently under the most difficult and sometimes the most dangerous circumstances, alone made it possible to present the scientific world at home with the above data of observations and results.

SCIENTIFIC SERIALS

THE *Journal of the Chemical Society* for February 1875 contains two original papers by Mr. A. H. Church. The first is on the composition of autunite. The recent discovery of a new locality in Cornwall for autunite induced Mr. Church to make a fresh examination of this mineral species. The quantity at his disposal was rather small, but as a remarkable peculiarity concerning the condition of the water in this mineral presented itself, the author availed himself of two fine French specimens. The Cornish specimens occurred in thin isolated rhombic tables, translucent to sub-transparent, and were sulphur-yellow. We then have a minute description of the analysis made, and in conclusion Mr. Church finds the formula of autunite, as it exists in the unaltered crystals, to be $\left.\begin{matrix}U_2O_3\\CaO\end{matrix}\right\} P_2O_5\ 10H_2O$, whereas autunite dried in vacuo is $\left.\begin{matrix}U_2O_3\\CaO\end{matrix}\right\} P_2O_5 . 2H_2O$. Upon examination of the closely allied uranium copper phosphate, *torbernite*, it did not show analogous results, and the author found the formula of torbernite to be $\left.\begin{matrix}U_2O_3\\CuO\end{matrix}\right\} P_2O_5 . 8H_2O$ and $\left.\begin{matrix}U_2O_3\\CuO\end{matrix}\right\} P_2O_5\ 2H_2O$ respectively; the latter, if the mineral is dried at 100°. Mr. Church considers, in conclusion, that there are cases in which the drying of minerals in vacuo removes essential water, and not accidental moisture only; and he further believes that absolutely dry air does, in still rarer instances, effect a similar alteration.—The second paper is on the action of baryta on oil of cloves. Considerable differences existing amongst chemists on the action of caustic baryta on eugenol, the author repeated experiments he had made some time ago on a larger scale, and with eugenol from oil of cloves of ascertained genuineness. The author first gives a description of experiments as to the physical characters of pure eugenol itself, and of the terpine with which it is associated in clove oil. We then come to the experiments with baryta, and their result was the conclusion that the action of baryta on eugenol is not a precise or definite one; that a greater part of the eugenol is carbonised and destroyed, and that from the products of such destruction a minute proportion of the remaining eugenol receives an addition of CH_2, becoming thereby converted partly into methyl-eugenol and partly into another body of the same empirical formula, and possibly isomeric with the ether. It is clear, therefore, that none of the former conclusions as to the nature of the action of baryta on eugenol are correct.—The remainder of the journal is dedicated to abstracts of papers published in other journals, many of which have already been noticed in these columns.

American Journal of Science and Arts, February.—The first paper in this number is Prof. Asa Gray's address on Jeffries Wyman at the Memorial Meeting of the Boston Society of Natural History, Oct. 7, 1874, to which, as well as to the subject of it, we have already referred.—On some points in the geology of the Blue Ridge of Virginia, a paper by Mr. W. M. Fontaine, is concluded in this number.—Mr. J. D. Dana reviews Dr. Sterry Hunt's "Chemical and Geological Essays," and Prof. Asay Gray contributes a short paper on the question, "Do varieties wear out?" The conclusion which he reaches we gave in a recent number (vol. xi. p. 334). In "Communications from the laboratory of Williams College," Mr. Ira Remsen treats of (1) the formation of paratoluic acid from parasulphotoluenic acid; (2) nitro-parasulphobenzoic acid; and (3) the action of potassium on ethyl succinate.—Another chemical paper is by Mr. M. Carey Lea on the detection of hydrocyanic acid.—M. A. E. Verrill sends his thirtieth contribution to zoology, from the museum of Yale College; it treats of the gigantic cephalopods of the North Atlantic, and is illustrated with some good cuts.—Among the smaller notes is a useful summary of the results obtained at twenty-six transit stations, twenty in the northern and six in the southern hemisphere.

Transactions of the Geological Society of Manchester, vol. xiii., part 7.—The papers in this part are—the President's (Prof. W. Boyd Dawkins) address on the most important additions during 1873-74 to our knowledge in those departments of geology that relate to mining, engineering, and terrestrial physics; "Fish Remains from the Coal Measures," by Mr. John Aitken, F.G.S.; "Geology of the Parish of Halifax," by Mr. James Spencer.

Memorie della Società degli Spettroscopisti Italiani, Dec. 1874.—Father Secchi writes on the physical study of the comets Coggia and Tempel 1874. He appears to have spectroscopically examined these comets on every opportunity, and to have compared their spectra with a Geissler's tube in front of the object-glass. He found the spectra of a hydrocarbon gas did not correspond with that of the comet; the brightest band of the spectrum of HC_2 is in the blue, while that of the gas CO or CO_2 is in the green, just as in Coggia's comet. On the other hand, the blue band is the brightest in the spectrum of Tempel's comet; and Secchi therefore attributes its light to a hydrocarbon. The nucleus appears to have given off polarised light, and also the surrounding portions of the comet. On July 9 the continuous spectrum of the nucleus appeared broken for a short distance on the red side of each of the hydrocarbon bands. On Sept. 5 Borrelly's comet appeared to have a number of bright points of nuclei dispersed throughout the comet.

Astronomische Nachrichten, No. 2,021.—Julius Schmidt communicates the observations on the number of sun-spots seen every available day at Athens. The average number of groups in January seems to be about five; in April it had decreased to two, and this average remained nearly constant throughout the remainder of the year. Position observations of Coggia's comet, by J. Dreyer, of Birr Castle, and the discovery of Planet 141, by Paul Henry, appear in this number. The transit of Venus appears to have been seen well at Java, by Metzger; the different appearances at various times during the transit are given. The eclipse of the sun was observed at Leipzig in January. It appears from the observations of the ends of the eclipse that the last contact was seen with the larger apertures before it was so seen with the smaller one.

Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie, Jan. 15.—The first paper is a contribution by Dr. Hildebrandsson to the question of the condition of vapour in the atmosphere, founded on researches made by him and Prof. Rosen some years ago, and not before published, to his knowledge, beyond Sweden, Le Roy started, and Saussure accepted the theory, that air dissolves water or vapour as a fluid dissolves a salt. Wallerius, de Luc, and Dalton, on the other hand, were of opinion that vapour is formed through the action of heat exactly in the same way in a vacuum as in air. Since the demonstrations of Regnault, the latter view has been generally adopted. By experiments resembling those of Rudberg and Regnault, Dr. Hildebrandsson and Prof. Rosen came to the following conclusions:—1. If a gas or vapour of water be brought (mechanically or by evaporation) into a volume of gas, this volume is immediately compressed or shoved aside until the difference in pressure is annulled. 2. If a gas or vapour of water be taken (mechanically or by condensation) from a volume of gas, this volume of gas rushes in from all sides to fill up the vacuum or equalise pressure. The condensation of vapour therefore doubtless plays a large part in the origin and propagation of storms,

not only by the liberation of heat, but also by the sudden diminution of pressure, which causes an inflow of air and vapour. 3. When different gases and vapours are at rest next each other, they mix and diffuse thoroughly till the mixture becomes homogeneous. Hence it follows: (1) That the permanent gases, of which air consists, are not independent atmospheres, but thoroughly penetrate each other. This result is confirmed by all experiments, which show the composition of the air at all attainable heights to be the same. (2) That the ceaseless evaporations and condensations render impossible the existence of an independent vapour atmosphere, or of a homogeneous mixture of vapour with the permanent gases, and cause a rapid decrease of vapour pressure with increase of height. (3) It is not permissible to subtract the tension of vapour from the height of the barometer, in order to find the pressure of dry air.—An article follows in the *Kleinere Mittheilungen* on the law of Dalton, respecting the independence of gas atmospheres, and on the composition of the air at great heights. The researches of Maxwell, Boltzmann, and especially of Stefan, lead to these results: The definitive equilibrium of a gas is determined by the law of Dalton, but not the manner in which the gas disposes itself before it has come to equilibrium. According to that law the mixture of two gases would take place with great rapidity, while experience shows the process to be very slow. The subtraction of vapour-tension from the height of the barometer is a false application of the law, and a reading thus corrected has a purely local signification in the narrowest sense.

THE four numbers of the *Nuovo Giornale Botanico Italiano* for 1874 contain the results of a good deal of work done by Italian botanists, though several of the papers are by Russians, and are printed in French. A large proportion of the papers in this vol. vi. relate to Cryptogams; including one by Prof. Tchistiakoff on the development of the sporangia and spores in Polypodiaceæ; by G. Arcangeli, on certain Fungi of the neighbourhood of Leghorn, and on Algæ of the group Cæloblastæ; by N. Sarokin, on the development of *Hormidium varium*, an Alga belonging to the family Ulothricaceæ; and by Prof. Tchistiakoff on the development of the spores of *Equisetum limosum* and *Lycopodium alpinum*, the subject being treated both in this and the previous paper by the same writer as a contribution to the history of the vegetable cell.—V. Cesati has a paper on hybridisation in the genus *Achillæa*, and on the gemmiparous leaves of *Cardamine pratensis*. There is a useful bibliography in each number, and we have a report of the proceedings of the Botanical Congress held at Lucca in 1843.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 18.—"Report on Observations of the Transit of Venus made at Luxor, Upper Egypt, 19th December, 1874." By Vice-Admiral E. Ommanney, C.B., F.R.S.

"Preliminary Abstract of Approximate Mean Results with the Invariable Pendulums Nos. 4 and 1821, in continuation of the Abstract published in vol. xix. of the Proceedings." By Captain W. J. Heaviside, R.E. Communicated by Professor Stokes, Sec. R.S.

Linnean Society, March 18.—Dr. G. J. Allmann, F.R.S., president, in the chair.—Mr. Rothery exhibited a convenient apparatus for drying plants when on a walking expedition.—The following papers were read:—On thirty-one new species of marine Planarians from the Eastern Seas, by Dr. Collingwood. On the resemblances of Ichthyosaurian bones with the bones of other animals, by Mr. H. G. Seeley.

Geological Society, March 10.—Mr. John Evans, V.P.R.S. president, in the chair.—The following communication was read:—"The Rocks of the Mining Districts of Cornwall, and their relation to Metalliferous Deposits," by Mr. John Arthur Phillips, M.I.C.E. In this paper the author adduced numerous facts observed by him in the examination of the rocks of the mining districts of Cornwall which led him to the following conclusions:—The clay-slates of Cornwall differ materially in composition, but no rearrangement of their constituents could result in the production of granite. Some of the "greenstones" of the Geological Survey Map are volcanic rocks contemporaneous with the slates among which they are found, whilst others are hornblendic slates, diorites, &c. Granites and elvans having a similar chemical and mineralogical composition were probably derived from the same source; but the volume of the bubbles in the fluid-cavities of both having no constant relation to the amount of liquid present, do not afford any reliable data from which to calculate the temperatures at which these rocks were respectively formed. The stone-cavities of elvans, and probably of some other rocks, are often the results of the irregular contraction, before the solidification of the base, of imbedded crystals of quartz. In rocks having a glassy base, glass-cavities will be produced. The vein-fissures of the tin- and copper-bearing lodes of Cornwall were produced by forces acting after the solidification of the elvans, but in the same general direction as those which caused the eruption of the latter; and these fissures were afterwards filled with minerals deposited by chemical action from water and aqueous vapours circulating through them, but not necessarily at a high temperature. How far these deposits were produced by water rising from below or influenced by lateral percolation cannot be determined; but the effects produced on the contents of veins by the nature of the enclosing rock, and the occurrence of deposits of ore parallel with the line of dip of the adjoining country, lead to the conclusion that lateral infiltrations must have materially influenced the results. Contact-deposits and "stockwerks" have been formed by analogous chemical action, set up in fissures resulting from the junction of dissimilar rocks, or in fractures produced during the upheaval of partially consolidated eruptive masses. The alteration produced in stratified deposits in the vicinity of eruptive rocks is probably often due to similar percolations. It is not improbable that quartz may sometimes retain a certain amount of plasticity after it has assumed a crystalline form.

Zoological Society, March 16.—Dr. A. Günther, F.R.S., V.P., in the chair.—Mr. Howard Saunders exhibited a specimen of a Gull obtained by Mr. Gervaise Mathew, R.N., at Magdalena Bay, Lower California, closely resembling *Larus fuscus*, a species hitherto unrecorded from the New World.—A letter was read, addressed to the Secretary by Capt. John Biddulph, containing remarks on the Wild Sheep met with during his recent journey to Yarkand.—A letter was read from the Rev. J. S. Whitmee, of Samoa, South Pacific, giving particulars as to the occurrence of the Palolo (*Palola viridis*) on the shores of that island in 1874.—Prof. W. H. Flower, F.R.S., read a memoir on the anatomy and affinities of the Musk Deer (*Moschus moschiferus*). After an exhaustive account of the structure of this animal, based on the examination of a specimen that had recently died in the Society's Gardens, Prof. Flower came to the conclusion that it was most nearly related to the *Cervidæ*, and might be placed within the limits of that family.—A communication was read from the Rev. O. Pickard-Cambridge, in which he gave the description of twenty-four new species of spiders of the genus *Erigone*, from France, Corsica, Sicily, Spain, Morocco, and Algiers.—Dr. A. Günther, F.R.S., read a second report on the collections of Indian Reptiles recently obtained by the British Museum, and described several species as new to science.—A paper was read by Messrs. Sclater and Salvin, containing an account of the birds collected by Mr. A. Goering on the Sierra Nevada of Merida, and at San Cristoval in Venezuela in 1874.—A communication was read from M. L. Taczanowski, containing the description of a new species of grouse from the mountains of Georgia, allied to the Black Grouse, which was proposed to be called *Lyrurus mokosiewiczi*.—Mr. A. G. Butler read the descriptions of a large number of new species of *Sphingidæ*.—Sir Victor Brooke gave a notice of a Deer allied to the Fallow Deer from Mesopotamia, of which he had lately received specimens from Mr. P. J. Robertson. H.B.M. Vice-Consul at Bussorah. For this new form, which is found in the jungles along the valley of the Euphrates, Sir V. Brooke proposed the name *Cervus mesopotamicus*.

Meteorological Society, March 17.—Dr. R. J. Mann, president, in the chair.—The following communications were read:—On the climate of Patras, Greece, during 1873, by Rev. Herbert A. Boys. This year was remarkable for sudden fluctuations and great ranges of temperature; the rainfall, amounting to 26·15 inches, was about the average, but the number of wet days (for that place) was great. The summer months, however, were very dry, there being only five days in June, none in July, and one in August, on which rain fell. There was a period of sixty-eight days from June 24 to August 30, without any rain whatever.—On ozone, by Mr. Francis E. Twemlow. This paper gives an account of nearly all that is known of this remarkable substance. An interesting discussion followed the reading of the paper, bearing chiefly upon the amount of oxygen in the

air at various health-resorts.—On the annual means of thirteen years' observations at London, by Mr. Richard Strachan. The author, having already read a series of papers on the different seasons, now gives a summary of the results for the thirteen years. The mean annual value for pressure from observations made at 9 A.M. is 29·958 inches; the mean temperature of the air at the same hour, 49°·6; the annual amount of rain, 24·2 inches; the number of rainy days, 165; the resultant direction of the wind, S. 84° W., and its force 0·95. The author concludes as follows:—On the whole it seems that excess of pressure accompanies deficiency of rainfall, slow translation of the air from the north of west, and fair weather. Deficiency of pressure accompanies excess of rainfall, rapid translation of air from the south of west, and foul weather. If meteorological science could give prescience of the annual value of any one of the elements, the others could be predicted with considerable accuracy.

Geologists' Association, March 5.—W. Carruthers, F.R.S., president, in the chair.—On the relative age of some valleys in the north and south of England, and of the various Glacial and Post-glacial deposits occurring in them, by C. E. De Rance, F.G.S. The application of geology to agriculture and medical science caused the want of an exact knowledge of the various superficial deposits, which lie scattered over the country, to be felt, and led the late Sir Roderick Murchison to direct the Government Geological Survey in future to prepare a drift edition of each map, showing the actual deposit at the surface. The publication of such maps of the lower Thames valley and of South Lancashire enabled the author to compare the sequence of deposits in these two important districts, and the results arrived at, with the sequence exhibited in other areas. In Lancashire the Glacial Drift deposits attain a thickness of 200, and in one instance of 400 feet, and the valleys of the Ribble, Irwell, and Mersey were shown to have been excavated in these deposits by the denuding action of these rivers in Post-glacial times, which, as they gradually cut their valleys lower and lower, left wide and extensive terraces of river gravels on the slopes above; Manchester, and the villages between it and Altrincham, being built on one of these terraces. Of still newer date is the alluvial plain beneath the terraces, which is made of loam, peat, and river gravel. The peat was shown to be connected with the great peat mosses of West Lancashire, where it reaches 30 feet in thickness, and was correlated with the peat beds and submerged forests found beneath the sea-level, around the entire coasts of the British Isles and the North of France. Beneath the peat in the West Lancashire plains occurred the Presall marine gravel, which was correlated with the Burth beds of Somersetshire, the raised beaches of Sussex, of the Isles of Wight and Portland, and of Cornwall; also with the fluviatile gravel lying beneath the peat horizon, in the Lancashire valley alluvial plains, and in the tin-bearing gravels of Cornwall. The subsidence marked by the marine beds, and subsequent elevation, during the forest continental era, followed by a subsidence to existing levels, took place after the rivers had cut down their valleys to their present depth, with few exceptions, Neolithic man entering the country during the forest era. The far older terraces on the valley slopes were compared with the implement-bearing gravels of the Post-glacial valley of the Ouse at Bedford, and with similar ancient high-level gravels in the Thames, the Hampshire Basin, the Somme, and the Seine near Paris, where no Glacial deposits occur, and it was argued, that regarding the similar relation to the depth of the valleys excavated, to the drainage area, and the position of the implement-bearing high-level gravels—that these, like the terraces of gravels of Lancashire without implements, and those of Bedfordshire with, were alike of Post-glacial date. In the Pre-glacial continental era the Thames flowed in a similar direction to the existing river, but 100 feet above its present level, its course nearly defining the southern limit of the subsequent Glacial sea, under which the Weald of Kent and Sussex was never submerged. In Post-glacial times the Thames may have denuded the southern edge of the Glacial deposits, when it commenced to cut down its present valley and to deposit its oldest and higher river gravels, which are immediately overhung by the Glacial beds. The valley appears to have attained its greatest depth in the era immediately preceding the subsidence that occurred prior to the great peat and forest period, the bottom of the valley east of London being considerably lower than the bed of the present stream, but the level is not sufficiently low to lead to the belief that any streams that may have flowed from the watershed of the Weald anticlinal, through what is now the Straits of Dover, to the prolongation of the Thames, would have cut sufficiently deep to have produced fissures that might have been fatal to either of the proposed lines of the Channel Tunnel.

Royal Horticultural Society, March 9.—Adjourned Annual Meeting.—Viscount Bury in the chair.—The Chairman moved the adoption of the amended report of the Council. The proposal of Messrs. Prince to construct a skating-rink, and to pay a rent equal to 1,100*l.* a year, had fallen through owing to H.M. Commissioners (without whose consent the Society had no power to underlet any portion of its premises) having deemed it inexpedient to grant their consent. The report also pointed out that "the ordinary income of the Society cannot support its present expenditure," and that "unless the rent of 2,400*l.* is paid to H.M. Commissioners next year the lease of the South Kensington Gardens may be forfeited, and to prevent this contingency an increased revenue must be obtained."—The Chairman announced that since the adjourned meeting, two members of Council, Sir A. Slade, Bart., and Mr. Chetwynd, had resigned, and the legal advisers of the Society had advised them that these vacancies must be filled by the Council, and not by the Fellows. In the interval, also, a despatch had been received from H.M. Commissioners, stating that they regarded the legal status of the Council as now free from objection, and were ready to resume official relations with it.—After some discussion, the amended report was unanimously adopted, and the Council having promised to summon a general meeting to consider the present position of the Society, the meeting adjourned.

Victoria (Philosophical) Institute, March 15.—C. Brooke, F.R.S., in the chair.—Rev. J. McCann, D.D., read a paper on the nature and character of evidence for scientific purposes. He commenced by stating that the mind could alone gain scientific knowledge by the process of generalisation. This must be based on evidence that was sufficient, and such as warranted the inferences drawn from it. The nature of evidence was then examined, and the difficulty, but necessity, of correct observation and logical reasoning from this, in order to form a sound hypothesis, was shown. Various points in Prof. Tyndall's address were criticised.

GLASGOW

Geological Society, March 11.—Mr. John Young, F.G.S., vice-president, in the chair.—The following papers were read:—Notes on a tract of vertical trees in carboniferous strata; and on river débris found in sandstone, by Wm. Grossart, Salzburg. In his first paper, the author described a number of trees which had been found in a pit, 40 fathoms in depth, lately sunk to the "Little Drumgray" coal in the west end of Shotts parish. This coal is of an average thickness of 22 inches, and is overlaid by a compact sandstone of from two to five fathoms in thickness, with a few inches of grey shale, seldom exceeding a foot, separating the coal from the sandstone above. In the workings of the mine eight erect tree-trunks had been brought to light, all resting on the coal-bed, and disappearing in the shale forming the roof of the mine; but there had been no opportunity of observing if they entered the sandstone above. The usual organic markings found on similar remains were absent, so that it was impossible to determine precisely to what genus they belonged. In his second paper, Dr. Grossart described a series of beds overlying the "Virtue Well" coal in his neighbourhood, the uppermost being a sandstone, 60 feet in thickness. Below this is a gritstone bed, two feet in thickness, containing rounded and angular pieces of quartz embedded in sand, also remains of trees, pieces of black shale, and gas coal. This is succeeded by a thin shale bed, then by a laminated sandstone ten feet in thickness, followed by a black shale resting on the coal. From a review of the whole series, the author concluded that the beds under consideration were formed at the mouth of a river flowing from east to west at a period posterior to the formation of the Virtue Well coal.

MANCHESTER

Literary and Philosophical Society, Jan. 18.—Mr. John Barrow in the chair.—Mr. James Cosmo Melvill, F.L.S., read a paper on the botany of Wilmington, North Carolina, with an especial reference to the habitat of *Dionæa muscipula*, Ellis.

Feb. 15.—Mr. Charles Bailey in the chair.—Mr. Rogers exhibited a specimen of *Carex ornithopoda*, Willd., collected by Mr. J. Whitehead in Millersdale, Derbyshire, in July of last year.—Mr. Sidebotham, F.R.A.S., then read a paper, entitled, "Notes on the Botany and Natural History of Tenby and the

Neighbourhood."—Mr. Spencer Bickham read a paper on the different kinds of beehive used in this country, and exhibited specimens.

Feb. 23.—Mr. R. Angus Smith, F.R.S., vice-president, in the chair.—Mr. Joseph Sidebotham, F.R.A.S., sent for exhibition a specimen of the Colorado Potato Beetle (*Doryphora decemlineata*), which had appeared in great numbers in Canada last year, and had caused great destruction in the potato crops.—E. W. Binney, F.R.S., V.P., exhibited to the Society specimens of a strong arenaceous shale, approaching to a flagstone, containing numbers of macrospores of *Lepidodendron*.

March 9.—Edward Schunk, F.R.S., president, in the chair.—On Mr. Millar's method of finding the axes of an ellipse when two conjugate diameters are given, by Mr. Robert Rawson.—Mr. A. M'Dougall invited attention to a specimen of carbon formed upon the roof of a gas retort, by the decomposition of the hydrocarbon gas by heat. The carbon thus formed resembles graphite in its almost metallic lustre, and it was suggested that its mode of formation might throw some light upon that of graphite.—On the presence of sulphate of copper in water heated in tinned copper boilers, by William Thomson, F.C.S.—Prof. W. Boyd Dawkins, F.R.S., exhibited a collection of articles of the Neolithic and Bronze ages from the pile dwellings in the Lake of Bienne, lately presented to the Manchester Museum, Owens College, by Mr. J. Thompson. He called attention to the fact that the Neolithic peoples were the first herdsmen and farmers of whom we have any trace, and stated that to them we owe the introduction into Europe of domestic animals and of cultivated cereals. They were also the first weavers and gardeners. From the southern character of some of the domestic animals such as *Sus palustris*, and of some of the vegetables such as the Egyptian wheat and *Silene Cretica*, it may be inferred that they came from the south, probably from the south-east, from the warmer regions of Central Asia.

WATFORD

Natural History Society, March 11.—Mr. John Evans, F.R.S., president, in the chair.—On the Cretaceous Rocks of England, by Mr. J. Logan Lobley, F.G.S. As an introduction to the study of the geology of Hertfordshire, the author described the stratigraphical relations and the geographical extension of the entire Cretaceous system and of its various subdivisions. The composition and origin of the chalk, including the results of the recent researches of the *Challenger* expedition, was specially dwelt upon, and the hypothesis of the organic origin of clays as well as of limestones was discussed. The relation of geology to botany was pointed out, and the members of this new Society were urged to make themselves acquainted with their local geology as a prelude to a more extensive knowledge of geological science.

PHILADELPHIA

Academy of Natural Sciences, Sept. 8.—Dr. Ruschenberger, president, in the chair.—"Notes on Santa Fé Marls and some of the contained Vertebrate Fossils," by Mr. E. D. Cope.—On a new variety of Helix, by James Lewis, M.D.—Prof. Leidy stated that in the early part of last June, in examining some of the material obtained from a mill-pond at Absecom, New Jersey, he had observed a most wonderful amœboid animal, of which he had made notes, but was not able at the time to make a drawing and satisfactory description. Subsequently he sought patiently for two days in the same material for another individual, but without success. Last week he paid a visit to the Absecom mill-pond to seek the curious amœboid, and was so fortunate as to find it again. Prof. Leidy exhibited a drawing of the animal, and described it as follows:—The animal at rest is spherical or oval, or constricted back of the middle. In the spherical form it measured the one-fifth of a millimetre in diameter; in the oval and constricted form it was about one-fourth of a millimetre long, and one-sixth of a millimetre broad. It is white or cream-coloured, opaque, or translucent at the border, and was spotted green from food-balls of desmids. It moves with extreme sluggishness, and with little change of form. From the fore part of the body the animal was observed to project almost simultaneously a number of long, conical, acute pseudopods, about the one-twelfth of a millimetre long. From the back part in the same manner a multitude of papillaform pseudopods were projected about one-fiftieth of a millimetre long. All the pseudopods and the surface of the body everywhere bristled with innumerable minute spicules. From time to time more or less obtuse portions of the clear ectosarc were projected, and these likewise were observed to be covered with the minute spicules. The opacity of the animal prevented the exhibition of a nucleus, if such exists. In general appearance the curious creature resembles one of the forms of *Pelomyxa palustris*, described by Prof. Greef, in "Schultze's Archiv," vol. x. Pl. iv., Fig. 9, but in this, minute spicules project only from the posterior disc-like extremity of the body, as they have also been observed to do in the corresponding part of *Amœba villosa* of Wallich, and perhaps other species. The general spiculate character of the Absecom amœboid is probably sufficient to distinguish the animal generically from Amœba, and in this view the animal may be named *Deinamœba mirabilis*.

BOSTON

Academy of Natural Sciences, April 8, 1874.—Mr. Bicknell in the chair.—Mr. Stodder exhibited scales of *Petrobius maritimus* and *Amathusia Horsfeldii*, to show that the so-called "beads" were the results of imperfect observation and illumination.—Mr. Bicknell exhibited and explained his achromatic condenser, made by Mr. Tolles after the design of Mr. Bicknell. Its focal distance is $\frac{4}{10}$, and its aperture 150°. Its most important variation from other condensers is in the position of the stops, the diaphragm plate being placed close to the front lens, which gives a power of controlling the illuminating ray greatly superior to that possessed by other condensers.—Mr. Samuel Wells exhibited a heliostat, remarkable chiefly for the small expense at which it was constructed. It was made from a marine clock, capable of running like a watch, in any position; the hands being removed, a pulley of $\frac{1}{2}$ in. diameter is slipped on to the arbor of the hour-hand; on the woodwork at the top of the clock is fastened bearings for a small shaft, carrying at its upper end the plane mirror intended to follow the movement of the sun. On this shaft is a pulley one inch in diameter, deriving motion from the pulley on the hour-hand arbor by a cord. A support attached to the side of the clock carries a subsidiary mirror directly above the revolving mirror. The clock is hung on a board, hinged so as to be capable of elevation to an angle equal to the complement of the latitude. The face of the clock is turned to the north. The revolving mirror is adjusted to the declination of the sun so as to reflect the ray to the north. The ray is received on the subsidiary mirror, which reflects it in any required direction. The cost of the heliostat was less than twenty dollars, and its performance sufficiently accurate for microscopic purposes.

April 15.—The president in the chair.—Dr. Samuel Kneeland read a paper on the geology, geography, and scenery of the Union Pacific Railroad, illustrated by specimens of ores, fossils, and minerals found along the route from Cheyenne to the Sierra Nevada, with lantern illustrations of such of the scenery as best displayed the geological features.

WELLINGTON, NEW ZEALAND

Philosophical Society, July 18, 1874.—The president, Dr. Knight, in opening the business of the evening, delivered an address, which passed in review the various questions discussed at the society's meetings during the past year. Its main feature was a dissertation upon certain peculiarities in the climate of New Zealand, and the evidences which, in the opinion of the president, proved the former existence of glacial periods in the southern hemisphere just as in the northern, but occurring alternately. The effect of ice in producing surface features had, in his opinion, been greatly overrated, and following up this opinion the president explained that the great ice sheets, several thousand feet in thickness, which the ice theorists required, could not have existed, as the pressure of the mass of ice would melt the lower stratum.

July 25, 1874.—Dr. Hector drew attention to the articles with which the museum had been enriched by the officers of H.M.S. *Challenger*. These consisted of specimens of different fishes, &c.—Mr. J. C. Crawford read a paper on the question, "Did the great Cook Strait River run N.W. or S.E.?" After which Mr. Hood read a paper on the hot winds of Australia having influence on the climate of New Zealand.

Aug. 8, 1874.—Mr. Travers read a letter from Capt. Turnbull, harbour master at Hokitika, to the Hon. J. A. Bonar, superintendent, descriptive of a portion of wreck found at the Haast, on the west coast of the Middle Island. This fragment was found at a great distance from the present high-water mark, surrounded by dense bush. It was discovered by diggers in 1867. Dr. Hector said that in 1867 he had called attention to the wreck. The most important point was the distance

from high-water mark at which it had been found, which was fully 300 yards. It was surrounded by low scrub, the terraces behind being heavily timbered. This proved that the high-water mark at that time must have been very different from what it is at present. Capt. Fraser suggested that it might be a portion of La Perouse's ship, which had for many years been sought in vain.—Dr. Hector then read an interesting paper on the Sumner Cave, in Canterbury, New Zealand, by Mr. A. McKay, of the Geological Department, who had made excavations there for Dr. Haast in 1872. The exploration occupied seven weeks, and on its completion the collections and notes which were made were given to Dr. Haast, and the paper now read was chiefly occupied with the author's own views on the question—whether the moa hunters were possessed of tools other than those of the rudest description; and whether there were any facts constituting a difference between them and the Maoris of later times. After discussing the relative age of the moa ovens at the Rakaia and elsewhere, the author considered the Sumner Cave to be the oldest. While the evidence obtained does not show that the moa hunters were in any way different from the Maoris, he yet considered the period of the cave deposits as much more remote than the traditional date of the first arrival of the Maoris in New Zealand—350 years ago—and thought that probably 1,350 years would be nearer the mark. He considered the asserted absence of any traditional knowledge of the moa amongst the Maoris showed that the moa was exterminated either by a different race, or that the Maoris arrived at a date long prior to which their traditions extend. Mr. Travers mentioned as an interesting fact, that there was a family of cavemen living in a cave at Port Nicholson, which was situate at less than a mile from the Pilot Station at the Heads. There were six or seven Maoris living there, and he had frequently visited them. Dr. Hector said that the only grounds Mr. McKay had for doubt as to the recent date of the moa's existence, seemed to be the absence of Maori traditions with regard to it. He could only say that modern Maoris seemed to know all about it. On the whole, he thought there was no reason for jumping to the conclusion that the moa had become extinct at a very remote period. The positive evidence of the existence of the moa in New Zealand was probably greater than that of the existence of the emu in some parts of Victoria. Many persons were not conversant with the rapidity with which animals disappear. In proof of this he would refer to the bison. A hundred and fifty years ago these animals roamed over the Eastern States in countless herds; yet it would now be very difficult to obtain positive proof of their former existence in those States.—Dr. Hector read a paper on the Tertiary series of Wanganui, by Mr. Purnell, and observed that the paper pointed out an unconformity in breaking up the lower Wanganui series, which, if established, would have an important bearing on the geology of the district.

Aug. 15, 1874.—On the alleged Pleistocene glaciation of New Zealand, by Mr. W. T. L. Travers, F.L.S. This paper was devoted to the discussion and refutation of the theory, advanced by Dr. Haast in various reports and addresses, that during the Pleistocene period the physical condition of these islands resembled that of Greenland, where the country is covered with an ice sheet, and glaciers protrude into the sea and break off to form icebergs. After showing that such a view is inconsistent with the evidence afforded by the existing and extinct fauna and flora of the country, the author argued that the former extension of the glaciers was due to a great elevation of the islands that followed the close of the Miocene period, to an altitude exceeding its present elevation by four or five thousand feet, and that the ensuing retreat of the glaciers was due to subsequent depression, the extent of which exceeded the former maximum elevation, and that in post-pleiocene times there has been a slight re-elevation with a corresponding re-advance of the glaciers in the valleys radiating from the chief mountain centres, such as Mount Cook.

VIENNA

Imperial Academy of Sciences, Dec. 3, 1874.—Herr K. Fritsch presented a memoir on the yearly periods in the insect-fauna of the Austro-Hungarian Empire, treating in detail of the yearly distribution and periodicity of appearance of insects, together with an account of meteorological influences upon them.—Capt. Volkmer communicated a note on the drinking waters of Vienna.—Dr. Daubrawa transmitted a paper on some pendulum experiments.—Herr Gruber gave an account of a "coincidence" apparatus for the determination of gravity; it was used with great success for geographical measurements during 1874.

Dec. 10, 1874.—Herr von Wüllerstorf-Urbair reported on the meteorological observations made by Schiffslieutnant Weyprecht, during the Austrian North Polar Expedition.—Herr Dr. Steindachner communicated a paper on the river-fishes of the south-eastern coast district of Brazil, from the mouth of the La Plata to that of the San Francisco.—Director von Littrow read a telegram from the observers of the Transit of Venus at Jassy, where the egress was successfully observed.

Dec. 17, 1874.—Prof. von Ettingshausen transmitted a paper entitled "The Genetic Organisation of the Flora of Australia.—Prof. Lieben communicated some notes on the oxidation products of camphor, and also an analysis of the mineral waters of Poschitz.—Prof. Puschl gave an account of the properties of saturated vapours.—Director Stefan read a paper on the laws of magnetic and electric forces in magnetic and dielectric media, and their relation to the theory of light.—Oberlieutnant Jul. Payer then gave an account of his sledge expeditions in Franz-Joseph's Land, with special reference to the character of its hills, glaciers, vegetation, and animal life.—Dr. Holetschek communicated the elements and ephemerides of Comet VI., 1874, discovered by Borrelly at Marseilles on Dec. 6.

PARIS

Academy of Sciences, March 8.—M. Frémy in the chair.—The President, in speaking of the sad loss the Academy has sustained in the death of one of its most eminent members, M. Mathieu, to whom they had just paid their last tribute of respect by attending his funeral, proposed, in honour of the deceased, to adjourn the meeting.—M. Broch then made a speech in the name of the Commission du Mètre, of which M. Mathieu was the president.—The meeting was then adjourned.—Four letters relating to the Transit of Venus were received, viz.:—From M. Fleuriais, dated Pekin, Jan. 5, 1875, giving the complete details of the observations made at that station, and containing an account of further scientific researches made during the time the severe cold detained the observers at Pekin, the rivers not being navigable; from M. Mouchez, dated Dec.. 13, 1874, with an account of the observations made on the Island of St. Paul; from M. Bouquet de la Grye, who will shortly arrive in Paris; lastly, from M. André, who reports that he could only observe one internal contact, and that he resolved to prolong his sojourn at Nouméa to make exact determinations of the longitude of that place.

BOOKS AND PAMPHLETS RECEIVED

BRITISH.—Practical Guide to the Determination of Minerals by the Blowpipe: Dr. E. W. C. Fuchs. Translated by T. W. Danby, M.A., F.G.S. (Field and Tuer).—Watford Natural History Society and Hertfordshire Field Club; Laws and List of Members.—The Development Law of the Earth: Prof. Bernhard von Cotta. Translated by R. R. Noel (Williams and Norgate).—St. Helena: a Physical, Historical, and Topographical Description of the Island: John C. Melliss, A.I.C.E., F.G.S., F.L.S. (Lovell Reeve).—Report of the Proceedings of the Conference on Maritime Meteorology held in London 1874 (H.M. Stationery Office).—Memoir of the Life and Labours of the Rev. Jeremiah Horrox: Rev. A. B. Whatton, B.A., LL.D. (William Hunt and Co.)—Manchester Field Naturalists' Society. Report of the Committee for the year 1874, with Accounts of the Excursions.

CONTENTS