THURSDAY, JUNE 16, 1887.

THE JUBILEE.

BEFORE our next number appears, most of the celebrations connected with the fiftieth anniversary of the Queen's accession will have taken place; and in London, at all events, the gorgeous ceremonials which are now being prepared for next Tuesday will have been the admiration of hundreds of thousands of Her Majesty's loyal subjects. It is therefore quite right and fitting that in a journal devoted to the progress of science, which the history of the last fifty years has shown to be the main basis of modern civilization, we should for a moment turn aside from our true function—that of fostering and recording the progress of natural knowledge—and dwell for one moment on the subject now uppermost in all minds, and dear to most British hearts. We know that in loyalty the students of Nature in these islands are second to none; and their gladness at the happy completion of the fifty years' reign, and their respect for the fifty years' pure and beautiful life, are also, we believe, second to none. But the satisfaction which they feel on these grounds is tempered when they consider, as men of science must, all the conditions of the problem.

The fancy of poets and the necessity of historians have from time to time marked certain ages of the world's history and distinguished them from their fellows. The golden age of the past is now represented by the scientific age of the present. Long after the names of all men who have lived on this planet during the Queen's reign, with the exception of such a name as that of Darwin, are forgotten; when the name of Queen Victoria even has paled; it will be recognized that in the latter half of the nineteenth century a new era of the world's history commenced. Whatever progress there has been in the history of any nation during the last fifty years—and this is truer of England than of any other country—the progress has been mainly due to labourers in the field of pure science, and to the applications of the results obtained by them to the purposes of our daily and national life.

Space utterly forbids that we should attempt to refer to the various memoirs, discoveries, and inventions which at once are suggested to the memory when one throws one's self back fifty years and compares the then condition of England with the present one; and we do not suppose that the most Philistine member of any community in our land, from the House of Lords downwards, will urge any objection against the statement.

It is quite true that some men of science take a pride in the fact that all this scientific work has been accomplished not only with the minimum of aid from the State, but without any sign of sympathy with it on the part of the powers that be.

We venture to doubt whether this pride is well founded. It is a matter of fact, whatever the origin of the fact may be, that during the Queen's reign, since the death of the lamented Prince Consort, there has been an impassable gulf between the highest culture of the nation and Royalty itself. The brain of the nation has been divorced from the head.

Literature and science, and we might almost add art, have no access to the throne. Our leaders in science, our leaders in letters, are personally unknown to Her Most Gracious Majesty. We do not venture to think for one moment that either Her Majesty or the leaders in question suffer from this condition of things; but we believe it to be detrimental to the State, inasmuch as it must end by giving a perfectly false perspective; and to the thoughtless the idea may rise that a great nation has nothing whatever to do either with literature, science, or art—that, in short, culture in its widest sense is a useless excrescence, and properly unrecognized by Royalty on that account, while the true men of the nation are only those who wield the sword, or struggle for bishoprics, or for place in some political party for pay.

The worst of such a state of things is that a view which is adopted in high quarters readily meets with general acceptance, and that even some of those who have done good service to the cause of learning are tempted to decry the studies by which their spurs have been won.

If literature is a "good thing to be left," as Sir G. Trevelyan has told us, if Mr. Morley the politician looks back with a half-contemptuous regret to the days when he occupied a "more humble sphere" as a leader of literature, if students are recommended to cultivate research only "in the seed-sowing time of life;" are not these things a proof that something is "rotten in the State," even in this Jubilee year? It surely is well that literature, science, and art should be cultivated by men who are willing to lay aside vulgar ambition of wealth and rank, if only they may add to the stock of knowledge and beauty which the world possesses. It surely is not well that no intellectual pre-eminence should condone for the lack of wealth or political place, and that as far as neglect can do it each scientific and literary man should be urged to leave work, the collective performance of which is nevertheless essential to the vitality of the nation.

We venture to think that our view has some claims for consideration when we note what happens in other civilized countries. If we take Germany, or France, or Italy, or Austria, we find there that the men of science and literature are recognized as subjects who can do the State some service, and as such are freely welcomed into the councils of the Sovereign. With us it is a matter of course that every Lord Mayor shall, and every President of the Royal Society shall not, be a member of the Privy Council; and a British Barnum may pass over a threshold which is denied to a Darwin, a Stokes, or a Huxley. Our own impression is that this treatment of men of culture does not depend upon the personal feelings of the noble woman who is now our Queen. We believe that it simply results from the ignorance of those by whom Her Majesty is, by an unfortunate necessity, for the most part surrounded. The courtier class in England is—and it is more its misfortune than its fault—interested in few of those things upon which the greatness of a nation really depends. Literary culture some of them may have obtained at the Universities, but of science or of art, to say nothing of applied science and applied art, they for the most part know nothing; and to bring the real leaders of England between themselves and the Queen's Majesty would be to commit a *bêtise* for which they would never be forgiven in their favourite *coteries*. No subject—still less a courtier—should be compelled to demonstrate his own insignificance. That this is the real cause of the present condition of things, which is giving rise to so many comments that we can no longer neglect them is, we think, further evidenced by the arrangements that have been made for the Jubilee ceremonial in Westminster Abbey. The Lord Chamberlain and his staff, who are responsible for these arrangements, have, we are informed, invited only one Fellow of the Royal Society, as such, to be present in the Abbey; while with regard to literature we believe not even this single exception has been made. It may be an excellent thing for men of science like Prof. Huxley, Prof. Adams, and Dr. Joule, and such a man of literature as Mr. Robert Browning, that they should not be required to attend at such a ceremonial, but it is bad for the ceremonial. The same system has been applied to the Government officials themselves. Thus, the Department responsible for Science and Art has, we believe, received four tickets, while thirty-five have, according to Mr. Plunket's statement in the House on Tuesday, been distributed among the lower clerks in the House of Commons. Her Gracious Majesty suffers when a ceremonial is rendered not only ridiculous but contemptible by such maladministration. England is not represented, but only England's paid officials and nobodies.

While we regret that there should be these notes of discord in the present condition of affairs, there can be no question that Her Majesty may be perfectly assured that the most cultured of her subjects are among the most loyal to her personally, and that they join with their fellow-subjects in many lands in hoping that Her Majesty may be long spared to reign over the magnificent Empire on which the sun never sets, and the members of which Science in the future will link closer together than she has been able to do in the past.

IMPERIAL GEOLOGICAL UNION.

NO one interested in geological science could fail to be impressed with the evidence afforded by the Colonial and Indian Exhibition, in its display of natural products, in the conferences connected with it, and in the number of scientific men collected from all parts of the Empire, of the amount of geological work represented by Great Britain and its dependencies, and the commanding position of the Empire with reference to the geology of the world. The same fact was apparent in the importance attached to Colonial and Indian geology and geography at the meeting of the British Association at Birmingham. Influenced by these facts, I was induced to speak somewhat strongly in the address which I had the honour of delivering at Birmingham on the position of Britain and its colonies and the English-speaking world in general with reference to scientific progress. On my return to Canada, and more particularly after the (temporary, as I hope) failure of the project to hold a meeting of the British Association next year in Australia, it seemed desirable to give the matter some definite form; and after correspondence and consultation with friends, I was induced, in February last, to address a letter on the subject to Prof. Stokes, the President of the Royal Society. The reasons for this course were that both Prof. Huxley and his successor in the Presidential chair of the Royal Society had suggested an Imperial Scientific Union, and the subject was understood to be under the consideration of the Council of the Society, which from its central and commanding position has a right to the initiative in any movement of this nature. In this letter geological science is alone directly referred to, as being that with which the writer is more immediately connected and that which in some respects has already the best organization; but without excluding other departments of science. Special reference is also made to Canada, as affording an apt illustration of the extent and value of the geological domain of the Empire. I need scarcely add that the present year, distinguished as it is by many movements in the direction of Imperial Union, in connexion with its being the fiftieth year of the reign of Her Gracious Majesty Queen Victoria, seems especially auspicious for such a project. The following are extracts from the letter referred to:—

"It is, I think, evident from the report of the last meeting of the International Congress of Geologists, that great, if not insuperable, difficulties lie in the way of any general agreement as to geological classification, nomenclature, and mapping. These difficulties, however, depend so largely on difference of language and of habits of thought, that they would not affect a union for scientific purposes on the part of the geologists of the British Empire, and ultimately of all English-speaking countries. It therefore appears that such a more limited union might with advantage be undertaken in the first instance, and with the view not of obstructing but of aiding the wider movement.

"The British Empire also possesses exceptional facilities for taking the lead of other nations in so far as geology and physical geography are concerned. The British Islands, as is well known, are remarkable for the great variety of their formations and the excellence of their exposures, and much of the present classification and methods of representation in geology has originated in Great Britain, and has been adopted with slight variation in all English-speaking countries, and to a considerable extent in other countries as well. In Canada we have the larger half of North America, and much of this very satisfactorily explored. We have also the advantages of the best exposures of the older crystalline rocks, of a development of the Palæozoic series in the Eastern Provinces, more closely allied to that of Europe than to that of the interior American plateau, and of Pleistocene deposits so extensive and complete that they must ultimately decide many of those questions of glacial geology which have been so much agitated. In India, Australasia, and South Africa, with the western districts of Canada and various smaller dependencies, we hold a controlling influence in the geology of the great Pacific and Indian Ocean areas. Arctic and Antarctic geology and modern oceanic deposits have been worked principally by English observers, and English-speaking geologists have been and are exploring in many countries not under the British flag. More especially the large amount of geological work done in the United States is based on English methods, and is published and discussed in the English language, and the most intimate and friendly relations subsist between the geologists of the United States and those of Great Britain and the colonies.

"In these circumstances it would seem that a union of British and English-speaking geologists might overcome the difficulties which appear so formidable as between the different European nations, and might lay a broad foundation of geological fact, classification, nomenclature, and representation, which would ultimately be adopted by other countries as far as local diversities and differences of language might permit. Such a geological union would naturally be accompanied or followed by similar co-operation in other departments of investigation in natural science.

"It seems probable that the Geological Survey of Great Britain and the Geological Surveys of the Colonies and of India, with the British Association and the Geological Societies and geological sections of Societies in all parts of the Empire, would be willing to co-operate in such a movement under the auspices of the Royal Society, and that the Council might usefully invite communications on the subject from public departments and Societies, beginning with those of the mother country and its colonies and dependencies, but looking ultimately to union with those of the United States also.

"In the meantime, I propose to mention the subject to the Council of the British Association, to the English and American Committees of the International Congress of Geologists, and to the Council of the Royal Society of Canada, and shall be glad to have your permission to regard this communication as an open letter to be used in any way likely to promote the object in view."

Copies of the above letter were sent to representative men in every part of the Empire, and a large number of replies have been received, expressing an interest in the proposal and readiness to aid in carrying it out. In so far as Canada is concerned, Lord Lorne, the founder of the Royal Society of Canada, and his successor as Patron of that Society, Lord Lansdowne, have signified their hearty concurrence, and the Council of the Society appointed a Committee on the subject, consisting of Dr. Selwyn, F.R.S., Rev. Prof. Laflamme, and the writer, whose report was adopted at the recent meeting of the Society in Ottawa. The following are the conclusions and recommendations of this report:—

"(1) That the objects referred to seem of the greatest importance to the advancement of geological science, and deserve the consideration of this Society, and more especially of its Geological Section.

"(2) That the present year, when all the subjects of the British Empire are united in a common desire to celebrate the fiftieth year of the reign of Her Most Gracious Majesty, when the public mind is impressed with the recent gathering of the resources of the Empire in the Colonial and Indian Exhibition, when plans for Imperial Federation are before the public, and when a Conference of delegates from the colonies, for the purpose of promoting a more intimate connexion, is being held in London, appears eminently favourable to the realization of the idea of an Imperial Geological Union.

"(3) It would appear that the first steps towards such union should be taken by scientific bodies in London, and that the Royal Society of London should be requested to begin the movement by inviting in the first instance to a Conference, representatives of the Geological Survey of Great Britain and of the various Societies and Associations in Great Britain and Ireland prosecuting geological work, with representatives from similar bodies in the colonies. Such Conference might define the objects to be attained, might prepare a constitution and arrange for subsequent meetings and for reports to be sent in on important questions.

"(4) It appears to your Committee that when thus organized, the work of the 'Imperial Geological Union' might be carried on by local and general conferences and conventions; by regular reports from local branches for publication annually by the Officers or Council of the Union; by correspondence and conference with geological bodies abroad, and possibly by other methods which would develop themselves.

"(5) In so far as Canada is concerned, this work might be aided by the Geological Survey of the Dominion, by this Society and the Societies affiliated with it, and possibly also by the Universities.

"(6) The Director of the Geological Survey of the Dominion has intimated his willingness to co-operate in sending representatives of the Survey to any conference or convention, and also by furnishing information as to the work and methods of the Survey.

"(7) It appears to your Committee that this Society might co-operate by empowering the Council to continue its Committee and to select delegates to represent the Society in the event of a preliminary conference being called in London, and by inviting all the affiliated Societies which prosecute geological work in the Dominion to take similar action.

"Your Committee would therefore recommend that this report, with the letter appended, be printed and circulated to the different local Societies connected with this Society, and to such other bodies as may be interested in the matter, and that their aid and countenance be solicited in carrying out the scheme, and that the Society empower the Council, or a committee appointed for the purpose, to represent the views of the Society by correspondence, or by attending any conference on the subject which may be summoned. It will, however, be understood that no expense shall be incurred without consent of the Council of the Society.

"It appears to your Committee that while the usual language of the Union would necessarily be English, communications should be received in any language used within the Empire, and that in this Dominion the English and French languages would be recognized as in this Society."

It will be seen that we hope the initiative will be taken by the Royal Society, and the present communication is intended to aid in securing that general co-operation throughout the Empire which is essential to success. With the same object I have asked the Council of the British Association to throw its influence on the side of union; and propose, in resigning the office with which the Association has honoured me, to make it a personal request that this great Society, which, by its meeting in Canada and its proposed meeting in Australia, has assumed an Imperial character, will take a leading part in the promotion of Imperial union both in reference to geology and to other sciences.

I need scarcely add that the project is not intended to interfere with the operations of the International Congress of Geologists, which is to meet in London in 1888; but it would appear eminently desirable that the contemplated Imperial Geological Union should be organized before that meeting, so as to enable British geology to present a united front, and to assume the importance to which it is entitled.

J. Wm. Dawson.

SOCIAL HISTORY OF THE RACES OF MANKIND.

Social History of the Races of Mankind. Second Division: "Papuo and Malayo Melanesians." By A. Featherman. (London: Trübner, 1887.)

Mr. Featherman does not improve. Those who have read the severe criticisms evoked by previous volumes, and still more those who have read the volumes themselves, will understand how much is implied in these few words, which could be justified only by a stern sense of duty, and regard for the interests of scientific truth. But, as the huge work grows under his hands, it becomes more and more evident that he has undertaken a task entirely beyond his strength. The present volume brings especially into painful evidence the inherent defects of his method, his inadequate grasp of the subject-matter, and his many shortcomings betrayed at every step in the treatment of details.

And first as to the method. A "social history of the races of mankind," which, as he is careful to tell us, eschews both anthropology and ethnology "in the technical sense of these words," necessarily resolves itself into a history of social progress, such as, for instance, is presented in Mr. E. B. Tylor's "Primitive Culture," or his "Researches into the Early History of Mankind." But Mr. Featherman's work is in no sense a "history," that is, a systematic and orderly treatise on the various phases through which mankind has passed, or is passing, in its upward development from the crude beginnings to the highest aspects of human culture. Any such broad and philosophic exposition of the subject is at once excluded by his method, which consists of a disconnected and more or less accurate account of the habits and customs, social usages, language, religion, and tribal or national organization of the various races and their subdivisions, classified according to a system peculiar to the author. Here we have an interminable series of minute ethnographic pictures, involving endless repetitions, without unity, without point, without those comprehensive generalizations which are essential to give coherence to the whole, and which would flow of themselves from a systematic treatment. These *disjecta membra* may to some extent supply the raw material, but they never can "be considered as a manual of sociology," as is claimed for them by the author.

But owing largely to his inadequate grasp of the subject-matter, this raw material itself is often of a highly unsatisfactory nature, and is so arranged as to be almost worthless to the ordinary student, or in fact to any except those few anthropologists who have the leisure and knowledge needed to re-arrange it for themselves. When Mr. Featherman passed from the "Nigritians" (African Negroes) of the first to the "Melanesians" of this second division, he was at once confronted by one of the most tremendous difficulties in the whole range of anthropology; but of that difficulty, turning upon some rational or at least working classification of the Oceanic peoples, he seems to be absolutely unconscious. Hence in his grouping of these peoples he has fallen into an abyss out of which there is no redemption. It is all very well for him to protest that "it is not the object of this work to discuss contested ethnological questions"; but he himself feels the necessity of some kind of grouping, in establishing which he is fain to discuss some very abstruse questions touching the origin of mankind, the nature of species, the value of language as a racial test, and the like. In general he professes to base his classifications "principally upon physical characteristics and language" ("Nigritians," p. xv.), and this leads him to a classification in the present volume, which confounds the yellow and dark races, which identifies the Malays with the Papuans, which ignores the presence not only of the fair Indonesians, but of the pygmy Negritoes in the Eastern Archipelago, and which, as shown on the very title-page, recognizes in that region, and in fact in the whole of Australasia, eastwards to Fiji, one stock only—the "Melanesian." Of this stock there are two groups, the "Papuo-Melanesians," and the "Malayo-Melanesians," which is like saying the "Black-Blacks" and the "Yellow-Blacks," the latter comprising the Malay race in its widest sense, the former all the rest—that is, the Melanesians proper of Melanesia, the Papuans of New Guinea and neighbouring islands, the natives of New Britain and New Ireland, the Negritoes of the Philippines, of the Malay Peninsula, and Andaman, the Nicobarese, the Australians and Tasmanians. Certainly the Negritoes are nowhere mentioned by name, being ignored as such; but they are nevertheless described as Papuans or Melanesians under other names, such as Ayetas (in the Philippines), Semangs (in the Malay Peninsula), and Mincopies (in the Andaman Islands). On the last-mentioned he quotes somewhat disparagingly (p. 227) Mr. E. H. Man, to whom we are indebted for the very best memoir on this race. Yet even from him he might have learnt that the Andamanese "are Negritoes, *not* Papuans" (Journal of the Anthropological Institute, August 1882, p. 70), just as from the photographs taken by Mikluho-Maclay, and Dr. A. B. Meyer, whom he does not quote, he might have seen how profoundly the Negritoes of the Malay Peninsula and the Philippines differ from the Melanesians. This term Melanesian, which here receives such a prodigious extension, is nowhere very clearly defined, and from its free application to the yellow Malays, one is tempted to ask whether Mr. Featherman is aware that it is Greek for "black."

Of these Malays, again, it is dogmatically asserted (p. 420) that they "did not originate in Asia," although nearly all anthropologists regard them as true Asiatics, a branch of the Mongolic stock, who migrated southwards to the Archipelago while it possibly still formed part of the mainland. But Mr. Featherman has a curious theory about migrations, denying, in fact, "that either animals or plants ever migrate." Hence, for him, the Malays cannot be a branch of the Mongolic race, which they closely resemble, but must be "an island people," a branch of the Melanesians, whom they do not resemble at all. With the Melanesians they constitute one of his six stock races, which, although "zoologically varieties of the same species," nevertheless originated in six different centres, and are consequently not genetically connected. This inference he doubtless seems to repudiate in the present volume (p. viii.). But it is clearly and unequivocally stated in the passage in the previous volume, which he omits to quote in his reply to the critics who had, as he now says, "erroneously if not purposely" affirmed this of him. The omitted words run thus: "The peculiar physical characteristics and the *habitats* of the existing races tend to show that they sprang from distinct individual pairs, developed under a variety of surrounding conditions in different parts of the world" ("Nigritians," xxii.). In fact, the assumption is that like conditions inevitably produce like results, that "the same causes must necessarily produce the same effects under any given circumstances," hence that "plants and animals must have been produced and evolved not by a single pair, but by an indefinite number of pairs in different parts of the world" (xiv.). It follows that crocodiles, for instance, have not migrated, but have been independently evolved under like surroundings in the Old and New Worlds; and so with the "six" human types, "zoologically varieties of the same species," but nevertheless independently evolved (from what lower types it is not stated) in different centres. So it is argued that "the Darwinian theory of transformism" is entirely wrong, and is caricatured by being compared to the Australian theory of the evolution of man from the lizard, which Mooramoora enabled to walk erect by striking off its tail (p. 181). "A weighty argument against the sweeping transmutation theory of Mr. Darwin" is elsewhere drawn from the Australian quadrupeds, hardly any of which are found in any other country, and it is triumphantly asked, "Why did they not advance beyond the marsupial type?" (p. 112). Mr. Featherman evidently still thinks that under given conditions the marsupial should "advance" to a higher or placental type, unaware that Marsh has shown that there is no such evolution, but that the marsupial and placental mammals descend in independent lines from a common undifferentiated prototype (*American Journal of Science* for April 1887).

We come, lastly, to Mr. Featherman's many shortcomings in the treatment of details, of which it may be said, without any exaggeration, "*Che formicolan d'errori*." Blunders and unaccountable inaccuracies in geology, history, geography, zoology, ethnology, seem to accumulate at almost geometrical ratio with each succeeding volume. But, as a previous critic is here said (p. xviii.) to have charged him with making mistakes of this sort without pointing them out, it will be only fair to specify at least a few of the more glaring errors occurring at almost every other page of the present volume. In the very first sentence of page 1, Borneo is connected geologically and biologically with the Australian instead of the Asiatic world, to which Wallace and others have conclusively shown that it undoubtedly belongs. A little further on "Borneo, Sumatra, Java, Celebes, and the smaller islands of the Archipelago," are said to have "formed a continuous peninsular dependence of Papua" (p. 1), with which the three first were certainly, and Celebes most probably, never connected. But this re-grouping of the Eastern Archipelago, and the removal of the Indo-Malayan to the Austro-Malayan region was necessary for the author's peculiar views regarding migrations and the "Melanesians," so the results of Wallace's labours in this field are quietly shelved. The members of the animal kingdom are shifted about in the same reckless way, and apparently for no purpose at all, unless it be to show the author's incompetency for the work he has undertaken. Thus the hippopotamus is transferred from Africa to Sumatra (p. 286); birds of paradise from New Guinea to the same region (p. 286), and to Borneo (p. 3); the babirusa from Celebes to "the islands nearest to Malacca" (p. 2), and even to New Guinea (p. 9), where it is described as the *Sus papuensis!* the gazelle from Africa and South-Western Asia to the Eastern Archipelago generally (p. 2); the emu from Australia to Java (p. 361); the orang-utan from Borneo to "Malacca" (p. x.); humming-birds from America to the Philippines (p. 469), after which long flight it was at least courageous to deny that "animals ever migrate" (p. ix.). Topography and geography fare no better, for we have Quettah transported from Baluchistan to the Malay Peninsula (p. 13). On the same page the Ayetas are said to be "found more especially on Alabat Island, where they inhabit the coast as well as the mountain regions." Think of "mountain regions" in Sheppey, for instance, at Thames mouth, for that is about the size of the islet of Alabat, on the east coast of Luzon! And think of this rock being the chief home of the Ayetas, who are scattered over tens of thousands of square miles in the Philippine Archipelago! Is Mr. Featherman poking fun at his readers, when he writes such stuff as this; or is it that he has not the remotest idea of the significance of the terms which he blindly copies from his mostly antiquated authorities? The latter alternative seems forced upon us, when we again read that the islet of Amboyna and the Sulus "are distinguished for their alluvial lands, their navigable rivers, &c." (2). Then the large Solomon Archipelago is reduced to "Solomon's Island" (11), while, by way of compensation, Palawan develops into "the Palaonans" (p. 491). Australia is divided at p. 114, into "five provincial States," which, however, are further on reduced to "four provinces" (p. 181), Queensland being here forgotten. So with the population of Fiji, given correctly at p. 183, and wrongly at p. 187; and of the Philippines, nearly right at p. 470, but entirely wrong (4,290,000) at p. 480; the laborious compiler, with no information of his own, being thus everywhere at the mercy of the authority he happens at the moment to be quoting. A glaring instance is his treatment of the Malay Peninsula and its inhabitants, for which he appears to have seen nothing more recent than Favre's "Wild Tribes" (1852), and an early edition of Wallace, quoting, however, Rosenberg's "Malayische Archipel" (1879), which has nothing at all about the peninsula. The result is ludicrous, the area of this region being given at "about 45,000 square miles" (p. 420), instead of 75,000, and the population at 374,266 instead of 1,200,000. Here, also, "the chief rivers" are said to be "the Lingie, the Malacca, and the Cassang" (p. 419), and the mountains —but without wearying the reader it will suffice to say that the mountains are worse than the rivers. Similar wild statements are made about the Malay language (p. 300) about the population of Java (p. 362), the Javanese language (p. 376), the "Kanaks" of New Caledonia (p. 77), and, to make an end of it, about the Bughis of Celebes, of whom we are gravely informed that their "commercial activity is extremely limited" (p. 447), these Bughis being far and away the most enterprising and commercial people in the whole Eastern Archipelago.

One word in conclusion. If Mr. Featherman sees good to continue this wearisome compilation on the old lines, let him at all events abstain from sneering at specialists like Mr. Man (p. 232, 235), Mr. Taplin (not *Tarplin*, p. 135), Messrs. Fisson and Howitt (p. 141), and others who have done such admirable ethnological work in this Oceanic domain. But above all let him respect the august name of Charles Darwin (pp. 112, 181). A. H. KEANE.

THE FAUNA OF LIVERPOOL BAY.

First Report on the Fauna of Liverpool Bay and the Neighbouring Seas. By Members of the Liverpoo Marine Biology Committee, edited by W. A. Herdman, D.Sc., F.R.S., Professor of Natural History in University College, Liverpool. (London: Longmans. Green and Co., 1886.)

IN this volume are published the results of investigations carried on by a Committee of Naturalists belonging to Liverpool and its neighbourhood. The inquiries were suggested by Prof. Herdman, and his energy and influence have evidently contributed largely to the success of the work. It is intended that the Committee shall endeavour to found a sea-side laboratory and form a permanent organisation for marine biological research, but its first operations in the summer of 1885 were limited to expeditions for obtaining invertebrate specimens, by dredging, trawling, and tow-netting from steam-tugs, and collecting on the shore at low-tide.

The volume consists of a number of reports by the members of the Committee and other naturalists on separate portions of the collections made. The greater number of these reports are lists of species, with a record of the places where each occurred; one or two of the papers deal with matters of more general scientific importance. Prof. Herdman himself identified the Alcyonaria, the Echinodermata, the Nudibranchiata, and the Tunicata, and also is jointly with two other gentlemen responsible for the Hydrozoa. Mr. Hoyle records the Cephalopoda. The experience of these naturalists is a sufficient security for the correctness of their work. In the list of Vermes given by J. A. Harvey Gibson, there are one or two errors which lessen its value. *Cirratulus borealis*, Lamarck, and *C. cirratus*, O. F. Müller, are set down as separate species, and it is stated that the latter, of which a single specimen was dredged, has not previously been recorded from the locality. The two names are synonyms, and to what species the single specimen "in a rather mutilated condition" belonged remains an open question. *Nephthys hembergii*, And. and M. Edw., is given as a synonmyn of *N. longisetosa*, Oersted, but the two names undoubtedly refer to distinct species, and it follows that the specimens of Nephthys examined were not accurately discriminated.

Mr. Harvey Gibson contributes another paper on the structure of some of the Polychæta, in which he gives some interesting notes on certain anatomical points, and gives reasons for concluding that *Pectinaria belgica*, Pallas, and *P. auricoma*, Müller, are synonyms. A short paper by Prof. Herdman, on variation in the Tunicata, discusses the value of different characters in these animals as diagnostic marks, and points out the necessity of thorough anatomical examination in describing species, or even identifying individuals. A species of Sycandra which could not be identified with any already known, and which is therefore probably new, is described by Mr. Harvey Gibson under the name *S. aspera*.

Three introductory papers precede the more special part of the book: one in which Prof. Herdman gives a history of the origin and work of the Liverpool Marine Biology Committee; one by the Rev. H. H. Higgins, containing a review of previous work in the domain to which the volume refers; and one by Prof. Milnes Marshall on shallow-water faunas. In this last a short but interesting comparison is made between the peculiarities of the physical conditions of the littoral region and features commonly occurring in the life-cycle of its inhabitants. Prof. Herdman, in summing up the results of the first year's work of the Committee, gives the following figures:—913 species of invertebrates have now been recorded from the district under examination, of which 235 are new finds made by the Committee: 16 of these are new to the record of the British marine fauna, and 7 species and 3 varieties are new to science. These additions to zoological knowledge are illustrated by ten lithographic plates, which, with the exception of Plate II., containing coloured figures of Anthozoa, and Plate IV., devoted to small crustacean forms, do not attain a very high standard. There are also two maps showing the district explored.

OUR BOOK SHELF.

Oberpliocän-Flora aus den Baugruben des Klärbeckens bei Niederrad und Schleuse bei Höchst a M. T. Geyler und F. Kinkelin. (Frankfort, 1887.)

As a general rule, the more recent the fossil flora the more satisfactory the determinations of the plants comprised in it will appear, though the work of Williamson and others has made an exception of those of the Carboniferous period. In the late Tertiaries the species are so closely allied to those still living that comparisons are relatively easy; but as we go back in time they diverge more and more, and there is less to guide us. The Pliocene floras especially show us that innumerable species that are now exotic were indigenous probably down almost to glacial times, and their study sheds an immense light on the more problematical floras which preceded them.

This work describes a Pliocene flora recently discovered, and regarded as newer in age than those formerly described from the valley of the Maine. It deals chiefly with the fruits of well-known existing genera of north temperate regions. A remarkable exception is an Australian type of Callitris, *Frenelites*, which appears to be correctly determined. The pines are numerous, among them being *Pinus montana*, and two varieties which are raised to the rank of species—*P. cembra*, determined on part of a cone, *P. strobus* on a scale, and some perfect examples named *P. cortesii*, Ad. Brong. Other conifers are the larch, the silver fir, and the Norway spruce. The American swamp or deciduous cypress, so prevalent in Europe from the Eocene age onward, is represented by foliage. Among the rest are leaves and supposed seeds of the hornbeam, the cup of an acorn, an abundance of beech-nuts, described as *Fagus pliocænica*, and the horse-chestnut, representing the Old World; and fruits of *Liquidambar*, *Nyssa*, a walnut, *Juglans cinerea*, and another nearly allied to *J. nigra*, and three hickories, representing the New. The European and American forms thus appear about equal in number, and there is one Asiatic, the horse-chestnut, and one Australian form.

The data are more trustworthy than are ordinarily obtainable from fossil floras, and they bring into prominence one significant fact—namely, that whenever we get the oak, hazel, walnut, or chestnut in strata so recent as the Pliocene, or even as true Miocene, there is no uncertainty about the genera, for fruits and other organs besides leaves are present; but in the older Tertiaries no distinct fruits of the kind are ever associated with the leaves ascribed to these genera. The evidence I have personally collected in the field seems to show that the early Eocene and pre-Eocene Dicotyledons had small clustered fruits, like *Platanus*, *Alnus*, *Liquidambar*, &c.; that leguminous plants were an Eocene development; while the larger-seeded oak, beech, walnut, hazel, are of later origin. The reliance placed on the mere similarity in the outward appearance of leaves of common types has not been justified by later discoveries, and an immense amount of revision is requisite before the botanist and geologist can safely put his trust in the descriptions of the older Tertiary floras.

J. STARKIE GARDNER.

LETTERS TO THE EDITOR.

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

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

British Association Sectional Procedure.

As the time for holding the Manchester meeting of the British Association approaches, it seems natural to inquire whether any action will be taken by the Council of the Association toward carrying out the important suggestions made in the columns of NATURE (vol. xxxiv. p. 495), by Prof. Oliver Lodge, immediately after the late meeting at Birmingham. I can vouch for the fact that many of the active workers in the Section meetings of the Association can heartily indorse the expression of discontent which fell from Prof. Lodge as to the inadequacy of the present arrangements. The effect of the attempt to shirk holding Section meetings on the Saturday, and on the succeeding Wednesday, has been to cause a most undesirable pressure upon the time available on other days, and has rendered serious and effective discussion of the subjects of the papers almost impossible. It is understood that at Manchester, thanks to the generous hospitality of the local leaders, the Association will be graced by the presence of an unusual number of foreign men of science, including some of the most distinguished of chemists, physicists, and biologists. This fact is in itself an additional reason for expecting earnest and lively discussions to arise in the Section meetings, —discussions such as add greatly to the interest of the meetings, and are of extreme value to those who are actual workers in science. It would indeed be cause for regret if the anticipated discussions were to be burked or spoiled by want of due attention to the arrangements of the meetings. The suggestions of Prof. Lodge are indeed so timely that I fear to weaken their force by adding to them or emphasizing any of them. Yet I cannot refrain from urging two points: one the extreme undesirability of scamping the Wednesday sitting; and the other the advisability of reconsidering the hours of holding Committee meetings. Why should not the Sectional Committees meet from 3 to 4 o'clock, and the Sections at 10.30? A clear half-hour would be gained; Committee-men might slip out for lunch instead of attempting to sit out a dwindling meeting in a famished state; and they would continue their attendance to the end of the Section meeting because of the Committee meeting at its close.

Further, much good would accrue if the Council would cause to be published from the first the days and hours appointed for the reading of papers or the holding of discussions on the various topics. Last year I succeeded in inducing the Sectional Secretaries to begin this practice, in spite of the cold water thrown upon my suggestion by more than one of the ancient lights of the Council. If the Council would only, as a matter of good business-like arrangement, issue instructions that this should be done in No. 1 of the Journals, the benefit would be double. As an instance I will only mention that many of the members of the Committee on Electrolysis, of which Prof. Lodge is Secretary, are looking forward to a full and interesting discussion of their report, in which discussion they especially anticipate that an important part will be taken by their distinguished Continental visitors. Knowing this to be the case, why cannot the Council fix beforehand a day and hour for this matter, which is to many of the physicists and chemists the most important event of the meeting, more important than the addresses of Presidents of Sections, more important than the set evening discourses, more important even than the address of the President himself?

SILVANUS P. THOMPSON.

20 Arundel Gardens, W., June 4.

The Recent Earthquakes in Mexico and Turkestan.

IN vol. xxxiv. p. 570 of NATURE you kindly allowed me to bring forward some facts in support of a view advanced by me and mentioned in your review of the "Catalogue of European Earthquakes" which appeared in your number of September 16, 1886 (vol. xxxiv. p. 465), that earthquake localities lie on or are connected by great circles representing main lines of fissuring and therefore coast-line directions. Since then I have observed and noted two or three other remarkable cases, but the earthquakes recently reported (May 30) from Mexico, and June 9 from Turkestan, are so interesting in this respect that I venture to ask you for permission to point out how a great circle connects them.

This great circle is a coast-line direction which I had laid down and called "Coast of Coromandel Great Circle." It passes through or near the following localities and points. Parting from the mouth of the Musi River on that coast it takes in the coast-line to Pulicat; traverses the Indian and Southern Oceans and South Polar region (passing not far from the South Magnetic Pole); traverses the South Pacific and cuts the coast of Mexico at Talipa; passes at Oaxaca (the province of the same name is named as having been affected by the recent earthquake), also between Puebla and Vera Cruz (also similarly affected); runs parallel to the west coast of the Mexican Gulf; traverses the United States, about 200 miles west of the boundary shown in Major Powell's map of the earthquake of August 31, 1886 (see NATURE, vol. xxxv. p. 31), and roughly parallel to it; cuts the west coast of Hudson's Bay at the mouth of the Nelson River; passes at about 1° east of the North Magnetic Pole; traverses the North Polar region; crosses Nova Zembla, and the promontory to the north of the Sea of Obi and Siberia; and passes at about fifty-two miles to the west of Vernoje.

It may be of interest to remark that a great circle representing the Riviera coast-line, so lately and so disastrously shaken, passes in a north-west and south-east direction about 4° to the north-east of this point, and as the Turkestan earthquake has evidently extended beyond Vernoje, the actual distance between this great circle and the district affected may be less than 4°. In any case it is an interesting relation, and all the more so as this Riviera great circle cut New Zealand in the vicinity of the earthquake district of June 10, 1886, itself antipodal to that of Andalusia of December 25, 1884.

J. P. O'REILLY.

Dublin, June 11.

The Late Earthquake on the Riviera, February 23, 1887.

HAVING been at Nice during the late earthquake, I was much interested in the accounts published in NATURE (vol. xxxv. pp. 419 and 442), from which I have drawn up the following table:—

Earthquake of February 23, 1887.

Local time.	Greenwich M.T.	Duration.	Distance, miles. (From	Time, minutes. Nice.)	Velocity miles per minute.
Nice— h. m. s.	h. m. s.				
(1) 5 59 0 a.m.	5 30 0	55 secs. / 25 intense.			
(2) 6 10 0	5 41 0	5 ?			
(3) 8 30 0	8 1 0	10 ?			
(4) 11 15 0 p.m.	22 46 0				
Marseilles—					
(1) 5 55 0 a.m.	5 33 40	90 secs.	100	$3\frac{2}{3}$	30
(2) 6 5 0	5 43 40	15 ,,	100	$2\frac{2}{3}$	37
Turin—					
(1) 6 22 0	5 32 0		100	2	50
(2) 6 31 0	5 41 0		100	? simul	taneous.
(3) 8 53 0	8 3 0		100	2	50
Basle—					
(1) 6 4 7	5 34 5		270	4	67
Paris—					
(1) 5 45 0	5 35 30		420	$5\frac{1}{2}$	76
Greenwich—					
(1) 5 38 0	5 38 0	20 secs.	650	8	81
(2) 5 45 0	5 45 0		650	4 ?	? 160
6 0 0	6 0 0				
7 40 0	7 40 0				
7 50 0	7 50 0				

I am indebted to M. Perrotin, of the Nice Observatory, for some useful information. He tells me that "the first shock lasted *nearly one minute*; it began by being very slight at first, and then became *very intense*: this latter phase lasted from 20 to 30 seconds."

We were all accused of great exaggeration in our accounts of the earthquake (I put the first shock at half a minute), but this more than confirms our estimates. A gentleman from South America, accustomed to earthquakes every week, told us that it was "a pretty good shake up."

According to Lyell, Mallet, and others, we at Nice being on alluvial deposits—gravel, clay, &c.,—felt not only the original shock, but also the rebounds from the rocks on either side; this would account for the very violent shaking that we had. I have compared notes with dozens of people, and feel sure that it was quite different from the sort of shock they felt at Cannes, Monte Carlo, and other places on rock, even the east bay at Mentone (the west bay suffered more than Nice). What saved us from being knocked down was, I suppose, that the amplitude of the vibrations was small, probably only a few inches. In the Italian Riviera (Diano Marina, &c.) they must have been more severe. Most people think that one more shock of the same strength would have brought half the houses down. A railway carriage going at 60 miles an hour gives the best idea of what our rooms were like during the first shock; it was impossible to stand on the floor without holding on to something, like a landsman on board a ship in a storm.

It would appear from the times given in the table that the velocity of this earthquake was high: 76 miles a minute to Paris, and 81 to London—a curious case of velocity increasing with distance.

The second shock seems to have gone faster than the first. The ordinary rate of earthquake-shock velocity is (according to Prestwich's "Geology"):—

1857.	Neapolitan earthquake	9 miles per minute.
1843.	United States ,, ...	32 ,, ,,
1869.	Cachar (India) ,, ...	83 ,, ,,

The centre of the shock was somewhere in the Gulf of Genoa, near Savona. The second shock was slight. The third was strong, but short.

The noise before the first shock was very loud, like a large steam blast. There were more than half a dozen other shocks in the two following days, but they were slighter, and chiefly oscillatory; curiously enough, we did not mind them so much as the vibrations, though I believe they are much more dangerous, if severe.

The night before the earthquake some horses were nervous and refused food, and dogs howled, but I naturally supposed that it had something to do with the Carnival which was being celebrated at the time.

J. E. H. PEYTON.

108 Marina, St. Leonards-on-Sea, May 19.

The Shadow of Adam's Peak.

I HAVE recently seen a paper, read before the Physical Society by the Hon. Ralph Abercromby, which apparently shatters an explanation proposed by me to the same Society of the phenomena of the shadow of Adam's Peak in Ceylon. Whilst not anxious to support my own theory, if one more consistent with the phenomena has been discovered, I venture to think that there are certain considerations which militate against the new theory, and render it incomplete; and, with your permission, I will enumerate them.

(1) Mr. Abercromby says that it is the intervention of near and moving mist which produces the apparent uprising of the shadow. Is it possible that such a simple explanation could have escaped the notice of the hundreds of observers who have witnessed the phenomenon, and returned with the impression that there was something inexplicable about the shadow? It is difficult to imagine observing and reasoning faculties so rudimentary as not to be able to observe that a shadow was on mist, and reason from that to an explanation of the apparent approach and uprising of the shadow.

(2) Mr. Abercromby's theory depends on the intervention of near and moving mist rising from the Maskeliya Valley. This valley stretches away behind the observer in a south-east direction as well as to the north-west, and mist rising from it would be quite as likely to intercept the sun's rays behind as to form a curtain in front for the shadow to be projected on, and it would be only on very rare occasions, such as Mr. Abercromby describes, that the mist would keep entirely to the north-west of the Peak. Why it should do so is not explained. Therefore the uprising of the shadow could only be seen on such very rare occasions.

(3) Mr. Abercromby says: "Our fortune was in the unsettled weather, which made the mist so coarse and close that the unequivocal bow left no doubt as to the true nature of the cause;" "the sky was covered with a confused mass of nearly every variety of cloud;" "below and around us cumulus and mist;" "a pale moon with an ill-defined *corona*;" "sometimes masses of mist coming up from the valley enveloped us with condensed vapour;" "driving condensed vapour was floating about, and a fragment of rainbow-tinted mist appeared near the top of the shadow." Under such conditions, what else could Mr. Abercromby have seen than what he describes, the shadow on the mist, a circular rainbow, spectral figures like those of the Brocken, the rising and falling of the shadow as the mist intervened or passed away? Instead of "fortunate" in his conditions, I think Mr. Abercromby was the very reverse. To be "fortunate" he should also have seen the shadow in a clear atmosphere, and noted the *absence* of any appearance of uprising. Mr. Whymper, in his famous descent of the Matterhorn after the accident, saw in the evening a fog-bow very similar to that described by Mr. Abercromby, and the presence of mist was noticed in that case. But I ask, and I am willing to rest my theory on the answer, Is not the phenomenon of the apparent uprising of the shadow, witnessed when no mist is visible, and the atmosphere to the north-west is clear? This furnishes a simple *crux* of the two theories; for any observer can notice whether mist is visible or not, and if not, whether there is any appearance of the uprising of the shadow or not. Until corrected by future observers, I maintain that the phenomenon is seen when there are not "around us cumulus and mist" and "masses of mist coming up from the valley;" in fact, when the air is so calm and clear that the coast-line can be traced at a distance of seventy miles or more. If I am proved to be correct in this opinion, the new theory has not advanced the explanation by a single step. My theory of total internal reflection depends on the difference of temperature between the air in the low country and on the Peak, which is most marked in clear calm weather, ice forming at such times on the Peak, while a fall of the thermometer to 70° F. in the low country is commented on as noteworthy by the newspapers. The conditions described by Mr. Abercromby render the idea of mirage absurd; but they also suggest, if the new theory be correct, the absurdity of there ever having been any mystery about the phenomena of the Shadow of the Peak.

May 30. R. ABBAY.

Upper Wind Currents near the Equator and the Diffusion of Krakatão Dust.

I REGRET that Mr. Abercromby, before writing his interesting and suggestive article under the above heading, had no opportunity of making himself acquainted with the conclusions arrived at by the Krakatão Committee regarding the rate at which the finest ejecta were carried round the world. The velocity he ascribes to the material, viz. 120 miles an hour, deduced apparently from the few observations he quotes, is quite 40 miles an hour in excess of that deduced from the numerous cases treated by Mr. Russell and myself. In one or two cases in the Indian Ocean the velocity does apparently approach to that given by Mr. Abercromby, but these are both exceptional and doubtful, since they were probably due to minor outbursts antecedent to that which gave rise to the grand stream which encircled the globe at an average pace of 80 miles an hour.

Mr. Abercromby has thus accidentally made the problem appear far more formidable than it really is. A constant velocity of 120 miles an hour right round the world, though not outrageous to anyone who reflects on the great mobility of the atmosphere at the height of 100,000 feet or more, certainly makes a considerable demand upon our powers of scientific imagination, while a velocity of only 80 miles an hour, even though constant over the entire equatorial belt, does not appear, at such a height, to be opposed to what is already known of the motions of the atmosphere at the far inferior elevation of the cirrus clouds.

The height of the stratum is certainly a factor which cannot be overlooked, for if we find the average velocity of the wind continually increase as we ascend to the cirrus, it is reasonable to conclude that it rises beyond this limit, and if so a constant wind of 80 miles an hour at an elevation of 100,000 feet (less than the height deduced by Verbeek for that reached by some of the ejecta) might theoretically co-exist with a trade wind of ordinary velocity at the earth's surface.

It is not so much with reference to the velocity as to the direction of the upper currents near the equator that Mr. Abercromby's itinerary observations are valuable, since they correspond both normally and exceptionally with what might be expected from the laws of aëro-dynamics. Theory is naturally perhaps, though still somewhat singularly, silent as to what is supposed to be the motion of the air in the upper regions of the belt bounded by 15° on either side of the equator. Ferrel's equations are not very satisfactory for this space, owing to the smallness of the term $2v\omega \sin \theta$ representing the deflecting force of terrestrial rotation (*ablenkungskraft*), and close to the equator fail altogether at the surface. That the wind there, however, still maintains its westward component under the normal conditions which accompany the north and south trades is plain both from Mr. Abercromby's and other observations. Higher up, owing to the absence of friction, the air tends to move in the "inertia curve" corresponding to its motion at the surface, whose radius of curvature is $\frac{v}{2\omega \sin \theta}$; and since near the equator $\sin \theta$ is very small this curve is very nearly a straight line parallel to the equator. Whatever therefore happens to the surface wind through local influences such as latitudinal shift of thermal equator or doldrums, or the establishment of a local heat maximum on a land surface causing a deflection of the normal trade wind into a local monsoon, ought not to interfere sensibly with *the general tendency of the upper air to stream from east to west for a considerable space on either side of the equator*. I may just remark, *en passant*, that the belt bounded by 15° N. and S. latitude embraces an area of more than one-quarter of the entire surface of the globe.

The apparent anomalies as well as rules exhibited by Mr. Abercromby are thus seen to be in complete accordance with the above principle. It is only when we get some distance away from the equator that the gradient towards the poles in the upper atmosphere becomes large enough to change the westward into an eastward motion. As the air slides down this slope the radius of the "inertia curve" becomes smaller, and it veers through S.E. and S. to S.W., the normal direction of the upper current at the boundaries of the trade zones.

That the barometer gradient at a height of 13,000 feet over the equator is very small either from or towards the poles may be gathered from the following extract from a table given by Dr. Sprung in his "Lehrbuch der Meteorologie" (Hamburg, 1885):—

	Height 13,123 feet. Mean pressure in inches.
Lat. 20° N.	18·504
10°	18·532
0	18·543
10° S.	18·547
20°	18·547

Above this height the gradient towards the poles would increase, but theoretically there might be no change in the direction of the wind near the equator.

June 3. E. DOUGLAS ARCHIBALD.

Mammaliferous Gravel at Elloughton, in the Humber Valley.

I WAS informed a short time ago that a large bone had been found in a gravel-pit near Brough, on the Humber, and went at once to examine the place. I found the "bone" to be a mammoth's tusk of large size, and learnt that other teeth and bones had not infrequently been exhumed in the pit. As this seems to be a new locality for mammalian remains, I think a short description of the deposit may be found useful.

The excavation was commenced about twelve months ago on the top of a small isolated hill known as Mill Hill, which rises out of the Humber Flat to a height of about 90 feet, close to the village of Elloughton, and since that time there has been a constant and steady removal of the material, so that a good section is now exposed. The hill forms an outlier of the Wold Range, from which it is separated by low ground nearly a mile in width, the north shore of the Humber lying about one mile to the south of it. It is composed of Oolitic rocks overlain by gravel. The section at present shown is as follows:—

A. Top-soil, &c.... ...	2½ feet.	A British burial found in this layer, on the west side of the pit.
B. Rough stony gravel, with sand...	about 9 feet.	Contains pebbles of flint, sandstone, red chalk, Oolitic limestone, and other local rocks, along with a few well-worn erratic pebbles of felstone, quartzite, &c.; also rolled lumps of clay and streaks of carbonaceous matter like decayed vegetation.
C. Yellow sand, with stony layers	about 5 feet.	The mammoth's tusk and other bones were found in this bed.
D. Hard gray clay, forming floor of pit		Of doubtful age, but probably belonging to the Estuarine Oolites.

In the rough gravel, B, there are some boulders of local rocks so large as to suggest the idea that floating ice has been the agent of their transportation, especially as it seems as though the blocks must either have been raised from a lower level, or floated over the depression intervening between this hill and the Oolitic exposures in the flanks of the adjacent Wolds.

The junction of B with C is very well marked, and there are signs of erosion, and unconformity between them; but as the whole of the beds are current-bedded and irregular, this line of separation may be of no importance. On the other hand, since fossils seem only to be found in the sand, C, this may be the remains of an older deposit which has been denuded during the deposition of the overlying unfossiliferous gravel, B, and this latter bed may be a continuation of similar rough unfossiliferous gravels seen on the lower ground to the westward.

If the clay exposed on the bottom of the pit really forms part of the Oolites, I see no means of determining the age of these gravels; but my impression is that at any rate they are not older than the oldest boulder-clay of Holderness, and are probably not later than the newest. At Hessle, six miles to the eastward, bones have been found in a chalky rubble underlying boulder-clay, which Prof. Phillips regarded as pre-Glacial. At Bielbecks, seven miles to the northward, similar remains were obtained in 1829 from a fresh-water deposit which I think was regarded as post-Glacial. It may be that these deposits will eventually prove all to be of one age.

The size and condition of the tusk were such that I do not think it can have been carried hither by water-currents alone. It has more probably either been dropped from the floating or living carcase of the animal or from a mass of floe-ice. Its length, as it lay exposed on the floor of the pit at the time of my visit, was 90 inches, but the workmen said they had broken up about two feet of the "thick end" before they were aware; and as the apex was also blunted and badly preserved, I think its length when first deposited cannot have fallen short of 10 feet. Its diameter was 6 inches at a distance of 10 inches from the apex; 7½ inches at 20 inches; 8 inches at 30; 8½ at 40, beyond which it did not seem perceptibly to thicken. It lay in a water-logged gravel, and was in a very friable state; and though I was enabled, through the kindness of Mr. H. Lyon, the owner of the pit, to strengthen the specimen with cement, it crumbled into small splinters when an attempt was made to remove it, and was irretrievably ruined. Its curvature was not great, and would lie within a breadth of about 20 inches.

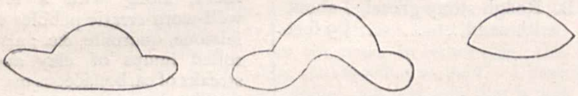
The only other remains I have yet obtained from the pit are some portions of the teeth of the mammoth and a few irrecognizable fragments of bone.

In the top-soil on the west side of the pit a British burial has been cut through, wherein lay the bones of a human skeleton, together with a fragmentary vase with the characteristic ornamentation. G. W. LAMPLUGH.

Bridlington Quay, June 6.

Fall of Peculiar Hailstones in Kingston, Jamaica.

SHORTLY after midday on the 2nd inst. a thunderstorm visited this city; the rain began with the wind from the east, as is usual with our May seasons, but it speedily changed to the west, accompanied with much lightning and thunder. Immediately hailstones became mingled with the rain, attention being drawn to their advent by the sharpness with which they struck on the shingled roofs. The west door of the laboratory being open to the air, the hail came in freely, nearly covering the floor for more than 12 feet. The hailstones were of clear ice, inclosing a few bubbles of air, varying from mere points to bubbles of the size of a split pea. The shape of the stones



was singular. Suppose a shallow and very thick saucer to have a shallow cup, without a handle, inserted in it, and you will have a good idea of the form of the hailstones when unbroken. Many had more or less lost the "saucer" by violence, while some were entirely without it, presenting the appearance of a double convex lens with faces of different curvature.

By actual measurement the hailstones were found to vary from one-quarter to three-quarters of an inch in diameter, and from one-eighth to one-quarter of an inch in thickness at the thickest part. I observed that in very many of the larger stones the air-bubbles could move about, showing the interior to be still liquid; as melting proceeded the bottom of the "saucer" would suddenly give way and become concave. The storm lasted about 15 or 20 minutes, hail falling for the greater part of the time. The hail which fell on grass remained unmelted for ten or fifteen minutes after the rain ceased. The fall of hail was very local, none falling at my house a mile away. I am informed that hail last fell in Kingston in 1839.

JAMES JOHN BOWREY.

Government Laboratory, May 12.

Singular Nesting-place of Linnets

IT may be interesting to some of your readers to know of the recurrence of a strange freak on the part of a pair of linnets. Last year they selected, as the scene of their nest-building and other parental operations, the interior of a Maltese water-bottle, hung against a brick wall, at the back of the house of Capt. G. Wood, and in a sort of half yard, half garden. The bottle is of porous ware, 10 inches high, 7 inches wide at its broadest part, which is mid-way between the bottom of the neck and the base, and having an upright constricted neck 4 inches long and only $1\frac{1}{4}$ inches in diameter on the inside. In this singular receptacle the birds contentedly built, laid their eggs, and successfully reared their brood.

This year, strange to say, the same pair, or one identically like them, have returned to the old haunt, deftly repaired and slightly added to the old nest, laid their eggs, and now have a vigorous progeny of five or six unfledged youngsters.

How the birds came, in the first instance, to select such a shelter, seeing that they could only pass in or out with folded wings, and by a sort of dart, and that to enter the neck from within in this way must have been a task of considerable skill and no little difficulty, is a mystery; but that they should have retained such a happy memory of their first sojourn as to lead them to return to their old quarters, is more interesting still.

H. VIAN-WILLIAMS.

3 Waterloo Place, North Shields, June 2.

A Brilliant Meteor.

YESTERDAY I saw a very brilliant meteor with train, resembling a firework in shape, colour, and other features. It was coming from Ursa Major, and vanished midway between α Lyræ and δ Cygni. Motion very slow; 21h. 19m. mean Turin time.

Turin, June 11. F. PORRO.

ELECTRICITY AT OXFORD.

IT is with very great regret that we learn that the study of natural science in the University of Oxford received last week a blow which is all the more to be deplored in that it was, in part at all events, delivered by those from whom such an onslaught was least to have been expected. Professed hostility or indifference to the great scientific movement of the day, injudicious economy,—these are obstacles which promoters of that movement must be prepared to face, and will in the long run overcome. It is not, however, to be expected that progress will be made if each forward step is checked by those who have themselves enlisted on the side of science.

The cardinal point which the University had to decide was whether it should or should not provide itself with a laboratory for the development of the teaching of electricity. The Clarendon Laboratory was, we believe, the first building in this country which was planned and erected for the study of experimental physics alone. It was designed about twenty years ago by Prof. Clifton, and, if we except the provision made for electricity, nothing better or more complete is to be found within the four seas.

Rooms were, it is true, originally set apart as electrical laboratories. The rapid growth of the science would have sufficed to render them inadequate now, but we gather from a statement circulated by Prof. Clifton that other causes have combined to strengthen the case for an extension of the building.

Optics has been a favourite subject among students of physics at Oxford, and optical apparatus now occupies the space intended for electrical instruments. Thus it has come to pass that "the important branches of electricity and magnetism are," in the words of the Professor, "necessarily excluded from the practical course."

In consequence of this unsatisfactory condition of affairs, Prof. Clifton has for some years lectured almost exclusively on electricity, and has been compelled to discuss methods of manipulation and details as to instruments which are usually mastered in a laboratory. The Lee's Reader in Physics, Mr. R. Baynes, has also established a practical course on electrical measurements, in Christ Church. Although the work he has thus done is excellent, we believe that it is not contended that Christ Church is in a position to make a permanent provision for instruction in electricity on a scale adequate to the requirements of the University.

For some time past, therefore, the University has been urged to add a wing for electrical work to the Clarendon Laboratory.

The necessity of providing for other University requirements has caused a long delay, but at length the turn of physics seemed to have come. Plans prepared by Prof. Clifton were submitted to the Hebdomadal Council. Mr. Henry Wilde, F.R.S., generously promised a gas-engine, dynamos, and an electric lamp. The Delegates of the Museum (who superintend the laboratories of the University), the Curators of the Chest (who have charge of its financial affairs), approved the scheme. It was adopted by the Council, and nothing remained but for the graduates in Convocation assembled to give their assent.

At the last moment, however, unexpected opposition arose. Balliol and Trinity Colleges have for some years combined their provision for the teaching of natural science, and the President of Trinity, acting for these Colleges, issued a pamphlet hostile to the grant for the proposed new laboratory. This step was taken on two grounds, both of which appear to us mistaken.

In the statement above referred to, Prof. Clifton had mentioned as an advantage incidental to the erection of the new laboratory that he would be able to abandon the lecture course of electrical demonstrations, as the instruction given in them would be better provided for in laboratory work. He proposed to substitute a general course on physics, addressed not only to the comparatively few students who aim at high honours in that subject, but to the larger body who enter for the first or preliminary stage of the honour examination. To this the authorities of Trinity objected that instruction of this kind was already given by one of their lecturers.

Into the merits of a dispute on a question of organization of this kind it is difficult, and perhaps unnecessary, to enter. The main fact is that, even if Balliol and Trinity are right in claiming as against the University something like a monopoly of general lecture instruction in physics, they have enforced that claim by placing, for an indefinite period, the Oxford school of physics at a serious disadvantage. Not a penny of the grant asked for was to be expended on apparatus for elementary lectures. It was all required for a lodge, for expenses connected with Mr. Wilde's installation, and for an electrical laboratory such as other Universities have and the University of Oxford has not. The President of Trinity no doubt thought that he was striving to prevent the University incurring an unnecessary expense. Could not some of his scientific advisers have informed him that the questions as to whether an electrical laboratory should be built, and as to whether Prof. Clifton should spend the time which its erection would place at his disposal in delivering a particular course of lectures, are separate and distinct? Are there no Boards or Faculties in Oxford in which the arrangement of lectures can be discussed without the friends of progress obstructing progress in Convocation? Opposition to the extension of the Clarendon Laboratory (the necessity for which they did not deny), lest as a secondary result of that extension a course of lectures should be given, which would involve no cost to the University, but which they feared might infringe their own real or supposed rights, is not an attitude for which the combined Colleges can expect much sympathy.

The second point which was raised by the President of Trinity was dealt with in an equally unsatisfactory manner. In 1886, Trinity College built and opened the Millard Laboratory for instruction in theoretical and practical mechanics and engineering. The Laboratory contains a steam-engine and three dynamos. It is about to be further extended, and it is claimed that it contains all the apparatus required for technical work in electricity. The President recited these facts in his pamphlet, and then added: "But with the question of advanced work I must leave others, who have more knowledge, to deal."

We venture to think that before describing the Millard Laboratory in detail in a pamphlet opposed to the Clarendon Laboratory grant, it would have been well for the President to have obtained from experts such information as would have enabled him to make up his mind as to what the two laboratories had or had not in common.

If it is really intended to concentrate the teaching of electricity in Balliol and Trinity, and, while placing it in the hands of College lecturers, to prevent the University Professor of Physics from acquiring the facilities for teaching it properly himself, we can only say that a most mistaken policy has been adopted. Physics, on account of the cost of the apparatus required, is a subject in which centralization is desirable, and, considering the place which electricity now occupies among the physical sciences, it would be absurd to exclude it from the University Laboratory, and from the curriculum of the only teacher of physics whom the University herself appoints. To do them justice, the combined Colleges did not directly make any such proposal; but, if they did not mean to make it, why was the Millard Laboratory imported into the controversy? As far as we can judge from the description given of it by the President of Trinity, it is a technical laboratory which may develop into something analogous to that of Prof. Stuart at Cambridge. If so, it does not—and those connected with it ought to have known that it does not—occupy the gap which the new building was to fill. "Theoretical and practical mechanics and engineering," coupled with electrical technology, afford plenty of scope for the energies even of such active Colleges as Balliol and Trinity. It is a pity that, with all this zeal, they have yet to learn that pure science is an ally and not a rival, that a dynamo is useful in a physical laboratory in which no technology is taught, and that the way for a young institution like the Millard Laboratory to earn respect is to do good work, and not to signalize its appearance on the field of labour by preventing others from doing it.

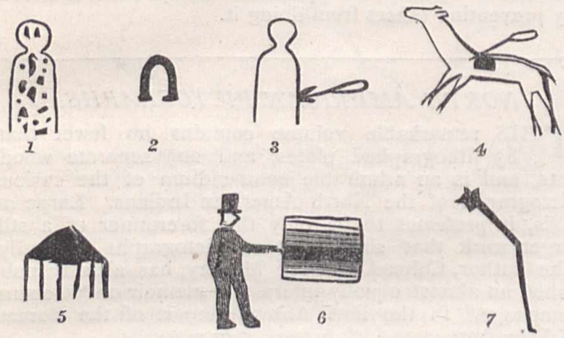
NORTH AMERICAN PICTOGRAPHS.[1]

THIS remarkable volume contains no fewer than 83 lithographed plates, and 209 separate woodcuts, and is an admirable compendium of the curious pictographs of the North American Indians. Large as it is, it professes to be only the forerunner of a still larger work that shall treat of pictographs generally. The author, Colonel Garrick Mallery, has already published an almost equally interesting memoir on "Gesture Language," in the first Annual Report of the Bureau of Ethnology.

One of the most striking features of the present work is the account it gives of the newly-discovered custom of the Sioux, or, more correctly speaking, of the Dakota Indians (for Sioux is some barbarism, repudiated by the natives), to keep national calendars. The custom is sufficiently ancient to have become generally established among this great branch of the Indians, but it is not old enough to have spread to the west of the Mississippi. One of the most important of the calendars begins with the year 1800; its historiographer was a man, still living in 1876, yclept "Lone-Dog." His calendar is painted on a buffalo hide, which appears to have been exhibited and explained to Indian audiences from time to time, and greatly admired by them, for four copies at least have been made from it (with variations of arrangement), and every intelligent adult Dakota knows its contents, and can read them in part. One of these copies is imitated in a beautiful plate, which is the most effective of all the many illustrations of this volume. The process of making the calendar is inferred to have been as follows:—During the dreary periods of their six winter months, certain elders of the tribe amused themselves with talking over the events of the past year, and Lone-Dog discussed with them which of those events should be selected by general suffrage as the representative of that period. Suppose it was an outbreak of the small-pox: then Lone-Dog drew the outline of Fig. 1 on one part of his buffalo robe, and dabbed it with red spots. Then that year became ever after known as the small-pox year, and the Dakotas would say so-and-so happened in the small-pox year, just as we should say in the year 1801. Or, again, the event might be that for the first time horses were seen by them that had been shod with iron: then the symbol of the year became a horse-shoe, Fig. 2. Lone-Dog's calendar is particularly graphic. Its earlier entries are probably derived from preceding chroniclers or from tradition; anyhow it covers the entire period from 1800 to 1871. The first entry is made in the middle of the robe, and the others are arranged year after year successively in an oblong spiral, the whole series being included in three turns and a half. They are drawn in black and red, the latter usually representing blood, of which plenty seems to be spilt in murder or in hunting. Thus Fig. 3 is a case of murder; Fig. 4 is a year in which a vast number of elk were killed, identified in the rude drawing by their cloven feet. Fig. 5 celebrates the erection of a trader's station; and Fig. 6 tells us that striped Spanish blankets were first introduced in that

[1] "Pictographs of the North American Indians." A Preliminary Paper by Garrick Mallery. Extract from the Fourth Annual Report of the Bureau of Ethnology. (Washington: Government Printing Office, 1886.)

year by a trader. Fig. 7 is the year of a great aërolite. Lone-Dog's system is not the only calendar. Others have recently been found by Dr. Corbussier which are drawn more elaborately, though not more intelligibly. The most important of these is only described, and not reproduced in this volume. It is by Battiste Good, and professes to date from prior to the year 1700. Being

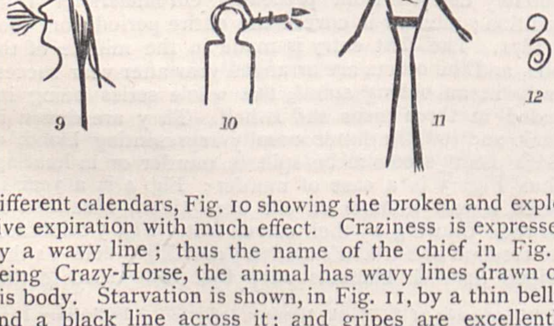


drawn in five colours, it would require much cost to imitate, and is withheld for the present.

Other curious features of the work are the pictorial censuses that it contains. One consists of eighty-four heads of families in the band of "Big-Road." Each is represented with the symbol expressive of his name attached to his head, after the manner of Fig. 8. Another

census is of the 289 adherents of Red-Cloud, who are for the most part portrayed on a similar principle.

Some of the more symbolic representations are amusing and instructive. Those for various diseases are as follow:—We have already seen the representation of small-pox, and that of measles is much the same. A whooping-cough year is typified by Figs. 9 and 10, in



different calendars, Fig. 10 showing the broken and explosive expiration with much effect. Craziness is expressed by a wavy line; thus the name of the chief in Fig. 8 being Crazy-Horse, the animal has wavy lines drawn on his body. Starvation is shown, in Fig. 11, by a thin belly, and a black line across it; and gripes are excellently expressed by a scroll, Fig. 12, something like a figure 3, only more twisted and tortured, scrawled over the abdomen.

The question is fully discussed whether this calendar-making was in any way due to the influence of the whites, but is decided on good grounds in the negative. The whole conception and the way of carrying it out seems to be thoroughly Indian, but it is not every Indian who is born with the historiographic capacities of Lone-Dog. The author testifies to the variety of individual aptitudes when speaking of the inhabitants of Queen Charlotte's Islands, who are beautifully tattooed. He says, "nor is it everyone who can tattoo. Certain ones, almost always men (let Mr. Romanes make a note of it), have a natural gift which enables them to excel in this kind of work."

The events that a group of persons are most apt to associate with an epoch during which they have lived together, are not necessarily the most important ones. They are those occurrences which are simple and well-defined, and have struck the fancy on that account, as well as from their unlikeness to former experiences. Such events are recalled with ease, and a partial or symbolic act of recollection suffices to identify them.

When pictorial nick-names are given to each successive year in council, as in the case of the Dakotas, the process must be very like that of giving verbal nick-names to new boys at school. This used to be a far more prevalent custom than it is now, and I have a vivid recollection of two old Etonians describing how it was done in their time. When the new boy made his appearance, he was of course well looked over and watched. Then, as the fancy took them, first one lad and then another addressed him with tentative nick-names. At the beginning, these trial names were apt to fall flat; at length one stuck; other lads adopted it, and usually in a few days the new boy was fitted with a generally-accepted name, by which he was afterwards known almost exclusively during the whole time he was at school. The appropriateness of the nick-name was by no means always obvious to strangers; it might even be due to some passing event with which by pure accident the boy was in some indirect way associated. I think this giving of nick-names is an excellent illustration of the manner in which many common words must have arisen.

The process of determining the most typical event of a year, and then of portraying it by a simple and bold design of a higher order of art than was known to Lone-Dog, and introducing no more detail than is necessary for identification, is well worth trying as an experiment. I tested it myself by attempting to construct such pictographs for the last few years of my life, under the condition that each should be included within a circle of the size of a shilling, and at last I succeeded fairly well, in my own, but probably too partial, judgment. I may add that, having done this, I laid a florin over my drawing, and traced a second circle round the florin. In the ring that lay between the two circles there was space for fully twenty-five bold capital letters, which I distributed among words that referred to other leading events of the year. The whole formed a by no means inartistic series of designs suitable for medallions.

I soon became so absorbed in my pictographs that I think others might interest themselves in the same way. It would be an amusing test of skill in a round game, to try who could make the most artistic and vigorous design within the compass of a circle traced, say, round a half-penny—that is, of exactly one inch in diameter—to commemorate some recent event known to all. What a capital prize subject for art students it would be, to refer them to some brief register of events during the fifty years of Her Majesty's reign, and to ask for fifty such medallions, one for each year. Then, again, many persons carve in wood or paint on china, and want designs; let them take episodes in their own histories, and make friezes that should illustrate the events in families, schools, houses, &c., such as the stained-glass windows in churches do those in the history of the Bible. How prettily girls might design pictographs to record notable events in a pleasant tour, and interchange them with their fellow-travellers as presents. Such designs as these could be made subjects of embroidery, or, if on a larger scale, of that brass *repoussé* work which is, or was, so much in fashion. It would be by no means difficult to convert them into actual medallions. First the wax model, then the plaster cast, then the cast in white fusible metal, then the covering with an electrotyped coating of silver, just in the way that the ancient coins are reproduced at the British Museum, at the cost of about three shillings each, which are now so frequently used in rows for necklaces. What a delightful memorial of twenty-five years of wedded history might be given by a husband to his wife, in the form of a necklace of such medals. It would be a pleasant labour to make a set of designs, which an artist could afterwards put into better forms, and construct from them the wax medallions for the electrotypist to cast and turn into metal. I commend this idea of commemorative pictographs and *glyptographs* (as works in relief ought to be called) to the notice of amateur artists, whether they work in pencil, ink, colour, carving, embroidery, *repoussé* work, china painting, or in modelling.

This volume is an excellent example of the growing variety and wealth of material now available to inquirers into the origin of language. We meet in it with abundant evidence of the rapidity with which pictographs become abbreviated into conventional symbols, and are thereby adapted to play the same important part in reasoning that is usually played by words. I cannot see that it makes any fundamental difference in the use of symbols whether they appeal to the ear or to the eye, though I fully grant that on many grounds, not worth entering into here, the former is more generally convenient, and best suits the idiosyncracies of the majority of persons. The unassisted sense of touch, as we have learnt from the case of Laura Bridgeman, may afford an adequate basis for the exercise of a considerable amount of reasoning. And for aught I can see to the contrary, a dog who "ponders," to use a dog-trainer's expression, may occasionally be carrying out some real act of thought by the aid of imagined and symbolic odours.

FRANCIS GALTON.

COCOA-NUT PEARLS.

THE following letter has been sent to us by Dr. Sydney J. Hickson:—

"During my recent travels in North Celebes I was frequently asked by the Dutch planters, and others, if I had ever seen a 'cocoa-nut stone.' These stones are said to be very rarely found (1 in 2000 or more) in the perisperm of the cocoa-nut, and when found are kept by the natives as a charm against disease and evil spirits. This story of the cocoa-nut stone was so constantly told me, and in every case without any variation in its details, that I made every effort before leaving to obtain some specimens, and eventually succeeded in obtaining two.

"One of these is nearly a perfect sphere, 14 mm. in diameter, and the other, rather smaller in size, is irregularly pear-shaped. In both specimens the surface is worn nearly smooth by friction. The spherical one I have had cut into two halves, but I can find no concentric or other markings on the polished cut surfaces.

"Dr. Kimmins has kindly submitted one half to a careful chemical analysis, and finds that it consists of pure carbonate of lime without any trace of other salts or vegetable tissue.

"I should be very glad if any of your readers could inform me if there are any of these stones in any of the Museums, or if there is any evidence beyond mere hearsay for their existence in the perisperm of the cocoa-nut."

On this letter Mr. Thiselton Dyer, to whom we sent it, has been good enough to make the following remarks:—

Dr. Hickson's account of the calcareous concretions occasionally found in the central hollow (filled with fluid—the so-called "milk") of the endosperm of the seed of the cocoa-nut is extremely interesting. It appears to me a phenomenon of the same order as tabasheer, to which I recently drew attention in this journal.

The circumstances of the occurrence of these stones or "pearls" are in many respects parallel to those which attend the formation of tabasheer. In both cases, mineral matter in palpable masses is withdrawn from solution in considerable volumes of fluid contained in tolerably large cavities in living plants—and in both instances they are Monocotyledons.

In the case of the cocoa-nut pearls the material is calcium carbonate, and this is well known to concrete in a peculiar manner from solutions in which organic matter is also present.

In my note on tabasheer I referred to the reported occurrence of mineral concretions in the wood of various tropical Dicotyledonous trees. Tabasheer is too well known to be pooh-poohed; but some of my scientific friends expressed a polite incredulity as to the other cases. I learn, however, from Prof. Judd, F.R.S., that he has obtained a specimen of apatite found in cutting up a mass of teak-wood. The occurrence of this mineral under these circumstances has long been recorded; but I have never had the good fortune to see a specimen.

Returning to cocoa-nut pearls, I send you a note which the *Tropical Agriculturist* for April last quotes from the *Straits Times*:—

"A trade journal appearing in Java gives the following particulars regarding a peculiar kind of pearl found in this part of the world:—It is well known that pearls have been met with within oysters and mussels. Sometimes even trees yield pearls. In the Proceedings of the Boston Society of Natural History, there is a paper by Mr. J. Bacon regarding the kind of pearls often found within cocoa-nuts. The specimens shown have been bought at Singapore. They are said to be so rare in the East Indies as to be highly prized by the native rajahs, and worn by them as precious stones. Mr. Bacon himself possessed a small pearl of this sort. It is said that when allowed to grow, they will reach the size of cherries. This pearl resembles the common variety in smoothness, whiteness, and scant lustre of surface. It is harder than it, and almost as hard as feldspar or opal. The common pearl varies in hardness, but is never harder than feldspar. The cocoa-nut pearl consists of carbonate of lime, with very few organic substances remaining after treatment with acid solutions. This organic matter is insoluble, shows no trace of vegetable substances after microscopical examination, and seems to be akin to albumen in structure. In the common pearl there is also found an albuminous substance, but the latter remains unchanged in appearance and lustre even after the calcareous constituent parts have been dissolved away. In other respects microscopical research has brought out the fact that the cocoa-nut pearl is formed of concentric layers without any nucleus. The whole mass is made up of layers of fine crystalline fibres. Prof. Bleekrode, in commenting on the former in a Dutch scientific periodical, says that Rumphius, the famous botanist, had in his 'Herbarium Amboinense,' given full particulars of this petrifaction in the cocoa-nut. Rumphius has even illustrated his account of it by accompanying drawings of the two forms in which this kind of pearl is met with—pear-shaped and round, either of uniform appearance or with red edges. Hardly one in a thousand cocoa-nuts on the average displays this strange peculiarity. The formation of the latter is always a remarkable phenomenon, hard to account for, from the water in the nuts generally lacking the chemical substances favouring abnormal growth of the kind. Rumphius states for a fact that cocoa-nuts from Macassar yield more pearls than those from other places. This scientist, in 1682, sent, as a present to the Grand Duke of Tuscany, a ring in which a cocoa-nut pearl had been set. Similar pearl-like formations are met with in other East Indian fruits, such as the waringin, the pomegranate, and the kechubong."

To this may be conveniently added two brief extracts from the long and admirable account given by Rumphius:—

"*Calappites*, Belgis *Calappus-Steen*, Malaicensibus *Mestica Calappa*, albus est lapillus instar marmoris seu silicis albi, durus, planus, ac glaber, cujus putaveram alio loco inter lapides ac mineras descriptionem dedisse, quum vero in *Calappa nuce* inveniatur, ac sollicitus sim, opus illud à me forte non absolutum iri, animo induxi hic loci ejus exhibere descriptionem. Est itaque albus ac politus, seu glaber lapillus in interiore *Calappæ nucis* parte concrescens, nunc putamini fixus, nunc vero media in lympha natans, diversæ ac duplicis potissimum formæ" (Rumphius, "Herbarium Amboinense," vol. i. pp. 21, 22).

"Incolæ plurimum omnes *Mesticas* amant, quarum quasdam tanti æstimant, ut optimis etiam præferant gemmis; plurimas enim ipsis tribuunt immo sine dubio superstitiosas etiam virtutes, gestant enim has ad nudum corpus, in annulis, et armis, ad prosperum conatuum successum obtinendum. Elegantissimos ac rotundissimos hujus Calappi lapillos, seu *Calappites* imponunt annulis suis, vel etiam telis adpendent, non auro, sed argento circumdatos, dicentes melius hoc cum natura *Calappites* convenire" (p. 22).

If Dr. Hickson would present one of his pearls to the Kew Museum, it would, I am sure, interest a great many persons who would be glad to see an authentic specimen of so interesting a curiosity.

NOTES.

The Annual Meeting of the Royal Society for the election of Fellows was held at the Society's rooms in Burlington House on Thursday last, when the following gentlemen were elected into the Society: John Young Buchanan, M.A., John Theodore Cash, M.D., Sir James Nicholas Douglass, M.I.C.E., Prof. James Alfred Ewing, B.Sc., Prof. George Forbes, M.A., William Richard Gowers, M.D., Prof. Alexander B. W. Kennedy, M.I.C.E., George King, M.B., Sir John Kirk, M.D., Prof. Oliver Joseph Lodge, D.Sc., Prof. John Milne, F.G.S., Rev. Octavius Pickard-Cambridge, M.A., George James Snelus, F.C.S., Thomas, Lord Walsingham, William Whitaker, B.A.

The Council of the London Mathematical Society have awarded the second De Morgan medal to Prof. Sylvester, F.R.S., for his numerous and brilliant contributions to pure mathematics. The medal will be presented at the Council meeting in November next.

The preparations for the forthcoming meeting of the British Association in Manchester are progressing very favourably. A strong Local Committee has been formed, and a guarantee fund of over £10,000 has been raised to meet the necessary local expenses. The reception-room will be in the recently-built Natural History Museum of the Owens College, and the Section rooms in the College or its immediate neighbourhood. A prominent feature of the meeting will be the presence of a large number of eminent foreign men of science, of whom more than a hundred have already accepted invitations to attend.

Arrangements for the dinner to Prof. Tyndall are progressing satisfactorily under the direction of the Executive Committee consisting of Prof. Stokes (Chairman), Sir F. Abel, Sir W. Bowman, Sir F. Bramwell, Dr. Evans, Prof. Frankland, Dr. Hirst, Prof. Huxley, and Sir Henry Roscoe. Circulars announcing the dinner have been largely issued. It is, however, for obvious reasons impossible to send notices to all those who might wish to attend, and applications for tickets are daily made by gentlemen who have received no special notification of the event. There is no doubt that a body of scientific men will meet at the dinner such as has seldom or never been brought together on a similar occasion. Nor will the gathering be confined to scientific men alone. Among others, the following have also expressed their intention of being present: Lord Derby, Lord Lytton, Earl Bathurst, Sir F. Pollock, Sir F. Leighton, Lieut.-General Smyth, Prof. Bonamy Price, and Messrs. Leslie Stephen, W. Lecky, and Wemyss Reid.

The Ladies' *Soirée* at the Royal Society, as we stated last week, was largely attended. Careful preparations had been made for it, and it was a great success. At intervals, in the Principal Library, a cornet solo was telephoned from Brighton. A large number of objects of great scientific interest were exhibited. Photographs of clouds, and photographs of the Firth of Forth Bridge, were shown with the lime-light; the former with demonstrations by the Hon. Ralph Abercromby, the latter with demonstrations by Mr. Baker. The microscopic structure of pearls was also shown with the lime-light, by Dr. George Harley. The Zoological Society of London exhibited a fine living specimen of the electric eel, from which shocks were taken. Prof. A. W. Rücker exhibited—(1) Colours of soap-films rotating under the influence of an air-current. A jet of air is directed on to the film so as to form a vortex, the colours of which change as the film becomes thinner. This experiment is due to Sir David Brewster. Attention has been recently called to it by Lord Rayleigh. (2) Artificial imitation of the colours of the setting sun. Light is passed through a glass cell containing a solution of sodium hyposulphite. If a little hydrochloric acid is added, the sulphur is deposited in fine particles which scatter the blue end of the spectrum. The transmitted light becomes redder, and colours like those of sunset are produced. This experiment is due to Capt. Abney. (3) Apparatus to illustrate the passage of light through lenses. An application on a large scale of the method of tracing the rays by passing them through air in a closed space charged with a small quantity of smoke. Chrysalides and living larvæ showing the influence of surroundings upon their colours were exhibited by Mr. E. B. Poulton; and Dr. E. Klein exhibited the following specimens of microbes under the microscope and in cultivation:—*Bacillus anthracis; Bacillus tuberculosis;* Bacillus of leprosy; Bacillus of swine fever; Bacillus of septicæmia; Bacillus found in typhoid fever; Spirillum found in Asiatic cholera; several other species of Spirilla; several species of *Bacterium termo;* Micrococcus of foot-and-mouth disease; Micrococcus of scarlet fever; Micrococcus of vaccine; different species of coloured microbes. Mr. Chichester A. Bell showed apparatus for reproducing audibly the vibrations of liquid jets. Vibratory motions of the orifice from which a liquid jet escapes, give rise to slight swellings, and constrictions of the liquid column. The swellings increase and the constrictions diminish as the jet travels downwards, finally causing it to break into drops. When the jet strikes upon a flat surface, the swellings are continued as waves in the thin sheet of liquid, which spreads out from the point of impact. The jet liquid being a conductor of electricity (acidulated water), and two platinum electrodes in circuit with a battery, and a telephone being immersed in the liquid sheet or nappe, the jet vibrations are reproduced as sound in the telephone.

A DEPUTATION consisting of Mr. Mundella, Mr. Joseph Chamberlain, Sir John Lubbock, Sir Henry Roscoe, Sir Lyon Playfair, Mr. John Morley, and others, will wait upon the Chancellor of the Exchequer on the 30th inst. to urge the claims of University Colleges upon the Government. Mr. Goschen has always taken so deep an interest in questions connected with education that he may be expected to consider carefully the arguments which will be submitted to him. It is almost certain that unless the University Colleges receive aid from the State some of them will have to be closed, for it has never been found that institutions of this kind can be maintained by fees alone. All that is asked is that the nation shall do for the University Colleges of England what is already done for like institutions in Wales, and for the Universities of Scotland.

THE foundation-stone of the new College of Science at Newcastle-upon-Tyne was laid yesterday by Sir William Armstrong.

THE Rev. J. E. Leefe has presented his botanical collections to Kew. Since the death of Borrer in 1862, Mr. Leefe has been universally recognized as the principal authority on British willows. In early life he lived in Essex and Yorkshire, but for the last generation he has held the living of Cresswell on the coast of Northumberland, opposite Morpeth. Here he got together a very fine collection of living willows, which had been obtained from Borrer, Darwall, the Duke of Bedford's collection at Woburn, and the Botanic Gardens of Kew and Cambridge. His sight having failed, he has retired to live at Coatham, near Redcar, and has given to Kew the collections he is no longer able to use. His principal publication was issued in 1842 under the title of "Salictum Britannicum." This contains ninety specimens, with printed tickets, and has been the recognized standard, ever since its publication, by which British willows have been named. His principal published papers are in the *Journal of Botany* for 1871—one entitled "An Arrangement of the British Willows," and another "On Hybridity in Salix, and the Growth of Willows from Seed." The collection he has now presented contains his own copy of the "Salictum," accompanied by a quarto manuscript; a valuable set of types from Hoch, the author of the classical "Flora Germanica"; a great many specimens dried from his living collection at Cresswell; and American types received from his correspondents in the United States. The general herbarium is of a miscellaneous character, principally British, but containing also a number of plants from Central Europe, Abyssinia, America, and other parts of the world. Amongst the British plants, the collection contains a curious *Ammophila*, gathered near Cresswell in 1872, with the glumes of ordinary *A. arenaria*, but with the decidedly tropical inflorescence of *A. baltica*, for which one of the only two known British stations is in Ross links, also on the Northumbrian coast, and which has by some botanists been regarded as a hybrid between *A. arenaria* and a *Calamagrostis*.

Apropos of our note last week on the invitations to the ceremony at Westminster Abbey, a correspondent writes to us from Dublin:—"We have the same state of things here. Neither the President of the Royal Irish Academy, nor the President of the Royal Dublin Society, as such, have got invitations. Invitations have been sent lavishly to Mayors, all of whom, save in three cases, have refused them, thus leaving, as one would have thought, a chance for science coming No. 2."

IN a despatch received at New York from Mexico on the 12th inst. it was announced that shocks of earthquake had been felt throughout Guerrero State on the 29th ult. and on the 1st and 2nd inst., and that several of the smaller towns had been injured.

SEVERE shocks of earthquake were felt last week in some parts of Turkestan. At Vernoje they began about 5 o'clock on the morning of the 9th inst. Almost all the buildings in the town were destroyed, and much life was lost. Great damage was also done at Kashelensk, Tsharkent, and other places. The telegraph line in the neighbourhood of Vernoje was broken down for a distance of about 200 versts.

THE last number of the *Annuaire de la Société Météorologique de France* (February, 1887) contains an interesting article by M. Hervé-Mangon on the distribution of rainfall and its duration in Paris, from observations taken during the years 1860-70. These observations, which were made with Hervé-Mangon's pluvioscope, show that rain falls on an average 19 hours a month. The month with the shortest duration of rain was August, which had only 12½ hours, while March had 26, and October and November a little more than 22 hours each. An examination of the hours of the rainfall during the night and during the day shows that on an average there are fewer hours of rain during the night than during the day. The longest interval without rain was 26 days, from September 11 to October 6, 1865. The greatest number of consecutive days of rain was 18, from October 3 to 20, 1867. The month of March had, on an average, the greatest number of rainy days, viz. 21·2, and the month of June the least, viz. 13·1. The months of greatest and least amount of rainfall do not correspond with these months, the maximum being 2·21 inches in September, and the minimum 1·00 inch in February.

THE *Monatsbericht der Deutschen Seewarte* for the whole year 1886 has been issued simultaneously with the Report for January 1887. The delay in the issue of the Reports is owing to some important alterations in the form of the work, especially the extension, considerably to the west, of the chart showing barometric minima. The above Report takes the place of the *Monatliche Uebersicht der Witterung*, which completed its tenth volume with the year 1885. It is proposed to issue it regularly in the third month after that to which it refers, and to include in it (1) a review of the atmospheric conditions over Central Europe, (2) preliminary communications respecting the weather in the North Atlantic, and (3) meteorological tables for Europe generally, and charts of the paths of the barometric minima over ocean and continent. This monthly report will be supplemented by a more complete quarterly review of the weather, which will appear after a lapse of about two years, and will serve as the explanatory text of the daily synoptic charts for the North Atlantic Ocean and adjacent continents lately referred to (May 26, p. 88). This text will be issued separately by the German Admiralty, and will be of great value to all interested in meteorological investigations.

FROM a recent report by Dr. Hellmann on statistics of lightning-damage in Schleswig-Holstein, Baden, and Hesse, it appears that the danger from lightning in these parts (unlike the case of other parts of Germany) has been decreasing of late years. Soft-roofed houses are fired about 7 times oftener than those with hard roofs. Windmills are struck 52 times, and church and clock towers 39 times, oftener than ordinary houses with hard roofs. The marshy regions in Schleswig-Holstein are the most dangerous; and the land about inlets of the east coast the safest. With like conditions, the relative danger decreases the more houses are grouped together. In Baden the danger varies more than in any part of Germany (about Heidelberg it is 24, and in Waldshut 265 per million houses). In Hesse, the low plain of the middle Rhine is the most dangerous part. In the fifteen years 1869-83, there were killed by lightning for every million men, in Prussia, 4·4; in Baden, 3·8; in France, 3·1; and in Sweden, 3·0. The geological nature of the ground, and especially its capacity for water, has important influence. Thus, calling the danger on lime 1, that for sand is 9, while for loam it is 22. This is partly why most of South Germany and Austria is less dangerous than North Germany.

There are four factors affecting the lightning-danger to buildings; two physical—unequal frequency of storms, and geological character; and two social—variable population, and mode of building. Of all trees, oaks are most frequently damaged, beeches most rarely (in the ratio 54 to 1).

AN electric trumpet has been recently devised by M. Zigang (*La Nature*, June 4). It consists of a short brass tube mounted on wood and containing an electro-magnet whose ends face a vibrating plate, on which is fixed a small piece of soft iron. Against this plate-armature rests a regulating screw with platinum point, which serves for automatic interruption, by vibration of the armature. With two Leclanché elements a musical sound is had, which may be varied in pitch, intensity, and timbre by means of the screw. This instrument may be usefully employed in signalling on ships, railways, tramways, &c.; it may also serve as a receiver for signals of the Morse type.

PROF. CHRISTENSEN, of Copenhagen, has recently (*Journal für praktische Chemie*, 1887, No. 11) made a redetermination of the atomic weight of fluorine, with the satisfactory result that this element is to be added to the already large list of those whose atomic weights are whole numbers and simple multiples of that of hydrogen. The determination was based upon the analysis of a double fluoride of ammonia and manganese, $4NH_4F \cdot Mn_2F6$, the extreme precautions displayed in the preparation and purification of which show the peculiar difficulties attending work upon this singular element. It is very interesting to read of the filtrations through platinum gauze placed in gutta-percha funnels, of the drying of the beautifully crystalline red salt spread out upon wide expanses of platinum-foil, and of the skllful manner in which all traces of silicon were eventually eliminated. The results of the numerous analyses show that, if Stas's value for oxygen be taken as the standard, the atomic weight of fluorine is 18·94, but if, as Mendelejeff concludes, oxygen be 16, then the atomic weight of fluorine becomes 18·99, or, in round numbers, 19·0.

IT will probably be remembered that, early in the year 1883 (*Ber. der Deut. Chem. Ges.*, xvi. 324), a number of chemical reactions, especially the formation of arsenides from mixtures of metals and arsenic, were brought about, by Dr. W. Spring, by subjecting the powdered mixtures to the immense pressure of 6000 atmospheres. A still more striking experiment, entirely unique in its way, has just been made by Dr. Spring, in conjunction with Dr. Van't Hoff (*Zeitschrift für physikalische Chemie*, i. 5). In the course of a study of chemical dynamics these workers found that the blue-coloured double acetate of copper and calcium, $(C_2H_3O_2)_4CaCu \cdot 8H_2O$, is perfectly stable at atmospheric pressure as far as 75°; above this temperature it is decomposed into its constituent acetates, three-quarters of its water of crystallization being set free. This decomposition is atended with contraction in volume, and the salts dissolve in the liberated water. The idea was at once suggested, Could this decomposition be effected by means of Dr. Spring's powerful compressing machinery? The idea was carried out, and no sooner was the pressure upon the solid double acetate increased to 7000 atmospheres, at a temperature of 40°, than the solution of the separated constituent salts spurted from every joint of the apparatus, and on releasing the pressure the resolidified mass was found to consist of a mixture of the white calcium and the green copper salt.

LAST week we referred to the fact that the Council of the Meteorological Society are anxious to obtain photographs of flashes of lightning. The *Photographic News*, dealing with the conditions under which such photographs should be taken, notes the following points as important:—"First, the exact position of the camera. In many countries, ordnance maps can be obtained on such a scale that a minute dot will indicate the position of the camera within a foot or two, and it will often be easy to record the position of the apparatus with far greater exactness, as, for example, when the camera is placed at a window. A thread with a plummet should be allowed to range from the optical centre (say the diaphragm in case of a doublet) to the floor, where a mark should be made. Second, the time at which the exposure was made. Third, the aspect of the camera. When the locality is exactly recorded, this datum may be approximate, as there will generally be the means of exactly determining it upon the plate itself. Fourth, the equivalent focus of the lens, but the determination of this may well be left until it it is found that something valuable may be deduced from the photograph. Fifth, the distance of the flash. The recording of this is a very important matter, as, when the focus of the lens is known, it will be easy to determine the actual distance between cloud and earth, also the horizontal angle subtended to the observer at the camera. To determine the distance, the observer should note as accurately as possible the time elapsing between the flash and the report, and in doing this, even such a chronograph watch as may now be had for five or six pounds will be found of great service."

AT a meeting of the Middlesex Natural History and Science Society, at the Natural History Museum, South Kensington, on the 11th inst., Prof. W. H. Flower, F.R.S., gave an address on the teeth of the Mammalia, especially referring to those specimens exhibited in the case in the Index Museum. Details of the structure, growth, and disposition of the teeth in the jaw were given, and the peculiarities of vestigial and rudimentary teeth pointed out. Prof. Flower referred to the value of these index museums, calling special attention to that of mineralogy, arranged by Mr. Lazarus Fletcher, and which for greater convenience was placed in the mineral gallery.

THIS evening, Prof. A. W. Williamson will deliver an address, in the Chemical Theatre, to the London University College Chemical and Physical Society. He has chosen as his subject, "Atomic Motion." Sir Henry Roscoe will take the chair.

"MY Microscope, and Some Objects from My Cabinet," a simple introduction to the study of "the infinitely little," by a Quekett Club man, is announced for immediate publication by Messrs. Roper and Drowley. The little volume is dedicated to the President and Members of the Quekett Microscopical Club.

MESSRS. WHITTAKER AND CO. will publish early next week Mr. E. C. Robin's book on "The Design and Construction of Applied Science and Art Buildings, and their Suitable Fittings and Sanitation."

THE Thuringian Fisheries Union held their tenth meeting at Jena on May 26. One of the members stated that 64,000 young salmon had been placed in the Saale last year. The Grand Duke of Saxe-Weimar was present at the meeting, and took part in the debates.

DR. MORITZ WAGNER, Professor at the Munich University, died at Munich on May 31. He was well known as a scientific traveller, and author of some excellent works of travel.

DURING the five months ended May 1887 the total value of the fish landed on the east coast of Scotland was £335,366; on the west coast, £75,290; in Orkney and Shetland, £34,516; the total value for five months being £445,172. As compared with the corresponding period of last year, this was a decrease of £4,113. The last month, however, showed an increase of £6,478 over the corresponding month of the year 1886.

ARTIFICIAL clouds for the protection of vines from frost were produced in a vineyard at Pagny on the Franco-German frontier during the night of May 13. About 3 a.m., when the thermometer had gone down to −1°·5 C., the signal was given to ignite liquid tar, which had been poured into tin boxes, and pieces of solid tar which had been placed in the ground near the vines. Large clouds of smoke quickly enveloped the vineyard. The fires lasted for about two hours, but the smoke did not clear off till a considerable time after. The object of the experiment was completely gained, as not one young shoot was destroyed by the frost.

THE American Institute of Electrical Engineers, organized three years ago, is making arrangements for the purchase of a suitable building in New York. It is proposed that there shall be an electrical library and museum, and, if space permits, an experimental laboratory. Suitable accommodation will be provided for council and general meetings, and the entertainment of members and their guests, and the house will be open "at all reasonable hours."

THE additions to the Zoological Society's Gardens during the past week include a Squirrel Monkey (*Chrysothrix sciurea*) from Guiana, presented by Miss Grace Williams; a Negro Tamarin (*Midas ursulus*) from Guiana, presented by Miss Julia Neilson; a Rhesus Monkey (*Macacus rhesus*) from India, presented by Miss R. M. Hurt; a Common Marmoset (*Hapale jacchus*) from South-East Brazil, presented by Mrs. Constance Hoendorff; a Common Raccoon (*Procyon lotor*) from North America, presented by Mr. G. F. Van Zandt; two Lanner Falcons (*Falco lanarius*), European, presented by Mr. William Thomson; two Scaly Ground Doves (*Scardafella squamosa*) from Brazil, presented by Mr. William de Castro; a Cockateel (*Calopsitta novæ-hollandiæ*) from Australia, presented by Mr. H. H. James; a Ring-necked Parrakeet (*Palæornis torquatus*) from India, presented by Mrs. Hill; a Yellow-billed Sheathbill (*Chionis alba*) from Cape Town, presented by Mr. R. C. Ashton; nine Barbary Turtle Doves (*Turtur risorius*) from Africa, presented by Mr. E. L. Armbrecht; a Red Brocket (*Cariacus rufus*), a Great American Egret (*Ardea egretta*) from Brazil, deposited; three Sandwich Island Geese (*Bernicla sandvicensis*) from the Sandwich Islands, a Wryneck (*Inyx torquilla*), European, purchased; a Wapiti Deer (*Cervus canadensis*), a Barbary Wild Sheep (*Ovis tragelaphus*), a Variegated Sheldrake (*Tadorna variegata*), nine Summer Ducks (*Æx sponsa*) bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

THE GREAT SOUTHERN COMET (1887 *a*).—Dr. J. M. Thome, of the Cordoba Observatory, has published in the *Astronomical Journal*, No. 156, some interesting particulars as to the appearance and observed positions of the great comet which he discovered on January 18. On the 21st it became evident that the comet was, in effect, all tail, the head being much the fainter part of the object, and being at least 15′ in diameter, very thin, and without nucleus or condensation of any kind. After various attempts at determining its co-ordinates, Dr. Thome adopted the plan of moving the telescope along the axis of the tail, until reaching a point beyond which nothing of a nebulous character could be distinguished, and determining its position. These points were approximately half a degree in advance of the true centre of the nebulosity, and nearly in its axis. The observations of position extend from January 21 to January 27. With regard to the appearance of the comet to the naked eye, Dr. Thome remarks that it was a beautiful sight—a narrow, straight, sharply-defined, graceful tail, over 40° long, shining with a soft starry light against the dark sky, beginning apparently without a head, and gradually widening and fading as it extended upwards.

The same number of the *Astronomical Journal* contains a discussion of the orbit of the comet by Mr. S. C. Chandler, Jun. The observations extend from January 20 to 29, and were made at Melbourne, Cordoba, the Cape, and Windsor, N.S.W. Two sets of elements—which do not materially differ, considering the extreme uncertainty of the observations—have been obtained; the first by taking the Cordoba observations as they stand, the second by attempting to determine the true centre of the nebulosity from Dr. Thome's statement that the recorded positions are 30′ in advance of the true centre and nearly in its axis. The elements are :—

		I.		II.
T (G.M.T.)		1887 Jan. 9·080		Jan. 8·730
ω	...	173° 36′·2	...	174° 48′·6
☊	...	130 46·2	...	132 48·6
i	...	61 48·9	...	57 52·1
log *q*	...	8·30484	...	8·36280

Mr. Chandler points out that these elements are very unlike those of comet 1880 I., with which this comet was at first associated. In fact the orbit found resembles more those assigned to the comets of 1680 and 1689, than that of the group 1843–80–82.

NEW MINOR PLANETS.—A new minor planet, No. 267, was discovered by M. Charlois at Nice on May 27. Another, No. 268, was discovered by M. Borelly at Marseilles on June 9.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1887 *JUNE* 19–25.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on June 19.

Sun rises, 3h. 44m.; souths, 12h. 0m. 58·8s.; sets, 20h. 17m.; decl. on meridian, 23° 26′ N.: Sidereal Time at Sunset, 14h. 8m.

Moon (New on June 21) rises, 2h. 48m.; souths, 10h. 20m.; sets, 18h. 1m.; decl. on meridian, 15° 57′ N.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Decl. on meridian. ° ′
Mercury ...	5 21	13 39	21 57	23 39 N.
Venus ...	7 21	15 9	22 57	19 11 N.
Mars ...	2 50	11 2	19 14	22 50 N.
Jupiter ...	14 28	19 47	1 6*	8 50 S.
Saturn ...	5 43	13 47	21 51	21 41 N.

* Indicates that the setting is that of the following morning.

June.	h.	
21	18	Sun at greatest declination north; longest day in northern latitudes.
23	5	Saturn in conjunction with and 2° 26′ north of the Moon.
23	10	Mercury in conjunction with and 3° 27′ north of the Moon.
23	19	Jupiter stationary.
25	0	Venus in conjunction with and 2° 1′ north of the Moon.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.
U Cephei ...	0 52·3	81 16 N.	June 23,	0 14 *m*
R Virginis ...	12 32·8	7 37 N.	,, 21,	*M*
δ Libræ ...	14 54·9	8 4 S.	,, 25,	1 0 *m*
U Ophiuchi ...	17 10·8	1 20 N.	,, 20,	1 46 *m*
			and at intervals of	20 8
W Sagittarii	17 57·8	29 35 S.	June 25,	2 0 *m*
U Sagittarii ...	18 25·2	19 12 S.	,, 25,	1 0 *m*
η Aquilæ ...	19 46·7	0 43 N.	,, 20,	1 0 *M*
S Sagittæ ...	19 50·9	16 20 N.	,, 24,	23 0 *m*
R Capricorni	20 5·0	14 36 S.	,, 23,	*M*
δ Cephei ...	22 25·0	57 50 N.	,, 21,	23 0 *m*

M signifies maximum; *m* minimum.

Meteor-Showers.

	R.A.	Decl.
Near β Ursæ Majoris ...	168	55° N.
α Cephei ...	315	60 N.

GEOGRAPHICAL NOTES.

EMIN PASHA contributes to the Scottish Geographical Society's Journal an account of an exploration he made recently of part of Lake Albert Nyanza, which contains some data bearing on the probable origin and the physical geography of the lake. Off the station of Mabagi, on the north-west shore of the lake, Dr. Junker found a long, low, sandy island, which he recognized as of quite recent formation; for in 1879 he noticed that the spot where it now lies was covered with shallow water. Its length is 1067 yards, and maximum breadth 99 yards. Tall grass and weeds grow at the water's edge, and a species of acacia (*A. mellifera*) on the higher parts. The island, Emin Pasha states, is due to the deposition of the detritus brought down by the two rivers which enter from the south-west. From what he observed on the lake, he is inclined to believe that the foreshore on the west is gradually encroaching on its waters; in other words, the lake in this part is gradually filling up. As for the lake itself, Emin Pasha attributes its origin solely to erosion. He thinks it more than probable that formerly a large stream may have made its way from between the two ranges to east and west of the lake, so that its erosive action, combined with that of inundations, heavy rains, caving-in, and the influence of the sun and weather, are quite sufficient to account for the result. The geological formation of both ranges is the same; their altitudes differ but little, and the terrace-like formation of their descent lakewards is in each case exactly alike. Emin Pasha hoped to examine the problem much more minutely. He landed at Kibiro, on the opposite side cf the lake, and gives an interesting description of the valuable salt-mines of the region. Emin Pasha afterwards made two other journeys on the lake, during one of which he discovered what he believes to be a new river, called Kakibbi by the Wasongora, and Duèru by the Wamboga. It flows from the Ussongora Mountains, and is of considerable size, and enters the lake at the south, having a large island near its *embouchure*. It abounds with cataracts, and is therefore unnavigable. To the south-west, Emin Pasha was informed, there is a large river on the banks of which there is a colony of Akkas—called Balia by the Wanyoro people, but by themselves Betua; the latter a name suggesting the Batua recently discovered by Lieut. Wolf on the Sankuru, to the south of the Congo. Is it not possible that the Kakibbi is the same as the "red river" discovered by Mason Bey in 1877, entering the south extremity of Lake Albert?

IN the *Bulletin* of the Lyons Anthropological Society will be found an interesting paper by M. Bertholon on the "Arab Colonization of France," in which the author, mainly on the basis of place-names, seeks to identify the existing effects of the Saracenic invasion of France. Dr. Collomb has also a useful paper on the peoples of the Upper Niger, their manners and their history.

M. ÉDOUARD DUPONT, Director of the Brussels Natural History Museum, is about to leave for the Congo, to make a geological investigation of the region along the south bank of the river, between Boma and Stanley Pool. He will endeavour especially to determine the epoch when the river broke through the coast range, and the age of these mountains. He will also explore any caves which may exist, in order to discover if there are any remains of a primitive population.

THE new number of Petermann's *Mitteilungen* is one of special scientific interest. The first paper gives the results of a series of researches by Japanese botanists on the botanical zones of Japan, in which the relation of these zones is shown to the configuration of the surface of the country. A much longer and perhaps more important paper in the same department is Herr Ernst Hartert's account of the botanical results of the expedition to the Niger under the late Herr Flegel; it abounds with detailed information on the plants collected by the expedition. Dr. Alex. Supan, the able editor of the *Mitteilungen*, who takes a special interest in meteorology, contributes a carefully elaborated paper on the mean duration of the chief heat periods in Europe. Then we have a series of extracts from Emin Pasha's letters, from 1883 down to 1886, much of which has already been published.

THE NEPHRIDIA OF "LANICE CONCHILEGA," MALMGREN.[1]

SEVERAL accounts of the nephridia of *Terebella conchilega* have been given. H. Milne-Edwards (*Ann. d. Sci. Nat.* (2) *Zoologie*, x., 1838, p. 220), in a paper published in 1838, on the circulation in Annelids, describes the vascular system in a species to which he gives this name, and gives a figure of the animal opened along the dorsal median line. In this figure four looped nephridia are distinctly shown, situated behind the branchial region. The representation of the position and character of these organs is perfectly correct so far as it goes: they are the upper parts of the four nephridia belonging to somites 6–9. But the paper I refer to does not describe the nephridia, as it deals with another subject: they are shown in the figure, and that is all; and in the description of the figure the organs are referred to as organs of generation.

[1] A Paper read before the Royal Society of Edinburgh by Mr. J. T. Cunningham, on Monday, May 16.

Keferstein (*Zeitschrift für wiss. Zoologie*, Bd. xii., 1862) mentions that the structure and number of the nephridia in *T. conchilega* are the same as in *T. gelatinosa*, Kef.: in both cases he says there are six pairs, each organ consisting of a tube bent on itself, of which one half is darker, the other lighter: the organs belong to segments 3–9.

Cosmovici[1] gives an erroneous description of the organs: he says there are two pairs without internal openings, which he calls "organs of Bojanus," one of these situated in front of the cephalic diaphragm, the other immediately behind it, each organ having an external opening; and two other pairs, each of which has an internal as well as external opening, and is shaped like an urn: the internal opening is large, and surrounded with a circular lip. The gonad is attached to the posterior part of each of these latter organs, which Cosmovici calls segmental organs, and which he says serve as efferent excretory ducts.

The species referred to by these three authors is the *Nereis conchilega* of Pallas, *Terebella conchilega* of Gmelin; and this is called *Lanice conchilega* by Malmgren. My specimens were identified from Malmgren's description, and there is no doubt of the identity of my specimens with the species of that author; but there is room for some uncertainty regarding the specific identity of the specimens referred to by the authors I have mentioned. For instance, Cosmovici identified his species by means of Quatrefages' "Histoire des Annelés," 1865, and there it is stated that the tube of *Terebella conchilega* possesses no hollow fringes at its mouth: these fringes are always present in the tube of *Lanice conchilega*, Malmgren. This species is distinguished by some marked characters: two of them are the presence of a large vertical lobe on the 3rd somite (second branchiferous) and the coalescence of the ventral scutes usually present into a continuous ventral plate.

The true relations of the excretory system are as follow:—Enumerating the somites from before backwards, and counting the buccal as the 1st, we find that the branchiæ belong to somites 2, 3, and 4: the first notopodial fascicle of capillary setæ is on the 4th somite, the third branchiferous; the first neuropodial uncinigerous torus is on the 5th: the neuropodial tori are repeated on every succeeding somite to the end of the body; the notopodial fascicles occur only on seventeen consecutive somites. There are traces of transverse septa behind the 1st, 2nd, 3rd, and 4th somites, but none in the rest of the thoracic region, which bears the notopodial fascicles. On dissection, four long double nephridial tubes are seen projecting dorsalwards with the body-cavity; the lower parts of these tubes are covered by strands of the oblique muscles which pass from the nerve cord to the neighbourhood of the notopodial bristles: careful examination shows that these tubes belong to somites 6, 7, 8, and 9. Their internal openings can be found immediately behind the fascicle of bristles belonging to somites 5, 6, 7, and 8 respectively, but their efferent tubes are seen to pass down beneath the fascicles of somites 6, 7, 8, and 9. The lower parts of these efferent tubes are very wide, and it is impossible to separate them from one another. Beneath the fascicles of the following four somites (10–13 inclusive) are seen membranous nephridial sacs, which externally at least are inseparable from one another. These sacs are simple, that is, they are not composed of a tube bent on itself like the anterior nephridia: they scarcely extend above the level of the oblique muscles, and no internal opening or nephrostome can be found in them. In front of the most anterior nephridium, that belonging to somite 6, are seen traces of a rudimentary nephridium. In order to trace out the relations of these nephridia more accurately, the anterior part of a specimen was cut into a series of horizontal longitudinal sections, commencing with the ventral surface, and the reason why the successive nephridia could not be isolated from one another was seen on examination of these sections: the lower parts of the efferent limbs of the four anterior normal nephridia, in somites 6–9, and the whole of the nephridial sacs in somites

[1] "Glandes génitales et Organes segmentaires des Annélides polychètes" (*Arch. de Zool. Exp.*, t. viii., 1879–80).

10–13, are in open communication, forming a wide continuous longitudinal tube extending from somite 6 to somite 13. Openings to the exterior from this tube were found in somites 6–9 inclusive, corresponding to the four large looped nephridia: each of these openings was close behind the upper end of an uncinigerous torus. The internal openings of the same four nephridia could be traced with ease and certainty: they are attached to the body-wall close behind the notopodial fascicles of somites 5–8. These openings are wide, and are overhung dorsally by a longitudinal lip furnished with a series of small ciliated digitate processes: lower down, the anterior and posterior lips of the opening are simple, thick-walled, and ciliated. The aperture leads into a thin tube, which passes inwards and backwards, curving round the inner end of the fascicle of bristles behind the aperture, and then, crossing the continuous tube, passes up on the inner or medial side of the loop, at the apex of which it is continued into the efferent wider limb of the loop, which passes down on the outer side to open into the longitudinal tube. Neither internal nor external openings could be found in that part of the longitudinal tube which is behind the loops: it seems evident that this part of the tube represents four somewhat reduced nephridia which have coalesced, but whose openings have disappeared. Anteriorly to the four looped nephridia are traces of three others: the longitudinal tube extends forwards into somite 5 as if it included a nephridium belonging to that somite, but I could find no external opening in this somite: at the angle between the septum behind somite 4 and the body-wall is a very obvious nephrostome, which ought to lead into the longitudinal tube, into that part of it corresponding to somite 5, but the connexion could not be traced. Nephrostomes were also present attached to the anterior face of the septa behind somites 2 and 3 (the first and second branchiferous), and leading into tubes seen in somites 3 and 4, but I could find no external openings in these somites. I could find no nephrostome in somite 1 (the buccal) nor any trace of a tube in somite 2. Gonads are present in the form of clumps of deeply-staining small indifferent cells attached to the exterior of all the nephrostomata mentioned, seven in all. The germinal cells, when still quite undifferentiated, separate from the gonads, and undergo further development in the cœlome. But I found no reproductive elements in the cavity of the nephridial system, though the body-cavity contained them in quantity, and it is probable that at the right season they are expelled through the nephridial system. The body-cavity contains, besides the reproductive elements, a large number of spherical, vacuolated, nucleated cells. This is the first case in which a communication between successive nephridia has ever been discovered in any adult invertebrate. It is true that in the development of Polygordius, according to Hatschek, each nephridium gives off backwards a prolongation of itself, from which the next nephridium is formed, and the two remain in communication for a time; but the connexion is soon severed, and in the adult the successive nephridia are isolated and independent. In *Lanice conchilega* the nephridia have coalesced together after coming in contact from before backwards, the separating membranes having disappeared. The case is extremely interesting in the fact that we have in it an approximation to the condition of the excretory system in Vertebrata: the presence of a metameric series of nephrostomata in vertebrate embryos has long ago been seen to constitute a resemblance between them and Chætopoda, but hitherto no Chætopod was known which resembled the vertebrate in having a number of nephridia coalesced to form a continuous longitudinal tube.

It is surprising to find that, as far as I have been able to discover, no resemblance to the condition seen in *Lanice conchilega* occurs in any of its near allies. The only species of the genus Terebella as defined by Malmgren that occurs in the Firth of Forth is *Terebella Danielsseni*, but of this I have only one specimen, and have not examined its nephridia. Of Amphitrite there are two species in the Forth: *Amphitrite cirrata* I have not examined anatomically; in *Amphitrite Johnstoni* there are a large number (15–17) of nephridia forming long loops projecting dorsalwards into the body-cavity, in the anterior region: each has its own internal and external openings, and is isolated and independent. In *Terebellides Strœmii* there is one pair of large dark-coloured nephridia in the anterior end, and three pairs of small rudimentary ones posterior to this. In *Pectinaria belgica* there are three pairs: they are all independent. In *Melinna cristata* there are several pairs, all separate. Figures showing the interesting relations which exist in *Lanice conchilega*, together with a more complete description of the nephridia in other forms of Polychæta, will I hope shortly be published in a paper on the anatomy of Polychæta.

NOTES ON THE GEOLOGY OF PART OF THE EASTERN COAST OF CHINA AND THE ADJACENT ISLANDS.

SURGEON P. W. BASSETT-SMITH, R.N., has forwarded to the Hydrographical Department of the Admiralty a brief Report on this area, embodying the results of ob ervations made in the course of last summer during the cruise of H.M.S. *Rambler*. Specimens of rocks were collected at certain points on the mainland and on the neighbouring islands, stretching from Chusan on the north to Ockseu Island, south of Hai-tan Strait, opposite the northern part of Formosa.

All the islands, with a single exception, appear to consist of crystalline rocks. They usually present sharp rugged outlines, with bold cliffs—more or less fissured and veined—rising, in many cases, vertically from moderately deep water. In the following notes, the stations from which the specimens were collected are described in succession from north southwards.

Tou-wah Island, the most northerly station, consists of an irregular range of hills trending in a north-west and south-east direction, and reaching an elevation of 1600 feet. A gray granitic rock was obtained from the summit. Thornton Peak, on the mainland in the province of Chi-kiang, separated from the Chusan group by a narrow sea, is composed of a pink granite. From Ta-fou Island, in San-moon Bay, a fine-grained purplish quartz-felsite was obtained. The group of Hae-shan Isles seems to be composed of a dark gray quartz-felsite, and a similar rock forms the Tai-chow Islands.

Another group of stations visited by the *Rambler* lies off the coast of the province of Fu-kien. Fuh-yan Island consists of hills reaching a height of 1700 feet, and yielding a fine-grained greenish rock, apparently a diabase. Coney Island is composed for the most part of a coarse pinkish granite, with veins of quartz, and dykes which appear to consist of diabase and hornblende-porphyrite. The two islands known as Tung Yung are formed mainly of quartz-felsite; the specimens obtained from the larger of the two isles containing much opaque white feldspar, porphyritically distributed through the rock. In a cove at the south-west end of the latter island, the rocks split up into irregular columns, and in certain parts these columns exhibit considerable curvature.

The third group of stations is situated on the River Min, and in the neighbourhood of its mouth. Chang-chi is a large irregular-shaped island of red porphyrite. The island known as Matsou is particularly interesting, the principal rock being a white quartz-felsite, with a complicated network of basaltic dykes. In a small sandy bay, a deep water-course exposes a layer of dark earth, about a foot in thickness, crowded with land shells. Two small neighbouring islands known as White Dog consist of dark gray quartz-felsite.

On the north side of the mouth of the River Min is an island, termed Sharp Peak, about three miles in length, which culminates in a rocky peak 1500 feet high. The island is formed, for the most part, of a hard conglomerate, associated with slates and shales, and with a talcose schist penetrated by veins of quartz. A cliff at the north-east point of the island displayed a clear section, in which this schist was seen to alternate with beds of slate and conglomerate, inclined at about 45°.

A small low island off the south point at the entrance to the River Min, consists of granite, gneiss, and mica-schist. A specimen of red granite, with crystals of iron pyrites, was obtained from the rugged mountains of the neighbouring mainland. Temple Point, on the north side of the Min, a few miles from its mouth, yielded a greenish-yellow steatitic rock, with dendritic markings. At Pagoda Anchorage, up the river, a fine-grained pink gneiss was obtained, and this locality also yielded a fragment of a large crystal of smoky quartz. About twelve miles further up the Yuen Fu branch of the Min River are some hot springs having a maximum temperature, in November, of 114° F. The rock is here a quartz-felsite. An orthoclase porphyry occurs about five miles further up the river, and quartz-felsite again occurred ten miles higher. Here, in a curious recess in the hill-side, in which a temple has been built, are numerous stalactites, some of large size. The mountains all up the Yuen Fu are very fine, presenting a succession of bold outlines and rocky peaks. A dark-gray quartz-felsite was obtained from a high peak in a range of hills bounding the water-shed of the Min on the south. From the base of the hills a stretch of low flat reclaimed land extends to the coast. The soil of the hills is of a bright red colour, contrasting with the dark tints of the felsitic rocks.

The fourth group of stations includes a number of localities around Hai-tan Strait. Here the hills present vivid colouring, which contrasts very markedly with the white sands of the shore, especially on Hai-tan Island itself. This consists of three ranges of hills, with intermediate barren plains. Near the north point is a group of reddish sand-cliffs, from 20 to 30 feet high, horizontally stratified, and presenting flat summits, which form a miniature plateau deeply trenched by numerous gullies. At the mouth of the strait is a small barren island—Tessara Island—composed of gneissose rocks, which carry iron pyrites. Slut Island, about 400 feet high, yielded a dark porphyritic felsite, and a weathered surface of the rock displayed evidence of fluxion structure. Syang Point, at Hai-tan, shows granitic rocks running up into high hills. Kiang-shan, on Hai-tan Island, is a hill 1800 feet high, composed of dark-gray quartz-felsite. Mount Bernie, on the mainland, at the south end of the strait, about 1400 feet in height, is composed of a similar rock, weathering to a reddish earth; and in Hungwah Sound the hills are of similar character. In Ockseu, a small rocky island, about twenty miles south of Hai-tan, is a dark-coloured rock, apparently dioritic, and certain masses of this rock when struck, emit a ringing sound, like that of a phonolite. There are here numerous veins of quartz, some showing rather bold crystals, and a good deal of schorl, or black tourmaline. It is notable that the island of Ockseu is especially subject to seismic disturbances.

THE METEOROLOGY OF INDIA[1]

IT is perhaps inseparable from the mode of issue of the "Indian Meteorological Memoirs" that their titles (*e.g.* Vol. III., Part I., I.—Rainfall, Part I.) are rather complex. It is stated that this memoir is to be in three parts, whereof the present part treats only of the normal rainfall of India; Part II. is to treat of its variations in past years; Part III. is to contain the tabular data: the whole to form Vol. III. of the series.

As India depends chiefly on agriculture, the investigation of the conditions affecting its rainfall is of the highest practical importance to it. The registers of rainfall available are, except a few private ones, all official work done under Government orders. Some few extend from 1844, but the most of those accepted as trustworthy, after a critical examination, date from about 1862; the discussion includes the data only down to 1883, *i.e.* covers pretty nearly a complete record for twenty-two years. Altogether, the registers of 424 stations are reviewed: for purposes of discussion these are grouped into twenty-five "rainfall districts," *i.e.* districts with similar rainfall.

From all these it appears that the average rainfall of the whole of India, excluding Burmah and the Himálya, is about 42 inches. The range of rainfall over this wide area is one of the most wonderful in the world, viz. from about 500 or 600 inches in Cherra Púnji to from 1 to 5 inches in Sindh. The average annual range over the whole of India (as above) is about 13 in the whole 42 inches. The rainfall is discussed under four heads:—

(1) Summer Monsoons. (2) Autumn Rains in South-East.
(3) Winter Rains. (4) Spring Storms.

The local distribution of 1, 3, and 4 is well shown by tints of various shades on three maps. For the connection with the state of air-pressure, twelve maps are given, showing the isobars for the mean pressure of each month; the discussion of this connection is complicated, and difficult to summarise.

(1) *Summer (South-West) Monsoon.*—By some, the south-west monsoon is considered to be an extension of the south-east trade-winds, but the author considers their connection to be very doubtful, and gives a rough calculation, showing that the evaporation from the Northern Indian Ocean, land of India, and Bay of Bengal is enough to account for the whole of this season's rain. This rainfall is far the heaviest of the four seasons, and the most important for agriculture for most part of India, being, in fact, popularly styled "the rains." On its sufficiency depend the lives of millions. The distribution is at once seen by the tinted map. The west coasts of India and Arakhan catch the first and heaviest fall of over 100 inches: this does not top the coast range of mountains. The next heaviest is from the head of the Bay of Bengal to the Himálya, thence all along the lower Himálya, of from 50 to 70 inches. The amount decreases thence steadily with distance from the head of the Bay of Bengal, and from the Himálya, dwindling to almost nothing on the south-east coast and north-west border.

The effect of a mountain-range in intercepting rain is clearly brought out, *e.g.* in the Western Ghâts this rainfall, coming from the south-west, decreases from 250 inches on the coast to 40 inches at 30 miles inland, and to 20 inches at 60 miles from the coast. Again, very little rain crosses the outer snowy range of the Himálya. In fact, it seems to be an established law that the precipitation of rain from damp air is greatest in an ascending current from the chill produced in the ascent, and only moderate in a horizontal current.

(2) *Autumn Rains in South-East.*—The author shows that these are not (as often stated) a part of the north-east monsoon, but are, in fact, a late part of the south-west monsoon, corresponding to the late and heaviest part of the same on the Arakhan coast.

(3) *Winter Rains.*—These are popularly styled the north-east monsoon, and are popularly said to be due to a reversal of the conditions of the south-west monsoon. Their distribution is, roughly speaking, the opposite of that of the south-west monsoon, and is well shown on the map given. The south-east coasts, which scarcely feel the south-west monsoon, catch the maximum of over 10 inches of this season, the North-West Himálya catch from 5 to 10 inches, the head of the Bay of Bengal from 3 to 5 inches, and the rest of the country less and less with increased distance from these places.

Small as these quantities are (compared to those of the south-west monsoon), they are of the greatest importance to some of the localities named, especially to North-West India, as on them depends the growth of the valuable crops of temperate climates, *e.g.* wheat, the staple of North-West India; indeed, in the extreme north-west the winter is the dampest season.

(4) *Spring Storms.*—This rainfall is distinguished by increasing with the advance of the season, *i.e.* with the rising temperature, and mainly restricted to the south and east provinces. It is often accompanied by hail and thunderstorms, and is common in the evenings. This rain is usually very local, of short duration, heavy, and frequently repeated.

Altogether, this is a most elaborate and valuable monograph on its subject—the normal rainfall of India.

Part I. of Vol. IV. of "Indian Meteorological Memoirs" contains three memoirs, each a short monograph on its own subject, by different authors: these will be dealt with separately.

I.—"Account of the South-West Monsoon Storm of May 12–17 in the Bay of Bengal and at Akyab," by J. Eliot (pp. 38, and 2 plates). The history of this storm has been worked out from the meteorological reports of fourteen coast stations, and the logs of fourteen vessels passing through the Bay of Bengal. The states of the barometer and wind are shown for four days on four charts, and the track of the storm-centre on another. The meteorological conditions seem to have been remarkably uniform over the Bay of Bengal for a fortnight preceding the storm; indeed, this seems to be the normal state of things before a cyclone. The south-east trade-winds seem to have extended north of the equator on May 10 and 11, and gradually advanced into the Bay of Bengal, as strong south and south-west squalls, with rain, increasing in violence within the Bay. In front of these, a barometric depression was formed about the 12th, round which, as a vortex, the wind became cyclonic. This cyclone advanced in a curved path north and east (whereas most cyclones advance north and west up the Bay), increasing from 6 miles per hour on the 15th to 15 miles per hour on the 17th, and broke up on the Arakhan Hills close over Akyab on the 17th, doing great damage to property.

II.—"On the Diurnal Variation of the Rainfall at Calcutta," by H. F. Blanford, F.R.S. (pp. 8, and 1 plate). This is a

[1] "Indian Meteorological Memoirs," Vol. III., Part I. I.—The Rainfall of India, Part I. Pp. 116, and 9 Plates. A Monograph by H. F. Blanford, F.R.S. (Calcutta: Government Printing Press, 1886.)
"Indian Meteorological Memoirs," Vol. IV., Part I. Pp. 57, and 4 Plates. Edited by H. F. Blanford, F.R.S. (Calcutta: Government Printing Press, 1886.)
"Report on the Meteorology of India in 1884," by H. F. Blanford, F.R.S. Pp. 305 and 3 Plates. (Calcutta: Government Printing Press, 1886.)

discussion of the hourly frequency and quantity of rain in a period of seven years (1878–84), derived from a self-registering Casella's hyetograph. The results do not seem of much practical importance. In the rainy season the rain is least frequent at the hour of maximum pressure, and most frequent at the coldest hour. At other seasons, dust-storms, with rain, are commonest in the evening. The greatest and least rainfall occur in general at the hours of greatest and least frequency.

III.—"The Meteorological Features of the Southern Part of the Bay of Bengal," by W. L. Dallas (pp. 11, and 1 plate). This is a discussion of the meteorology of a square district of 4° by 4° of the Indian Ocean, about half way between Ceylon and Sumatra, derived from the logs of ships. The air-pressure is at a maximum in January and at a minimum in May, with slight minima in July and October, which seem related to the occurrence of cyclones. The diurnal variation is extremely regular, the minima falling about 3h. 30m. and 15h 40m., and the maxima about 9h. and 22h. The range is markedly largest in April and September, *i.e.* at the two great seasonal changes. The mean temperature is 80°·9, and the range of the mean monthly temperature is only 3°, which is smaller than at any coast station: the diurnal range of the year is about 2°·7, varying from 3°·75 in April to 1°·8 in May, the maximum and minimum being thus close together. In the summer (south-west) monsoon calms are rare. From April to September the wind is pretty steady from south-west to west-south-west, and, from December to March, generally from north to north-east. Only thirteen gales are recorded in twenty-five years, and none of them over force 9 of the Beaufort scale.

Mr. Blanford's "Report" for 1884 is a discussion of the meteorology of India in 1884, on the same general plan as adopted for the ten years preceding. The discussion rests on observations supplied from 134 reporting-stations. Each meteorological element is discussed separately, beginning with the solar radiation as being the prime cause of all meteorological change; next, earth-radiation, temperature, humidity, cloudiness; and, lastly, rainfall. The great extent of India, and its isolation by ocean and mountain from other countries, render it a country most favourable for meteorological study. One singular feature is, that most considerable variations are of a somewhat lasting character, sometimes lasting two seasons, *e.g.* heavy snow in the spring in the Himálya is followed by steady north-west winds over the plains of Northern India, afterwards turning into the hot west winds.

The year under review was in some ways peculiar. Perhaps the most striking feature brought out is that, ever since 1878, the temperature of insolation and of the air have both steadily fallen, and were lowest in 1884 (1°·2 less than in 1878), although the sky was slightly less cloudy than in 1883: it seems likely that this is part of a cyclic change connected with that of the sunspots, the temperature being highest at the sunspot minimum, and *vice versâ*. The mean air-pressure was slightly (0"·01) above that of past years, and also much steadier. The average humidity was rather lower, and the average clearness of sky somewhat greater than in the recent years, and yet the total rainfall was somewhat greater: this was chiefly due to excess of rain in North-West, Central, and South-East India. Heavy snow fell in the North-West Himálya early in the year, bringing rain to the North-West Punjab, and dry north-west winds in North India generally, followed by a hotter summer than usual. The south-west monsoon bringing the rain sets in in North India in June. The storms of the year were somewhat singular. From July to September a series of cyclones formed in the Bay of Bengal, and followed a north and west course far into the plains of India: this course seems to be the usual cyclone track of the Bay of Bengal. One of these, in July, crossed the entire breadth of India, and one, in September, lasted over a fortnight. Heavy snow fell in the outer Himálya in September and October, followed by north-west winds in North India, and by an unusually cool winter in India generally. Twelve charts accompany this Report, showing the mean monthly temperature, air-pressure, and wind; the isotherms, isobars, and wind-resultants being plotted in colours on each monthly chart. This annual Report, of which a very brief summary only is here given, is the outcome of an enormous amount of labour: the detailed tables of data covering 305 quarto pages, these tables being themselves mostly the result of laborious computation from the data furnished by the observatories.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The Mathematical Examiners have bracketed as Senior Wranglers Messrs. Baker and Flux of St. John's, and Iles and Michell of Trinity. It is unprecedented to have a bracketed Senior Wrangler. No women students have this year been placed as Wranglers.

The following women students have been placed in the first class of the Natural Sciences Tripos, Part I., E. E. Field, A. J. Flavell, and M. M. Smith, all of Newnham College.

The Honorary Degree of Doctor in Science has been conferred on Prof. Asa Gray, of Harvard.

SCIENTIFIC SERIALS.

Annalen der Physik und Chemie, No. 6, June.—R. Emden, on the vapour-pressures of saline solutions. Criticism of prior results, and fresh experiments conducted according to the method of Konowalow. Babo's law, that the vapour-tension of saline solutions is always proportional to that of pure water at the same temperature, is shown to be true between 20° C. and 95° C.—Max Planck, on the principle of increase of entropy. Application of this principle in the study of dissociation of gases.—C. R. Schulze, on the amount of water of crystallization held in various salts. Proves the existence of a new form of sulphate of magnesia having density 1·8981, containing six molecules of water, and therefore differing from Mitscherlich's salt of same composition of density 1·6151.—W. Voigt, on the theory of light for absorbing isotropic media. A development of the theory propounded by the author three years ago.—C. L. Weber, on the galvanic conductivity of amalgams. The amalgams examined were of tin, bismuth, lead, cadmium. Addition of tin increases conductivity of mercury; bismuth increases it until 10 per cent. of bismuth has been added, after which further addition decreases the conductivity; lead shows a maximum at about 25 per cent.; cadmium produces a steady increase in conductivity.—Adolf Koepsel, determination of magnetic moments and absolute strength of currents by means of the balance. The method is due to R. von Helmholtz, and is independent of the earth's magnetic field or its variations. The author has made by this method a new determination of the electro-chemical equivalent of silver, which he gives as 0·011740 ± 0·0000022 in C.G.S. measure. Lord Rayleigh's value was 0·011794.—Walter König, magnetic researches on crystals. A very careful research on magnetic susceptibility of quartz and calc-spar in magnetic fields of various degrees of intensity. The two principal permeabilities in calc-spar possess a constant difference in fields of various strengths up to 3000 C.G.S.; for quartz, the difference diminishes as the field is strengthened, and is less than that of calc-spar.—R. Clausius, reply to some remarks of Lorberg upon dynamo-electric machines.—A. Foeppl, electricity as an elastic fluid. A speculative paper: the author thinks the existence of the Hall effect a criterion of his theory.—K. Wesondonck, on the absence of polar difference in spark-potential.—G. Meyer, note on the index of refraction of ice; the value for sodium light is 1·3133.—E. Ketteler, on the dispersion of rock-salt. The author thinks he has established the law that the absorbing power of substances for heat-rays is proportional to the negative coefficient of the term in λ^2 in the formula which he uses in place of Cauchy's for the law of dispersion.—W. Voigt, reply to Wernicke's remarks on elliptic polarization.—F. Braun, on the diminution of the compressibility of solutions of sal-ammoniac with increase in temperature.—A. Overbeck, on the signification of the absolute system of measurement.

SOCIETIES AND ACADEMIES.

LONDON.

Geological Society, May 25.—Prof. J. W. Judd, F.R.S., President, in the chair.—The following communications were read:—On the remains of fishes from the Keuper of Warwick and Nottingham, by Mr. E. T. Newton; with notes on their mode of occurrence by the Rev. P. B. Brodie and Mr. E. Wilson.—Considerations on the date, duration, and conditions of the Glacial period with reference to the antiquity of man, by Prof. Joseph Prestwich. After showing how the discoveries in the valley of the Somme and elsewhere, twenty-eight years ago, led geologists who had previously been disposed to restrict the age of man to exaggerate the period during which the human race had existed, the author proceeded to discuss the views of Dr. Croll on the date of the Glacial epoch. Dr. Croll, who had at first referred this to an earlier phase of orbital eccentricity, commencing 980,000 years ago, subsequently regarded it as coinciding with a minor period of eccentricity that commenced 240,000 and terminated 80,000 years since. This last estimate was chiefly supported by the amount of denudation that had subsequently taken place. The efficacy of the increased eccentricity of the earth's orbit in producing the cold of the Glacial epoch was shown to be very doubtful; for as similar changes in the eccentricity had occurred 165 times in the last 100 millions of years, there must have been many glacial epochs in geological time, several of them much more severe than that of the Pleistocene period. But of such glacial epochs there was no valid evidence. Another inference from Dr. Croll's theories, that each glacial epoch consisted of a succession of alternating cold and warm or interglacial phases, was also questioned, such alternations as had been indicated having probably been due to changes in the distribution of land and water, not to cosmical causes. The time requisite for such interglacial periods as were supported by geological evidence was more probably hundreds than thousands of years. Recent observations in Greenland by Prof. Helland, Mr. V. Steenstrup, and Dr. Rink, had shown that the movement of ice in large quantities was much more rapid, and consequently the denudation produced much greater than was formerly supposed. The average rate of progress in several of the large iceberg-producing glaciers in Greenland had been found to be 36 feet daily. Applying these data and the probable accumulation of ice due to the rainfall and condensation to the determination of the time necessary for the formation of the ice-sheet, the author was disposed to limit the duration of the Glacial epoch to from 15,000 to 20,000 years, including in this estimate the time during which the cold was increasing, or preglacial time, and that during which the cold was diminishing, or postglacial time. Details were then given to show that the estimate of 1 foot on an average being removed from the surface by denudation in 6000 years, on which estimate was founded the hypothesis of 80,000 years having elapsed since the Glacial epoch, was insufficient, as a somewhat heavier rainfall and the disintegrating effects of frost would produce far more rapid denudation. It was incredible that man should have remained physically unchanged throughout so long a period. At the same time, the evidence brought forward by Mr. Tiddeman, Dr. Hicks, and Mr. Skertchly of the occurrence of human relics in preglacial times, had led the author to change his views as to the age of the high-level gravels in the Somme, Seine, Thames, and Avon valleys, and he was now disposed to assign these beds to the early part of the Glacial epoch, when the ice-sheet was advancing. This advance drove the men who then inhabited Western Europe to localities such as those mentioned which were not covered with ice. Man must, however, have occupied the country but a short time before the land was overwhelmed by the ice-sheet. The close of the Glacial epoch, *i.e.* the final melting of the ice-sheet, might have taken place from 8000 to 10,000 years since. Neolithic man made his appearance in Europe 3000 to 4000 years B.C., but may have existed for a long time previously in the east, as in Egypt and Asia Minor civilized communities and large States flourished at an earlier date than 4000 B.C. After the reading of the paper there was a discussion, in which the President, Dr. Evans, Dr. Geikie, Prof. Boyd Dawkins, Dr. Hicks, and others took part. —Notes on some Carboniferous species of *Murchisonia* in our public museums, by Miss Jane Donald. Communicated by Mr. J. G. Goodchild.

Zoological Society, June 7.—Mr. E. W. H. Holdsworth, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of May, and called attention to a Tooth-billed Pigeon (*Didunculus strigirostris*) brought home from the Samoan Islands, and presented to the Society by Mr. Wilfred Powell; to two Red-spotted Lizards (*Eremias rubro-punctata*) obtained at Moses' Well, in the Peninsula of Sinai, and presented to the Society by Mr. G. Wigan; and to a small scarlet Tree-Frog (*Dendrobates typographus*) from Costa Rica, presented to the Society by Mr. C. H. Blomefield.—Mr. Sclater called attention to examples of two North American Foxes now living in the Society's Gardens, which he referred to *Canis velox* and *C. virginianus*.—A communication was read from Mr. A. O. Hume, containing some notes on *Budorcas taxicolor*, the Gnu-goat or Takin of the Mishmee Hills, and some remarks on the question of the form of the horns in the female of this animal.—A communication was read from Mr. E. Symonds, containing notes on various species of Snakes met with in the vicinity of Kroonstadt, Orange Free State, specimens of which had been forwarded to Mr. J. H. Gurney, and determined by Dr. Günther.—Mr. Martin Jacoby, gave an account of a small collection of Coleoptera obtained by Mr. W. L. Sclater in British Guiana.—Prof. G. B. Howes, read a paper on a hitherto unrecognized feature in the larynx of the Anurous Amphibians. This was the existence in many individuals of various species of a rudimentary structure, which appeared to correspond to the epiglottis of Mammals, and which in some instances attained a remarkable development as an organ of voice.

Institution of Civil Engineers, June 7.—Annual General Meeting.—Mr. Woods, President, in the chair.—The Report of the Council on the condition of the Institution, and the annual statement of the accounts, were received. The number of members on the roll of the Institution, on March 31, 1887, was 4347, of whom 20 were honorary members, 1568 members, 2275 associate members, and 484 associates. This was a net increase of 173, or 4·19 per cent., on the 4174 members of all classes recorded last year. The elections had included 34 members, 234 associate members, and 6 associates, while the deaths, resignations, and erasures were 106. Many deaths had occurred among the older members of the Institution during the past twelve months, chief among whom must be placed Sir Joseph Whitworth, whose world-wide renown as a mechanician it was unnecessary to dwell upon. By his will he bequeathed to the Institution 80 shares, of £25 each, in the firm of Sir Joseph Whitworth and Company, Limited. During the twelve months under review, 211 candidates were admitted as students. On the other hand, 82 were elected into the corporation as associate members, and 106 ceased, from various causes, to belong to the class. The total number of students on March 31 last was 949, as against 926 at the same date in 1886. There were twenty-six ordinary meetings during the session, when twenty original communications were read and discussed. The Howard Quinquennial Prize had been adjudged to Dr. John Percy, in recognition of his researches on the uses and properties of iron. To the authors of some of the papers read and discussed at the ordinary meetings medals and premiums had been awarded, viz.: Telford Medals and Telford Premiums to Alexander B. W. Kennedy, Dr. J. Hopkinson, Colonel E. Maitland, and W. Willcocks; a Watt Medal and a Telford Premium to E. A. Clowes; Telford Premiums to W. J. Dibdin, W. S. Crimp, J. J. Webster, and J. Kyle; and the Manby Premium to L. H. Ransome. For papers printed in Section II. of the Proceedings, without having been publicly discussed, the following awards had been made: a Telford Medal and a Telford Premium to J. G. Gamble; a Watt Medal and a Telford Premium to W. J. Last, and Telford Premiums to J. Hetherington, K. W. Hedges, C. J. Wood, A. Leslie, and D. A. Stevenson. Twelve students' meetings had been held on alternate Friday evenings, at which thirteen papers were read and discussed.—The ballot for Council resulted in the election of Mr. G. B. Bruce, as President; of Sir John Coode, Mr. G. Berkley, Mr. H. Hayter, and Mr. A. Giles, M.P., as Vice-Presidents; and of Mr. W. Anderson, Mr. B. Baker, Mr. J. W. Barry, Sir Henry Bessemer, F.R.S., Mr. E. A. Cowper, Sir James N. Douglass, Sir Douglas Fox, Mr. C. Hawksley, Mr. J. Mansergh, Mr. W. H. Preece, F.R.S., Sir Robert Rawlinson, C.B., Sir E. J. Reed, K.C.B., F.R.S., M.P., Mr. W. Shelford, Mr. F. C. Stileman, and Sir William Thomson, F.R.S., as other Members of Council.

Chemical Society, June 2.—Mr. William Crookes, F.R.S., President, in the chair.—The following papers were read:—The equivalent of zinc, by Lieut.-Colonel Reynolds, late R.E., and Prof. W. Ramsay.—The magnetic rotation produced by chloral, chloral hydrate, and hydrated aldehyde, by Dr. W. H. Perkin, F.R.S.—Note on a new class of voltaic combinations in which oxidizable metals are replaced by alterable solutions, by Dr. C. R. Alder Wright and Mr. C. Thompson. It appeared to the authors probable that just as a liquid capable of parting with oxygen, chlorine, &c., can be used in conjunction with an electrode of unchangeable material at one side of a voltaic cell (as in Grove's nitric acid battery and analagous combinations), or may be replaced by a solid conducting electrode, itself capable of losing oxygen (*e.g.* a plate of strongly compressed peroxide of lead), so conversely might a conducting plate of oxidizable material (*e.g.* zinc) at the other side be replaced by an unchangeable electrode in conjunction with a liquid capable of taking up oxygen, chlorine, &c., without producing any fundamental change in the character of the actions taking place in the cell whilst generating a current. The electrode immersed in this oxidizable substance, like the zinc of an ordinary cell, would acquire the lower potential, and the opposed plate the higher potential; *i.e.* the wire connected with the latter would be the "positive pole" of the construction in reference to the external circuit. On trial, it has been found that such is the case, and that in consequence a large variety of novel forms of cell becomes easy of construction. For example, sodium sulphite or potassium ferrocyanide solution opposed to chromic-sulphuric acid solution; preferably with an intermediate layer of some neutral salt solution, such as sodium sulphate, to prevent the direct action of the two fluids on one another. During the passage of a current, sodium sulphate or potassium ferrocyanide is formed in quantity proportionate to the electricity passing, *i.e.* to the amount of silver thrown down in a silver voltameter included in the circuit; whilst chromium sulphate is produced at the other side Various analogous cells are described, in particular one where lead oxide dissolved in caustic soda is opposed to alkaline hypobromite: in this case lead dioxide is produced and separates out in the solid form; and one where chromium sesquioxide dissolved in caustic soda is opposed to chromium trioxide dissolved in sulphuric acid; here sodium chromate and chromium sulphate are formed, an E.M.F. about equal to that of a Daniell cell being set up.—The composition of Prussian blue and Turnbull's blue, by Mr. Edgar F. Reynolds.—Phlorizin, by Prof. E. H. Rennie.—Further notes on the chemical action of *Bacterium aceti*, by Mr. Adrian J. Brown.—Note on the cellulose formed by *Bacterium xylinum*, by Mr. Adrian J. Brown.—The oxidation of ethyl alcohol in the presence of turpentine, by Mr. C. E. Steedman, Williamstown, Victoria.

Royal Microscopical Society, May 11.—Rev. Dr. Dallinger, F.R.S., President, in the chair.—Mr. Crisp called attention to a number of slides of hair which Dr. Ondaatje, of Ceylon, had forwarded to the Society with a request for information as to its peculiarities of structure; also to a donation by Mr. Deby of sixty-two slides, chiefly of Micro-Hymenoptera, which came from the collection of the late Mr. F. Smith.—Mr. J. Mayall, Jun., said that he took it for granted that the Fellows were interested in whatever concerned the history of the microscope, and would therefore be glad of any new facts which tended to throw light upon the subject. He had lately come across evidence which showed that magnifying glasses were used at least as early as 1513–20, for, in the celebrated portrait of Leo X., by Raphael, the Pope is shown holding one in his hand. The picture was painted between 1513 and 1520, as the Pope was elected in 1513 and Raphael died in 1520. He brought to the meeting a large volume (lent for the purpose by Mr. Quaritch) which contained an engraving of Raphael's portrait of Leo X. During a recent visit to Florence he also paid some attention to the microscopes which had been attributed to Galileo. It was of course rather difficult to say in such matters what was really authentic and what was not. He could not, however, help noting that all the telescopes made in 1660, or about that time, had cardboard tubes, and wood or horn cells for the lenses, whereas these microscopes were made with substantial brass body-tubes with strong and well-made screw threads and firm tripod support. He could only say, therefore, that if the microscope-makers had arrived at that stage of perfection in Galileo's time, they had reached a point not attained by his successors until many years afterwards.—Mr. J. Mayall, Jun., also exhibited a microscope which had come from Japan. It was made after one of the old upright tripod models and had a ring of inlaid silver ornamentation at both top and bottom.—Dr. Maddox's paper, on the different tissues found in the muscles of a mummy, was read.—Professor Bell gave an account of a recent visit which he had paid to M. Pasteur's laboratory in Paris.—Mr. Deby called attention to a series of double-stained sections of the rare parasitical plant, *Brugmansia Lowii*, one of the Rafflesiæ, but differing in its being hermaphrodite. It grows on the overground roots of a species of Cissus, and was collected by him in 1884 in the Raritau range of mountains in Central West Sumatra. The sections showed the development of the plant from the time it begins to raise the bark of its host as a minute tubercle up to the complete maturity of its ovules. The double staining allows of distinguishing between the tissues of the parasite and of its host, which in unstained sections cannot be determined. The formation of the locula of the ovary is very remarkable, and partakes more of a fungoid growth than phanerogamic.

PARIS.

Academy of Sciences, June 6.—M. Janssen in the chair.—Researches on the density of sulphurous acid in the state of liquid and of saturated vapour, by MM. L. Cailletet and E. Mathias. Having already described the method employed by them for determining the density of ethylene, of the protoxide of nitrogen, and of carbonic acid as liquids and saturated vapours, the authors here generalize their method by applying it to the study of a substance (sulphurous acid), whose critical point, approaching 156° C., is much higher than that of the former gases. Their researches show that the densities of the liquid and of the saturated vapour have a common limit, which is opposed to the conclusion arrived at by Avenarius; also that the critical density is 0·520.—Heats of combustion, by MM. Berthelot and Recoura. Continuing their studies of the heats of combustion by the new calorimetric method, the authors have determined the mean for glucose at 3·762 calories; for quinone, 6·102; for napthalene, 9·688; for benzoic acid, 6·345; and for salicylic acid, 5·326. These studies are being continued with a view to determining the heat of combustion of liquid and volatile bodies, and the measure of the heat of combustion of pure carbon in its various states. Notwithstanding its fundamental importance for calculating the heats of formation of organic compounds, this element has been neglected since the time of Favre and Silbermann.—Heats of combustion, by MM. Berthelot and Louguinine. Mean determinations are given for several compounds, such as napthalene, 9·6961 calories; phenol, 7·8105; benzoic acid, 6·3221; cuminic acid, 7·5533; quinone, 6·0613; hydroquinone, 6·2295; pyrogallol, 5·0262.—A new endless tape odograph, by M. Marey. The ingenious instrument here described has been prepared for the purpose of automatically recording the velocity of men walking or running with or without burdens, and under the varying conditions of level or inclined, smooth or rugged tracks, with or against the wind, and so forth. It is especially applicable for determining the marching capacity of troops, as well as the velocity of locomotives and other engines, of water and atmospheric currents.—Action of oil on troubled waters, by Admiral Cloué. The author has studied the results of over two hundred experiments, made especially in England and the United States, and concludes that the question is now definitely settled. There can no longer be any doubt that oil has a most efficacious effect in calming storm-tossed waters, and thus saving vessels in danger of foundering at sea. Fish oils appear to be the best, mineral oils owing to their lightness the least effective, but kitchen refuse of all sorts and similar substances floating compactly on the surface, tend to produce the same result.—On the character and results of the improved methods of amputation lately introduced into hospitals, by M. Trélat. The author's observations for the Charité and Necker Hospitals in Paris show that since 1880, when the antiseptic methods came into general use, the mortality under all kinds of amputations has fallen from 50 and upwards to an average of about 15 per cent.—On the density of the celestial vault, in relation to the radiant-points, by M. Alexis de Tillo. According to their right ascensions the 1315 radiant-points of the northern hemisphere are shown to be disposed in such a way as to make it evident that the regions traversed by the Milky Way (0°–90° and 270°–360°) have a perceptibly greater meteoric density than the others (90°–180° and 180°–270°) which lie mainly beyond that stellar zone.—On the melotrope, a new musical apparatus, by M. J. Carpentier. This instrument is intended to serve as a complement to the recently described melograph, the automatic records of which it faithfully reproduces on any piano. But it may also be so adjusted as to constitute itself an independent instrument suitable for the performance of automatic music generally.—Action of an electro-static field on a variable current, by M. Vaschy. It is shown that in a magnetic field of varying intensity a closed conductor placed in this field is traversed by induced currents, and in general there arises in each point of the space an electric force capable of being calculated. In other words, the variations of the magnetic field develop a true electro-static field exercising a mechanical action on the electrified bodies. In virtue of the principle of equilibrium between action and reaction, the latter must react on the magnets or variable currents to which is due the magnetic field.—On the conductibility of abnormal salts and of acids in extended solution, by M. E. Bouty. The author's previous conclusion is here confirmed, that in respect of their conductibility these acids differ greatly from each other, not even excepting sulphuric, nitric, and hydrochloric acids; further, that these varying degrees of conductibility are not directly comparable with those of the neutral salts.—On cyanoacetic acid, by M. Louis Henry. These researches show, as anticipated, that the hydrogen element (CH_2) in this acid, $CN—CH_2—CO(OH)$, has a basic character; also that the acid itself may be obtained in well-defined and perfectly white crystals, and that it dissolves, not at 55° C., as indicated by Van't Hoff, but at 65°–66° C.—On the periodicity of magnetic perturbations and solar rotation, by M. Ch. V. Zenger. A comparative study of observations recorded at the Parc Saint-Maur and Paulovsk Observatories shows that the dates of magnetic perturbations largely coincide either with the days of the solar period or with those of the periodic shooting-stars. This coincidence is observed at points far distant from each other on the surface of the globe, and in years of least (1878) as well as of greatest solar activity (1883–84).

BERLIN.

Physiological Society, May 27.—Prof. Munk, President, in the chair.—Dr. Lœwy spoke on the respiratory centre in the medulla oblongata. His experiments were carried out on rabbits in the laboratory of Prof. Zuntz. He found that severing the medulla from the brain had no influence on either the frequency, depth, or rhythm of the respiration. On cutting one vagus in the animal operated upon as above, he observed a slight slowing of the respiratory movements; in order to produce any marked alteration of the respiration, he found it necessary to cut both vagi. After this operation the frequency of the movements was considerably lessened, the inspirations being very deep, while the expirations either did not take place at all, or were passive: in some few cases active expiration continued. The volume of the respired air was considerably diminished, while the rhythm was normal. By the above experiments it was shown that the centre in the medulla is able to maintain the rhythm of the respiratory movements after it is severed from both the brain and the peripheral parts of the vagi. Moreover the centre when thus isolated was found to be equally susceptible to stimuli, whether applied directly or arriving from the periphery, as when it was still connected with the brain and lungs. In one experiment after the medulla was separated from the brain and both vagi were divided, the spinal cord was cut through, and the muscles of the hind-limbs tetanized; this produced a quickening of the respiratory movements similar to that observed in normal animals, in accordance with the experiments of Zuntz and Geppert. (Muscular contractions lead to the formation of some product of their metabolism which has not yet been isolated, but which stimulates the respiratory centre when brought to it in the blood.) Similarly an excess of carbonic acid gas in the respired air had the same stimulating effect on the isolated respiratory centre as on the centre of normal animals. The irritability of the centre was not altered either qualitatively or quantitatively by its severance from the brain and lungs; thus equal percentage increments of carbonic acid gas in the respired air produced an equal increase of the respiratory movements in animals with isolated and unisolated respiratory centre. Dr. Lœwy has also endeavoured to find experimentally an answer to another important question connected with respiration. The vagus, as is well known, is the only nerve that is in a state of continuous stimulation. Hering and Breuer have explained this as the result of the distension of the lung-alveoli during respiration, which acts as a stimulus to the endings of the vagus in the lungs. But inasmuch as they found that this continuous stimulation of the vagus does not entirely disappear when the lungs are no longer distended, after making an incision into the thorax, they assumed the existence of other unknown factors to explain the phenomenon. Dr. Lœwy spoke against this view, pointing out that even in the collapsed lungs the alveoli are distended beyond their real size and that they are of normal size only in the atelectatic lung, and will then no longer stimulate the endings of the vagus. Experiments made by him confirmed this opinion: by occluding the bronchus of one lung, this lung became completely atelectatic, and then the vagus of the other side was severed. The immediate result of this was a considerable diminution in the frequency of the respiratory movements, greater in fact than is usually observed by section of only one vagus. Subsequent section of the vagus of the atelectatic lung produced no further effect on the respiration, thus showing that this vagus was not in a state of tonic stimulation.—Dr. Gad has carried on researches in his laboratory on the reaction-time for stimulation and inhibition. The experiments were made on the masseter muscle of man; the lower jaw was fixed so that the muscles antagonistic to the masseter did not come into play, and the contraction or relaxation of the muscle was graphically recorded on a Marey drum by means of a specially constructed muscle forceps. The experiments showed that as nearly as possible the same time elapsed between a given signal and the subsequent contraction of the muscle as between the given signal and its relaxtion. According to this, the will has an equally exact control of the inhibitory as of the stimulatory process.—Dr. Benda recommended the use of the kidney of mice for studying the structure of the glomeruli, and demonstrated this structure on a series of preparations which he exhibited.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

A B C Five-Figure Logarithms: C. J. Woodward (Simpkin).—Elementary Microscopical Technology, Part 1: Dr. F. L. James (St. Louis).—Summary and Review of International Meteorological Observations, July to December 1885 (Washington).—Histoire des Sciences Mathématiques et Physiques, tome xi.: MM. Marie (Gauthier-Villars, Paris).—A Dictionary of Philosophy: J. R. Thomson (Dickinsons).—Results of Observations of the Fixed Stars made with the Meridian Circle at the Government Observatory, Madras, in the years 1862-63-64: N. R. Pogson (Madras).—Rustic Walking Tours in the London Vicinity: W. R. Evans (Philip).—Encyclopædia Britannica, 9th ed., vol. xxii. (Black, Edinburgh).—Ocean Birds: J. F. Green (Porter).—Philips' Handy-Volume Atlas of the World (Philip).—Scala Naturæ: J. Cleland (Douglas, Edinburgh).—British Dogs, No. 8: H. Dalziel (Gill).—Annals of the Astronomical Observatory of Harvard College, vol. xvii. The Almucantar: S. C. Chandler (Cambridge, Mass.).—Higher Algebra: Hall and Knight (Macmillan).—Beiträge zur Biologie der Pflanzen, Vierter Band, Drittes Heft (Breslau).—Journal of the Liverpool Astronomical Society, vol. v.—Bulletin of the U.S. National Museum, No. 31—Synopsis of the North American Syrphidæ: S. W. Williston (Washington).

CONTENTS.

PAGE
The Jubilee 145
Imperial Geological Union. By Sir J. William Dawson, K.C.M.G., F.R.S. 146
Social History of the Races of Mankind. By Prof. A. H. Keane 147
The Fauna of Liverpool Bay 149
Our Book Shelf :—
Geyler and Kinkelin: "Oberpliocän-Flora aus den Baugruben des Klärbeckens bei Niederrad und Schleuse bei Hochst a M."—**J. Starkie Gardner** . 150
Letters to the Editor :—
British Association Sectional Procedure.—**Prof. Silvanus P. Thompson** 151
The Recent Earthquakes in Mexico and Turkestan.—**Prof. J. P. O'Reilly** 151
The Late Earthquake on the Riviera, February 23, 1887.—**J. E. H. Peyton** 151
The Shadow of Adam's Peak.—**R. Abbay** 152
Upper Wind-Currents near the Equator and the Diffusion of Krakatão Dust.—**E. Douglas Archibald** 152
Mammaliferous Gravel at Elloughton, in the Humber Valley.—**G. W. Lamplugh** 153
Fall of Peculiar Hailstones in Kingston, Jamaica.—**James John Bowrey.** (*Illustrated*) 153
Singular Nesting-place of Linnets.—**H. Vian-Williams** 154
A Brilliant Meteor.—**Dr. F. Porro** 154
Electricity at Oxford 154
North American Pictographs. By Francis Galton, F.R.S. (*Illustrated*) 155
Cocoa-nut Pearls. By Dr. Sydney J. Hickson and W. T. Thiselton Dyer, C.M.G., F.R.S. 157
Notes 158
Our Astronomical Column :—
The Great Southern Comet (1887 *a*) 161
New Minor Planets 161
Astronomical Phenomena for the Week 1887 June 19–25 161
Geographical Notes 161
The Nephridia of *Lanice conchilega*, Malmgren. By J. T. Cunningham 162
Notes on the Geology of Part of the Eastern Coast of China and the Adjacent Islands 163
The Meteorology of India 164
University and Educational Intelligence 165
Scientific Serials 165
Societies and Academies 165
Books, Pamphlets, and Serials Received 168