THURSDAY, JANUARY 1, 1880

GEOLOGICAL SURVEY OF THE UNITED STATES

IT will be in the recollection of geological readers that the chronic feuds to which so many independent United States Government Surveys with rival objects and officers gave rise, were last year referred by Congress to the National Academy of Sciences, and that, acting on the Report submitted by the Academy, Congress determined to abolish all the separate geological and geographical surveys then in existence under different Departments, and to consolidate the work under one establishment, to be termed the United States Geological Survey. In order, however, that the work already in progress might not be wholly lost or indefinitely postponed it was enacted that for the preparation and completion of the reports, maps, and other work of the Geological and Geographical Survey of the Territories, of the Geographical and Geological Survey of the Rocky Mountain Region, and of the Geographical Surveys West of the 100th Meridian under the direction of the Secretary of War, the sum of twenty thousand dollars, to be immediately available, should be given to each of these three offices. It is to be hoped that these provisions will suffice for the publication of several valuable memoirs which are known to have been in progress for some years.

One of the recommendations made by the Academy of Sciences was that a separate organisation should be provided for the surveys of mensuration, including the purely geographical and topographical work such as had been carried on by the Coast and Geodetic Surveys and the Land Office. For this fundamentally important and indispensable branch of the scientific examination of the country no special provision was, however, made by Congress; which is all the more to be regretted seeing that by the terms of the Act, so far as we can make out, the Engineer bureau was to be relieved of the important geodetic work it had so long and so ably been conducting west of the 100th meridian. There are ways indeed of driving a carriage and four through an Act of Congress, and the Engineers have shown themselves so able to hold their own under many successive administrations, that we wait with some interest to learn how far exactly their operations will be curtailed or modified.

The Act which constituted the new organisation of the Geological Survey likewise made provision for a Commission on the codification of the laws relating to the Survey and disposition of the Public Domain. Of this Commission the Director of the United States Geological Survey was *ex officio* appointed a member. The Commission began its work last summer in the Western Territories, and made rapid progress. Besides Mr. Clarence King, it included among its members Major Powell and Capt. Dutton, who have so long been known for their geological labours among the great plateaux and Cañons of the West. Doubtless the objects of the Commission were of paramount importance, and these three geologists, from their long and intimate knowledge of the Territories, were probably better fitted than any other citizens for carrying out rapidly and exhaustively the special inquiries entrusted to them. Otherwise some natural regret might be expressed that the services of such men should have been removed for practically a year from the geological work for which they have proved themselves so eminently qualified.

It is an excellent custom in the United States to define the time within which a Commission appointed by Congress is to send in its Report. This inquiry into the Land Laws and the classification of public lands was required to be completed within a year from the organisation of the Commission. We hear that the work is now finished so far as collecting evidence goes, and that the Report on the whole subject may shortly be expected. How long would a Royal Commission of similar nature and scope have lasted here?

The cessation of the labours of the Commission will free the geologists for the work of the Geological Survey. Much interest is felt as to the distribution of their staff and the areas over which it will be extended. Certainly no corps of geologists ever had a more magnificent opportunity of adding to the temple of science. They have large funds at their disposal, boundless territory, ground of surpassing geological interest, and the enormous advantage of a previous experience of many years spent in the West. Their doings are watched with particular care and even with some anxiety in the eastern States, owing to a curious episode after the passing of the Act establishing the Geological Survey. Subsequent to the appointment of the Director of the new organisation, an extra Session of Congress was held, in which a resolution was passed in the House of Representatives to the effect "that the Director may extend his examinations into the States." As this resolution was adopted on June 29 and the Session closed next day, there was not time to bring it before the Senate.

It will be seen that the addition of these words enormously widens the area of the Director's jurisdiction. As Prof. Dana complains, this area is "suddenly enlarged to the dimensions of the whole country from the Atlantic to the Pacific," and he adds that this was the view of the director himself, who had personally informed him "that it was his purpose under the Act, to send a party into New England next spring." We can hardly suppose that any such vast extension of the original scope of the Geological Survey was present to the minds of the representatives who passed the resolution. The additional words were probably meant only to authorise the work of the Survey to be prolonged into States adjoining the Territories, to such an extent as the necessities or advantages of the service might require. And this was a very proper addition. Geological boundary lines have seldom any close relation to political ones, even when physical features are used as lines of demarcation. But in America, where the limits of States and Territories are defined by meridians and parallels, it would be absurd to arrest a geologist's work in the middle of a prairie, or a cañon, or a mountain-range, because he had reached the limiting but invisible boundary of his territory. The idea of sending a party into New England looks like a joke, and as such we shall believe it to have been intended until authentic news of the arrival of the Survey party actually reaches this country. That it is not so regarded in the United States, however, is manifest by the flutter

into which the geologists of the Eastern States have been thrown. We hear of the scheme being stigmatised as another example of the infringement of State rights, of the illegal assumption of State responsibilities, and of the danger to private interests as well as public morality to be apprehended from the temptations which such a vastly extended supervision would put in the way of the central authority.

The area in the West yet to be explored is so vast, the problems offered by it so numerous and so tempting, the field so free from "vested interests" of any previous explorers, that we cannot for a moment imagine that Mr. Clarence King and his associates, who, having already cleared a way for themselves through that wide West, know better than any other men its infinite variety and attractiveness, will trouble themselves with the geology of the East, where for generations past the labourers have been so many, and where, comparatively speaking, the field is so small and already so well tilled. With the humour of their countrymen they may have made use of the rather indefinite language of a congressional resolution to scare their less adventurous brethren in the Eastern cities. We would, therefore, counsel the geologists of the East to treat the matter as a joke. They have nothing to fear. It would be as absurd to give the Director of the United States Geological Survey control over the geology of all the States, as to make the Chief Constable of New York comptroller of morals for the whole of the Union. A. G.

SAHARA AND SUDAN

Saharâ und Sudan Ergebnisse sechsjâhriger Reisen in Africa. Von Dr. Gustav Nachtigal. Erster Theil, mit 49 Holzschnitten und 2 Karten. (Berlin, 1879.)

DR. NACHTIGAL'S wanderings came to an end more than six years ago. Most of his results have been brought at various times before learned societies and otherwise published, and the most important parts of his route are laid down in published atlases. The present work contains a detailed account of his entire travels and observations. The book now under consideration is only an instalment extending over his journey up to the end of the year 1870; a second is to follow. The volume is a large octavo of 750 closely printed pages with an appendix containing meteorological observations.

Dr. Nachtigal undertook the duty of conveying to the Sultan of Bornu, the country surrounding Lake Tsad, a present sent by the Emperor of Germany in acknowledgment of the hospitality and assistance afforded by the Sultan to the German travellers, Barth and Overweg, Vogel, von Beurman, and Rohlfs. In his journey from Tripolis to Bornu the author passed along the caravan route traversed before by Denham and Clapperton in 1822-23-24, and by Barth and Vogel in 1849-55, and also by Rohlfs. During all this portion of his journey he was therefore on ground comparatively well-known from the writings of the above travellers. He made however three long excursions to the eastward, one into Tibesti or Tu, another to Borku, and a third into Bagirmi to the south of Lake Tsad; finally he made his way eastward from Lake Tsad across Wadai and Darfor, to Chartum.

Of the present volume more than two-thirds is occupied with the account of the journey along the direct route between Tripolis and Bornu, and an account of Fezzan, and of Bornu and its capital, Kuka. The remaining third of the book relates to the journey into the unexplored region of Tibesti and is thus the most interesting and important portion of the work.

Lake Tsad lies almost due south of Tripolis and the caravan route follows an almost straight line between the two points. Dr. Nachtigal left Tripolis on February 18, 1869, and after his wanderings in Tibesti and many mishaps reached Kuka in June 1870. At Tripolis, and also in Murzuq he frequently met with the well-known traveller, Miss Tinne, of whose history and deplorable murder by the Tuaric he gives a full account. Miss Tinne or "the King's Daughter," as she was called by the inhabitants of the country, excited the greatest curiosity and was believed to possess supernatural powers. One story circulated about her at Murzuq was to the effect that her large pet dog which travelled with her was a bewitched man and changed into the human form from time to time.

The fourth chapter deals with the natural characteristics of the district of Fezzan. So scarce and dear are mutton and goats' flesh in Fezzan that recourse is had to minute crustacea and the larvæ of diptera from lakes of brackish water as food. The Bahâr-el-Dûd, or "worm lake," is so full of the larvæ and of the crustacea, the cosmopolitan inhabitant of salt water lakes, Artemia, that the inhabitants collect these animals in masses and knead them up with dates and an alga which also grows in the lake to form a repast which is highly esteemed. An Artemia occurs in the Great Salt Lake in Utah; the species in the present case is *A. Oudneyi.*

A long chapter on the climate and diseases of Fezzan follows, in which the maladies are described with an amount and character of detail which, though highly valuable, is perhaps more befitting a strictly medical publication than a general book on travel with a more or less popular aim. Similar medical details are given throughout the book and sometimes seem very much out of place. The native notions of medical treatment are curious and primitive. Thus patients suffering from cancer of the breast must most carefully abstain from all food derived from animals provided with tails, even such as milk and butter. To promote fruitfulness in women young suckling hares are prescribed. No one in Fezzan doubts that it is possible for a child to remain dormant within the mother for years or even for ever and this theory is most conveniently made use of when mishap necessitates it by wives whose husbands have been absent on very long journeys. As an aphrodisiac the fat of a Manatee, *Manatus Vogellii*, is used. The drug is sold at a high price being brought from the River Binüe a tributary of the Kowara in which the animal is abundant. Diseases are believed to be caused either by evil spirits or by the action of the evil eye.

During his exploration of Tibesti Dr. Nachtigal experienced many dangers and difficulties, losing his way, and suffering from want of water and forced night marches. A very interesting account is given of the ceremonials observed by the Tubu people in greeting one another. A most elaborate performance is gone through when two strangers meet in this wild country. Each of

the performers covers all his face but his eyes with his turban, seizes his spear and throwing iron (a curious boomerang-like weapon with a long projecting prong on the concave margin), and thus prepared the two approach one another. At a distance of about six steps from one another they squat on their heels with spear upright in one hand and iron in the other. The one then asks "How do you do?" about a dozen times by means of four different words having that meaning used alternately, the reply being varied of the use of two words Laha, or Killala.

Then one of the two loudly sings the word "Ihilla," which is returned by the other in a similar tone. The word is exchanged again and again, being commenced in a loud high pitched note and gradually run down the scale until it reaches a low bass murmur. When it has become so low as scarcely to be heard, on a sudden it is shouted again in high key and the gamut is run through as before. This goes on for a very long while, the performers going through it as a strict matter of ceremony, and taking no interest in one another all the while but looking round at the horizon or elsewhere during their vocal exertions. After a while various forms of the question "How are you?" and the answer "Well," are introduced, at last questions or other topics are brought forward, although now and again the "Ihilla" bursts out in the midst of them, but the series of notes in which it is shouted becomes shorter and shorter. At last the Ihilla is got rid of altogether and ordinary conversation becomes possible. Strangers do not shake hands, but acquaintances do. The covering of the face when greeting or meeting strangers is considered as a most important matter of etiquette.

In the Zuar Valley the large baboons (*Cynocephalus babuin*) were met with in great numbers climbing on the rocks and trees, and, on account of their greenish grey colour, hardly to be distinguished from the tree trunks and stones. They tumble about amongst trees beset thickly with thorns many inches long without hurt. The Tubu do not molest them, partly because they are afraid of their strength and partly from superstitious motives.

On the cliffs bounding the river Udêno, near Bardai, in the centre of Tibesti, the author found a series of rude drawings of the same kind as those discovered by Barth in the north-eastern Tuârik region. The drawings are incised on the stone and represent almost without exception oxen with the horns bent forwards, all of which have a rope attached to the horns and drawn forward as if they were being led by it; some have on their backs the pack-saddle now used for oxen in Sudan. That the drawings were not inspired by reminiscences of the pack cattle of Sudan is shown by the circumstance that the leading rope is attached to the nostrils of the oxen and by the absence of the hump in them. The drawings are probably very ancient and date back from a time when cattle were used as beasts of burden in the country, and camels as yet not introduced. Barth remarked on the entire absence of the camel from amongst the very numerous drawings examined by him, in the present instance one drawing of a camel does occur, but Dr. Nachtigal thinks it has been probably added by a later hand in imitation of the ancient drawings. There is one figure of a man, a warrior of life size, with a spear in one hand and in the other a shield of a different form from that now used in Tubu and curiously enough divided into four fields by a cross.

Dr. Nachtigal had a hard time of it in Bardai, being kept a prisoner in his camp and cruelly stoned by crowds of girls of 12 or 14 years of age, if he attempted to move out. The children evidently thought it good fun stoning him as well as their religious duty to do so. They watched him closely in case he should dare to steal out during quiet hours and rallied one another with the shout of "at the heathen." Sometimes a drunken man joined in the sport with his throwing-iron and made matters very serious indeed. It was of no avail for Dr. Nachtigal to give the children sugar, or other presents, or to attend the sick; as soon as the presents were secured or the visit to the patient completed, the volleys of stones came flying as before. It was just before his flight from Bardai that Dr. Nachtigal heard of the murder of Miss Tinne; the news hastened his departure, and he returned to Fezzan.

A chapter is devoted to the natural productions of Tu. The best camels of the Eastern part of the Great Desert are bred by the Tubu. They belong to that variety of the animal which is peculiar to the Central and Southern Sahara, and which is distinguished at first glance from the Northern or Arab camel. The latter has short limbs, stout body, heavy head and neck, and shaggy hair; the former is higher on the legs and lighter built with smooth hair. The Arab variety looks built for weight-carrying, the Tuarik animal for pace.

The fat-tailed sheep of the coast does not occur in Tibesti, the sheep of the region having long legs, a long thin tail and pretty long black shining hair instead of wool.

The throwing irons of the Teda are curious weapons of boomerang form beset with projecting prongs of various shapes. They are double-edged in parts and single-edged with a stout back in others. The handle is bound with leather to give a firm grip.

The weapon is thrown horizontally with great precision and terrible effect. Children practise with a piece of bent flattened wood sharpened on one edge in imitation of the throwing iron and carry also a wooden-tipped spear. Being thus accustomed to carry weapons in their hands all their lives, the full-grown men when they are about their dwelling-places where they are strictly forbidden by custom to carry actual arms, return to the weapons of their childhood and carry about the wooden spear and throwing weapon.

The illustration given by the author of his reception by the Sultan of Bornu may be compared with the similar reception accorded to Denham and Clapperton so many years ago, and with their illustration of the ceremony. The then Sultan when he received Denham and Clapperton was concealed behind a lattice which was dispensed with in Dr. Nachtigal's case. Amongst the presents conveyed by the present author were life-sized portraits of the King and Queen of Germany and of the Crown Prince.

We cannot follow Dr. Nachtigal further, or pick out more interesting matter. The book seems to us rather too long and somewhat spun out; it is most sumptuously got up, with two large maps, well bound, and is full of good illustrations. Of these latter no list is given nor any information as to the sources from which those which

have appeared before are derived. The familiar figure in Denham and Clapperton's work of a mail-clad warrior and horse of Bornu is copied without any kind of acknowledgment. Very slight differences have been made in the present figure: thus in it the great toe only is placed in the stirrup instead of the whole foot, as in the original, and the spear-blade is double instead of single, whilst the helmet has a plume added, but all the rest is directly copied without any reason being given for the alterations. A most remarkable defect in the book, considering that it is German and scientific, is the almost entire absence of references to former works of all kinds. As far as we have been able to discover there are only two references to other books in the entire work, one to Fournel's "Les Berbes," the other to the publications of the German Geographical Society. Though Barth and Duveyrier are mentioned and their views are quoted, no references to their writings are given. And Denham and Clapperton are entirely ignored even in the account of Bornu. A serious drawback is that the book is published so long after the travels to which it relates were completed. We hope that the second volume may not be long in appearing. We understand that the book is shortly to be published in English. It is full of interesting and valuable matter and of scientific details.

THE SCIENCE OF AGRICULTURE

First Lessons in the Science of Agriculture; for Use in Indian Elementary Schools or Classes. Pp. 67. By J. B. Fuller. (Calcutta: Stanhope Press, 1879.)

THIS little primer is issued under the authority of the Department of Agriculture and Commerce, North-West Provinces and Oudh. If its teachings be accepted and followed by those for whom they are intended, increased and improved crops must be the consequence. Of course, within the narrow limits of some seventy small pages, we cannot expect to find the scientific basis of the art of agriculture fully developed; indeed, the explanations of the materials and processes with which Indian farming is concerned are neither numerous nor full. But to show clearly a few of the worst mistakes made by Eastern cultivators of the soil, and to indicate remedies and improved methods of procedure in but half-a-dozen cases, is a useful beginning of an important work. We note, in passing, a few examples of the recommendations, based upon scientific knowledge, which Mr. Fuller makes in these "First Lessons." On p. 7 the usefulness of a good tilth and of a feeding-ground deepened by thorough ploughing for crops during seasons of drought, is illustrated and enforced. We learn from pp. 26 and 27 that due importance is not generally attached to the selection and securing of the best varieties and qualities of seed for sowing the fields. Too often they sow any seed they have by them, the produce of their own fields, and often of inferior quality. Good kinds of grain, &c., are thus found to be confined to one village, though they might be grown successfully in many neighbouring places. Thus, the village of Jaláli in the Aligarh district is well known for its fine white wheat; Sánkni, in Bulandshahar, for its safflower; some districts north-west of Allahabad for indigo, and Hinganghát for cotton. The value of new plants to India is discussed on pp. 31 and 32, the cases cited being tea, the potato, reana, and Egyptian cotton. Passing over a chapter in which some elementary facts about plant-food are given, we find many useful remarks (pp. 37 to 44) on the fertility of the soil and the means of restoring or increasing it. Here we are introduced to *reh* and *usar*. The former term is applied to the saline efflorescence, which, in some seasons especially, appear in many tracts of land in the North-West Provinces and elsewhere in India. *Reh* consists mainly of sodium and calcium sulphates, with some common salt and nitrates. The *usar* plain is infected with *reh*, but I cannot agree with Mr. Fuller in condemning the usar soils as sterile through deficiency of plant-food (p. 38). My analyses of such soils gave in most cases no evidence of deficiencies in the mineral elements of plant-nutrition, they merely showed an excess of soluble salts. What Mr. Fuller says about the best way of getting rid of *reh* is very judicious, so are his remarks about the sad waste of animal and vegetable residues (including indigo waste, and the bones of bullocks and buffaloes, in India)—residues which, instead of being burnt or neglected, should certainly be much more largely than at present ploughed into the land. His contrast between the work of the Indian plough and the English, the latter doing in one ploughing what the former needs twelve ploughings to accomplish, should be of some real service, especially as the new English-pattern ploughs made at Cawnpore are very light, and do not cost more than eight rupees apiece. By the use of this improved implement the "pan," which has been formed two or three inches under so large a tract of Indian soil by the rubbing of the old ploughshares and the trampling of the bullocks, would be broken up, and the rains would penetrate and moisten a much greater depth of soil. Mr. Fuller illustrates the advantage of increasing by such deep ploughing the depth of water-holding soil. He says: "In Madras, in the year 1878, when there was a great famine from the failure of the rains, some land was ploughed with the European plough, and some with the native plough, on the Government farm. Neither was irrigated, and both had to depend for their water on the little rain that fell. The European-ploughed land gave a rice-crop of six maunds per acre; the native-ploughed land did not yield a single grain." The two last lessons in this useful little book contain some quite satisfactory explanations as to the respective merits of canal and well water, and of thin and thick seeding in India.

A. H. C.

OUR BOOK SHELF

On the Crystallography of Calcite. By J. R. McD. Irby, B.Sc., of Lynchburg, U.S. (Bonn: Charles Georgi, 1878.)

ONE is pleased to find that, in an essay on the crystallography of calcite, by a gentleman who has received his training in America and Germany, the system of representation used by Prof. Miller has been adopted, and not the objectional modification employed by Professors Groth and Dana, jun. One regrets that the paper is unaccompanied by a stereographic projection, which would have much simplified the discussion of the distribution and position of the forms.

The original part of the essay consists of a criticism

and redetermination of some forms involving very high indices on crystals examined by the late M. Hessenberg. The measurements were made with one of the goniometers devised by Prof. Groth, which gives definite results when the faces are good. The collimator and telescope are fixed, however, at right angles to one another, so that the determination of striated faces, such as many of those examined were, is difficult and uncertain. Much more reliable measurements would be obtained were the angle between collimator and telescope small, and it would be very easy to arrange the collimator so that the angle of incidence and reflection might be varied at will. Prof. Miller used to arrange his goniometer so that the angle between the incident and reflected ray was less than 20°, and was thus able to get rid of a good deal of the difficulty arising from striation.

Mr. Irby has guarded himself from error by the comparison of several independent observations of the angles made by a new face with those adjoining it, with the angles obtained by calculation, and has avoided employing the angles made with faces on more distant parts of the crystal, though the latter would be often better adapted for purposes of calculation. He criticises Prof. vom Rath's method of observation by taking the reflection of a window-bar as signal. The error which would thus arise would not exceed 1′ in the case of good faces, and I believe Prof. vom Rath only employs this method of observation with very good faces. Another source of error would be due to the proximity of the signal which would give a considerable error if the edge were not well-centred. Moreover, a goniometer with vertical plane of reflection is very difficult to get into or keep in good adjustment, and errors might arise in this way. None of these errors will, however, account for the impossibility of getting simpler indices for the form $\{35, 17, \bar{3}2\}$, considering how definite were the angles obtained from the several faces of the scalenohedron. A careful criticism of this form at the time it was published, and of all the different ways in which errors might be piled up in the course of the analysis, failed to lead to any result but that of admitting the possibility of forms with these high indices. In the Cambridge collection is a crystal of quartz with an extremely well-developed face, which Prof. Miller has determined to be $\{50, 19, \bar{1}9\}$. It is very slightly rounded on the edge of the prism face. Of course, when the faces are rounded or otherwise distorted, indices calculated from the observations are mere approximations. Seeing the great variations which occur in the angles of well-crystallised minerals, good work might be done in testing the constancy of the angle of the cleavage rhomb in the specimens from different localities. Breithaupt's determinations of this angle are unfortunately not sufficiently reliable.

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 ensure the appearance even of communications containing interesting and novel facts.*]

The Molecular Velocity of Gases

YOUR correspondent, M. Hajniš, asserts in a foot-note appended to his letter published in NATURE, vol. xxi. p. 176, that "the formula for the molecular velocity (of gases) was first given by Krönig," and not by Joule. I am at a loss to understand how this statement can be justified.

Krönig's paper appeared in 1856, while Joule's calculation, which is that now generally received, is of date 1848. In his discourse on molecules (*Phil. Mag.*, December, 1873), Prof. Maxwell says: "The further development of the theory is generally supposed to have begun with a paper by Krönig, which does not, however, so far as I can see, contain any improvement on what had gone before." R.

Weaver Birds and Fire-Flies

UNDER the heading "Natural History Notes from Burmah," in NATURE, vol. xx. p. 362 of the present series, Mr. R. Romanis asked if any of your readers have ever seen or heard of weaver birds sticking fire-flies to lumps of mud on the sides of their nest for the purpose of illumination.

The tradition that certain birds of the weaver family (*Ploceidæ*) and their allies do this, is prevalent over a large portion of the globe inhabited by these birds. I have traced it personally from China, all parts of India, Burmah, Ceylon, the Malayan Peninsula, Indian Archipelago, Southern, Eastern, and Western Africa, and South America. I have examined "weaver birds'" nests from all these countries, and have found lumps of mud sticking inside them, and "*therefore it must be true, you know!!*"

But for what use are these lumps of mud stuck there?

Some years ago I wrote an article in the *Cape Monthly Magazine* on this very subject, entitled "Strange Stories and their probable Origin," and I started by saying "Where there is smoke there must be fire," quoting the old proverb.

My belief is that these lumps of mud are used as *scrapers* on which to clean the birds' bills, as I have frequently found the wing cases, and other *débris* of *Coleoptera*, &c., fixed to them. Hence the superstition that they stick fireflies thereon. I should remind your readers that all the "weavers" are grain feeders, and perhaps only occasionally partaking of insect-food, they are bothered by the bits sticking to their bills. I see my tamed birds are most careful in cleaning their beaks.

At the time I wrote my article above alluded to, I was not so conversant with the African "hang-nests" as I afterwards became, but I can affirm that in all the places I have named the superstition, *and the mud*, is to be found. E. L. LAYARD

British Consulate, Noumea, October 22, 1879

The Papau

PERMIT me to add to my friend the Rev. S. J. Whitmee's testimony of the papau being eaten by birds in the Samoan Islands, that it is here (New Caledonia) a favourite food of the "white eye" (*Zosterops*), and in the Loyalty Islands was used as the only bait to attract these birds, of which dozens were brought me—of the three known species of that genus which inhabit that group (see my letters to *Field* newspaper) all caught by the boys through its means. If my memory serves me rightly, I have seen the papau in Mauritius eaten by a species of *Zosterops*. E. L. LAYARD

British Consulate, Noumea, New Caledonia,
October 22, 1879

Scale of Colours

IN NATURE, vol. xxi. p. 172, it is stated that at a meeting of the Zoological Society, December 2, 1879, "A letter was read from Mr. F. L. Layard, F.L.S., advocating the desirability of a fixed scale of colour for use among naturalists in describing the plumage and pelages of birds and other animals." Perhaps Mr. Layard is not aware that such a scale, in form of thin 8vo, was published by Patrick Syme in Edinburgh, in 1821, the tints being illustrated by carefully coloured examples. The exact title of the work, a copy of which is in my own library, is as follows:—"Werner's Nomenclature of Colours, with Additions, arranged so as to render it highly useful to the Arts and Sciences, particularly Zoology, Botany, Mineralogy, and Morbid Anatomy. Annexed to which are Examples selected from well-known Objects in the Animal, Vegetable, and Mineral Kingdoms." The date given above is that of the second edition, which was "Printed for William Blackwood, Edinburgh, and T. Cadells, Strand, London." L. BLOMEFIELD

Bath, December 22, 1879 (late JENYNS)

On the "Habitat" of Lophiomys

ON reading the review of "Cassell's Natural History," vol. iii., given in NATURE, vol. xxi. p. 136, I find that both the author and the reviewer do not appear to have been aware that the "habitat" of that most interesting rodent, *Lophiomys imhausi*, is

well known. The rich and interesting Museo Civico di Storia Naturale, of Genoa, amongst its many rarities, contains a magnificent specimen of the *Lophiomys*, mounted skin and skeleton, which specimen was caught at Keren in the Bogos land, in June, 1870, and forms part of the fine collections made at that place by Dr. Beccari and Marquis Antinori. The native name of the *Lophiomys*, according to Antinori, is *Tzechiza*.

The reviewer cites M. Alphonse Milne-Edwards's impression of the resemblance of *Lophiomys* to certain opossums, a point in which I cannot completely agree; my impression is that this very remarkable rodent offers one of the best cases of "defensive mimicry," being strangely like a Viverrine carnivore in outward appearance. The granulation of the upper portion of the skull, which extends to the upper surface of the first cervical vertebra, is very peculiar; but it is not strictly correct to assert that nothing of the kind is met with in other mammals; in the very same order, Rodentia, we find a very similar structure in the cranium of the Paca (*Cœlogenys*), and I believe some allied forms.

HENRY HILLYER GIGLIOLI

Reale Istituto, Florence, December 17, 1879

On Haloporphyrus lepidion (Risso)

I HAVE recently had occasion to examine two specimens of this rare and remarkable gadoid fish of the Mediterranean, originally described as *Gadus lepidion* by Risso ("Ichthyologie de Nice," p. 118). The first was captured in my presence in the Gulf of Genoa, in July last, from a depth of about 900 metres, the second I received from Nice, where it was captured in deep waters on September 1 last, and I know of a third specimen taken at the latter place. All agree perfectly with Risso's description except in the general colour, a light brown, and not "*un beau rouge incarnat*," while Risso appears to have overlooked the presence of a small patch of vomerine teeth. But our Mediterranean specimens present notable differences from that described by Dr. Günther ("Catalogue of Fishes," iv. p. 358), and referred by him to this species; besides being considerably larger, the British Museum specimen, which is from Madeira, has a much smaller eye and much longer snout and barbel. Such differences *might* depend on age, but I am strongly inclined to consider them specific, and therefore beg to draw the attention of ichthyologists to the case; should my opinion prove correct, the Madeiran fish might go by the name of *Haloporphyrus güntheri*.

While rapidly completing the rich series of fishes belonging to the central collection of Italian vertebrata, formed by me in the Florence Zoological Museum, I have recently been able to add thereto a second very rare gadoid, the *Physiculus dalwigki*, Kaup, a new acquisition to the Mediterranean fauna. My specimen was captured at Nice on August 4 last, and strange to say was sent to me as *Uraleptus maraldi*.

Reale Istituto, Florence HENRY HILLYER GIGLIOLI

Edison's New Lamp

I OBSERVE in NATURE, vol. xxi. p. 187, a statement to the effect that Mr. Edison has adopted the use of carbon in his new electric lamp, and that the carbon he uses is charred paper or card of the shape of a horse-shoe.

Fifteen years ago I used charred paper and card in the construction of an electric lamp on the incandescent principle. I used it, too, of the shape of a horse-shoe, precisely as, you say, Mr. Edison is now using it. I did not then succeed in obtaining the durability which I was in search of, but I have since made many experiments on the subject, and within the last six months I have, I believe, completely conquered the difficulty which led to previous failure, and I am now able to produce a perfectly durable electric lamp by means of incandescent carbon.

JOSEPH W. SWAN

Underhill, Low Fell, Gateshead, December 29, 1879

Flow of Viscous Materials

MR. BOTTOMLEY, in his paper on this subject in NATURE, vol. xxi. p. 159, refers to experiments made four years ago, but if he refers to the *Philosophical Magazine*, vol. xxvi. 206, 1845, he will find a notice of an experiment made twenty-four years ago. It occurred thus:—A barrel of pitch, with one end partly knocked out, had been lying in the yard exposed to the sun for some months, and a part of it had run out on the ground.

My late partner, Prof. L. Gordon, visited the wire-rope works one day in August, 1844, and I called his attention to the appearance of the pitch as being a good illustration of Prof. Forbes's theory of glaciers; thereupon he wrote the letter referred to; which is also quoted in Forbes's "Theory of Glaciers," p. 269.

Any sort of pitch, such as that obtained from gas tar, will answer the purpose. If the surface is rubbed over with some white material, the formation of crevasses will be well shown; and if a row of pins are stuck into the pitch about an inch and allowed to project they will soon lose their perpendicularity and thus indicate the movements in the model glacier. The rapidity of flow of course varies with the temperature.

I had a curious illustration of the power of plants in forcing their way through resisting materials. I had covered the ground with about two inches of asphalt, and a dandelion pushed its flower and leaves through this viscous mass.

Ferndene, December 28, 1879. R. S. NEWALL

Hungarian Earthquakes and the Kolumbács Flies

A NOTE in NATURE, vol. xxi. p. 89, speaking of the recent Hungarian earthquakes, contains, amongst others, the following passage:—"Near Weisskirchen, the old ruins of the Castle of Golubacz have fallen in com pletely, and in the vicinity several caves were rendered inaccessible. These caves were the *breeding places* of the dreaded Kolumbács mosquitos, and if this insect is thus exterminated the earthquake may, with all the damage it did, have yet been of some use."

This report is based on obvious error, for it is a well-known act that the small (3-4 millim. long) Kolumbács flies (*Simulia golumbacensis*, Fabr.), which, in the southern part of Hungary, especially in the old Banat and the county of Hunyad, cause considerable damage among the pasturing cattle (especially among horned cattle, horses, swine, and sheep), breed by no means in those caves which are to be found around the ancient Galambócz (known nowadays under the name of Golubácz or Kolumbács, on the Servian territory), but in the shallower parts of the waters extending in great quantities in that country. The course of life of the Kolumbács fly is, for the most part, in conformity with that of many families of the Nemocera, or Tipulariæ group, as are the Culicidæ, -many species of flies (Brachycera), the Phryganidæ, &c. The mature and fecundated mother-fly lays her eggs upon the plants vegetating on the water-borders, whence they get on the stones under the water, and other objects, there living through their larva and nymph states until they arrive at their full development.

But, in the first years after 1850, under the rule of the Austrian military system of that time, there did occur the curious fact that —upon the advice of a military officer of the frontier-districts, who, as it was supposed, had made out that the breeding-nests of these flies are in the caves around Galambócz, Old Moldavia, and their environs—the Government of Vienna officially decreed the walling up of the openings of the caves. And actually they were walled up. But in the next mild spring, the conditions of development being favourable again, the Kolumbács fly appeared and ravaged once more. The Viennese Government, on learning this unpleasant and disappointing news, hastened to amend the blunder, and sent to the place a Hungarian *savant*, Vincent Kollár, and a German entomologist, Joseph Mann, to take the question under examination. These, in a brief space of time, succeeded in clearing up the true state of things, and in gathering such a series, as contained all the stages of the development of the Kolumbács fly in numerous specimens. This collection is to be seen now in the entomological section of the Naturalien Cabinet of Vienna, grouped in the best order.

The imputation, therefore, as if it were the Hungarians who had walled up the orifices of the caves in the vicinity of Galambócz, in order to exterminate the Kolumbács flies by that means—an opinion which, as I, this year, happened to hear at the lecture of an eminent German *savant*, is propagated even in Germany—is entirely erroneous and without any foundation.

Budapest, December 2 JULIUS LETHÖ

Unconscious Thought

RESUMING this subject, I again call attention to the circumstance that unconscious thought in children is more developed than conscious thought, though conscious thought or sensation

lays the foundation of what becomes habitual or instinctive. In man, unconscious thought becoming habitual, it is the nursery again of conscious thought, the two conditions in the adult coexisting.

Turning to comparative psychology, a branch which has always appeared to me of particular importance, we find in intelligent animals, as the dog, either in community (commonly called wild) or in the domesticated state, the same nature of mind as in man and the like manifestations. In the young animal, however, there must have been the same precedent stage, though the conscious stage is of course produced earlier than in man.

This raises the question, on which we can speculate, but which we cannot as yet solve, whether some animals are not mostly in the state of unconscious thought, never attaining to that of conscious thought. Looking to the cases of degradation in man, it appears to me that in softening of the brain the man falls back to the unconscious stage, and in some instances remains for some time in it, so that here we get an example of prolongation, it may be called continuance, of the unconscious stage.

Such a state as that of habitual unconscious thought may be regarded as possible and probable, and we are justified in applying it to many animals of inferior nervous organisation. The condition of consciousness being absent, the degree of pain is less, as must be the case in infants. So far from the saying of the master painter of mankind being true that the worm feels as great a pang as when the giant dies, the worm must be less sensitive and less sensible. It is quite possible that the antivivisectionists may be in the wrong as to lower animals, whatever reason they may have as to those like the dog.

There will be at least the like gradations of mind as of form in the animal world, and the difference between an animalcule and a dog will be enormous, and still greater that between the animalcule and man. In the higher stages the differences will be vastly augmented by the agencies at work. Thus it must be that the conscious stage producing precision of action influences the habitual condition of the unconscious stage. Having applied this to man, we may better conceive it, and form some notion of its prodigious relative development by considering how man so constituted has his power of thought enhanced by the great instrument of speech.

These causes contribute to the great differences which I long since pointed out between the rapidity of thought of one man and another, or of the same man at different times of life or under various conditions. My paper "On the Geographical Distribution of Intellectual Faculties in England," following one at the British Association, being published in the *Journal* of the Statistical Society (June, 1871, p. 357), has escaped the notice of psychologists and physiologists, being esteemed statistical, whereas it is also psychological. At p. 357 I gave an account of an experiment, showing a fluctuation in conscious thought in one adult of from 1 to 4, or 100 to 400, denoting an enormous difference, and illustrative of the variations in mental power which exist in society. If, however, we were to estimate a child of 14 at 50, then the ratio would be as 1 to 8. If we take a child of 7 at the quarter of an adult, then we should have 1 to 16. These are not extreme measures, for in the babe we may find 1 to 100, 1 to 200, 1 to 400.

This is given as an illustration of what must exist in the animal world as to conscious thought, and that without reference to unconscious thought, which must be the condition of many classes. Physiologically the subject has been treated by many physiologists, and notably most admirably by Dr. Carpenter; but here the psychological aspect in the special forms indicated is alone brought into prominence.

The phenomena of unconscious thought, indeed, require much greater attention. Not only do they underlie the distinctions between animals and between animals and man, but they must be taken into consideration as explanatory of dreams and of many forms of mental disease. This has been partly dealt with by Dr. Carpenter.

While the later steps of dreams, the visible and pictorial stages, are greatly under the influence of conscious thought, the early stages are under the influence of unconscious thought. It appears to me quite possible that unconscious thought is not altogether latent in sleep. It is worthy of consideration what is the condition of a wakeful animal, say a dog—whether it is one succession of dreams or a form like delirium.

The recurrence of an error once implanted in the mind, notwithstanding our efforts to eliminate or counteract it, is probably due to the tenacious resistance of unconscious thought, storing up and reproducing the error.

Heredity of thought, whether as dealt with by Mr. Francis Galton or by myself in the paper quoted at p. 359, &c., may be assigned chiefly to the transmission of the habits of unconscious thought, if we consider more especially the condition of the lower animals.

As my last communication was mentioned in the *Daily Telegraph* of November 29, and with the assertion that Dr. Carpenter, Mr. C. T. Munro, and myself have provided in unconscious thought a new plea for unaccountability for criminal actions, it is well to remark that the phenomena discussed have no such bearing. HYDE CLARKE

December 20, 1879

Stags' Horns

THE disappearance of the antlers of stags, in the Highlands and elsewhere, is to be accounted for by the fact that they are saleable articles; but although they do not assist as *entremets* at the animal's meal it may happen that they assist—in the form of knife-handles—in the distribution of his venison at our dinners.

When a lad I obtained many antlers of the Fallow Deer from a neighbouring park, the tines of which were sometimes broken but never gnawed or polished by licking.

It would scarcely be surprising that deer should crave for calcareous matter during the rapid development of their antlers, but neither are their tongues adapted for rasping nor their teeth for comminuting hard bones. PAUL HENRY STOKOE

Beddington Park

No gillie that I know of has the honour of my acquaintance, and therefore no gillie can know, save indirectly, that I have picked up a horn of the red deer, in a park near Sheffield! I was told at the time by the gardener who accompanied me that these horns were eagerly sought after by the Sheffield knife-makers for the purpose of making bucks' horn knife-handles.

M. T. M.

A Query

I HAVE seen somewhere (but I am unable to say where) a statement to the effect that there is some evidence for the supposition that in the crystallising state of matter the forces between molecule and molecule are not directed in the right lines joining the molecules. Can any of your readers throw light on this subject, or give references to sources of information about any other case in which the mutual action of two molecules is not directed in the line joining them? IGNORAMUS

THE ASSERTED ARTIFICIAL PRODUCTION OF THE DIAMOND

PROF. MASKELYNE sends us the following letter on this subject:—

I should be obliged if you would accord me space in one of your columns in order that I may answer a great number of letters and applications which have pursued me during the past few days on a subject of some little public interest, that subject being the asserted formation of diamonds by a gentleman at Glasgow.

Some ten days ago I had heard nothing whatever of the claim of Mr. Mactear, of the St. Rollox Works, Glasgow, to the artificial production of the diamond.

My name, however, was already in several newspapers as that of a person in whose hands the asserted diamonds had been placed for a decision as to their true nature. Ultimately a small watch-glass with a few microscopic crystalline particles came into my hands for this purpose from Mr. Warington Smyth, and subsequently a supply came to me direct from Mr. Mactear. I shall proceed to state the results I have obtained from the examination of these.

Out of the first supply I selected by far the largest particle, one about the $\frac{1}{50}$th of an inch in length, and it may be that I wasted some time in experimenting on this particle, as it might not have been an authentic example

of the "manufactured diamond," since it differed in some respects from the specimens I have since received direct from Mr. Mactear.

The diamond excels all substances in hardness. Its crystals belong to the cubic system, and should not, therefore, present the property of doubly refracting light. Frequently, however, from the influence of strains within the crystal due to inclosed gas bubbles, or other causes, diamonds are not entirely without action on a ray of polarised light sent through them. Finally, the diamond is pure carbon, and, as such, burns entirely away when heated to a sufficiently high temperature in the air, and more vividly so burns, or rather glows away, when heated in oxygen gas.

The specimens I had to experiment upon were too light to possess appreciable weight, too small even to see unless by very good eyesight or with a lens, yet were, nevertheless, sufficiently large to answer the three questions suggested by the above properties.

A few grains of the dust, for such the substance must be termed, were placed between a plate of topaz—a cleavage-face with its fine natural polish—and a polished surface of sapphire, and the two surfaces were carefully "worked" over each other with a view to the production of lines of abrasion from the particles between them. There was no abrasion. Ultimately the particles became bruised into a powder but without scratching even the topaz. They are not diamond.

Secondly, some particles more crystalline in appearance than the rest were mounted on a glass microscope slide and examined in the microscope with polarised light. They acted each and all powerfully in the manner of a birefringent crystal. It seemed even in one or two of them that when they lay on their broadest surface (it can scarcely be called a "crystal-face") a principal section of the crystal was just slightly inclined to a flattish side of it in a manner that suggested its not being a crystal of any of the orthosymmetrical systems. Be that as it may, it is not a diamond.

Finally, I took two of these microscopic particles and exposed them to the intense heat of a table blow-pipe on a bit of platinum foil. They resisted this attempt to burn them. Then, for comparison, they were placed in contact with two little particles of diamond dust exceeding them in size, and the experiment was repeated. The result was that the diamond particles glowed and disappeared, while the little particle from Glasgow was as obstinate and as unacted on as before. I had previously treated the specimen I have alluded to as the first on which I experimented by making a similar attempt in a hard glass tube in a stream of oxygen, and the result was the same. Hence I conclude that the substance supposed to be artificially formed diamond is not diamond and is not carbon, and I feel as confident in the results thus obtained from a few infinitesimal particles that can barely be measured and could only be weighed by an assay balance of the most refined delicacy, as if the experiments had been performed on crystals of appreciable size.

Not content with merely proving what these crystalline particles are not, I made an experiment to determine something about what they are.

Heated on platinum foil several times with ammonium fluoride, they became visibly more minute, and a slight reddish white incrustation was seen on the foil. At the suggestion of Dr. Flight, assistant in this department, a master in the craft of the chemical analyst, these little particles were left for the night in hydrofluoric acid in a platinum capsule. This morning they have disappeared, having become dissolved in the acid.

I have, therefore, no hesitation in declaring Mr. Mactear's "diamonds" not only not to be diamonds at all, but to consist of some crystallised silicate, possibly one resembling an augite, though it would be very rash to assert anything beyond the fact that they consist of a compound of silica, and possibly of more than one such compound.

The problem of the permutation of carbon from its ordinary opaque black condition into that in which it occurs in nature, as the limpid crystal of diamond is still unsolved. That it will be solved no scientific mind can doubt, though the conditions necessary may prove to be very difficult to fulfil. It is possible that carbon, like metallic arsenic, passes directly into the condition of vapour from that of a solid, and that the condition for its sublimation in the form of crystals, or its cooling into crystal diamond from the liquid state, is one involving a combination of high temperature and high pressure present in the depths of the earth's crust, but very difficult to establish in a laboratory experiment.

NEVIL STORY-MASKELYNE

FURTHER NOTES UPON THE PAPUANS OF MACLAY COAST, NEW GUINEA

I.

HAVING recently received from my friend M. von Miklucho Maclay, by way of Singapore, some further notes upon the ethnology of the Papuans of Maclay Coast, in New Guinea, I herewith contribute the following abstract of them to the pages of NATURE, as the periodical in which they were published is not readily accessible to English readers.[1]

The Daily Life of the Papuans.—With regard to the application of pigment to the face and body, the Papuans paint the face with red and black colours, the red being such usually used by the young (those from fifteen to thirty years "malassi"), and the black by those of riper years. The young further use the colouring agents in the form of various devices. On ordinary days they are unpainted, or confine themselves to a ring round the eyes or a line along the nose, which goes to join another running from the temple to the vertex, over the shaved eyebrows. On formal occasions, however, the whole face is smeared with a pigment over which white and black are drawn. Sometimes half of the face is painted black, while the other half is red, which gives a very remarkable appearance. The Tamo, or men over thirty years old, almost never employ the real colour, but substitute black instead. On important occasions the whole head is covered with the pigment; in fact, in certain districts, *e.g.*, "Kar Kar," Dampier Island, where this is abundant, the inhabitants smear the whole body with it, and with such care that it would be readily taken for their natural colour.

The women of Maclay coast are seldom to be seen painted, and, when they are, in not so elaborate a mode as are the men. A description has been already given of the *coiffure*. Before the arrival of Maclay bamboo knives and fragments of flint were used for the removal of the hair; but during his stay sherds of glass collected in the neighbourhood of his hut were substituted. Another method was also employed for the removal of single hairs by means of a noose made with a stalk of grass, in which the hair was twisted out of its follicle. Although this operation would seem to be a painful one, a Papuan has been seen engaged for three or four hours on this occupation, without a shade of an expression of pain being seen to pass over his features. Although the Papuans of this region are not conversant with the art of tattooing, they are accustomed to burn rows of scars in lines upon the skin. The operation is thus performed:—The patient having been placed either upon his back or belly, a red-hot fragment of dry bark is laid

[1] "Ethnologische Bemerkungen über die Papuas der Maclay-Küste in Neu Guinea—Alltägiges Leben der Papuas" (Fortsetzung). Reprinted from the *Natuurkundig Tijdschrift voor Nederlandsch Indie*, Zevende Serie, Deel vi. p. 294. (Batavia, 1876.) This abstract may be regarded as a continuation of two articles by me upon the same subject, which were published in NATURE, vol. ix. p. 328, vol. xiv. pp. 107, 136.—J. C. G.

upon the skin until it is entirely consumed to ashes, and so on with each mark. This procedure, too, must demand great patience and self-control. The women, curiously enough, ornament their bodies much less than do the men, their costume being not infrequently reduced to a minimum. In Billi-Billi, Maclay saw a marriageable maiden in the most singular costume that could possibly be conceived, consisting, as it did, of a single large shell (a white *Cypræa*) upon the lower part of the *mons Veneris*.

The men employ four or five hours in the combing of their hair and in smearing it with a decoction of the fruit of the Súbari (*Calophyllum inophyllum*), also in adorning it with feathers and flowers, and in painting their faces and backs. The only decorations, on the other hand, in which the females indulge on festal occasions is in a little dye with which they smear their hair, cheeks, and forehead, and a number of necklaces composed of shells of various sizes and gaily-coloured fruit kernels.

With regard to the social position of the women. Although it can hardly be said that the Maclay Coast Papuans ill-treat their wives, or that these latter have no influence upon the men, it is nevertheless the case that the women in almost every particular play an inferior *rôle;* for even when they are not overworked they have always enough employment throughout the year, while the men, with the exception of a few weeks spent in heavy work—the laying-out of plantations and cultivation of the ground—can for three-fourths of the time enjoy a *dolce far niente*. The women, moreover, have a worse diet, and dare not take their meals in company with the men, and in comparison with the latter wear scarcely any ornaments, nor do they take any part in their feasts.

Neither the marriage nor the birth of children are celebrated with any particular festal observance. Circumcision, on the other hand, is a somewhat important rite. This is performed at the age of twelve years, in the forest, at a distance from the village, and, as Zipporah did it, with a sharp flint, and after the ceremony the neophyte is escorted with songs back to the village. He is now no longer regarded as a boy, but as having come to man's estate, and enjoys, accordingly, many privileges which are not accorded to mere children.

The mode of salutation is somewhat laconic. When a neighbour comes into a village he says to the children, "*E-Wau!*" "Hey, children!" while the men and women are greeted respectively with a "*E-Nangeli!*" and "*E-Mem!*" "Hey, you women!" and "Hey, fathers!" The greeting of the Tamo among themselves is "*E-Aba!*" "Hey, brothers!" Relations, however, and friends are not accustomed to greet one another. The Papuans reach out their hands one to another, with a kind of movement, but without any mutual pressure. On departure the guest says "*Adi-angarmem,*" "I am going," to which the host and any others who may be present reply "*E-Aba,*" or "*E-Mem,*" and the guest answers in corresponding terms. Upon this the host says, "*Glembe*" —"Depart, then"—and escorts his guest as far as the entrance of the village, carrying with him the presents and the remnants of the feast. Hereupon the guest frequently remarks, "Stay you here, but I must be off." If the parting be of a particularly feeling character, one presses the other on the left side of the breast, embracing him at the same time with one arm, while with the other hand he pats him gently on the back. In the village Bogat, and in the Archipelago of Contentment, Maclay remarked that the people greeted a particularly honourable guest by squatting in a particular position on the ground.[1]

The custom of mutual exchange of names is pretty widely spread throughout the coast, and Maclay was frequently begged to change his name with that of one of the natives whom he might have distinguished in some way or other. In order, however, to avoid any misunderstanding, he always refused this request, and only as a particular favour allowed his name, "Maclay," to be borne by the newly-born boys, whose fathers regarded themselves as his special friends. He was, moreover, frequently requested to choose a name for newly-born boys and girls.

As regards the treatment of the dead, the news of the death of a man is announced to the surrounding villages by a fixed succession of strokes on the *barum*. On the same or the next day the whole male population assembles in complete war equipment in the neighbourhood of the village. To the sound of the *barum* the guests stream into the village, and are awaited in the neighbourhood of the hut of the deceased by a crowd, likewise in warlike accoutrements. After a short palaver those present divide into two opposite camps, after which the performance of a sham fight takes place. They go to work, however, somewhat carefully in that they make no use of their spears; dozens of arrows, however, are shot off, so that not a few are somewhat seriously wounded in this make-believe encounter. The relations and friends of the deceased seem in particular to get excited and behave like madmen. After all are tired out, and all arrows have been shot away, the *quasi* enemies sit down in a circle and comport themselves merely as lookers-on. The nearest relations of the deceased then bring a pair of mats and the sheaths of the petioles of the fronds of the sago-palm, and lay them in the midst of the open space. Next they bring the corpse out of its hut, maintained in the stooping posture, with the chin resting upon the knees, and the arms embracing the legs, by means of strips of rattan. Close to the corpse are placed its property, gifts of its neighbours, and a couple of bowls (*tabir*) full of freshly-cooked food, while the men sit in a circle round the open space, the women, but only those nearest related to the deceased, merely look on at a distance. The corpse is then, with great neatness and art, wrapped in the mats and palm leaves, and tied up fast with a quantity of rattan and lianas, so that the whole finally resembles a well-made parcel. This, after being fastened to a strong stake, is brought into the hut and the stake is fastened under the roof; finally, after arranging all the property, presents, and food in the neighbourhood of the corpse, the guests leave the hut and return to to their respective villages.

Some days later, when the corpse has become very decomposed, it is buried in the hut itself, a proceeding which in no wise hinders the relations from continuing to use it as a dwelling-place. About a year afterwards the skull is dug up and separated from the body of the corpse; but it is not the whole skull, but only the lower jaw which is preserved, and that by the nearest relation of the deceased, being carried, not infrequently, in the *gun*, or worn as a kind of armlet.[1] This bone is most carefully preserved as a *souvenir* of the deceased, and it was only by the help of much persuasion, backed by numerous presents, that Dr. M. Maclay prevailed upon its possessor to part, under the seal of secresy, with this treasured memento. The burial of a child or of a woman is attended with much less ceremony, being heralded by the sound of no *barum*, and accompanied by no assembly of neighbours, nor martial pomp and circumstance.

[1] "Niederhocken." This position has been already described in the first paper on the Papuans of Maclay coast.—NATURE, vol. ix. p. 329.

[1] This is not the only instance of the bones of the dead being worn by their surviving relatives. For instance, the Tasmanians (*vide* NATURE, vol. xiv. p. 211), according to Dr. Barnard Davis, carry as necklaces fragments of the bones of their relatives; and it is moreover stated by Prof. Allen Thomson, that the widows among the Andaman Islanders—the Mincopies according to Dr. B. Davis—actually wear the skulls of their late husbands upon their shoulders (NATURE, vol. xiv. p. 489). Prof. Flower, in a recent lecture on ethnology at the Royal College of Surgeons, showed the skull of an Andamanese man, to which was attached a very elegant webbed sling by which it had been suspended from the neck of the widow.—J. C. G.

With regard to the language and dialects. This study was attended with great difficulty because there was at hand no go-between who could play the part of a mutual interpreter, for the terms which were required could only be learnt either by pointing to the corresponding object, or through such signs as would be employed in barter. These two methods were, however, the source of many misunderstandings and mistakes, for the same object was variously named by different people, and for weeks Maclay was uncertain as to which term was the correct one. Here is an instance of what frequently happened. Dr. Maclay showed a leaf, hoping to arrive at its name, a native mentioned a name, which was forthwith written down; another Papuan gave another name on being shown the same thing; a third, fourth, and fifth, each gave a different word. Which out of all these was the proper name of the leaf in question?

After a time and by degrees it was discovered that the word first mentioned was the proper name of the plant to which the leaf belonged, the second betokened its colour, *e.g.*, *green*, the third *dirt* or *useless*, probably because the leaf had been picked up from the ground, or belonged to a tree not turned to account by the Papuans. And so it came to pass with many words with abstract expressions and such as could not be explained by signs. Maclay, too, had obviously greater difficulties, for instance, how to inquire the equivalent word for "friend," and that for "friendship," and it was only after the lapse of four months that the corresponding word to "seeing" was arrived at, but as to the equivalent of "hearing," this was never come upon. The writing down of words was involved in further difficulties; there were certain tones of the Papuan language which were absolutely impossible to imitate. This Maclay rightly attributes to fundamental differences in the anatomical structure of the larynx and the whole muscular system of the organ of speech in the two races. Not only the organ of speech but also that of hearing plays an important part, for the same word may be heard in a totally distinct manner by different individuals. There is, too, in the denotation of the words of such a tongue quite a series of sources of fallacy—(1) the aborigines have not the same pronunciation; (2) the translator hears the words with his individual organ of hearing; (3) previously to writing it down he pronounces it with his individual organ of speech; (4) and finally, after pronunciation, the foreign word must be expressed in the characters of a known language. Nearly every village on Maclay Coast has its peculiar dialect, and these vary so much, that when making an excursion of two or three days, M. Maclay required the assistance of two, and even three, interpreters. It is only the old who understand two or three dialects, and it not infrequently happens that young persons do not know words of their own dialect, in which case they resort for information to some old Papuan. From this it may come to pass that upon the death of elders new words must be brought out by the young and introduced into the vocabulary. On the other hand the Papuans are fairly quick at learning a new language, consequently there are now to be heard on Maclay Coast a number of Russian equivalents for such words as axe, knife, nail, &c. The names of various birds are founded upon the cry which they utter. There are, moreover, among the dialects of Maclay Coast a number of Malayo-Polynesian words. J. C. GALTON

(*To be continued.*)

JAMES R. NAPIER, F.R.S.

MANY cultivators of science, both at home and abroad, more especially those engaged in engineering and shipbuilding, will deeply regret to learn of the decease of Mr. James R. Napier, F.R.S., the eldest son of the late Mr. Robert Napier of Shandon, the eminent pioneer of the shipbuilding and marine engineering industries of the Clyde. The sad event occurred on Saturday, the 13th ult., at his house in Glasgow, after an illness which had confined him to his room for about three weeks. His health had been very unsatisfactory, however, for a number of years, and, with the view in a great measure of securing a better bodily condition, he had travelled a good deal—to Australia, twice to America, several times up the Mediterranean, wintering once at Malta, and on another occasion at Madeira, where he had the melancholy satisfaction of having as a brother invalid the late Prof. W. K. Clifford.

Born in the year 1821, and educated at the High School of Glasgow, Mr. Napier studied mathematics under Dr. James Thomson (Sir William Thomson's father), natural philosophy under Dr. W. Meikleham (Sir William's immediate predecessor), and practical astronomy under the late Prof. J. P. Nichol.

When quite a young man he was installed in his father's shipbuilding yard at Govan in a responsible position, having had, however, an excellent practical training in the workshop under the late David Elder, a man who did much to train the present race of mechanics who have since secured prominent positions in their profession. By and by the firm of Robert Napier and Sons was constituted, the sons being the deceased and his brother John; and the firm eventually attained a position in connection with marine engineering and naval architecture that has never been excelled in the annals of steam navigation. About twenty years ago Mr. James R. Napier retired from the firm, and for a time he conducted a shipbuilding business of his own, when he availed himself of the opportunity of putting into practice a number of his most advanced notions in ship construction. But it would seem as if he was not destined to shine as a man of business, being very unlike his father in this respect. During his subsequent career he occasionally executed a number of commissions in connection with matters in which his special knowledge could be profitably turned to account, and much of his time was devoted to scientific pursuits.

From time to time Mr. Napier communicated many interesting papers to learned societies with which he became connected. One of those bodies was the Philosophical Society of Glasgow, which he joined in the year 1850, when its presidential chair was filled by Dr. Thomas Thomson, F.R.S., the eminent chemist and mineralogist. In 1855 he became a life member of the British Association, on the occasion of its second meeting in Glasgow, and he long took a deep interest in its affairs, by serving on special committees, and otherwise. He was one of the founders, and subsequently president, of the Institution of Engineers in Scotland (now Institution of Engineers and Shipbuilders), the birth of which took place in 1857, with Prof. Rankine as the first president. When the Institution of Naval Architects was formed in the year 1860, he became a member, and was honoured by a seat in its first council.

Following the example of Prof. Roscoe in Manchester, a number of people of scientific proclivities, a few years ago, originated the Glasgow Science Lectures Association, the first lecture of which was, appropriately, delivered by Roscoe himself. The movement in Glasgow met with very hearty co-operation from the deceased. His sympathy with scientific progress was shown in a great variety of ways; and as an inventor who had often to apply to the Patent Office, he was leagued with Sir William Thomson and others in the recent movements for bringing about a comprehensive reform of the patent laws.

One of the leading features of Mr. Napier's career was the unbroken intercourse, personal and professional, which was maintained between him and Prof. Rankine. They had numerous joint undertakings in experimental investigation, and each was of very great service to his fellow, and in the end to science. As might well be understood, to no person was Rankine's too early decease a greater loss than to James R. Napier. JOHN MAYER

FERTILITY OF HYBRIDS FROM THE COMMON AND CHINESE GOOSE

IN the "Origin of Species" I have given the case, on the excellent authority of Mr. Eyton, of hybrids from the common and Chinese goose (*Anser cygnoides*) being quite fertile *inter se*; and this is the most remarkable fact as yet recorded with respect to the fertility of hybrids, for many persons feel sceptical about the hare and the rabbit. I was therefore glad to have the opportunity of repeating the trial, through the kindness of the Rev. Dr. Goodacre, who gave me a brother and sister hybrid from the same hatch. A union between these birds was therefore a shade closer than that made by Mr. Eyton, who coupled a brother and sister from different hatches. As there were tame geese at a neighbouring farm-house, and as my birds were apt to wander, they were confined in a large cage; but we found out after a time that a daily visit to a pond (during which time they were watched) was indispensable for the fertilisation of the eggs. The result was that three birds were hatched from the first set of eggs; two others were fully formed, but did not succeed in breaking through the shell; and the remaining first-laid eggs were unfertilised. From a second lot of eggs two birds were hatched. I should have thought that this small number of only five birds reared alive indicated some degree of infertility in the parents, had not Mr. Eyton reared eight hybrids from one set of eggs. My small success may perhaps be attributed in part to the confinement of the parents and their very close relationship. The five hybrids, grandchildren of the pure parents, were extremely fine birds, and resembled in every detail their hybrid parents. It appeared superfluous to test the fertility of these hybrids with either pure species, as this had been done by Dr. Goodacre; and every possible gradation between them may be commonly seen, according to Mr. Blyth and Capt. Hutton in India, and occasionally in England.

The fact of these two species of geese breeding so freely together is remarkable from their distinctness, which has led some ornithologists to place them in separate genera or sub-genera. The Chinese goose differs conspicuously from the common goose in the knob at the base of the beak, which affects the shape of the skull; in the very long neck with a stripe of dark feathers running down it; in the number of the sacral vertebræ; in the proportions of the sternum;[1] markedly in the voice or "resonant trumpeting," and, according to Mr. Dixon,[2] in the period of incubation, though this has been denied by others. In the wild state the two species inhabit different regions.[3] I am aware that Dr. Goodacre is inclined to believe that *Anser cygnoides* is only a variety of the common goose raised under domestication. He shows that in all the above indicated characters, parallel or almost parallel variations have arisen with other animals under domestication. But it would, I believe, be quite impossible to find so many *concurrent and constant* points of difference as the above, between any two domesticated varieties of the same species. If these two species are classed as varieties, so might the horse and ass, or the hare and rabbit.

The fertility of the hybrids in the present case probably depends to a limited degree (1) on the reproductive power of all the Anatidæ being very little affected by changed conditions, and (2) on both species having been long domesticated. For the view propounded by Pallas, that domestication tends to eliminate the almost universal sterility of species when intercrossed, becomes the more probable the more we learn about the history and multiple origin of most of our domesticated animals. This view, in so far as it can be trusted, removes a difficulty in the acceptance of the descent-theory, for it shows that mutual sterility is no safe and immutable criterion of specific difference. We have, however, much better evidence on this head, in the fact of two individuals of the same form of heterostyled plants, which belong to the same species as certainly as do two individuals of any species, yielding when crossed fewer seeds than the normal number, and the plants raised from such seeds being, in the case of *Lythrum salicaria*, as sterile as are the most sterile hybrids.

Down, December 15 CHARLES DARWIN

[1] Charlesworth's "Mag. of Nat. Hist.," vol. iv., new series, 1840, p. 90. T. C. Eyton, "Remarks on the Skeletons of the Common and Chinese Goose."

[2] "Ornamental and Domestic Poultry," 1848, p. 85.

[3] Dr. L. v. Schrenck's "Reisen und Forschungen im Amur-Land,' B. i. p. 457.

CLOUD CLASSIFICATION[1]

THE work of a meteorologist who has devoted himself with great diligence for many years to the study of the structure, forms, and movements of the clouds, possesses a strong claim on the attention of all who are interested in this difficult branch of science. Independently of the importance of the challenge which Prof. Poëy offers to an existing system of nomenclature, his book contains numerous facts and suggestions of very considerable scientific value. In the present enlarged and revised edition the author has endeavoured to satisfy the requirements of our advancing knowledge on the subject of which he treats; a task which ought, unfortunately, to be one of no great difficulty, owing to the small amount of progress which has been made in this, as compared with other departments of meteorology, since the appearance of the second edition.

The history of cloud-nomenclature has been to a great extent a record of wrecks and casualties, because classification has, by an unfortunate necessity, preceded the knowledge of the physical structure of the objects classified. Prof. Poëy was one of the first to appreciate the importance of the fact that the terminology of the clouds must, ultimately, be based not simply upon the varieties of the forms of clouds, but upon those physical conditions to which these varieties are related. But our knowledge of the physical conditions which determine the development of the modifications of cloud is at the present time so limited that no classification founded thereon can as yet be unreservedly adopted. A great deal of questionable hypothesis necessarily enters into the construction of Prof. Poëy's scheme, as he would, we believe, with the candour which distinguishes him, be the first to admit. There is of course a strong *prima facie* desirability that cloud observers should possess some definite system of nomenclature; and at present nearly all of them, not of the lazy class, complain that cloud-classification is still in a state of chaos. Yet it may be doubted whether, for some years to come, a Meteorological Congress will be able to establish an absolutely fixed system of classification which will be universally accepted. Of the ground on which such a system should be built science has hitherto explored but a small portion; and even where we have the materials for observational and experimental research in this direction, very inadequate use has been made of these materials. The immediately practical problem which is raised by the study of this book is this:—In the provisional adaptation of our cloud classification to the status of our knowledge, is it desirable that Prof. Poëy's terminology be adopted in lieu of that of Howard, or should the still prevailing nomenclature be retained, with such modifications as the observations of Poëy and of other students of the subject have as yet shown to be necessary? To this problem we shall venture in the present article to suggest an answer.

As might be expected from the condition of the subject the critical portion of Prof. Poëy's treatise is more successful than the constructive. Several of Howard's terms have had from the first an ill-fated career. To

[1] "Comment on observe les Nuages pour prevoir le Temps." Par André Poëy. Third Edition. (Paris: Gauthier-Villars, 1879.)

FIG. 1.—"Cumulus" with "Fracto-cumulus."

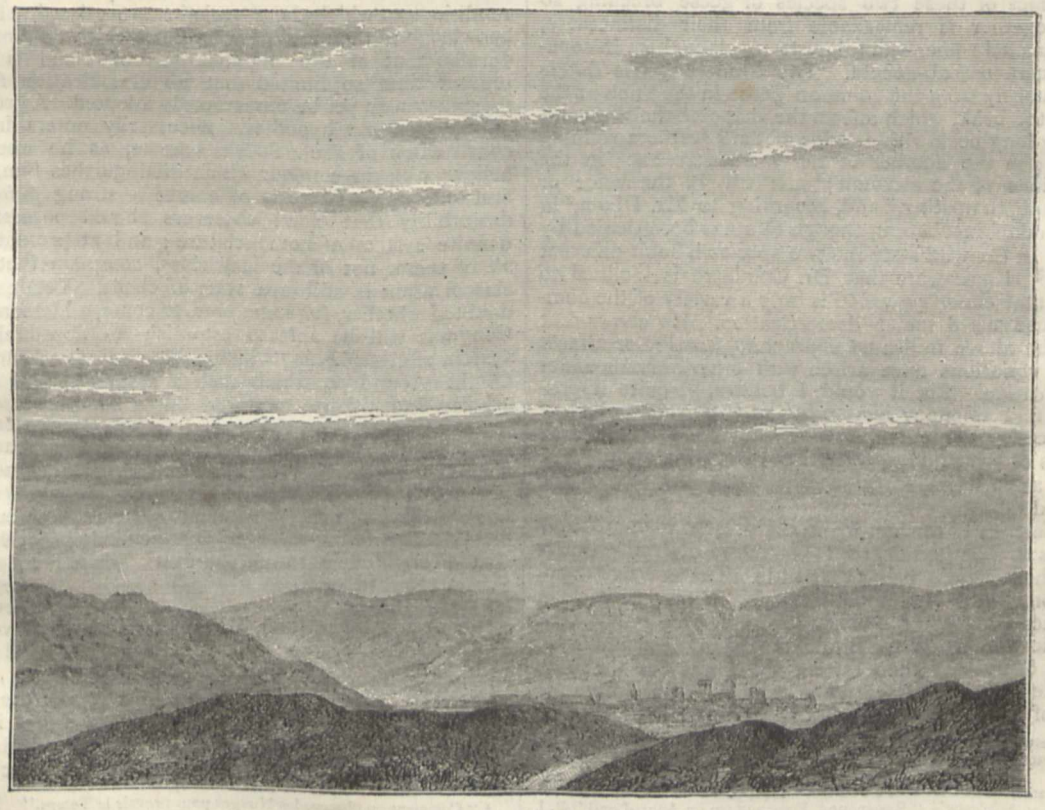

FIG. 2.—"Stratus" with "Fracto-stratus."

begin with, the name "stratus," which has ever been the object of Poëy's especial animadversion, was unluckily applied by Howard himself to ground fog. The result has been a curious condition of anarchy among the followers of Howard's system up to the present day. The predicament in which these observers have found themselves is this. One of the three primary cloud-names which Howard introduced is never, if his system be rigidly followed, to be applied to any object which most people call a cloud at all. It must be admitted that a fog and a cloud are, in structure, one and the same thing: a cloud is a fog viewed from without, and a fog is a cloud viewed from within. But it is precisely because a fog is, in this sense, a cloud, and not a particular kind of cloud, that it is objectionable in practice to apply to a fog a specific cloud name. An observer may be for hours together enveloped in a fog of the form of which he can discover nothing, except that the under surface necessarily follows the contour of the earth's surface. In a classification having reference to the shapes of clouds, it is undesirable to give to such a phenomenon a technical name distinctive of a special form of cloud. Prof. Poëy pertinently says "aucun observateur consciencieux ne voudra enregistrer sous le nom de 'stratus' un phénomène de brouillard." On the other hand, a very large class of clouds, occurring in every part of the globe, and in some parts actually the predominant type, have possessed in Howard's terminology no appellation at all, viz., the clouds, neither cumulus nor cirrus, which extend themselves in a bed or layer, whose vertical dimensions as compared with its horizontal are very small. A certain number of observers have freely applied the term "stratus" to this type of cloud. Others,

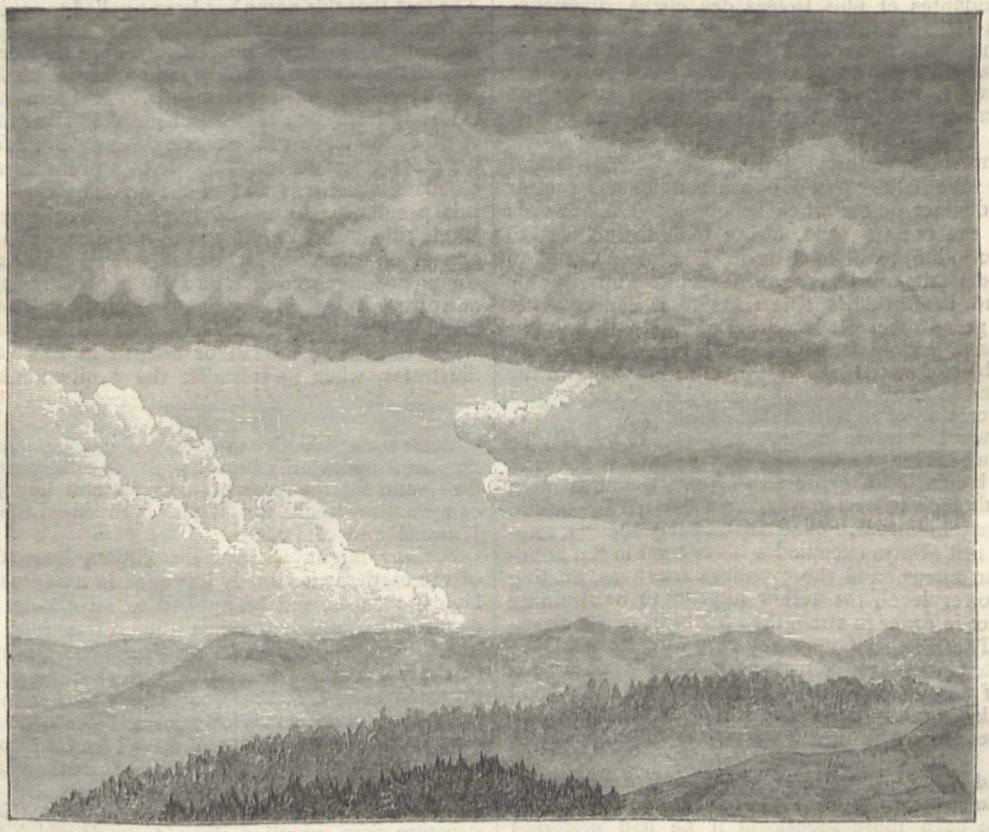

FIG. 3.—"Mammato-cumulus."

perhaps more conservative, have created endless confusion by bestowing the name "cirro-stratus" on all clouds of the description to which we refer, while others again have wrought similar havoc by a corresponding misapplication of another of Howard's compounds "cumulo-stratus." Finally, Prof. Hildebrandsson is driven to the revival of the "strato-cumulus" of Kaemtz, as the title for the prevailing winter-cloud of Northern Europe. Prof. Poëy's remedy for this state of things is to abolish the term "stratus," and to apply to all clouds which lie in beds the title "pallium." The effort has already proved partially successful, for, owing to the defect in Howard's system, "pallium" and its compounds have to some extent replaced, at least among American meteorologists, the "stratus" of Howard and its compounds. Ice-clouds disposed in a sheet or layer are to receive the name "pallio-cirrus"; water-clouds the name "pallio-cumulus." We think Prof. Poëy's objection to the word "stratus" as applied to a bed or layer of cloud somewhat ill-directed. The term (signifying "levelled," or "laid flat") is in itself quite as expressive as "pallium" (which does not so much involve the idea of the horizontal); and, however it may have been misapplied, we suspect that it will yet prove possessed of too much respectability to be summarily ejected. Prof. Poëy would retain, inconsistently as it appears to us, the compound name "cirro-stratus," but we have always found it extremely difficult to understand precisely what kind of cloud he means to describe under this name, or to recognise with any distinctness what is his idea of "nuage stratifié," the clouds which he terms "stratified" being rather what most persons would call "striated." Whenever cirrus becomes sufficiently extended to form a veil or sheet, it is to receive the name "pallio-cirrus." "Cirro-stratus" is

something which floats at a higher level than "pallio-cirrus." Looking at one of the figures in which "cirro-stratus" is portrayed, we recognise only cirrus, tending slightly to the form cirro-cumulus (Plate 3, Fig. 1). Some of the other representations convey the idea of clouds which would certainly be at a lower level than the usual veil or bed of extensive sheet-cirrus. Some readers may however be more fortunate than we have been in recognising the form of cloud which the author intends to designate as "cirro-stratus." His theory of the formation of the varieties of clouds of the cirrus types is perhaps as clearly expressed in the following as in any passage in the book. "Voici exactement ce qui se passe dans la nature: lorsque les cirrus s'abaissent, ils se transforment en cirro-stratus. Les aiguilles glacées de ce dernier nuage inférieur sont plus compactes et abondantes, plus définies et mieux géométriquement distribuées que les particules moins abondantes et plus isolées des cirrus supérieurs. Quand les cirro-stratus s'abaissent à leur tour, ils se transforment en cirro-cumulus: la structure neigeuse remplace la structure glacée par l'effet de la hausse de la température. Les cirro-cumulus en s'abaissant eux-mêmes, se transforment en pallio-cirrus ou en une couche neigeuse" (p. 29).

The compound "cumulo-stratus" Prof. Poëy would get rid of. We believe that Howard had himself a clear idea of a distinct object when he employed this word; but up to the present time, owing to indistinctness of verbal description, to ill luck as to illustrations, and to other accidents, the word has had a desperately unfortunate history, and Prof. Poëy's objections to it consequently come with great force. It is no exaggeration to say that while we have seldom found two observers really agreed as to the object denoted by this word, we have known the word applied to every existing description of cloud, with the sole exception of unmistakable cirrus.

Poëy's word "tracto-cirrus," the use of which he advocates whenever the cirrus-clouds arrange themselves in parallel bands, is an expressive term. But it is often extremely difficult to decide whether the cirri are or are not arranged in bands. And in treating the "tracto-cirrus" as if it always occupied a lower level in the atmosphere than cirrus, and the "pallio-cirrus" as floating at a still lower level, the author appears to be straining physical fact in order to strengthen the basis of his classification. There is, so far as we are aware, no evidence to show that whenever cirrus adopts, as it does in a majority of cases in most regions of the globe, the band form, it sinks in the atmosphere, and that a further subsidence takes place whenever it spreads itself into a veil or sheet.

The word "nimbus" is to share the fate of stratus and cumulo-stratus. Here again we think the author would have been more successful if he had preferred reform to abolition. That two distinct beds of cloud, the one at a high, and the other at a low level, frequently exist when rain is falling, there is abundant evidence to show, and perhaps this is especially the case during extensive intra-tropical rains. But observers are at least equally agreed as to the fact that a bed of cirrus may coexist with a layer of low cloud, either with or without one or more intermediate layers, without the occurrence of rain or snow. And it is equally certain again that the majority of passing showers are produced in a single mass of cloud, not necessarily, and perhaps never, homogeneous in structure in the portions near the earth and in those which extend into the higher regions of the atmosphere, but certainly not divided into two ocularly distinguishable strata. These facts seem to be ignored by the author when he substitutes "pallium" for "nimbus," and then makes the rainy "pallium" to consist in all cases of "pallio-cirrus" superimposed upon "pallio-cumulus."

As regards the term "pallio-cumulus," we are again obliged to hesitate in accepting it as a thoroughly descriptive title for a layer of low cloud, which has little in common with cumulus except that it occupies much the same level in the atmosphere.

Another of the author's terms, "fracto-cumulus," which he employs for those fragments of low cloud, which, though not themselves hemispherical, are nascent or potential cumuli, seems a useful word (perhaps only open to the slight objection that the affix would be liable, if Poëy's system were adopted, to be confounded, especially in MS. reports, with his other affix tracto). His French equivalent "nuage venteux" is, however, not sufficiently comprehensive, and is open to the same objection as the English word "scud," which involves the idea of rapid motion. The low cloud-fragments are not necessarily either the concomitants or the precursors of wind.

A highly interesting section is devoted to the clouds which have been in England denominated "pocky clouds." The fact that this name has been applied to several distinct varieties of clouds is certainly not unduly pressed by the author; in truth he scarcely appears adequately to realize the amount of misapprehension which has existed on the subject of these clouds. A Latin affix would certainly have the desirable effect of obliging the observer to give attention to the generic form of cloud from which hang the characteristic bladder-like protuberances; thus clouds of the cirrus and of the cumulus type, presenting this peculiarity, would no longer be registered under a single title. But Poëy's proposed affix "globo" does not appear satisfactory, for there is reason to suspect that some observers would be likely to apply it to any spherical or apparently spherical masses of cloud. How easily, in cloud terminology, misapprehension arises from the mere sound of a name the author himself in this very section illustrates, when he mistakes the "roll-cumulus" of the English Meteorological Office for ill-developed pocky cloud.

Beset with difficulty as all questions of cloud classification must necessarily be, we yet believe that at the present time, and for the present, a useful and unobjectionable compromise might be made between the systems of Howard and of Poëy.

Stratus might, without dissolution, leave the surface of the earth, as it already has done in numerous meteorological records, and be applied to all clouds, not of the cirrus type, which arrange themselves in a horizontal bed. *Cirro-stratus* would then form the descriptive title of the ice-clouds of the higher regions whenever these are disposed in a bed, sheet, or veil. The terms *cumulus* and *cirro-cumulus* may remain undisturbed. If the title *cumulo-stratus* have not received mortal injury from abuse, it might be applied to those peculiar descriptions of "mackerel cloud" or "nuage pommelé," which are only at a moderate elevation, and are not in physical structure cirro-cumuli, a class of clouds which much need a distinctive title. If *nimbus* is to be retained, it might be subdivided into its two essentially distinct varieties, the massive local shower-cloud, and the extensive bank of composite rain-cloud; and for these varieties the titles *cumulo-nimbus* and *strato-nimbus*, or some equivalent expressions, might come into use. The expressive *fracto-cumulus* should have its place secured; and this affix of Poëy's may have further applications; detached pieces of those clouds which tend to arrange themselves in horizontal beds (pieces which are in no sense the nuclei of cumulus clouds), may conveniently be termed *fracto-stratus*, while to the little wavy or broken shreds of ice-cloud which Poëy seems to designate "cirro-strati," the term *fracto-cirrus* might perhaps be applied. For the bizarre "pocky clouds," which, though not nearly so rare as is usually suposed, are certainly not common, an affix, if descriptive, would be none the worse for being somewhat outlandish, and possibly "*mammato*," or even "papillato," might be acceptable. If the course suggested in the present article be adopted, no very serious changes will

have to be made in the application of Howard's terminology, and no terms will have either to be coined or to be introduced from other systems of classification into that of Howard, with the exception of the affix "fracto," and the affix "mammato" (or one equivalent to it). We have thought it desirable to give illustrations of the types of cloud to be distinguished by these last names. In the first sketch "cumulus" is shown with "fracto-cumulus"; in the second "stratus" with "fracto-stratus"; in the third the characteristic base of "mammato-cumulus"; and in the fourth that of "mammato-cirrus."

We are not without hopes that Prof. Poëy will be induced to give his aid to proposals of moderate reform in the direction above indicated. We are convinced that he will find it easier to modify, by limitations and expansions, a long existing terminology, wherever the terms are essentially truthful and expressive, than to sweep it away and introduce another in its place.

To return to the book under notice. "How to classify the Clouds" would be a more descriptive title than that which it possesses. However, the reader who wishes to learn the art of cloud observation, with the view of learning to forecast the weather, will obtain valuable information from the descriptions which the author founds upon his own observations, as well as from those which he quotes from other observers, *e.g.* the exquisitely truthful description of cirrus quoted from Bravais (pp. 64 and 65). Some of the remarks on the azimuthal rotation of the clouds in Havanna, and on other phenomena, are well worthy of the attention of meteorologists. Here, *e.g.* is an observation, which, taken in conjunction with the inclination of the axes of cyclones and anti-cyclones in-

FIG. 4.—"Mammato-cirrus."

dicated by cloud-observations in Europe, and also with the recent conclusions of Prof. Loomis as to the sequence of winds at the American mountain observatories, may point to an important general law; "dans le plus grand nombre de cas, le vent anticipe sur les fracto-cumulus, ceux-ci sur les cirro-cumulus, et ces derniers sur les cirrus, c'est-à-dire de bas en haut, au lieu d'être de haut en bas. Ce fait paraît contredire l'hypothèse que les courants supérieurs déterminent, de proche en proche, le passage, sous le même parallèle, des courants inférieurs jusqu'aux vents de surface" (p. 127).

One who writes on a generally neglected subject, to which he has himself devoted much attention, is often tempted to accept too readily as grist anything that comes to his mill, and Prof. Poëy is not altogether free from this tendency, especially in those parts of his works in which he launches out into very questionable hypotheses both on the theory of winds, and on the action of heat and of electricity upon the clouds. Still more to be regretted is a certain looseness, not so much of language as of conception, which occasionally leads him to make some surprising statements, as well as to employ inaccurate expressions.

He usually speaks of the water-clouds as composed of aqueous vesicles, sometimes of vesicular vapour. In one passage, speaking of frozen clouds, he talks of the "vesicular vapour passing from the state of particles of ice to those of snow" (p. 77).

A protest is necessary against his often repeated definition of cumulus as a "cloud of the horizon." He says (p. 23), "Nous pouvons assurer que, sous toutes les latitudes du globe, les cumulus sont spécifiquement des nuages d'*été*, de *jour*, et de l'*horizon*." And again (p. 104), "Ils demeurent toujours confinés à l'horizon, et ne travers-

ent jamais la région zénithale qu'ils n'atteignent même pas. Cette seule circonstance distingue profondément les cumulus des fracto-cumulus." Truly a profound distinction! We had supposed that in regard to clouds, as in some other matters, "one man's horizon is another man's zenith." Are cloud-classifiers really driven to such extremities? What would be thought of the botanist who appended to his description of the *Ulmaceæ* the statement that "the trees belonging to this family are objects seen upon the horizon," and then proceeded to meet the reasonable objection of the surprised reader by the remark that certainly the elm trees around his (the botanist's) residence, were all seen near the horizon? Yet this is how (p. 24) the author handles his descriptions of cumulus. (The fact of course is that the characteristic form of cumulus is not readily discernible when the cloud is near the zenith.) A somewhat similar remark, made by the author in explanation of the fact that a belt of cirrus, clearly visible towards opposite points of the horizon, is frequently invisible, or nearly so, overhead, a fact of which the optical explanation is obvious, is so strange that we must quote it. "Nous l'attribuons à l'extrême degré de froid que nous avons toujours observé dans la région zénithale, relativement aux autres azimuts. Sous cette basse température et cette extrême sécheresse, la vapeur d'eau se maintient à l'état élastique, et se précipite difficilement sous la forme de filaments extrêmement déliés. C'est pour cela que les cirrus sont plus rares, moins denses et passagers vers la région zénithale," (p. 69).

It is with reluctance that we notice statements of this kind in a work the general idea of which we admire, and in the aim of which we cordially sympathise.

W. CLEMENT LEY

THE PLANETS OF THE SEASON

MARS

IF the two great leaders of the planetary system have filled us with astonishment at their magnitude and velocity, and with perplexity in the contemplation of arrangements so incomprehensibly unlike our own, they have not exhausted all the resources of the season. There yet remains a much nearer and more intelligible neighbour, who possesses a peculiar interest for an opposite reason—his similarity to ourselves. This especial character of the ruddy planet has long been known to astronomers, and will naturally make him an object of careful study before we leave him too far behind; and though the opposition of this year does not diminish his distance so much as that of 1877, yet his almost startling brilliancy has been alone enough to prove it among the favourable ones; for English astronomers, at least, it is far more propitious than the last, from his greatly-increased elevation. Much had been expected at that last opposition from the broad expansion of his disk, but the indistinctness of detail was a general source of disappointment here, though the success of Schiaparelli at Milan and Green at Madeira showed that the fault lay chiefly—perhaps not exclusively—in the English sky. My own impression certainly then was that, besides the want of clear outline inseparable from so low an altitude, there was a deficiency in decidedness of form and strength of tone as compared with previous observations, the cause of which may have lain in the atmosphere of the planet, affected possibly by especial proximity to the sun in an orbit of considerable excentricity. At any rate, we may reasonably hope to find the present season more favourable for exploration than the last; for though at nearest approach we have only had 23″ of disk instead of 29″·4 in 1877, success depends, with equal instrumental sharpness, much more upon altitude and steadiness of air than on increase of visible surface. Schiaparelli was enabled to obtain his most valuable results after opposition, when the diameter had decreased to 20″ or even 16″, and he asserts that he was able to continue his researches with advantage even till it came down to less than 6″.

We have alluded to the special interest of this planet arising from its supposed close correspondence with the earth, and it may not be out of place on this occasion if we bestow a little pains in examining the ground of that supposition. This we may conveniently do by imagining what would be the telescopic aspect of our own globe at a distance not equal to that of Mars, as we should then appear about twice as large, but such as to reduce our apparent diameter to equality with his in a favourable opposition.

There is every reason to believe that our surface would then appear mapped out by a distinct separation into oceans and continents, the fluid being darker than the solid masses, and preserving their bluish-green tinge but little affected by distance. Except in very shallow parts, their darkness would be uniform from the rapid absorption of incident light, and their contour would be sharply defined. The general hue of the land would be lighter; and at a distance where its variegated patches of colour would be separately undistinguishable, the result would be a grey resulting from the mixture of many tints, except where tracts such as the great deserts or prairies might subtend a sufficient angle to preserve their natural hue, or where extensive forests might rival seas in depth of tone. In many places, too, brilliant streaks and patches would show where mountain masses were capped with dense clouds, or surpassed the level of perpetual snow; but our largest rivers, except possibly at some great *embouchure*, would be totally imperceptible.

Such, in its general lineaments, would be the distant aspect of our globe, if the whole lay at once distinctly before the eye. But this would never be the case. The formation and transference of masses of vapour would produce incessant and most uncertain changes. In some regions and at certain times of year there would be unbroken clearness; in other tracts the outlines and colouring of land and sea would be indistinct, or concealed, at times for short, but occasionally for very lengthened, periods. And the interposition would doubtless be always of a white aspect, since such is the character of our clouds wherever they are illuminated by the sun. Towards our polar regions this whiteness would be permanent in the form of great spots, excentric as regards the axis of rotation, increasing through and after the winter, with a corresponding diminution after the summer solstice. There would always be, however, a large unmelted area, even at the warmest period, and its outlines would probably be often irregular and extended from the presence of great masses of frozen clouds. Now, if these would be the probable features of the earth, presented to us at a distance of seventy or eighty millions of miles, in what respects shall we be able to trace the resemblance on Mars? We are soon brought to the conclusion that, according to the general rule already referred to, there is more analogical than identical correspondence: the inclination of axis, the excentricity of orbit, the duration of day and night, the respective length of the seasons—from the relative similarity but not identity in these particulars, we are prepared to meet with the same kind of proportion throughout. As far as aspect goes, a solid and fluid condition may be thought to divide each superficies; but if so, the land there is in a much larger ratio to the water; and if the colour of our oceans is repeated on Mars, we have little to correspond with the orange-yellow tinge which, since it leaves unaffected the polar snows, cannot arise from atmospheric absorption. The so-called seas, too, though in some places apparently deep and dark, frequently shoal off and show subaqueous markings in a way that perhaps would be scarcely paralleled in our own.

In atmospheric conditions, indeed, we find great approach to identity; yet even here there are discrepancies; the polar snows of the earth would probably not be distinguishable from the upper surfaces of terrestrial clouds floating in any latitude, while on Mars such peculiar whiteness, though sometimes vividly brought out in certain localities, is by no means universally concurrent with the local indistinctness and confusion that so often puzzle the areographer. The action of solar heat on the polar deposits seems identical, and yet it may be a question whether our Arctic snows are marked out by as regular a contour as those of Mars, and still less would they show what has often been observed there—a strongly-marked border of darkness. And however striking and suggestive may be the fact that in either globe the thermal axis is not that of rotation, we have the discrepancy that on Mars the glaciation is reduced in a much greater ratio, so that the pole, according to Schiaparelli, was, in 1877, entirely free. This observer, who is fully impressed with the terrestrial theory, admits that the vertical sunlight, instead of producing clouds, as on the earth, appears to clear the sky of Mars, and thinks the atmospheric changes there of a more simple nature. That the southern hemisphere would be subject to greater extremes of temperature than the opposite, as shown by the variation in size of the white caps, might have been expected as a direct consequence of the elliptical form of its orbit greatly surpassing our own.

A passing reference will be sufficient to the brighter zone, which, according to some observers, distinguishes the edge of the disk, but which others, including myself, have never detected; or to the bluish or greenish patches sometimes noticed on the limb. Such appearances may be mere results of contrast; at any rate they may be left on one side as not directly affecting our present comparison. But there is one consideration which cannot be thus disposed of, and which, obvious as it is, seems to have been taken little into account—the very different amount of solar radiation on the two planets. The heat derived from the sun on Mars is only from $\frac{1}{3}$ to $\frac{1}{2}$ of that received by ourselves. And thus we seem reduced to the alternative of either abandoning to a considerable extent the supposed closeness of resemblance in material and constitution, or of maintaining it by the hypothesis of a supply of heat on Mars derived in some other way. No ice such as ours would be so reduced by the unaided action of that distant sun—no terrestrial continents could remain so long unclothed with snow. The dilemma is a curious one. It may not be incapable of explanation, but it certainly requires more special and careful consideration than it has yet received.

We have been looking at the subject much as though a supposed view of the earth at a suitable distance might be fairly paralleled with a corresponding representation of Mars as drawn by the best observers. But it must be added, with much regret, that such is not yet the case. As to certain main features of that planet, there is indeed a very satisfactory agreement; but with regard to others, and as to details in general, we feel, as a first impression, some extent of disappointment. It may be fairly admitted that the disk is after all not large, and its markings often feeble; and there is great diversity in instruments, and eyes, and hands, and aptitude for the work. Yet still an exhaustive survey, of which we cannot even indicate the materials in this place, but which we trust will be carried on, as it has been most ably commenced, by Dr. Terby of Louvain, would show much unexplained, and some things unsatisfactory. Mädler laid the foundation of definite areography; but his successors, while enlarging, have not always confirmed his results, and, to say nothing of others who have bestowed much pains upon the subject with more or less mutual agreement, our own keen-eyed and accomplished Dawes—at least as represented by Proctor—is found to differ in some parts materially from Lockyer, Kaiser, and Secchi. At the last opposition in 1877, the subject was taken in hand with especial zeal and perseverance by Schiaparelli at Milan with an exquisitely sharp Merz object-glass of 7·15 inches aperture and 10 feet 8 inches focus, and by Green, who went out purposely to Madeira with a 13-inch mirror by With, the perfect polish and critical definition of which are sufficiently guaranteed by the maker's name. Each did his best; each was far in advance of the other observers of the season; and yet at first sight there is more apparent difference in their results than might have been expected. It is not surprising that in the case of minute details each should have caught something peculiarly his own; but there is a general want of resemblance not easily explained, till, on careful comparison, we find that much may be due to the different mode of viewing the same objects, to the different training of the observers, and to the different principles on which the delineation was undertaken. Green, an accomplished master of form and colour, has given a portraiture, the resemblance of which as a whole, commends itself to every eye familiar with the original. The Italian professor, on the other hand, inconvenienced by colour-blindness, but of micrometric vision, commenced by actual measurement of sixty-two fundamental points, and carrying on his work with most commendable pertinacity, has plotted a sharply-outlined chart, which, whatever may be its fidelity, no one would at first imagine to be intended as a representation of Mars. His style is as unpleasantly conventional as that of Green indicates the pencil of an artist; the one has produced a picture, the other a plan. The discordance arising from such opposite modes of treatment would naturally be less real than apparent; still, a good deal remains that it is not easy to harmonise. Let us hope that during the present favourable opportunity, much may be effected towards clearing up the obscurities that still rest upon the study of Mars. Every contribution may prove of use, provided it is the result of that conscientious spirit that will show only what it sees, and take care to show it well.

A suggestion may be permitted that observations in the twilight might obviate the unpleasant glare arising from the vivid light of the disk, or that a screen-glass might be advantageously employed for the same purpose at a later hour.

Meanwhile the nomenclature of the spots—a point of increasing importance for identification—is in a state of pitiable confusion. This ought to be remedied at once; and its revision could be more suitably intrusted to no one than to Dr. Terby, who so thoroughly knows its difficulties, and is so competent to decide upon some system that may be adopted with the general concurrence of observers.

With regard to the satellites, we have entered into so much detail about the primary, that little space remains for them. Yet we must express our hope that, once discovered, they may be more easily caught in our larger instruments, and that the magnificent reflector of Mr. Common may, as is very possible, increase their recognised number. Those already discovered are certainly among the most wonderful objects in the whole solar system. So disproportionally minute, according to our limited ideas of proportion; so speedy in their revolution that the innermost rises in the west and sets in the east, and compasses the whole heavens more than three times in a Martial day; so close that the same attendant ranges at less than 4,000 miles from the surface of his primary; so much of their time invisible in total eclipse; so powerless to influence any fluid mass beneath them; one might call them exceptions, while yet they are among the strongest illustrations of the great principle of identity of character combined with the extremest variety in detail, in the inscrutable work of the Creator.

T. W. WEBB

RECORDING SUNSHINE[1]

So far as I have seen there is in use at present but one form of apparatus which effects an automatic registration of the duration and the times of sunshine, and that is the instrument of Campbell, in which a sphere of glass is so disposed as to burn a piece of wood or paper by the concentration of his rays when the sun may chance to shine. During the past few years I have devoted some attention to this matter and devised a number of appliances having the same object for their end but differing materially both in their construction and in the manner of their use from the apparatus I have named.

One of these, with your permission, I will now describe.

It is an arrangement which places a lead pencil on a sheet of paper and writes down therewith when and for how long the sunshine lasts.

It consists essentially of a differential thermometer with a long horizontal stem, in which latter is contained throughout the greater portion of its length some fluid intended to operate by its weight. This thermometer is attached to a scale beam or some equivalent device which also carries the pencil by means of which the record shall be made.

The whole is so arranged that in its normal state it rests gently—upon that side to which the pencil is *not* attached—on an embankment provided for that end.

Close beneath the pencil point a disk of metal rotated at the proper speed carries a paper dial whereon marks and figures are engraved corresponding with the hours at which the sun may shine.

When using this instrument I have it inclosed within a box which permits one bulb only of the thermometer—that most distant from the clock—to be affected by the radiance of the sun, which when it shines expands the air contained therein, forces the fluid along the tube and by altering the equilibrium of the beam brings some portion of its weight to bear upon the pencil point, and so the record is commenced.

When the sun becomes obscured, the air expanded by his rays contracts, the fluid in the tube returns, the normal equilibrium is restored, and the pencil ceases to produce its mark.

In the instance of the instrument I use the stem of the thermometer is 18 inches long and the eighth of an inch or thereabouts in bore.

Mercury in consideration of its weight is the fluid I employ, and in conjunction with it some sulphuric acid is inclosed, because of the mobility which is thereby gained. I am aware that in these circumstances mercuric sulphate is very slowly formed, but after two years' lapse of time no inconvenience has been caused thereby and the mobility of the mercury remains.

The bulbs of the thermometer are 2 inches in diameter or thereabouts, and that they may be more rapidly affected the glass thereof is thin. Both are blacked, and the one intended to receive the radiance of the sun projects above the box in which the apparatus is contained into a dome of glass.

[1] Paper read at the Literary and Philosophical Society of Manchester by David Winstanley, F.R.A.S., November 18, 1879.

NOTES

W. Hepworth Dixon died very suddenly early on Saturday morning. He was best known to us as a brilliant writer and speaker, and but comparatively few knew how profoundly, and with what patient determination he would sift the truth, alike of even the most well attested, as of the most apparently trivial fact, before making use of it in his work. Only those within the circle of his more intimate friends were aware how well he followed and how easily he grasped the progress of scientific thought. In this circle were several with whom and about whose labours he delighted to converse, and none could listen without benefiting by the practical views his vigorous intellect suggested, the more so as they were possibly induced by quite other claims of thought. These columns have called attention to the ethnological value of his researches in America. His travels, especially those in the Far West, in the wilder parts of Russia, in the Holy Land, and in Cyprus, attended at times with personal risk, are full of suggestive interest to the scientific mind, and we may shortly to call attention to some of the salient facts connected with natural science which they contain. In his early days he studied astronomy and kindred subjects, and it almost seemed at one period of his life that his bent would have led him more deeply into these researches. That this early inclination never forsook him, even those who knew him least, may gather from his attendance at the meetings of the British Association, his unremitting labours as chairman of the Palestine Exploration Fund, and his presence at numerous anniversary meetings of our learned societies. His surviving son, Harold, is already known as a teacher of natural science at Oxford University.

The death, on December 18, is announced of Prof. Franz Boll, who has filled the Chair of Physiology and Comparative Anatomy in the Roman University; he was only thirty years of age. Born at New Brandenburg in February, 1849, he studied at Berlin and took his Doctor's degree in medicine and surgery in 1869. When little more than twenty years old, he became assistant to Dubois-Reymond in his physiological laboratory at Berlin. Having been obliged on account of his health to seek the warmer climate of Italy, he was in 1873 offered an appointment in the Roman University, and in 1877 was, by the unanimous decision of the Commission of Examiners, elected to the chair he has since held. His researches regarding the arterial circulation of the retina are recognised as a most valuable contribution to physiological science.

General surprise is naturally expressed that Dr. William Farr has not been appointed to succeed Major Graham as Registrar-General. Dr. Farr's qualifications for the post are known to all the world; but it has been conferred upon Sir Brydges Henniker, Bart., for what reason we have failed to discover. It must be regarded as an almost national misfortune, though it will surprise no one, that Dr. Farr has resigned his post as head of the statistical department.

The *Hannoversche Courier* announces that Leibnitz's long-lost calculating machine has been recovered. Leibnitz invented and constructed this machine in 1672, during his stay in Paris. It can add, subtract, divide, and multiply, and was the wonder of the time. This machine became the property of the Hanover public library, but long ago disappeared from among its treasures. All that was known about its disappearance was that it had once been sent to an instrument maker at Göttingen to be repaired. It has now turned up again in the Göttingen library, and through the efforts of Dr. Bodemann, the librarian of the Hanover public library, has again come into the possession of the institution.

It is only about a year since we gave some account (Nature, vol. xviii. p. 361) of the railway bridge which spans the Firth of Tay at Dundee, and on Sunday it was the scene of one of the most terrible railway accidents on record. With the details of this sad occurrence our readers are no doubt familiar; for accurate information as to the prime cause we must await the searching inquiry which will no doubt be instituted. The structure appears to have been subjected to the most rigid tests before being opened to traffic, but we fear there must have been more than one screw loose somewhere. Upwards of 3,000 feet of the high girders are reported to have been swept away. One conjecture is that the train had got well upon the girders when a

gust of greater strength had caught the structure. There would thus be, in addition to the ordinary vibration of the train, an enormous lateral pressure from the wind. The carriages of the train would also, of course, feel the full force of the blast, and once the weakest part yielded the whole would go with a sudden crash. In a letter to the *Glasgow Herald*, Prof. Grant states that the storm of Sunday was the most violent in Scotland for thirty years, and that the rate of the wind about 7 P.M. was upwards of seventy miles per hour, equal to a pressure of forty-two pounds per square foot. No doubt there were frequent sudden gusts reaching a rate of ninety miles per hour. A Commission of Investigation has already been appointed.

THE *Times* correspondent describes a visit he made to inspect Mr. Edison's new electric light at Menlo Park. Two of the lights had been burning continuously for ten days without injury to the baked cardboard horseshoe in the little glass globe which furnishes the light. Cardboard, he states, seems sufficiently durable, successfully resisting quite rough usage, such as dropping, shaking, turning the current on and off thousands of times, and raising the intensity of light to that of 400 candles. All the arrangements are simple. Mr. Edison will put about 800 lights at Menlo Park, while the inventions immediately go into practical operation in New York city. The globe containing the horseshoe is exhausted to one-millionth of an atmosphere by the Sprengel pump, measured by the M'Leod gauge. By successfully dividing the electric current Mr. Edison gets individual lamps of 16-candle power, each lamp having 100 ohms resistance. Light is turned on or off, and the current regulated with the same ease as gas is, while the current can be transmitted on wire as small as No. 36. The central regulator contains an even current, while the meters accurately measure the supply furnished to each consumer. Mr. Edison finds that the best generators are of five to seven horse power, each one-horse power maintaining eight lamps. Each lamp costs about one shilling to manufacture, while a supply equivalent to 10,000 feet of gas can be produced for tenpence or less. Mr. Edison calculates the cost of furnishing light thus :—the consumption of 3 lb. of coal in a steam engine will maintain eight to ten lamps one hour. Mr. Edison's system also furnishes electric power for small industries, such as running sewing machines. Mr. Edison's light is bright, clear, mellow, regular, free from flickering or pulsations, while the observer gets more satisfaction from it than from gas. Mr. Edison lights at Menlo Park, dwellings, offices, desks, street-lamps, also laboratory and workshop, making it available for every lighting purpose for which gas is used.

PROFESSORS C. A. F. PETERS (director of Kiel Observatory) and Albert von Kölliker (Würzburg) have been decorated by the King of Bavaria with the Maximilian Order for Art and Science.

THE death is announced of Dr. Alexander Sadebeck, of Kiel, professor of mineralogy and geology at Kiel University, on December 9, 1879, at the early age of thirty-six years.

THE Emperor of Austria has presented the Austrian Gold Medal for Arts and Sciences to Herr Wilhelm Hoffmann, of Dresden, in recognition of his merits in advancing the art of photography.

ON January 2, 1882, the University of Würzburg will celebrate the 300th anniversary of its foundation. The Bavarian Government had intended to set aside a sum of 2,000*l.* to defray the expenses of the celebration. The Finance Committee of the Bavarian House of Deputies have, however, declined to allow the sum in question.

THE two first parts of an interesting work, "Bibliotheca Belgica: Bibliographie générale des Pays Bas," have just been published. The editor is M. Ferd. van der Haeghen, librarian of Ghent University. The work will contain (1) the description of all works printed in the Netherlands during the fifteenth and sixteenth centuries, as well as of the principal ones printed between 1600 and 1879; (2) a description of all works whose authors are born Netherlanders, as well as of all works printed abroad which refer to the Netherlands; (3) a list of all the works printed by Netherlanders who settled abroad.

A HIGHLY interesting discovery has recently been made on the Russian peninsula of Kertch. The director of the Kertch Museum discovered a tomb dating from the third century B.C., and from the reign of Persidas II., King of the Bosphorus. The tomb is situated on the road from Temruk and near the Sennaja Station. In it were found (1) a thick gold necklace, with a lion's head at each end; (2) a gold crown of about one inch in breadth, the exterior part being formed of intertwisted rings, and ornamented with fine stones; (3) several pairs of gold earrings; (4) two gold chains, of which one is ornamented with figures; (5) two gold bracelets; (6) a round gold brooch, and a gold pin representing Venus and Cupid; (7) four gold leaves; (8) a pearl necklace, some amulets, and three small gold rings; (9) a phial, an urn, a vase, a spoon, &c.—all these of silver.

THE opening meeting of the Epping Forest and County of Essex Naturalists' Field Club will be held on Saturday evening, January 10, at the rooms of the Buckhurst Hill Art Classes, 3, St. John's Terrace, at seven o'clock. The objects of the club, as set forth in the proposed rules, are as follows :—"The investigation of the natural history, geology, and archæology of the County of Essex (special attention being given to the fauna, flora, geology, and antiquities of Epping Forest), the publication of the results of such investigations, the formation of a library of works of local interest and other publications, and the dissemination amongst its members of information on natural science and antiquities." Excursions, under skilful direction, to various localities of interest to the naturalist and antiquary, will also be a main object of the Club. The Club will strongly discourage the practice of removing rare plants from the localities where they are to be found or of which they are characteristic, and of risking the extermination of rare birds and other animals by wanton persecution; it will also endeavour to use its influence with landowners and others for the protection of the same, and to dispel the prejudices which are leading to their destruction. In like manner the club will endeavour to cultivate a fuller knowledge of local antiquities, historical, popular, and idiomatic, and to promote a taste for carefully preserving the monuments of the past from wanton injury. Considering the fine field offered to the biologist in Epping Forest and the surrounding country, it is certainly a matter of surprise that a society similar to that now in process of formation was not long since founded. We trust the club will meet ample support.

THE latest news from the St. Gothard Tunnel states that the thickness of the soft strata recently encountered was only ten metres, and that the boring machines are again at work on solid and firm rock.

AN earthquake is reported from Agram. It occurred during the night of December 8, 1879, and lasted three seconds. Another phenomenon of the same nature was observed at Seisenberg (Carniola) on December 4, at 6.45 A.M., lasting two seconds. The direction of the shock was from north to south. Ten minutes later a second shock was felt. The intensity of the shocks was alarming. A smart shock was felt at Geneva on December 30, at 12.15 P.M. Several shocks were felt on December 26, at Lyons, where the winter has been exceptionally severe.

THE *Times* correspondent describes an eruption of Vesuvius on the night of December 18, 1879. The mountain has been in

an uneasy state for several years, and slight eruptions have constantly taken place; but the climax seemed to have been arrived at on the 17th, when Vesuvius changed its mantle of snow for one of fire. As the wind blew furiously from the north-east, the lava descended in the direction of Portici, covering a large portion of the cone and presenting a magnificent spectacle. On the 18th there was less disturbance; but even in its state of greatest activity the mountain made none of those awful efforts which form a grand eruption. There were some local shocks, and a heavy breathing from the furnace, but there was no tremendous explosion. The cup was full, and it flowed over. This flowing over, however, if continued to great excess, may produce far greater disasters than a roaring discharge which finishes the whole business. Prof. Palmieri's reports of Mount Vesuvius state that the present modest eruption has lasted since 1875. It commenced at the bottom of the vast and deep crater left after the eruption of 1872, and was therefore only visible to those who ascended to the summit of the mountain. But now this crater is filled up by the new lava which flowed at successive periods, and therefore the fresh streams which issue from the eruptive cone flow down the external parts of the mountain, generally on the side towards Naples. The new eruptive cone has gradually increased in height until it now protrudes about fifty feet above the edge of the old crater.

WRITING to the *Western Daily Press* under the date of December 22, 1879, Prof. Silvanus Thompson says:—I had the opportunity about half-past ten this morning of witnessing from Clifton Down a phenomenon which enjoys the repute of being very rare. The entire gorge of the Avon was filled with mist, so that the river in the bottom and the Leigh Woods opposite were quite obscured. Standing on the western extremity of the Observatory Hill, I observed a dim gigantic figure apparently standing out through the mist upon one of the lower slopes of Clifton Down, where it runs down in undulating ridges from the promenade towards the river. A moment's glance sufficed to show me that it was my own shadow on the mist, and as I waved my arms about the gaunt spectre followed every movement. A gentleman who stood beside me likewise saw his spectre, but not mine, as we ascertained by the movements executed; nor could I see his, unless we stood so close together that the spectres seemed combined into one. The analogy presented by these spectres with the famous *Spectre of the Brocken*, seen by travellers in the level rays of the morning sun from the summit of that celebrated mountain, and described by Sir David Brewster in his "Letters on Natural Magic," is very striking.

A PRIZE of 200*l.* has been offered by the Rev. E. Wyatt Edgell, through the Sanitary Institute of Great Britain, for the best essay that may be sent in by August 1 next, on "The Cause of Hereditary Tendencies in Health and Disease." The subject is of first importance in its bearings not only on personal but on natural health, and the Council of the Institute expects to receive many valuable contributions in competition. It only regrets that the generous donor, who for a long time has filled the office of Honorary Treasurer of the Institute, is obliged to resign office owing to a state of impaired health, which demands for a time residence abroad. The Chairman of Council of the Institute, Dr. Benjamin W. Richardson, F.R.S., and Dr. W. Farr, F.R.S., are appointed adjudicators of the prize.

PROF. F. W. HUTTON, of Dunedin, New Zealand, has been appointed to fill the new Chair of Biology in the Canterbury College at Christchurch. In consequence of this move the Chair of Natural Science in the Otago University is vacant. We have not heard what steps are being taken to fill it.

A REMARKABLE anthropological discovery has recently been made at Sypniewo, near Marienwerder (Prussia), by Herr Wilckens. In a bronze cauldron which was imbedded in the ground several feet deep, were found calcined human bones (apparently both male and female), a golden hoop, an open necklace with hook and eye, two square sticks of greenish glass with marks on them, similar to the eyes of dice, twenty button-like ball segments without holes, four bronze plates, and fragments of some metal implements evidently burnt with the bodies. The articles seem to be of old Etruscan or Phœnician workmanship, and are now in the hands of the Historical Society of Marienwerder.

"WATER ANALYSIS," by Prof. Frankland, a long-promised contribution to an important question, will be published during January, by Mr. Van Voorst.

IN reporting the reception of Prof. Nordenskjöld and the staff of the *Vega* at Nagasáki, the correspondent of the *North China Herald* notes that there was not a single case of scurvy during the whole voyage. This, he learns, was owing to the free use of a curious little berry that springs out of the eternal ice and snow during the short summer; it bears profusely, and has a taste like the raspberry, but more acid. The fruit is dried, and then mixed with the milk of the reindeer, and it can be carried in a frozen state for thousands of miles. There was also used a curious kind of food made from the whale's hide, which is pickled and eaten freely during the winter.

THE additions to the Zoological Society's Gardens during the past week include a Yellow Conure (*Conurus solstitialis*) from Guiana, received in exchange; a Vulpine Phalanger (*Phalangista vulpina*), a Geoffroy's Dove (*Peristera geoffroi*), bred in the Gardens.

GEOGRAPHICAL NOTES

THE eminent Russo-German traveller, Dr. Wilhelm Junker, well known by his successful tours in the Nile districts, left Cairo for Chartum on December 1. He travels *viâ* Suez and Suakin, and hopes during the present winter to reach the Upper Nile districts beyond Chartum. This time the Monbuttu land will form the basis of his operations, and he intends to penetrate into the interior in the direction of the Congo or the Schari rivers.

DR. GERHARD ROHLFS has arrived at Rome on his return from North Africa.

THE expedition charged with the investigation of the question whether it is possible to conduct the waters of the Amu Daria into the Caspian Sea has started from St. Petersburg. General A. J. Glushowski is commander of the Expedition, and M. Holmstrem acts as chief engineer. MM. Bole, Svichtchoff, and Macsimovich are assistant engineers. Prince Gedroitz takes part in the expedition in the capacity of geologist. These gentlemen will be joined by Capt. Roop, from Turkestan, and by Engineer Hellmann, from the Caucasus. The company will first proceed to the delta of the Amu Daria, and then begin the investigation of the river's course and of the surrounding territory, with regard to elevation, geology, &c., &c. It is considered that two or three years will be necessary for collecting the materials to finally decide the question.

PROF. BASTIAN has arrived at Batavia. He has made important ethnological and anthropological researches in Assam, and has also brought together a valuable collection of illustrative specimens. He then continued his studies in the Padang Islands, and will now do the same on the island of Java.

THE Geographical Society of Hamburg has elected the well-known author of numerous descriptions of travels, cities, and countries, Herr Ernst von Hesse Wartegg, as a corresponding member.

THE Archbishop of Algiers has received from Zanzibar favourable reports of the eighteen missionaries who left Algeria last June and had reached Ugogo, as also of the missionaries sent out last year for Tanganyika. The latter had lost their superior, Père Pascal, but had arrived at Ujiji and had been well received there by the English mission and the Arab chiefs. They had explored Urundi, a rich region, which they depict in altogether different colours from Stanley, and by invitation of

the Sultan of Bikari they had established a station, commencing operations by rescuing abandoned infants. The Abbé Debaize, on the other hand, had been twice deserted by his porters, had been plundered of a great part of his outfit, and had returned sick and discouraged to Ujiji, where the Algerian and English missions were nursing him. It was not known whether he would recommence the exploration intrusted to him by the French Government.

THE death is announced of Prof. Wappæus, of Göttingen, an industrious German geographer.

THE newly-established Geographical Society of Rochefort has just issued the first number of their *Bulletin*, the more noteworthy contents of which are a paper by M. L. Delavaud on the Portuguese in Central Africa before the seventeenth century, and another by M. Silvestre on Indo-China.

ON THE HETEROSTYLISM OF "MELOCHIA PARVIFOLIA"

MELOCHIA PARVIFOLIA, H.B.K. (nova gen. et spec., pl. v., 325) is a very common plant on the dry plains in the neighbourhood of Carácas, where it flowers nearly all the year round, and not only in the month of January, as Kunth says in his description, which in all other respects is a very complete and good one. I was led to notice the heterostylism of this plant when comparing carefully Kunth's words with a specimen I had brought home. Humboldt's specimen belonged to the long-styled form, for Kunth says:—*Stamina petalis dimidio breviora, Styli longitudine petalorum.* Mine was short-styled, so that I found these proportions to be inverse. I searched immediately our *sabanas* (or plains) for long-styled plants, and came at once across a considerable number of both forms. A comparison of their flowers gives the following result:—

Short-styled Flowers.

1. Stamens as long as the petals.
2. Styles scarcely half as long as the stamens.
3. Stigmata with few and short papillæ.
4. Styles without stellate hairs.
5. Pollen grains:—
   - *a.* Dry, globular, diam. 0·044 mm.
   - *b.* In water, globular, diam. 0·060 mm.
   - *c.* In alc. abs., globular, diam. 0·036 mm.

Long-styled Flowers.

1. Stamens half as long as the petals.
2. Styles as long as the petals.
3. Stigmata with many and rather long papillæ.
4. Styles with stellate hairs.
5. Pollen grains:—
   - *a.* Dry, elliptical, obtusely triangular in cross-section, diam. 0·044 × 0·024 mm.
   - *b.* In water, globular, diam. 0·052 mm.
   - *c.* In alc. abs., elliptical, diam. 0·040 × 0·028 mm.

(My measurements were made with a glass micrometer by Oberhäuser, five divisions of which are equal to 0·02 millimetres for the enlargement I used.)

It would appear that the protoplasm of the pollen-grains of the short-styled form contains a larger percentage of water, their size shrinking more in alcohol than that of the pollen-grains of the long-styled form.

Although the heterostylism of *Melochia parvifolia* might be fairly admitted from the stated morphological differences, I was desirous to try by experiments whether there was also a functional difference, as Darwin and Hildebrand have done in the case of other heterostyled plants.

Both forms of *Melochia parvifolia* seem to be equally common in our flora. This I ascertained in the following manner:—On the *Sabana de San Lázaro*, where this plant constitutes all the higher vegetation, together with *Turnera ulmifolia*, *Pavonia cancellata*, and *Hyptis suaveolens*, all the plants of *Melochia* were examined in a square, the side of which was 100 steps. There were altogether forty-two plants, twenty with long-styled flowers, and twenty-two with short-styled ones. In one single plant of the former two short-styled flowers were discovered, in all the rest each plant had only one kind of flower. I collected seeds from both forms, and began last year my experiments by sowing them in cases placed in one of the yards of my house in town. This circumstance was perhaps of some consequence, the yard being surrounded by walls 12 feet high, so that there could be next to nothing of the influence of the wind, just the reverse as in the open field.

Ten seeds taken from plants with long-styled flowers produced eight plants, which this year flowered, all the flowers being long-styled ones.

Ten seeds of the short-styled form gave nine plants; two of these perished before setting flowers; the remainder produced in due time a large number of short-styled blossoms.

The last summer was very rainy, thus not at all favourable to experimental research connected with artificial fecundation. However, I tried my best, and obtained the results given in the following table, which is constructed according to Darwin's models in his "Forms of Flowers":—

Nature of union.	Number of flowers fertilised.	Number of capsules produced.	Average number of seeds per capsule.	Percentage of capsules in reference to flowers.
a. Long-styled form by pollen of short-styled	12	12	5[1]	100
b. Long-styled form by own-form pollen, from a distinct plant	10	8	3·5	80
c. Long-styled form by pollen from the same flower[2] ...	6	1	5	16·6
d. Short-styled form by pollen of long-styled	12	12	5	100
e. Short-styled form by own-form pollen from a distinct plant	10	9	3·3	90
f. Short-styled form by pollen from the same flower[3] ...	8	6	4	75
Cases *a* and *d* together (legitimate unions)	24	24	5	100
Cases *b* and *e* together (illegitimate unions)	20	17	3·4	85
Cases *c* and *f* together (illegitimate unions)	14	7	3·6	50

I think the favourable influence of cross-fertilisation is evident, as in no other case the *average* number of seeds per capsule reached the *normal* number, although there were some few capsules in the other crops which also contained five seeds.

In the open field the flowers of *Melochia parvifolia* are visited by large numbers of small hymenoptera, which fly about during the hottest hours of the day, when these flowers are open. They have no particular smell, and fade very soon; on cloudy or rainy days they do not open at all, so that not a few wither before getting fertilised, which accounts for the considerable number of seedless capsules to be found on nearly every plant.

The seeds of my crop appeared to be of good quality (their specific weight being greater than that of water). I have sown them already in separate lots, in order to find out how far they will germinate and produce strong and healthy plants, and which forms of flowers these latter will have.

A. ERNST

Carácas, November 2

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Next term, at Cambridge, practical anatomy in the dissecting-room will commence on January 17. The professor of anatomy is to be assigned (as to his fellowship) to King's College, and not to Caius, as originally proposed; it was thought more advisable not to assign two professorial fellowships in medical science to Caius, but rather to divide the association. Prof. Paget is especially fitted to receive further honour from Caius College, and we trust he will ultimately attain the mastership.

Prof. Newton announces that his lectures will recommence on February 2; and the demonstrator will take an advanced class on Sauropsida, beginning on the same day.

[1] Normal number of seeds in *Melochia parvifolia*.

[2] The plant was left to itself, foreign pollen being excluded by a fine muslin-bag tied around it. The numbers show that self-fertilisation was difficult in this case; though in the open field, where the wind has its full sway, it may be much easier, and perhaps more frequent.

[3] The plant was treated as stated in the foregoing note. Self-fertilisation is no doubt easier in this case, but the result of the crop was not very good.

Candidates for the natural science scholarship at Clare College are to be examined in chemistry and chemical physics, without restrictions in age.

At King's College any candidates for honours are now received, a great improvement on the old exclusiveness. The Vintner exhibition for natural science is worth 90*l.* a year, but only candidates under twenty, and British subjects, may compete, also undergraduates of the College in their first or second year. The scholarships are to be held till M.A. standing, or until election to a fellowship. Candidates in natural science must notify before March 1 in what branches of natural science they wish to be examined.

Every encouragement is now offered to selected candidates for the Indian Civil Service.

It having been decided that there should be a memorial to Prof. Clerk Maxwell, it might be suggested that a Maxwell university scholarship in experimental and molecular physics would be a great benefit, as there are scarcely any mathematical or natural science competitions open to the University. Let it be given for a specified research, rather than spend it on a posthumous bust or portrait.

MANCHESTER.—Mr. J. E. A. Steggall, B.A., scholar of Trinity College, Cambridge, mathematical master at Clifton College, Bristol, has been appointed to the Fielden lectureship in mathematics in the Owens College, vacant by the appointment of Mr. A. T. Bentley, M.A., to the principalship of the Firth College, Sheffield. Mr. Steggall graduated as second wrangler in January, 1878, and subsequently gained the First Smith's Prize. There were twenty candidates.

WE have received a very favourable report from the Liverpool School of Science, which now numbers 800 students. Before long it is hoped that a central college may be established in Liverpool, from which all existing branches with extensions may be worked.

THE Kaiser Wilhelm University at Strassburg is seemingly becoming popular in Germany. During the last term the number of students rose to 810, this being the largest number reached since the University was inaugurated.

SCIENTIFIC SERIALS

Annalen der Physik und Chemie, No. 11, 1879.—This opens with a valuable contribution by Herr Hagenbach in support of Stokes's law, the validity of which has been somewhat controverted recently. The author regards Lommel's division of fluorescent bodies as based on no essentially different behaviour of them.—Some curious experiments on electric perforation of glass are described in papers by Herren Mach and Doubrava, and Herr Waltenhofen; the latter considers the phenomenon as "a mechanical work taking place at cost of the *vis viva* of the colliding air-molecules at the part perforated, and this transformation of energy is evidently more easily effected the stronger the molecular motions; which, when they meet an obstacle, are suddenly checked." Herr Doubrava also writes on the motion of plates between the electrodes of the Holtz machine.—A series of experiments, by Herr L. Weber, with electricity of high tension used in the telephone, seem to clear up some sources of error in like observations by other physicists, to give new proof of the availability of the telephone for observing weak periodic discharges of a conductor, and to illustrate the conception of Helmholtz and others as to electric movements in an induction circuit and electrolytes inserted in it.—The relations between velocity of rotation, resistance, current strength, and electromotive force, in the Gramme machine, are set forth by Herr Meyer and Herr Auerbach.—Other papers:—On the true theory of Fresnel's interference phenomena, by Herr F. Weber.—On the relation between galvanic resistance and specific heat, by Herr Auerbach.—On extra currents in iron wires, by Herr Herwig.—Experimental researches in determination of the indices of refraction of liquefied gases, by Herr Bleekrode.—Influence of temperature on tuning-forks, by Herr Kayser.—On galvanic conduction of metallic alloys, by Herr Elsässer.—On phosphorescence-phenomena, by Herr Stürtz.

Gazetta Chimica Italiana, fasc. x. 1879.—Researches on cobalt and nickel, and methods for distinguishing them when mixed, by Dr. Papasogli.—On the constitution of ellagic acid, by S. Schiff.—On determination of acetyl by means of magnesia, by the same.—Ozone with some noble metals, by Prof. Volta.—On paraoxymethylphenyl-cinnamic acid, and on oxymethylstilbene, by Dr. Oglialoro.—On the action of perchloride of phosphorus on molybdic anhydrides, by S. Piutti.—On some derivatives of naphtols, by S. Marchetti.—Researches on the diffusion of copper in the animal kingdom, by Dr. Giunti.—On amines corresponding to a toluic alcohol, by Dr. Spica.—On the preparation of hydroxylamine, by Dr. Bertoni.—Transformation of hydroxylamine into nitrous and nitric acid, by Dr. Bertoni.—On an easy and rapid process for determining at any time the nitrogen, sulphur and chlorine, in organic substances, by Dr. Spica.

Bulletin de l'Académie Royale des Sciences de Belgique, Nos. 9 and 10.—M. Montigny here describes a case of supernumerary rainbows which were only visible at the lower extremities of the principal bow (a phenomenon overlooked in works on meteorology).—M. van Mensbrugghe shows how the ventral and nodal appearances of liquid veins may be explained on principles he lately enunciated.—Dr. Jorissen contributes a note on the employment of chloride of zinc as reagent for certain alkaloids, glucosides, &c.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 18, 1879.—"Chemico-Electric Relations of Metals in Solutions of Salts of Potassium," by G. Gore, LL.D., F.R.S.

In this investigation the author has determined the chemico-electric positions of about twenty-four elementary substances in a number of solutions, of various degrees of strength, and both cold and hot, of chloride, bromide, iodide, and cyanide of potassium, and has drawn from the results of the experiments various general conclusions. The results are exhibited in a series of tables. The experiments were made with the intention of also determining by means of a capillary electrometer the quantitative differences of electromotive force between each two consecutive elementary substances of the entire series; but after making many attempts the author was unable to construct such a form of that instrument as might be relied upon for accurately measuring such differences.

Chemical Society, December 18, 1879.—Mr. Warren De La Rue, president, in the chair.—The following papers were read:—On the specific volume of water of crystallisation, by T. E. Thorpe and J. J. Watts. Some years ago Playfair and Joule pointed out that the volumes of certain highly hydrated salts, for example, sodium carbonate with ten molecules of water, are equal to that of the water, considered as ice, which they respectively contain. This law does not hold good for salts less highly hydrated. The authors of the present paper have determined the precise relations between the specific volumes of various sulphates of copper, magnesium, zinc, nickel, cobalt, iron, and manganese, and their respective degrees of hydration. They conclude that in the case, at least of the so-called magnesian sulphates, the volume occupied by the several molecules of water varies with the degree of hydration. The first molecule occupies less bulk than any other, its mean relative value is 10·7, the value of the second molecule being 13·3, of the third 14·5, the fourth 15·4, the fifth 15·6, the sixth 15·7, the seventh 16·2. These results accord with the fact that the different molecules of water in a hydrated salt are held with various degrees of tenacity. The authors point out the importance of estimating the amounts of heat resulting from the combination of successive molecules of water.—Note on the formation of ozone during the slow oxidation of phosphorus, by H. McLeod. The active substance formed during the slow oxidation of phosphorus is probably either ozone or peroxide of hydrogen. Air in which phosphorus is slowly oxidising, was drawn through a U-tube 9½ inches long (filled with fragments of glass containing in succession sodic carbonate, a mixture of potassic bichromate and sulphuric acid, and potassic permanganate), the U-tube was at the temperature of the air or at 100° C., in both cases the gas which passed through rendered blue a solution of potassic iodide and starch, hydroxyl under these circumstances would be completely decomposed. In another series of experiments the gas was passed through a narrow U-tube heated to 150° to 200° C., but no water was formed. It is extremely improbable that ozone and hydroxyl are simultaneously formed, as these substances decompose each other. The author therefore concludes that the gas obtained during the slow oxidation of phosphorus possesses the properties of ozone and not those of hydroxyl, the only known peroxide of hydrogen.—On the analysis of organic bodies containing

nitrogen, by W. H. Perkin. The author proposes to substitute for the freshly reduced metallic copper, which has several disadvantages (such as being hygroscopic, occluding iron, &c.), roughly powdered or granulated potassic chromate. About 4 to 7 inches of this substance are placed in the front of the combustion tube and maintained at a low red heat. All nitrous fumes are completely absorbed, whilst no effect is produced on the carbonic acid determination. The salt can be readily dried. It also absorbs sulphurous acid completely.

Linnean Society, December 18, 1879.—Prof. Allman, F.R.S., president, in the chair.—Mr. B. Daydon Jackson exhibited series of the various editions of Dillenius's "Historia Muscorum," Oxford, 1741, and its reprint, Edinburgh, 1811, in illustration of the following communication.—The Rev. J. M. Crombie read a paper on the lichens of Dillenius's "Historia Muscorum," as illustrated by his herbarium. This latter collection is preserved in the Botanic Gardens at Oxford, and the specimens, though well nigh 150 years old, are still in a fair state of preservation. The intrinsic value of Dillenius's material rests in the fact of the earlier writers on cryptogamic botany referring constantly, in their synonomy and nomenclature, to his descriptions; hence the importance of an accurate knowledge of the collection, to judge from a present standard, in how far his descriptions and figures agree with the specimens themselves. No systematic examination has hitherto been made, though some old writers have compared certain of the forms. While the Dillenian lichens identified are, as a whole, now found to bear considerable accuracy with his descriptions and figures, yet serious mistakes have crept in. Mr. Crombie gives technical data and details of the series, and adds a conspectus for reference to workers on lichens who have not Dillenius's volumes and figures at hand.—Prof. Allman then gave a description of what appears to be true sense-organs in the hydroids. In one form the organ in question is a bulb, with rod-like structures and a series of radiating filaments. These latter terminate in conical bodies containing filaments which resemble thread-cells, though differing physiologically. Another form is met with in a Medusa (*Gemmellaria*), where free, club-topped filaments constantly in motion are attached to the tentacles, and possess sacs with thread-cells, but incapable of being exserted. Prof. Allman suggests the term *Podocysts* for these, and says, from his observations in *Myriothela* and other genera, they have a wide extension among the hydroids.—Mr. H. Seebohm was elected a Fellow of the Society, and Messrs. A. D. Bartlett (Zool. Gard.), N. E. Brown (Kew Herb.), and F. H. Waterhouse (Librarian, Z.S.) were balloted for and elected Associates.

Entomological Society, December 3, 1879.—J. W. Dunning, F.L.S., vice-president, in the chair.—Mr. Howard Vaughan exhibited a series of extreme varieties of *Lycæna corydon* which had been taken at Dover.—Mr. W. L. Distant exhibited a hitherto unrecorded variety of *Danais plexippus* (commonly known as *D. archippus*) received from Antigua.—Mr. T. R. Billups exhibited some rare British beetles, and a specimen of *Carabus auratus* taken in the Borough Market.—Mr. C. O. Waterhouse communicated some interesting details as to tenacity of life in *Curculio cleonus*.—The Rev. H. S. Gorham read a paper entitled "Materials for a Revision of the Lampyridæ." Mr. Bates, in connection with the light-emitting power of this family, remarked that certain species of Longicorns mimicked Lampyrids with great exactness, the light-giving segments of the latter being perfectly represented in the Longicorns, although destitute of phosphorescent power.—Mr. J. W. Slater communicated a paper on certain minute characters of insects with reference to the theory of evolution.—A communication was received from Mr. P. H. Gosse, on *Papilia homerus*, its ovum and larva, and a paper from Mr. Roland Trimen, on some hitherto undetermined butterflies inhabiting Southern Africa.

Geological Society, December 17, 1879.—Henry Clifton Sorby, F.R.S., president, in the chair.—James Booth, Edgar S. Cobbold, D. M. Ford Gaskin, John Farran Penrose, Stephen Seal, Thomas Tate, and Richard Taylor were elected Fellows of the Society.—The following communications were read:—A contribution to the physical history of the cretaceous flints, by Surgeon-Major G. C. Wallich, M.D. The author described the origin, the mode of formation, and the cause of the stratification of the chalk flints. Taking as the basis of his conclusions the fact brought to notice by him in 1860, namely, that the whole of the protozoan life at the sea-bed is strictly limited to the immediate surface-layer of the muddy deposits, he pointed out in detail the successive stages of the flint-formation, from the period when the chief portion of the silica of which they are composed, was eliminated from the ocean-water by the deep-sea sponges to the period when it became consolidated in layers or sheets conforming to the stratification of the chalk. In relation to this subject the author claimed to have sustained the following conclusions:—1. That the silica of the flints is derived mainly from the sponge-beds and sponge-fields, which exist in immense profusion over the areas occupied by the globigerine or calcareous "ooze." 2. That the deep-sea sponges, with their environment of protoplasmic matter, constitute by far the most important and essential factors in the production and stratification of the flints. 3. That whereas nearly the whole of the carbonate of lime, derived partly from foraminifera and other organisms that have lived and died at the bottom, and partly from such as have subsided to the bottom only after death, goes to build up the calcareous stratum, nearly the whole of the silica, whether derived from the deep sea sponges or from surface protozoa, goes to form the flints. 4. That the sponges are the only really important contributors to the flint-formation that live and die at the sea-bed. 5. That the flints are just as much an organic product as the chalk itself. 6. That the stratification of the flint is the immediate result of all sessile protozoan life being confined to the superficial layer of the muddy deposits. 7. That the substance which received the name of "*Bathybius*," and was declared to be an independent living Moneron, is, in reality, sponge-protoplasm. 8. That no valid *lithological* distinction exists between the chalk and the calcareous mud of the Atlantic, and *pro tanto*, therefore, the calcareous mud may be, and in all probability is, "a continuation of *the* chalk-formation."—Undescribed fossil carnivora from the Sivalik Hills, in the collection of the British Museum, by P. N. Bose. This communication contained descriptions of nine species of carnivora from the ossiferous Sivaliks, together with an introduction, in which the age of the Sivalik fauna, and several matters of general interest, were briefly discussed. The species described were: *Machærodus sivalensis*, *M. palæindicus*, *Felis grandicristata*, *Hyæna sivalensis*, *H. felina*, *Viverra bakerii*, *Lutra palæindica*, *Canis curvipalatus*, and *C. cautleyi*. *Canis curvipalatus* is so named on account of the curvation of the palate. *C. cautleyi* is closely allied to the wolf, as is *Viverra bakerii* to the civet. The form of the forehead is peculiar in *Lutra palæindica*. In the form of the skull, the dimensions of the upper tubercular, &c., *Hyæna sivalensis* approximates to the living Indian hyæna (*H. striata*); but, in the absence or extremely rudimentary character of the postero-internal cusp in the lower carnassial, as well as in the entire absence of the anterior accessory cusps in the upper and the first two lower premolars, the Sivalik species comes closer to *H. crocuta*. *H. felina* differs from all other species of hyæna, living or extinct, in the absence of the upper premolar 1. *Felis grandicristata*, which was of about the same size as some of the larger varieties of the Royal Tiger, had the sagittal crest even more prominent than the *F. cristata* of Falconer and Cautley. *Machærodus sivalensis* was of about the same size as the jaguar. One of the specimens, on which this species is based, shows two molars in the deciduous dentition instead of three (as in the genus *Felis*). *M. palæindicus* was considerably larger than *M. sivalensis*. Both differ from all other known species of *Machærodus* in the form of the lower jaw, &c.

PARIS

Academy of Sciences, December 15, 1879.—M. Daubrée in the chair.—The following papers were read:—On some applications of elliptic functions, by M. Hermite.—Researches on the substance designated hydride of copper, by M. Berthelot. The amorphous substance precipitated in the reaction of hypophosphorous acid with sulphate of copper is not a true hydride; it contains constitutional water, oxygen, and phosphorus in considerable quantity.—On the cold of December and its influence on the temperature of the snow-covered ground, by MM. Becquerel. Snow alone does not preserve the bodies it covers from frost. It acts, indeed, as a screen, preventing radiation, and gives water at 0°, which filters through the ground; but under 0° it undergoes, like other bodies, by its conductivity, variations of temperature, and may transmit them, attenuated much, however, by reason of its thickness. But the presence of straw or the like under the snow may preserve organic bodies in the ground.—M. Pasteur stated that the bacteridium of anthrax, and the organism which produces the cholera of fowls, could both resist a temperature of 40° below zero.—On the variations of

the vertical, by M. D'Abbadie. In his observatory near the Pyrenees he has found the place of the vertical vary in only six hours, from 7″·4 to 2″·4, and he thinks the changes there do not depend on temperature (as M. Plantamour explains the phenomena he noted). The desirability of all astronomers publishing their observations on this subject is referred to.—Craniology of Australian races, by MM. Quatrefages and Hamy. The eighth volume of their "Crania Ethnica" completes the study of the Australians, and treats partly of the African negro races. The Australian continent seems to contain only two indigenous races, one forming the Australian race proper, the other distinguished as *neanderthaloid*, and represented by a small number of homogeneous and disappearing tribes. The craniological characters are indicated. The male natives of the interior have considerably larger cranial capacity than those of the coast, but the women have slightly less.—Observations during a voyage in Equatorial America, by M. Crévaux. The River Içá (one of the affluents of the Amazon) is navigable for 800 geographical miles, as far as the outliers of the Andes.—New æroplane, moved by a compressed air-engine; experimental determination of the work necessary to make it fly, by M. Tatin. The apparatus resembled that of Henson's (1843), except in dimensions, a sort of kite moved by screw propellers. It rises and describes a curve in the air, coming to the ground again. The horse-power was about 1 per 50 kg.—Reply to M. Balbiani, on the presence of the winter egg of phylloxera in the ground, by M. Boiteau.—A head of jacquez grafted on a French vine, by M. de Lafitte.—On a class of functions connected with the functions of M. Heine, by M. Appell.—On measurement of the intensity of absorption lines and dark lines of the solar spectrum, by M. Gouy. The problem is reduced to making a pure spectrum, and measuring the intensity of different portions of it.—On a curare of the unstriped muscles, by MM. Couty and De Lacerda. This kills by lowering the arterial tension, and consequent cessation of the circulation. The effects were got with preparations from *Strychnos gardnerii* and *S. triplinervia*.—Alterations of the cutaneous nerves in a case of vitiligo, by MM. Leloir and Chabrier.—Researches on vaso-dilator nerves contained in various branches of the fifth pair, by MM. Jolyet and Laffont.—On the chemical composition of bones in arthropathy of the ataxic, by M. Regnard. Fat becomes abundant, and phosphate of lime is greatly diminished.—Researches on the mode of formation of the spinal fissure, by M. Dareste.—On a new form of vesicular worm found in a jerboa, by M. Mégnin.—New remarks on the Orthonectida, by M. Giard.—On the reproduction of marine algæ (Bryopsis), by M. Cornu.—On the influence of forests on rain-currents traversing them, and the affinity of pines for vapours, by M. Fautrat. On an average the weight of aqueous vapour contained in 1 cub. metre above pines is 8·66 gr., and on bare ground at the same height 7·39 gr.; showing 1·27 gr. in favour of the pines. Above leafy trees the corresponding numbers are 8·46 gr. and 8·04 gr.; difference in favour of leafy trees 0·42 gr.—On a very intense hoar-frost observed at Angers on December 12 and 13, by M. Decharme. The temperature was − 8°·8 to − 6°·4; pressure 779 mm.; wind weak. The numerous long opaque needles of ice were all placed on one side of the branches, that opposite to the direction of the wind.—M. Jobert proposed a large celestial reflector, giving, in a dark chamber which might hold as many as a hundred observers, an enlarged image of heavenly bodies.

December 22, 1879.—M. Daubrée in the chair.—M. Faye presented his "Cours d'Astronomie nautique." His method is to bring all questions to two or three fundamental equations (which ever recur). The study of chronometers is treated with special care. The graphic solutions of Douwes's problem are expounded from a new standpoint.—Reply to M. St. Claire Deville's remarks on the temperature of decomposition of vapours, by M. Wurtz.—Observations on M. Berthelot's note entitled "Researches on the Substance named Hydride of Copper," by M. Wurtz. He adheres to his formula, Cu_2H_2. The presence of a small quantity of copper and phosphate of copper in the product explains at once the existence of small quantities of oxygen and phosphorus, and the deficit in hydrogen.—On a new hydride of silicium, by M. Ogier. He submitted some siliciuretted hydrogen to the electric *effluve*. After some time the gas is wholly destroyed; a yellow coat forms on the walls of the tube, and the gaseous volume (pure hydrogen) increases to a sensibly constant limit. The composition of the deposited matter (arrived at from comparing the volume of the siliciuretted hydrogen and the resulting hydrogen), appeared to be Si_8H_3. The body is thus a sub-hydride of silicium corresponding to sub-oxide of carbon, or to crotonylene. (Its properties are specified.) Similar effects are got with the *effluve* acting on arseniuretted hydrogen; a solid hydride As_2H is formed, corresponding to solid phosphide of hydrogen, P_2H.—Comparative studies on ptyaline and diastase, by M. Defresne. These two bodies are not identical physiologically. Ptyaline saccharifies starch in the mixed gastric juice as well as in the mouth; it is only paralysed an instant in pure gastric juice, and recovers its action in the mixed juice and in the duodenum. Diastase or maltine is destroyed immediately in chlorhydic solutions or in pure gastric juice, and after having passed into the mixed juice, it is profoundly altered, for, if again dissolved with starch, it no longer saccharifies it.—M. Debrun submitted a new capillary electrometer, a modification of Lippmann's, a microscope being dispensed with, and the mercury surface whose displacements are observed being in a graduated tube inclined at an angle of 10° to the horizon. The change of level is about 75 mm. for a variation of one volt (giving, with a Vernier, a sensibility of at least $\frac{1}{100}$ of a volt).—On the determination of the elements of a vibratory movement; measurement of periods, by M. Mercadier. Two very fine styles are fixed (parallel, and one behind the other, and very near it, in a horizontal plane) to the two vibrating bodies; and their shadows with light coincide on a vertical screen. When the bodies vibrate vertically, a certain number of lines result in the projection, some of which are broader than others, and seem fixed. (These effects are investigated).—Researches on nitrification, by MM. Schlœsing and Muntz. The conditions affecting the production of nitrates are set forth; temperature, access of oxygen, humidity, weak alkalinity, presence of various organic matters, &c. *Nitrites* are formed in general when the conditions of temperature and aëration are not advantageous.—On dioxyethylmethylene, and on the preparation of chloride of methylene, by M. Greene.—On two substances, palmelline and characine, extracted from fresh-water algæ, by Mr. Phipson. It is characine that gives plants of the *chara* genus their marshy odour; it is formed by the plant during life, and is not a product of decomposition. It is lighter than water, and is a species of camphor, forming very thin pellicles on the water surface, but dissolving very little in it.—Habits and parthenogenesis of *Halictus*, by M. Fabre. These animals have two generations annually, one in spring, and sexual, from mothers which, fecundated in autumn, have passed the winter in their cells; the other in summer, and due to parthenogenesis.—On tubercular inflammation of the internal coat of the vessels in tubercular meningitis, by M. Cornil.—On the structure of the bark and wood of *strychnos*, by M. Planchon.

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