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THURSDAY, NOVEMBER 18, 1869

LECTURES TO WORKING MEN

THE workmen of England wish for more education. I speak of the better classes of them; those who can read and write and cast up accounts in some sort of fashion, though it may in many cases be a poor one. There is a great desire, which is very widely spread among them, for some kind of higher education: they wish to learn something of Science. They cannot learn it at school, and they cannot get all they want from books; so that they must look to a great extent for what they require to evening lectures. Now in these there are two things which they dread. The first is that they should only hear a string of technical terms, which they cannot understand; and the second is that they should have what ordinarily go by the name of "Popular Lectures on Science," lectures which are often illustrated by inconsequent "experiments." We have not to go far to find the reason of their dislike to such lectures: the fact is, they distrust them. The English workman is a clear-headed, shrewd man, and he has a good intuition of what is worth having. That is the reason he cares for scientific knowledge. He knows very well that science is "one of the best things going;" and he has also a very thorough appreciation of everything of the nature of humbug in any line whatsoever. Perhaps there is no audience in the world who, on the one hand, recognises readily the existence of humbug, and, on the other, recognises what is genuine, so well as an audience of intelligent English working men. I have often conversed with such men, and while I have heard them express the greatest desire for scientific information, I have heard them also speak most disrespectfully of that which is too often presented to them instead of it; and I have, over and over again, heard this said, "What is the use of our going to lectures, when we are to hear no more of the subject again?" Such sentiments as these find practical expression in the fact that I have found courses of a few consecutive and carefully digested lectures to workmen always well attended by a persistent audience. It is nothing desultory that these men want, but something solid—something which will give them real information. What they want is not a single lecture, or bits of the thing shown to them in a random sort of way, but a piece of real teaching, something which helps them to see their way a little through some subject, and gives them a better grasp of the thing which they are seeking for, namely, the method and facts of science. To be told only a number of the facts and results of science without the method is what workmen do *not* want; they are greedy for the facts of science, but they want something more. On the other hand, to try to impart to them the method of science without doing so by some particular instance, is to engage them in a kind of vague philosophising, suitable perhaps for the learned, but not for the ignorant. Ignorant people do not want, and cannot profit by, abstractions.

I believe, therefore, that a real demand amongst working men is supplied by short courses of lectures on scientific subjects, given in the evenings in some Institute or Mechanics' Hall. The lectures should not occur more than twice, or perhaps once, a week. We must never forget that it is a hard matter for a working man to get to a lecture in an evening. To give such a set of lectures to working men calls for those who are well versed in the subject with which they are to deal; for it is only such who can speak free from technicalities. It must be remembered that workmen have no previous information, no knowledge of mathematics or of technical terms, which may enable us to shorten demonstrations or explanations. Everything requires to be explained to them *ab initio*; and it is only a man well versed in the subject down to the minutest particulars who can do this well. It is only such a man who can bring forward the first rudiments of a subject shortly, distinctly, and so as to interest his audience, *without being superficial*. Others speak from too bare a mind. But a man deeply versed in a subject can put it in a perfectly elementary way, and yet weave about it the interest of its most advanced portions. We have to show workmen the main points of an argument; they cannot come to, nor can we afford to give them, thirty or forty lectures, as we should do at the University. We can only give them three or four, and we must do the best we can in these. The best we can do seems to me to be this, to choose from the branch of science, which we wish to bring before them, some one of its most characteristic parts; and, while following out the great steps of that particular argument, to so illustrate it as to suggest and open up the rest of the subject, at the same time taking care to bring all to bear on one thing. A great point to aim at is, that all that we speak about should have a relation to the subject in hand, and such a relation as our audience will easily perceive—that we should not, in fact, bring before them isolated facts or theories, but always something connected, something logical. This indeed is the great end of teaching science: to get people into a better style of thinking about things; and this is just what, as soon as these men find it, they greedily snatch at; for they aim at some knowledge of science for a reason which is perhaps not quite clear to their own minds; but when they get the thing they want, they recognise that it is what they want.

Our English workmen, in fact, have not quite enough logicalness about them. They are apt to be led away by wrong arguments, by conclusions which do not quite follow from the premises. And, what is more, they (at least the best of them) know that quite well. And that is just the very point where some instruction in science helps them; where the scientific method—the method of getting hold of facts and putting them together, and doing so in a strict and careful way—helps people. And this is just what the workmen of this country need, and what a large number of them feel that they need, and the very reason for which they desire scientific knowledge. Now where this desire exists, do not let us hear them ask for bread and give them a stone. The future of England depends on these men. They are hard-headed, honest, straightforward men; and they think a deal; and they have got their faults, and not the least of them is this fault of being somewhat illogical. I have heard both employers and workmen say, "It is because our men are too apt to be led away by inconclusive arguments, that half the errors which they commit are committed." To any one who has studied the matter of the failure of so many workmen's Benefit Societies, the truth of these

remarks will be evident. I am not here expressing any opinion as to the rights or wrongs of many things at which workmen aim, and in which they engage. But totally irrespective of opinion, it is evident that there are many important questions the management and the decision of which are in the hands of the working men, and a right view of the respective importance of facts and of argument is the only safeguard against being misled. It is just at this very point that scientific teaching helps to set men right. I am not saying whether or not I believe that Science is to be the regenerator of mankind. But this is certain, that there is a great benefit to be gained from scientific teaching, that it supplies to working men that which as a class they are deficient, and that which as a class they are desirous of having; and that here there is open before all who care for these matters a wide field of direct and immediate utility.

I have seen six hundred men, on a tempestuous winter evening, come to a lecture on Astronomy at one of our great workshops in the North. It is a wonderful sight to see so many faces intelligent and seeking for knowledge. Working men are a peculiar audience: they are rather fond of cheering; and I have often had to check a piece of applause arising just before the conclusion of a demonstration which was tying together, so to speak, in a knot, several threads of argument. Such applause, coming, as I have so often seen it, *just before* the completion of an argument, indicates the satisfaction which all feel, and which these men are unsophisticated enough to express, when there just begins to dawn upon them the feeling of seeing, without being told, what some things have got to do with one another; the feeling in fact of making a discovery. And I can fancy nothing more encouraging to a lecturer who loves his subject than such facts, and nothing which more bears out the assertion that I have made, that there is among working men a true desire for, and a true appreciation of, something genuine in science. Working men —at least those with whom I am acquainted, and I am acquainted chiefly with the northern districts of England— have a strong perception of right and wrong, a strong moral character, a clear and open way of giving everything a fair hearing—that natural honesty which is the backbone of a nation. And if we add to this the powerful logic and the wide information which the true teaching of science imparts, we bid fair to make the democracy of England a model for that of all other countries.

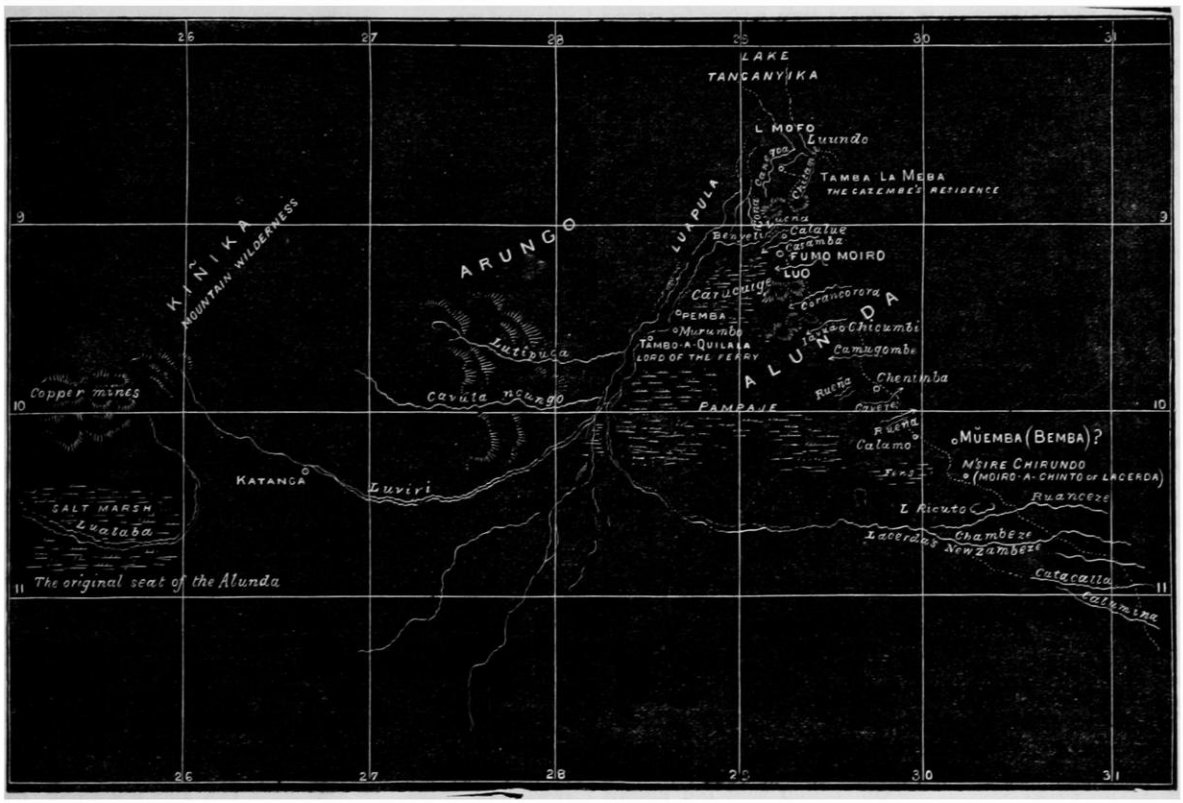
JAMES STUART

DR. LIVINGSTONE'S EXPLORATIONS

THE letters from Dr. Livingstone lately read at the Royal Geographical Society, give the grateful assurance, not only that he was in good health and spirits in July 1868, but also that he was under no apprehension of ill-treatment from the Cazembe. Visiting that chief without a numerous escort, he created no alarm. He has, in truth, notwithstanding seeming difficulties, been singularly fortunate; for his rumoured death and expected captivity have created a sensation of much greater value to him than the discovery of the Nile's sources. Dr. Livingstone's account of his journey northwards from the Aroangoa is in general reconcilable with those given by the Portuguese expeditions, with some difference, however, arising from difference of route. He seems to have crossed that river much further to the west than Monteiro, whose line of march was ten or twelve miles more west than that of Lacerda. He saw mountains, he tells us, and the Portuguese saw none. Herein he is greatly mistaken: Monteiro's expedition crossed over the flanks of a wondrous mountain, supposed to be a Portuguese league (about 20,000 feet) high, with trees, population, but no snow on its broad summit. The account of this mountain, called by mistake Muchingue (the glen or defile), given by a writer in the Journal of the Royal Geographical Society (vol. xxvi.), improves the original by a precise statement of longitude and latitude, and by a description of the panoramic view from the summit to a distance of 200 miles.

The high land which culminates towards the east in Muchingue was ascended on leaving the valley of the Aroangoa. The traveller then came in lat. 10° 34′ S., to the river Chambezi, called by Lacerda the New Zambezi, flowing from east to west, and rarely fordable. He remarks that it resembles the Zambezi, not in name only, but also in the abundance of food found in the stream or on its banks. He forgets that the critic who denied his explanation of the name Zambezi (river *par excellence*), showed that in all its forms, Liambegi, Chambezi, Yabengi, &c., it means simply (river) "of meat" or animal food. The Chambezi abounds in oysters, but we know nothing of their flavour. This river, according to Dr. Livingstone, forms in the west the great Lake Bengweolo, from which it again issues to the north under the name of Luapula; but we believe it would be more correct to say that it joins the Luapula, a much larger river, the great marsh Pampage, which is, doubtless, often overflowed and converted into a lake, lying in the angle between the two rivers. Then we are told—"The Luapula flows down north past the town of Cazembe, and twelve miles below it enters the Lake Moero." From this it might be concluded that the river flows by the chief's town, and that twelve miles lower down, or further north, it enters the lake, but this cannot possibly be the traveller's meaning. Lake Moero forms a remarkable feature in Dr. Livingstone's latest discoveries, but his account of it is singularly perplexed and obscure. We know that the Luapula flows to the north or N.N.E., some eight or ten miles west of the Cazembe. Lake Moero, by our traveller's account, is fifty miles long, and from 30 to 60 miles wide. "Passing down," he says, "the eastern side of Moero, we came to the Cazembe;" and again he states that "the Cazembe's town stands on the north-east bank of the lakelet Mofwe, two or three miles broad and four long, totally unconnected with Lake Moero." In endeavouring to reconcile these statements it is necessary to beware of rash conclusions and inaccurate expressions. It is a hazardous thing to pronounce upon the length, breadth, and boundaries of lakes without surveying them. The Portuguese officers in 1831 obtained leave to examine Lake Mofo or Mofwe, and for that purpose went four and a half leagues N.N.E. along its shore, till they came to the Lounde, a river, as they called it, two miles wide, where they expected to find boats. These, however, had been purposely removed, so that the explorers were brought to a stand. They had proceeded far enough, however, to perceive that the lake turned to the north-west. They did not see the end of it,

but state distinctly that it communicates with other large lakes. Dr. Livingstone, describing the flooded state of the country, tells his experience of two rivers which flow into the north end of Moero: the Luo, which was crossed by the Portuguese, thirty miles south of the Cazembe's town; and the Chungu, near which Lacerda died, about ten miles south of that place. From these particulars we cannot help concluding that the Moero of our traveller, who has found the country in a state of flood, is the Carucuige of the Portuguese, or at least that these names apply to parts of the same great marsh or lagoon. At the eastern side of it, visited by Dr. Livingstone, is the Fumo Moiro, whose title is probably taken from his district. Manoel Gaetano Pereira, who first visited the Cazembe, related, that near the chief's river into many branches. "These branches," he goes on to say, "are all gathered up by the Lufira. I have not seen the Lufira; but, pointed out west of 11° S., it is there asserted always to require canoes. This is purely native information." Now it is quite possible that the traveller totally misunderstood his native informants. They spoke of the waters to the S.W., and he understood them to speak of the N. or N.E. The great river Luviri, called by the Arabs Lufira, flows into the Luapula from the west, about 100 miles S.W. or S.S.W. from the Cazembe. The Lualaba, the sacred river of the Alunda, whence their forefathers emigrated, still farther west (a month's journey), falls into the Lulua, and so joins the Zaire. The great salt marshes, which chiefly supply the interior of Africa, are situated on its banks at its southern



town he spent a whole day wading breast-deep through a lagoon. It was subsequently found that the lagoon in question was Carucuige. The strength of the Cazembe's position lies in the difficulty of approaching it through a labyrinth of swamps, lakes, and wide drains. The Portuguese spent some hours in crossing a river, as they called it, two miles wide, on matted vegetation which sank under their feet. This and the Loûnde above mentioned were probably the connecting arms of large lakes.

Our traveller informs us, that "the Luapula, leaving Moero at its northern end by a rent in the mountains of Rua, takes the name of Lualaba, and, passing on N.N.W., forms Ulenge in the country west of Tanganyika." He saw the Luapula only at this gap in the mountains. Ulenge is a lake with many islands, or a separation of the bend; these may be the Ulenze above described, if it be not a marshy tract lying between the sources of the two rivers. The native information here given cannot be received as perfectly pure. When our author speaks of the Luviri entering Tanganyika at Uvira, he evidently casts the dimly discerned views of the natives into his own preconceived mould, and clothes them in his own language.

Respecting the language of this country, our author informs us that "the people are known by the initial Ba instead of the initial Lo or U for the country." This is not merely confused, but also, we believe, wholly erroneous. The initial U never forms the name of a country, but the collective name of a nation, chief, and people. The Portuguese, who on this point are the best authorities, use

the names Alunda, Arungo, Acumbe, not Balunda, &c. They tell us that the Alunda never pronounce the letter r, and that in writing the names Arungo, Moiro, &c., in which that letter occurs, they have adhered to the Maravi dialect. We thence conclude that for the names Rua, Moero, Lufira, &c., and perhaps for the initial Ba above alluded to, Dr. Livingstone is probably indebted to his Arab friends, who rest satisfied with a jargon, in some degree intelligible everywhere, and nowhere perfect.

Dr. Livingstone seems to be elated with the discovery that "the chief sources of the Nile arise between 10° and 12° S. lat., or nearly in the position assigned to them by Ptolemy, whose river Rhapta (?) is probably the Rovuma." Here two different problems are attempted to be solved at once—one touching the Sources of the White Nile, and the other, those of Ptolemy's Nile. With respect to these latter, it will be enough to observe that Ptolemy's Lakes of the Nile, two in number, 8 degrees asunder, are placed by him respectively in lats. 6° and 7° S., but his graduation being defective, through an imperfect estimate of the length of a degree, the positions thus assigned to the lakes fall under true graduation, to 11′ N., and 40′ S. of the equator. Ptolemy's Lakes, therefore, have not been reached by the zealous traveller.

With respect to the sources of the Bahr el Abyad, they may of course be traced to the head waters of the Luapula, provided that the results of Capt. Burton's observations on the altitude of Nyanza and the character of its northern end are completely thrown aside. With a greater elevation, and an outlet through Speke's Mountains of the Moon, the waters of the lake may reach Egypt.

It is to be regretted that Dr. Livingstone missed the opportunity of viewing the highest mountain in this part of the world, now known only by a ridiculously exaggerated description; and also a most interesting point in the centre of Africa. The great town, Katanga, as described by the Arabs, is near the copper mines, where 75 lbs. of copper may be bought for 4 cubits of American sheeting. The town is larger than Roonda (the Cazembe's town), and has good bazaars; it stands on the Rafira (Luvira) which joins the Ruapura (Luapula). The people are peaceable, and kind to strangers. The people from Zanzibar learned the language almost immediately.

F.R.G.S.

[We give a map of the region recently traversed by Livingstone, showing its connection with the known points in this part of Africa. We owe this map to the courtesy of the officers of the Royal Geographical Society. —ED.]

CUCKOWS' EGGS

SCARCELY any bird has so much occupied the attention, not merely of naturalists, but of people generally, as the Common Cuckow of Europe, and (we might almost add, consequently) scarcely any bird has had so many idle tales connected with it. Setting aside several of its habits wherein it differs from the common run of birds, its strange, and, according to the experience of most persons, its singular mode of entrusting its offspring to foster-parents, is enough to account for much of the interest which has been so long felt in its history. Within the last twenty years a theory (which is, as I shall presently show, by no means a new one) with respect to an important fact in its economy, has attracted a good deal of attention, first in Germany, and latterly in England; and as this theory seems to be especially open to misconception, and in some quarters to have been entirely misunderstood, I shall endeavour to give an account of it in a manner more distinct than has yet (I think) been done; and to show that there is no good ground for believing it to be irrational, as some have supposed, and for scouting it as something beneath contempt.

It has long been notorious to oologists that the eggs of the Cuckow are subject to very great variety in colour, and that a large number of birds laying eggs of very different colours enjoy the doubtful advantage of acting as foster-parents to the young Cuckow. Now the theory to which I refer is that "the egg of the Cuckow is approximately coloured and marked like those of the bird in whose nest it is deposited, that it may be the less easily recognised by the foster-parents as a substituted one."

This theory is old enough, for it was announced and criticised nearly a hundred years ago by Salerne,* who, after mentioning that he had seen two Stonechats' nests, each containing eggs of that bird, as well as a Cuckow's (which was as blue as the others, but twice [?] as large), goes on to say that he was assured by an inhabitant of Sologne (a district in France to the south of Orleans), that the Cuckow's egg is always blue; and then comes this remarkable statement:—"As to the assertion of another Solognot who says that the hen Cuckow lays its eggs precisely of the same colour as those in the nest of which she makes use, it is an incomprehensible thing." Many of my readers will, I doubt not, be at once inclined to agree with Salerne.

Little attention seems to have been paid to this passage by succeeding naturalists;† but in 1853 the same theory was prominently and (I believe) independently brought forward by Dr. Baldamus, then editor of *Naumannia*, a German ornithological magazine, now defunct; so far as I know, however, it was not until April, 1865, that an article in the English ornithological journal, the *Ibis*, by Mr. Dawson Rowley, gave anything like an idea of it to the public of this country. Some months later (14th September) Mr. A. C. Smith introduced the subject to the Wiltshire Archæological and Natural History Society, and the paper he then read, having been since printed in the *Wiltshire Magazine* (vol. ix. p. 57), and elsewhere, has, with Mr. Rowley's article, made the theory very generally known. Mr. Smith also published, subsequently, in the *Zoologist* for 1868, a translation of Dr. Baldamus's elaborate essay; but this translation being unaccompanied by the coloured plate which illustrated the original, unfortunately fails to do justice to the Doctor's theory, for without seeing the specimens on which this is founded, or good figures of them, the evidence in its favour can scarcely be appreciated fully.

Dr. Baldamus's theory had been some time known to me, when in 1861 I had the pleasure of being shown by him his collection of Cuckows' eggs, and I can declare

* L'histoire naturelle, éclaircie dans une de ses parties principales, l'ornithologie, &c. Paris: 1767, p. 42.

† Montbeillard (Hist. Nat. des Ois, vi. p. 309) mentions it, but I am not aware of any one else who has done so, until M. Vian in the *Revue et Magasin de Zoologie* for 1865 (p. 40), referred to it, and from this reference I became acquainted with it.

that his published figures represent the specimens (sixteen in number) from which they are drawn, as faithfully as figures of eggs usually do, and that an inspection of the series convinced me that the belief he entertained was not groundless. All the eggs in question, some departing very widely from what I had been used to regard as the normal colouring, bore an unmistakable resemblance to those of the birds in the nests of which they were asserted (in most cases, I was assured, on very good authority) to have been found; while in some cases there was just enough difference between them and those they "mimicked," to show that it was far more unlikely that they should have been extraordinary varieties of the eggs of the species in question, than eggs of the Cuckow.

Dr. Baldamus's allegation therefore seemed to me to be in part proved. If the history of the eggs before me could be trusted—and I had no reason to doubt it, the fact of the likeness was in many respects self-evident, in others certainly not so striking, and in some perhaps questionable. In further corroboration of the theory also, there were the similar instances cited with much assiduity from foreign sources by Dr. Baldamus in his essay,* and one, apparently not known to him, but given by Mr. Blyth in Sir William Jardine's "Contributions to Ornithology" for 1850 (p. 69 *bis*, pl. 52). Another and very remarkable case had also come to my own knowledge. In the autumn of 1857 I had received from Mr. Tristram all the eggs collected by him in Algeria during the preceding season. When they were unpacked, it appeared that there were two more specimens of the egg of a large North-African Cuckow (*Oxylophus glandarius*) than I had been led by him to expect. On examination, I found that the first two eggs of this species which had been obtained by him so much resembled eggs of the Magpie of the country (*Pica mauritanica*), in the nests of which they had been found, that, skilful oologist as he was, they had passed, even to his practised though unsuspecting eye, as those of the latter bird. Had I known then of Salerne's words, I should have exclaimed with him, "c'est une chose incompréhensible!"

Having said thus much, and believing as I do the Doctor to be partly justified in the carefully-worded enunciation of what he calls a "Law of Nature," I must now declare that it is only "approximately" and by no means *universally* true that the Cuckow's egg is coloured like those of the victims of her imposition. Increase as we may, by renewed observations, the number of cases which bear in favour of his theory, yet, as almost every bird's-nesting boy knows, the instances in which we cannot, even by dint of straining our fancy, see resemblances where none exist, are still so numerous as to preclude me from believing in the generality of the practice imputed to the Cuckow. In proof of this I have only to mention the many eggs of that bird which are yearly found in nests of the Hedge-Sparrow in this country, without ever bearing the faintest similarity to its well-known green-blue eggs. One may grant that an ordinary English Cuckow's egg will pass well enough, in the eyes of the dupe, for that of a Titlark, a Pied Wagtail, or a Reed-Wren, which, according to my experience, are the most common foster-parents of the Cuckow in this country; and indeed one may say, perhaps, that such an egg is a compromise between the three, or a resultant, perhaps, of three opposing forces; but any likeness between the Hedge-Sparrow's egg and the Cuckow's, so often found along side of it, or in its place, is not to be traced by the most fertile imagination. We must keep therefore strictly to the letter of the law laid down by Dr. Baldamus, and the practice imputed to the Cuckow is not universally but only "approximately" followed.

Now, is it possible to give a satisfactory explanation of the process by which the facts alleged are produced? Dr. Baldamus assigns none. He lays down a number of aphorisms, most of which are very interesting, and, I believe, true; but they do not touch the question. A good many people who have only read hastily, and still more those who have to all appearance only read at second or third-hand what has been written on the subject, seem to imagine that the Doctor has wished to assert that the Cuckow can voluntarily influence the colour of her egg, so as to assimilate it to those already in the nest in which she is about to deposit it.* Dr. Baldamus, indeed, mentions such a supposition, but expressly says that he rejects it, and herein I think that nearly every physiologist will agree with him.

It will be admitted, I think, that Dr. Baldamus's inference as to the object of the practice being that the Cuckow's egg should be "less easily recognised by the foster-parents as a substituted one," is likely to be true. This being the case, only one explanation of the process can to my mind be offered. Every person who has studied the habits of animals with sufficient attention will be conversant with the tendency which certain of those habits have to become hereditary. It is, I am sure, no violent hypothesis to suppose that there is a very reasonable probability of each Cuckow most commonly placing her eggs in the nests of the same species of bird, and of this habit being transmitted to her posterity. Without attributing any wonderful sagacity to the Cuckow, it does seem likely that the bird which once successfully deposited her eggs in a Reed-Wren's or a Titlark's nest should again seek for another Reed-Wren's or another Titlark's nest (as the case may be), when she had an egg to dispose of, and that she should continue her practice from one season to another. We know that year after year the same migratory bird will return to the same locality, and build its nest in almost the same spot. Though the Cuckow be somewhat of a vagrant, there is no improbability of her being subject to thus much regularity of habit, and, indeed, such has been asserted as an observed fact. If then this be so, there is every probability of her offspring inheriting the same habit, and the daughter of a Cuckow which always placed her egg in a Reed-Wren's or a Titlark's nest doing the like.

Further, I am in a position to maintain positively that there is a family likeness between the eggs laid by the same bird, even at an interval of many years. I know of more than one case in which a particular Golden Eagle has gone on season after season laying eggs that could be at once distinguished by a practised eye from the eggs of almost any other Golden Eagle; and I know of one case

* I do not here enumerate them; they will be found in *Naumannia* for 1853, p. 317, note. The plate which illustrates the paper is in the volume of the same magazine for the following year.

Thus Mr. Cecil Smith (not to be confounded with Mr. A. C. Smith, before mentioned) in a work published within the last few weeks, falls into this mistake ("Birds of Somersetshire," p. 265), after having stigmatised the Doctor's theory as "wild," which he well might if it had been as it is represented.

in which the presumed daughter of a particular Golden Eagle, remarkable for having produced eggs of very great beauty, has in two successive years laid eggs which unmistakably resembled those of her reputed mother in the brilliant character of their colouring.

Hence I am not afraid of hazarding the supposition, that the habit of laying a particular style of egg is likely to become hereditary in the Cuckow; just as I have previously maintained that the habit of depositing that egg in the nest of a particular kind of bird is also likely to become hereditary.

Now it will be seen that it requires but only an application to this case of the principle of "Natural Selection" or "Survival of the Fittest" to show that if my argument be sound, nothing can be more likely than that, in the course of time, that principle would operate so as to produce the facts asserted by the anonymous Solognot of a hundred years ago, and by Dr. Baldamus and others since. The particular *gens* of Cuckow which inherited and transmitted the habit of laying in the nest of any particular species of bird eggs having more or less resemblance to the eggs of that species, would prosper most in those members of the *gens* where the likeness was strongest, and the other members would (*cæteris paribus*) in time be eliminated. It is not to be supposed that all species, or even all individuals of a species, are duped with equal ease. The operation of this kind of "Natural Selection" would be most marked in those cases where the species are not easily duped, that is, in those cases which occur the least frequently. Here it is that we find it, for it has been shown that eggs of the Cuckow, deposited in the nests of the Red-backed Shrike, of the Bunting-Lark, and of that bird which for some reason best known to the donor bears the English name of "Melodious Willow-warbler," approximate in their colouring to the eggs of those species—species in whose nests the Cuckow rarely (in comparison with others) deposits her eggs. Of species which would appear to be more easily duped, or duped in some other manner—the species in whose nests Cuckow's eggs are more commonly found, I may have something to say in another paper. ALFRED NEWTON

THE ORIGIN OF BLOOD-LETTING

THE flamingo in the gardens of the Zoological Society has recently been observed to vomit a red-coloured fluid over certain smaller birds kept with it; and it has been shown that this red fluid contains true blood-corpuscles, and inferred that the flamingo is in the habit of feeding its young by this ejection of a blood-stained "pigeon's milk" into their mouths. Further, the habit of the flamingo has been with great probability connected with the story of the pelican, which, as is well known, is stated to wound its own breast in order to feed its young with the blood. It is not at all improbable that birds so alike in their plumage and habitat as the pelican and flamingo should be confused in the way suggested by Mr. Bartlett, who, I believe, first observed the habit of the captive flamingo. The extravasation of *blood corpuscles* normally from the pharynx or œsophagus of such an animal is a matter of great interest. Mr. Lowne has a paper in the Journal of the Queckett Microscopical Club, in which he gives a full account of the case, having examined the bloody exudation microscopically. To this the reader is referred; but I have something to add to it.

The connection of the flamingo with the classical story of the pelican's self sacrifice is increased in interest, since it appears that the red exudation of the hippopotamus is connected with an equally ancient and more important tradition—namely, the history of the origin of blood-letting. Before giving this tradition, I would mention that two years since, by the kindness of Dr. Murie, I obtained some of the red exudation of the hippopotamus on a slip of glass, and on examining it with the spectroscope, I did *not* obtain a blood-spectrum. Mr. Tomes (Proc. Zool. Society, 1857) described the microscopic appearances of the exudation of the hippopotamus, and stated that he found in it remarkable corpuscles with pigmentary granules, but not *blood corpuscles*. The folds of the skin in various parts of the body of the hippopotamus are coloured bright pink by a distinct pigment, and the same tint suffuses the darker parts of the skin. I believe it is this pigmentary matter which causes the red colour of the exudation of the hippopotamus, and that it is not a sweat of blood at all. The case of Mr. Jamrack's rhinoceros mentioned by Mr. Lowne may be otherwise. Mr. Lowne says that cases of blood-stained sweat from the skin of man are, though rare, well authenticated. This is perhaps true; but many apparent cases of such staining are due to the formation of a purpurate in the sweat, from the decomposition of the uric acid which it contains.

Now, with regard to the hippopotamus, it is important to note how popular tradition has attributed the origin of a very valuable medical art to a totally false inference on the part of Egyptian priests.

M. Milne-Edwards, in the 3rd volume of his "Leçons sur la Physiologie" (p. 3), has the following note:—"Homer, whose poems constitute a sort of encyclopædia of the science which the Greeks possessed about the ninth century before Jesus Christ, does not speak of bleeding: but if we are to believe an author of the fifth century, Stephanus of Byzantium, this operation was known to the surgeons of the army of Agamemnon. In fact, he relates that one of them, Podalirius, son of Æsculapius, and brother of Machaon, on the return from the siege of Troy, practised it on a patient whose cure obtained for him the sovereignty of the Chersonese. This would be the first case of blood-letting of which the remembrance has been preserved; and, on consideration of a fable reported by Pliny, I am induced to believe that this practice had taken its rise in Upper Egypt: in fact, this naturalist tells us that the hippopotami, when they become too obese, have the habit of piercing for themselves the vein of the thigh, by pressing against a pointed reed; and that these animals have thus taught physicians to practise analogous operations. Now, this account does not apply to the sea-horse (or *Syngnathus*), as the author of an estimable work on the history of medicine (Leclerc) supposes, but to the great pachyderm which inhabits the rivers of the interior of Africa, and which is found in Upper Egypt. It is evidently a fable: but this fable could only have reached us from Egypt."

M. Milne-Edwards was not aware of, at any rate does not refer to, the red oozing observed on the skin of the hippopotamus sometimes after emerging from his bath,

or when enraged, which gives so marked a confirmation to the Egyptian story. We may conclude fairly enough, either that the Egyptian priests saw this red exudation, and imitated it with the practice of bleeding, or, as is infinitely more probable, that the Egyptian laity noticed the blood-coloured sweat of the great river-horse, and connected it with the practice of bleeding then in operation, by the interpolation of the sharp reed, and an inability to understand that their wise men could discover a remedy untaught. E. RAY LANKESTER

PREHISTORIC ARCHÆOLOGY

Transactions of the International Congress of Prehistoric Archæology, 3rd Session, 1869. Royal 8vo, pp. 419, with 53 illustrations. (Longmans, 1869.)

IN these days of annual gatherings or Congresses intended for the promotion of Science, whether Natural, Social, or Ecclesiastical, we need not be surprised at the numerous observers now engaged in different countries in the various branches of Prehistoric Anthropology and Prehistoric Archæology founding an International Congress for the discussion of questions in which they are particularly interested. It was at a meeting of the *Société Italienne des Sciences Naturelles*, held at La Spezzia in 1865, that this Congress originated, with the more comprehensive than euphonious title of "Palæoethnological." With a slight change in its designation it met at Neuchâtel in 1866, and at Paris in 1867; while the Congress, the transactions of which are recorded in the volume before us, assembled at Norwich last year under the presidency of Sir John Lubbock, and with Colonel A. Lane Fox as organising secretary, contemporaneously with the meeting of the British Association. During the present year it has found a congenial home in the midst of the richly-stored museums of Copenhagen, under the fitting presidency of Professor Worsaae; has dug in the Kjökkenmöddings, and been right royally entertained by the King of Denmark; and next year the gathering is to be at Bologna, with Count Gozzadini as president. Such meetings, especially in the case of the followers of what must be regarded as a comparatively new science, serve at least a double purpose; as social gatherings they promote that intercourse and kindly feeling between those engaged in the same pursuit, which helps the onward progress of knowledge, while the discussions at the meetings tend to elicit truth from what may apparently be conflicting facts and opinions, and when too unruly hobby-horses are introduced into the arena, serve to control their wilder caracoles, if not effectually to break them in.

The success that has attended the institution of this particular Congress, which, by the way, is not to be held during two consecutive years in one country, cannot be better evinced than by the Report of its seven meetings at Norwich, which has just made its appearance, and forms a volume of upwards of four hundred pages, illustrated by more than fifty plates, for the most part presented by the authors of the papers they illustrate.

These Papers range over a wide area, both in space and time. The Pacific and South Sea Islands, the Cape of Good Hope and Southern and Western India, Japan and Algeria, as well as Spain, Portugal, France, Britain, and Ireland, all contribute their *quota* of facts; while various general questions relating to the condition, the arts, the distribution, and other circumstances of early races of mankind are brought forward and discussed. On the whole we may congratulate the Congress on the object of its assembly having been so carefully kept in view by the authors of the papers read before it, since hardly any of them, though varying much in value, can be regarded as having been irrelevant to its general purposes.

The time and space at our command being small in proportion to that ranged over by the Prehistoric Archæologists, we cannot give more than a brief notice of some few of what seem to us the more important papers; but at the outset we must express our regret, which we are sure many others will share with us, that the excellent Opening Address of the President was not more fully reported.

First of the Papers, and among the first in interest, is one by Mr. E. B. Tylor, on the "Condition of Prehistoric Races as inferred from Observation of Modern Tribes," in which some curious anomalies in the degree of knowledge in different branches of art and constructive appliances possessed by certain tribes are pointed out, and the inference drawn that it is unsafe to attempt to fix the stage of civilisation of any given people from the rudeness of one single class of implements in use among them.

Professor Huxley's Paper on the "Distribution of the Races of Mankind, and its Bearing on the Antiquity of Man," appears to have met with more favourable criticism from those present, including Professor Carl Vogt, than the author anticipated. And certainly the connection between some of the changes which in comparatively recent times have taken place in the physical geography of the earth, and the limitation of the areas occupied by different races, such as the Negroid and Australioid, seems, if not susceptible of proof, at least possible; and, if so, Professor Huxley's conclusion that the distribution of these two races of Man affords as strong evidence of his antiquity as the occurrence of his works in the gravel of Hoxne and Amiens is in a fair way of being adopted.

Touching these early works of man, we commend attention to the excellent account given by Mr. R. Bruce Foote, of his discoveries of quartzite implements of Palæolithic types in the Laterite formation of the east coast of Southern India. We know of nothing more striking than the wonderful similarity of these implements to those discovered associated with remains of extinct mammals in the old river gravels of Western Europe. But for the difference in the material there are numerous twin specimens so like each other that they might be thought to have been formed by the same hand, and yet they occur thousands of miles apart, and under what are apparently different geological conditions, though we think that much remains to be unravelled as to the origin and age of the Lateritic deposits of Madras. Still this parallelism of type seems to afford most remarkable proof that the same wants, with the same means at command for fulfilling them, result, so far as tools are concerned, in the production of similar forms, no matter where or when the men live who make them.

This is further illustrated by the stone implements from Japan, described by Mr. Franks, nearly all of which may be matched in form by arrow-heads, lance-heads, and hatchets found in Western Europe; and what is no less remarkable, the former are by the Japanese regarded as of heavenly origin, like the Elf-bolts of Scotland, and the

stone-celts are considered to be thunderbolts—a belief so universal in historic times that it may be said to have been held *semper, ubique, et ab omnibus.* There is, in fact, no difference of opinion between the old Greek Sotacus and the Chinese Emperor Kang-hi's encyclopædist (A.D. 1662). The former informs us, through Pliny, as translated by Philemon Holland, that "there be two kinds of Cerauniæ, to wit, the black and the red," and, "that they doe resemble halberds or axe-heads." The latter that "some of the lightning-stones have the shape of a hatchet, others that of a knife, and some are made like mallets. They are of different colours; there are blackish ones, others are greenish."

The curious similarity observed among Megalithic monuments in different parts of the world may possibly be due to some analogous development of thought and feeling rather than to any intimate connection between the races who erected them. The Dolmens of Algeria, described by Mr. Flower, those of Brittany by Mr. Lukis, those of the Aveyron by M. Cartailhac, are all, more or less, closely allied to the ancient sepulchres and Pandukulis of the Nilagiri Mountains in Southern India, described by Sir Walter Elliot.

We cannot close this brief notice without mentioning one of the most carefully illustrated and important contributions to the volume,—the account of the caves of Gibraltar, in which human remains and works of art have been found, by Mr. George Busk, who, in company with the late Dr. Falconer, visited the scene of the explorations of Captain Brome, which are now unfortunately suspended, but of which the record drawn up by himself is here preserved, and additional value given to it by the commentary of Mr. Busk.

We have, we hope, said enough to show the interesting character of this volume of the Transactions of the Congress, and the reports of the meeting at Copenhagen lead us to hope that it may next year be productive of another volume of at least equal value.

JOHN EVANS

THE WORLD OF THE SEA

The World of the Sea. Translated and enlarged by the Rev. H. Martyn Hart, M.A., from "Le Monde de la Mer," by M. Moquin Tandon, Membre de l'Institut, &c. Demy 8vo. pp. 500, with coloured and tinted plates and numerous woodcuts, price 21*s.* (London: Cassell, Petter, and Galpin.)

THERE are two methods of reviewing a book, the ungracious and the gracious. One, and the easier, is to find all possible fault with it; to prove, at least to the critic's own satisfaction, how much better he could have written the book, if he too had had the time, and the money, and the will. As for the talent, the critic has that, as a matter of course; for is not a critic one who judges other men, and is therefore wiser than they? And as for the knowledge, that is not needed. He may acquire that in the very process of reviewing, from the book which he reviews. Thus, following nature in economising force as much as possible, he is at once learner and teacher; judge and—parasite? Taking another man's materials, he shows the world how much better a house he could have built with them; and so has the clear profit of all the author's work, his carrying of the bricks and mortar, even his planning the house, beside all the expenses incident thereto, at the cost on his own part of a few suggestions which he is not even at the trouble of seeing carried out. Thus he leaves the hapless man, who has tried to do something, instead of sitting still like the reviewer, and seeing others do it, to cry *Sic vos non vobis;* and after a few more attempts to write books, to give up in despair, and take to the more easy and profitable employment (at which every lad can now earn an honest penny), of showing how books should have been written.

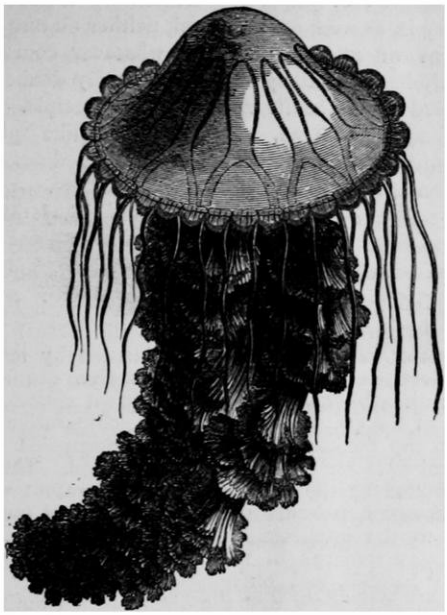
But the other, or gracious method of reviewing a book, is to ascertain what the book is really worth, at least to the class for whom it is written; and if it be worth anything, to recommend it to them heartily; being sure that attractiveness is no test of value, and that there is no more utter fallacy than that good wine needs no bush.

Unfortunately, this gracious and hearty method of reviewing a book is not only difficult, being contrary to the affections and lusts of the animal within, who delights to bite and devour his kin, while he is indignant at the very notion of his ancestors having been cannibals: but it is also morally dangerous; for if the reviewer begins by being gracious and hearty, he may descend to kindness, even to indulgence. He may be to the author's "faults a little blind, and to his virtues very kind;" and so fall altogether from that boasted impartiality which surely portends detraction.

For the sake, therefore, of preserving the virtue of impartiality, it is most prudent for the reviewer to begin by complaining, and to say that this very beautiful book has certain defects, which he hopes may be amended in future editions (for he must be allowed to be gracious enough to hope for future editions); that several of the most important and novel illustrations have no authority appended; that the very clever drawing of the sea-lions has not only no authority, but no description or notice in the text; that some chapters are meagre, and some of the illustrations bad—for instance, the Holothurians, of which only two very poor and inaccurate cuts occur; that the large drawing of Cuttle-fish is also very bad and wrong; and that there are many misprints and misspellings (possibly mere faults of the printers, but still faults), such as *rostro* for rostrum, *Ottary* for Otary, *a* Poritidæ, *an* Alcyonideæ, &c., which must be corrected; and that, as a whole, the latter part of the book is inferior to the beginning. It may be, of course, that this is owing to the simple fact, too common among other classes besides publishers, that the money did not hold out; or that the book, if finished in the style in which it was begun, would have grown too big to be published at a paying price. But what has a reviewer to do with excuses and with mercy?

Having thus fulfilled his duty, he has something of a right to take his pleasure; and to say—Here is a really beautiful book. It is a pleasure to turn over the pictures; a pleasure to think that it will lie on many tables, teaching folk, especially young folk, a thousand things which those of the last generation did not learn, hard as they worked, each for himself alone, simply because the works which could teach them were not yet written; nay, the microscopes which could show the facts not yet made. The text is, as is to be expected from M. Moquin Tandon, brilliant, interesting, full of feeling for that wonderful and poetic element which runs through nature, and should

therefore run through sound physical science. The illustrations are, on the whole, very good indeed; the large tinted plates altogether exquisite; notably one of the development of corals; and many of the cuts are not only accurate, but real works of art; for instance, a drawing



THE BEAUTIFUL-HAIRED MEDUSA (*Cyanæa euplocamia*)

seemingly from a photograph, of sponges, &c., on laminaria stems, and three drawings of medusæ, pp. 132-4, in which the grace and grandeur of the natural outlines has been excellently preserved.

Especially do the author, translator, and publishers deserve thanks for the mere number of the illustrations.

THE CROSS MEDUSA (*Rhizostoma cruciata*)

If the wonder of nature is ever to be got into the heads of the uneducated (rich or poor) it must be done, in the long run, through the eye. "Pictures," said certain men of old, "are the books of the unlearned;" and they used them with effect during the middle ages, to get into the heads of men wonders which—nineteen twentieths of them—never happened at all. Let Science, now her turn is come, use to the utmost of her resources, the same engine, to get into the heads of men—and of children from their earliest years—some of the wonders which are actually happening round them all day long. Let scientific men, therefore, welcome graciously this book, and all books of the kind, in spite of a few defects of haste or of insufficient knowledge. Let them recommend it to their friends—especially to those who have children. And if any shall raise the cry of "book-making," let them answer, "What else would you have?" In this age of "specialisation," when each minute branch of physical science requires a life-time of research, how are the many unscientific to be taught the vastness and beauty of Nature, save by book-makers; by those who take the results of other men's labour, and cast them together into a shape which the many will care to look at? Provided

THE MEDUSA OF GAUDICHAUD (*Chrysaora Gaudichaudii*)

they do not actually steal, allow them to borrow as freely as they will. What they borrow from the scientific writer, they will repay him a hundred-fold, in the form of pupils readers, and enlightened public opinion. Meanwhile, those who wish well to the cause of Truth, may trust that by every book of this kind one more human being will be awakened to the magnificence, as well as the importance, of facts; one more will be saved from the ancient empire of unreason; one more will be inclined to give rational glory to God, as he discovers how glorious His works are, even in the minutest polype; one more artist will discover, in his search for the beautiful, that the world contains a few objects quite as worthy of his pencil, as a Scotch fir-tree, or a country lane; and one school-boy, it may be, or even undergraduate, seeing this book in his sister's hands while he is at home for the vacation, will be led to inquire (not without reason)

why he also is not taught something about these strange and beautiful works of God, and something of the science which investigates them, instead of the mispronounced Latin and Greek, in learning which (and most imperfectly) he spends the ten or twelve golden years of youth. He will receive for answer (or rather he will soon learn to answer himself) that those who have the monopoly of education know nothing of these matters, and therefore cannot teach them; while those who do know about them are not asked to teach them, because they will not pay in an examination. But that discovery may make him resolve, for the sake of his children or his younger brothers, to do what in him lies when he grows up, to alter radically the course of instruction now pursued in almost every boys' school in these islands; in which case this book, and others like it, will not have been published in vain.

C. KINGSLEY

BARFF'S HANDBOOK OF CHEMISTRY

An Introduction to Scientific Chemistry; designed for the use of Schools, and Candidates for University Matriculation Examinations. By F. S. Barff, M.A. Second Edition. Fcap. 8vo. pp. xv. and 315, with woodcuts, price 4*s*. (London: Groombridge.)

THE rapid progress of experimental discovery is in itself an obstacle to the elementary teaching of any scientific subject. Nowhere has the truth of this observation been more frequently attested than in chemistry, a science which, during the present century, has had a more brilliant, or at least a more active, career than any of its old companions. We cannot, therefore, be surprised that the superior attractions of research have so far had a depreciating influence on the dogmatic department of this study, that many chemical manuals are meagre, partial, or unsystematic. It is true that a large number of such books has appeared during the last few years, under the powerful stimulus of an increasing demand for chemical education; but their general character is such as we have assigned, and the composition of a treatise for the use of school-boys seems to have been in many cases shelved, as either too humble or too great a task for an author.

Such considerations induce us to welcome very cordially the little handbook which Mr. Barff has just republished. The first edition must be too well known, and too fresh in the memory of many of our readers to render any detailed reference to the present one necessary. The writer's efforts have evidently been directed towards attaining as much as possible of both clearness and brevity in exposition; but his tendency to avoid speculative assumptions is still more meritorious. No one is more sceptical than a boy; no one more difficult to convince by experiment of the truth of a theory. The teacher will therefore economise his time in the most useful manner by putting before his class only the simpler practical illustrations in which he knows he can succeed, and but a few of the most general and securely established laws. Hence Mr. Barff has boldly, but very judiciously, postponed the entire discussion of formulæ and symbols to the concluding portion of his work, using in its former part only absolute units of weight and measure—which, of course, have the advantage over the usual abstract numbers, that an audience can see and handle them. The nomenclature is that first systematised by Berzelius, and introduced into this country by Professor Williamson; it has also been adopted of late in the examinations of the University of London.

The method of imparting elementary instruction in chemistry is, as we have indicated, neither mature nor on the point of attainment. But whatever course may ultimately be decided upon, we can hardly doubt that it will include Mr. Barff's fundamental principle. Meanwhile this little volume, with its business-like spirit and undeniable accomplishment of its design, deserves the general and hearty commendation of teachers.

E. J. MILLS

OUR BOOK SHELF

Contribution to Climatology.—*Klimatologische Beiträge.* By Professor A. W. Dove. (Berlin, 1869.)

ISOTHERMAL Charts like those published by Professor Dove in 1864 derive their chief interest from the fact that they permit a birds'-eye view of the great climatological features of the globe, but they are of comparatively little value to the meteorologist, unless accompanied by the numerical data on which they are founded. These are now supplied by the publication of the present volume, which, however, contains also a great deal of matter of interest to the intellectual community generally. The introductory remarks to the tables on the climate of Western Europe, and on non-periodical meteorological phenomena, will show that the distinguished author has just claims to be considered the greatest master of meteorological generalisations.

B. L.

Wonders of Italian Art.—By Louis Viardot. Small 8vo. Pp. 257. Illustrated with photographs and engravings. (Sampson Low & Co.)

IF photographs were not children of the sun, and if artists were not sometimes—like Leonardo da Vinci—men of science, and would always work the better for a knowledge of it, and if scientific men were not among those who can most highly appreciate works of art, this book would hardly come within our programme. It is a beautiful book, full of beautiful photographs and engravings of the best and most typical pictures of the Italian school, and one altogether refreshing to look upon. We should also add, that it is translated from the "Bibliothèque des Merveilles," which contains so many works on science.

Astronomical Publications.—1. *Astronomische Mittheilungen von der Königlischen Sternwarte zu Göttingen.* (Göttingen, 1869.) 2. *Sammlung von Hilfstafeln der Berliner Sternwarte.* By W. Foerster. (Berlin, 1869.)

THE first publication is an account of some recent astronomical labours at the Observatory in Göttingen, and contains the results of observations with the meridian circle in zone 0° and 1°, made in accordance with the well-known scheme of a zone revision so successfully initiated and established by English and Continental astronomers. The volume, which deserves in every respect the special attention of star observers, contains the mean places of stars up to the ninth magnitude, reduced to 1875·0. A new method of calculating the determinations of time, originally proposed by Gauss, has been for the first time made use of by the observers. It is shown at page ix. of the Introduction, and will be found of the highest merit.

The Berlin publication contains a set of tables for the routine business of the Observatory. Although calculated with reference to the local circumstances of the Berlin establishment, they are likely to be instructive elsewhere, their arrangement being extremely compact and at the same time lucid.

B. L.

The Half-crown Atlas of Physical Geography. By Keith Johnston, jun. 31 maps, printed in colours. Small 8vo. (Edinburgh, Johnston.)

THIS atlas astonishes and delights us. For two shillings and sixpence we at last get beautifully finished maps, showing the land and water hemispheres, and the lands which are blessed with an antipodes; a perspectic view of the globe; physical maps of the continents, Australasia, British Isles, and the Holy Land, a geological map of the British Isles, maps of ocean and river systems, ocean basins, winds and storms, annual isothermal lines, and range of temperature, distribution of earthquakes and volcanoes; the geographical distribution of useful plants and species, the chief animals, and varieties of man himself. There are, moreover, notes as to the preparation of the atlas, and an analytical index. We warmly congratulate Messrs. Johnstons on their last achievement, and advise everybody to buy the atlas.

Cassell's Technical Manuals.—1. Linear Drawing. 2. Projection. 3. Building Construction. By Ellis A. Davidson. Price 2*s.* each. (London: Cassell, Petter, & Galpin.)

THESE little books are intended to promote the technical education of artisans, and seem to be well-adapted to facilitate the work of teachers and learners. The manual of Linear Drawing shows the application of practical geometry to trade and manufactures, and has been appropriately chosen as the first volume of a technical series for craftsmen. The methods of constructing geometrical figures are given without the mathematical proofs which usually accompany such problems. The application of some of the figures to decorative and mechanical work is illustrated in diagrams of the trefoil, quatrefoil, toothed wheel, ellipse, &c. Accuracy is persistently inculcated, and all the figures are admirably executed. The manual of Projection leads the student many steps further, and treats of the drawing of plans, elevations, and sections of solids. The chapter on isometrical projection explains that system of drawing in a clear and concise manner. In some of the more elaborate figures fewer lines of construction might have been used with advantage. The observations on drawing instruments, and their use, are thoroughly practical. The third treatise elucidates the principles of Building Construction, and gives some useful hints on architectural drawing. It is profusely illustrated with diagrams; these are generally good, but the minor details of a few need correction. C. W. W.

Picture Natural History. (London: Cassell, Petter, and Galpin.)

WE have submitted this volume to an abler critic than ourselves—to a little boy. He is delighted with the pictures, and interested in the text. We should like to give it to every little boy and girl we know.

Tommy Try, and what he did in Science. By C. O. G. Napier (of Merchiston), F.G.S. Pp. 302, with 46 Illustrations, by J. D. Cooper, and others. (Chapman & Hall.)

A BOOK for boys, in which science and anecdote chase each other through a pleasant narrative, until Tommy Try takes to consulting phrenologists, and then, fortunately for his young readers, brings his memoirs to a close.

THE SUEZ CANAL

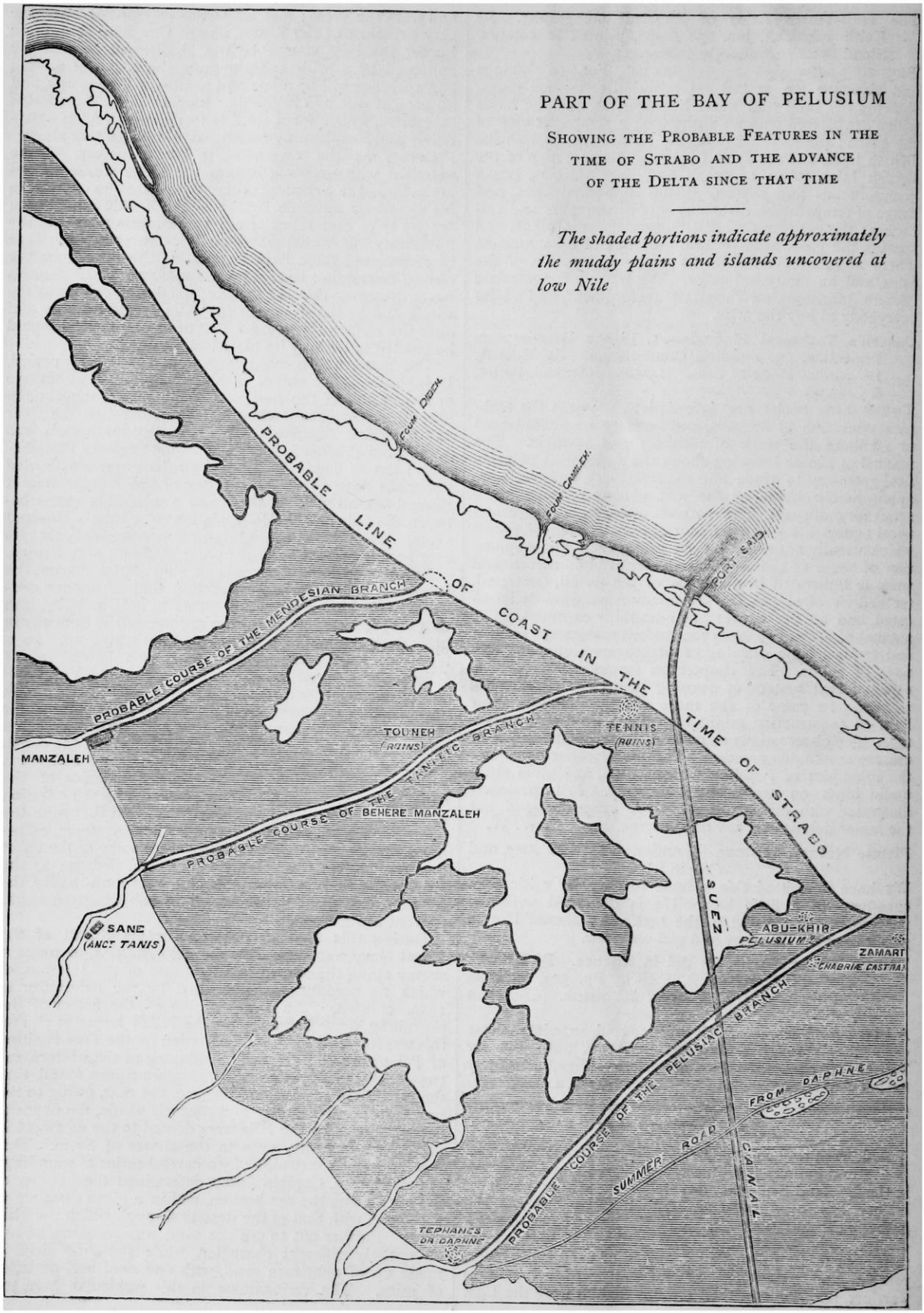
IF all went well, and we hope it did, yesterday witnessed a grand gathering on the sandy shores of a dreary bay in the Midland Sea—that sea around which so much of history has been enacted, and in whose annals the gathering in question will not be the least noteworthy incident. The Suez Canal—that problem of many centuries—is to be opened in presence of emperors, kings, princes, and potentates; of eminent engineers, famous warriors, and distinguished *savants* invited from the East and from the West; and while the ceremonial lasts the very dreariest of the dreary wastes that here and there border the blue waters of the Mediterranean will be animated by a brilliant throng and the sound of music; and speeches will be made and healths will be drunk, and all present will join in wishing success to the memorable enterprise, which, for a time, is to furnish to Arab story-tellers and Frankish newsmongers a topic to talk about.

Dreary as the region is, it has a history. There marched with invading armies the kings whose names are recorded in Scripture; there Artaxerxes was stayed in his victorious advance by the siege of Pelusium; there are yet to be seen relics of cities and towns named in the "Itinerary" of Antoninus; there Titus marched to the siege of Jerusalem; there Baldwin and his Crusaders took the city of Pharamia: the actors in these and other exploits never dreaming that the sands of the desert, drifted by the winds and by the stream of the Nile, would so bury and alter the surface of the land, that after generations should be puzzled to identify its historical localities.

The question of a canal dates from a very early period. In high floods the waters of the Nile spread to within two or three miles of the Red Sea, which would suggest the idea of a permanent communication between the river and the great Arabian Gulf. This communication was actually established, as is said, under Ptolemy Philadelphus; but of course it fell into neglect, and was buried under the drifting sands, until one of the caliphs had it cleared out, after which there was a navigable canal between the Nile and the Red Sea for more than a hundred years. Then it was again lost, and so completely that its ever having existed became matter of doubt and dispute.

But the main project was a ship canal across the isthmus. There is some tradition that Alexander consulted with his engineer officers as to its feasibility, and that they reported against it on account of the difficulty in preventing the mouth of the canal from silting up. In a later age Sultan Selim, who had been baffled in his scheme for a canal to connect the Don and Volga, resolved on cutting one from Pelusium to Suez; and he took an important step towards accomplishing his purpose, for he conquered the country all across, and made his name a terror to the Arabs. But he did not live to cut the canal. The first Napoleon revived the project, and ordered a survey, during which the long-buried remains of the canal above-mentioned were discovered, and the question as to its having existed was settled. From that time the question of a ship-canal became a standing topic, enlisting divers opinions, among which were some to the effect that the project was simply impossible, because, as the level of the Red Sea was so much higher than that of the Mediterranean, the swift current in one direction would prevent navigation.

During this time of debate, Captain Spratt of the Royal Navy was sent, with the ship *Medina*, to make a survey along the shores of Egypt and of the Isthmus, of which an account was published by the Admiralty in 1859, entitled, "An Investigation of the Effect of the prevailing Wave Influence on the Nile's Deposits;" and this was followed by "A Dissertation on the True Position of Pelusium and Farama." Beginning at the western extremity of the Egyptian coast, Captain Spratt found that the Nile there exerted no influence, but that, owing to the prevalent north-westerly and westerly winds, the deposits brought down by the Nile were drifted to the eastward in prodigious quantity, even to the shores of Syria. This was no hasty conclusion: by a careful series of soundings and dredgings, Captain Spratt determined the identity of the sand along the sea bottom, within a given distance of the shore, with that of the deserts through which the Nile flows. Farther out to sea the sand was coralline, and of an entirely different character, while the Nile drift is made up of quartzose sand, with fine mud and particles of mica. The verifications in this particular were too


PART OF THE BAY OF PELUSIUM
SHOWING THE PROBABLE FEATURES IN THE TIME OF STRABO AND THE ADVANCE OF THE DELTA SINCE THAT TIME
The shaded portions indicate approximately the muddy plains and islands uncovered at low Nile
PROBABLE LINE OF COAST IN THE TIME OF STRABO
PROBABLE COURSE OF THE MENDESIAN BRANCH
PROBABLE COURSE OF THE TANITIC BRANCH
PROBABLE COURSE OF BEHERE-MANZALEH
PROBABLE COURSE OF THE PELUSIAC BRANCH
FROM DAPHNE
SUMMER ROAD
CANAL
SUEZ
PORT SAID
FOUM DEEH
FOUM CASSEUH
MANZALEH
TOUNEH (RUINS)
TENNIS (RUINS)
SANE (ANCT TANIS)
ABU-KHIR PELUSIUM
ZAMART CHABRIÆ CASTRA
TEPHANES DAPHNE

numerous and too exact to leave room for doubt. "By this means," writes Captain Spratt, "I was enabled to trace the extent of the Nile's influence both directly off the coast and along it, as well as to ascertain the large quantity of sand—pure silicious sand—it must annually bring to the sea; and to an amount which far exceeded my expectations and experience in respect to other rivers, particularly that of the Danube, which, in comparison, brings a very much less proportion of sand to mud. The Danube sand, also, is of the finest quality. The Nile sand, on the contrary, is much coarser generally, and forms sandbanks off the coast that are composed of quartzose sand nearly as large as mustard seed."

The quantity of solid matter brought down by the Nile when in flood is prodigious, and precisely at this season —that is, for three or four months—the north-west winds blow strongest. Indeed, if the wind did not blow with the violence of a monsoon it would be impossible for sailing-vessels to navigate the river during the time of its rise. The suspended matter is consequently driven to the eastward along the coast, and there accumulating forms dunes or sandhills, which shift their position with every gale, "burying at times the huts of the coastguard men." The hollows between the dunes are cultivated by the Arabs, but the plots must be protected by screens of reeds, against which the sand accumulates by repetition, until in some instances the hill is a hundred feet in height. Captain Spratt here remarks: "The best efforts of a population of several thousand Arabs, who inhabit the villages along this strip of land, fail in permanently fixing these dunes. For as the sea continually reaccumulates the sand upon the beach, onward it moves, in spite of those efforts, and the rate of progress may be imagined when I state that a mosque near Brulos has in about twelve months been nearly buried in one of the dunes" advancing from the westward. "And as the coarse sand of which these hills are composed is not distinguishable in differing from the sands of the desert near the Pyramids, or that on the route to Suez, they must undoubtedly be all the gifts of the Nile."

Besides coarse sand the Nile carries down fragments of brick, pottery, and other heavy substances, which are also drifted along the coast by the combined action of wind and current. When the wind blows its strongest the coastguard men say they cannot walk against it. To test these facts, Captain Spratt one day landed eleven bags of ashes and clinkers, five of the bags containing pure clinkers, the largest of which weighed from four to five pounds. The whole were laid in a heap just above the water's edge, and left to the care of wind and sea. Twelve days later, when the party returned, not a vestige of the heap, which had weighed nearly two tons, was to be seen. The shore was examined towards the quarter from which the wind blew, but without result; while in the other direction, that of the prevailing wave movement, clinkers weighing about two ounces were found dispersed to a distance of fully 1,500 yards, one of 3½ pounds was picked up at 240 yards, and others from 4 to 8 ounces at from 600 to 700 yards. The greater portion had, however, been buried by the movement of the sand. "Thus this evidence," writes Captain Spratt, "of the movement of the beach in only twelve days, in the month of May, during which there was but one strong westerly breeze and several fresh easterly breezes, is a positive evidence of the great easterly movement of the shore and littoral shallows along this coast, but which, during a succession of winter gales, and during the prevailing north-west breezes at the period of high Nile, must cause a continuous progression of an immense quantity of the sands and matter carried out by the turbid river."

We quote another passage bearing on this point. The captain was walking along the coast for the purpose of observation, from the beacon marking the site of Port Said, to the head of the bay of Tineh, when he found a great quantity of broken pottery, broken jars, ancient and modern, and broken bricks scattered on the shore, at the highest and lowest surf margin. "On discovering them in such quantity," he continues, "I was naturally anxious to trace out their origin, thinking they must have come from some adjacent ruin. But I found eventually that they had come wholly from the mouths of the Nile, and that they were the positive *débris* from the towns situated on the banks of the river, and brought out by the strength of the current at high Nile, but then dispersed along the coast to the eastward by its littoral currents and prevailing ground swell."

It would be easy to multiply facts, if further evidence were wanted, that the Nile is no exception in the great transforming powers of Nature, washing down the dry land into the sea, and forming there beneath and on the margin of the waves new continents and islands. The Mississippi, the Ganges, the Yang-tse-Kiang, and other rivers of the great continents, carry down millions of tons of solid matter every year. The North Sea is gradually being silted up by the rivers of Belgium, Holland, and the British islands. At the mouth of the Ebro, on the northern side of the Mediterranean, the deposits brought down by the river are in course of reclamation by an eminent English engineer. Hence we need not feel surprise that the Nile—one of the greatest of rivers—has during long ages wrought great changes on the southern shores of the same sea. In the face of facts such as are above adduced, a government or a nation might well be justified in believing the project of a harbour and canal on the Bay of Pelusium to be, if not impossible of execution, at least unprofitable. Places which were on the shore when Strabo wrote are now from four to six miles inland, as is shown on the accompanying map, reduced from that published with Captain Spratt's report; and this modifying action is still going on.

Since the Suez canal was first projected engineering science has advanced; and though the sands will accumulate at Port Said as from of old, the piers and breakwaters will be periodically lengthened, made to stretch further and further into the sea, while powerful steam-dredges will scrape away the sand from the mouth of the harbour. Whether heavy gales will effect any more serious choking of the approaches, or drift tons of blowing sand into the canal itself remains to be seen. But while the world is greeting, and worthily greeting, the great work as a triumph of engineering skill, it may be well, at the same time, to bestow a little thought on the facts and conclusions here brought under notice, which in the pre-scientific age rendered man's contests against the works of the winds and sea perfectly hopeless.

MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

IN the last number of *Silliman's Journal* is an account of this year's meeting of the American Association, held at Salem, under the presidency of Mr. J. M. Foster, of Chicago, which seems to have passed off as pleasantly and usefully as did our own at Exeter. Over one hundred and fifty new members were elected. The number of communications entered upon the daily programmes of the Standing Committee was about one hundred and fifty. The range of these papers was considerable, and it was found expedient to have sub-sections on Archæology and Microscopy, to facilitate the disposal of papers which could not be reached in the other sections.

The then recent total eclipse of the sun was naturally a prominent subject of interest; the astronomers being present in considerable force.

The dedication of the Peabody Academy of Science was an occasion worthy to occupy the attention of the Association at its opening session. A few notes on this Academy will be welcome to many readers. The Institution

was founded at Salem in the year 1867, by the munificence of George Peabody, with the design of promoting the study of science in his native county of Essex. The first Annual Report of the Trustees of this Academy, made in January, 1869, shows that it is already fully organized, with an able corps of officers and a well-ordered museum, library, &c., and the activity of its Director and Curators is evident not only in the extent and fine condition of the collections, but in the zeal and ability with which the various publications of the Academy are conducted. Advantage was taken of the present occasion to make the formal transfer of the building of the Museum to the Trustees, and its delivery and acceptance by the Director, Mr. F. W. Putnam. In an eloquent address the President of the Academy, Mr. William C. Endicott, gave the history of the Museum from its foundation, in 1801, as the East India Marine Hall, to its purchase and reorganization in its present form. The Essex Institute, which is well known by its Proceedings, Bulletin, and Historical Collections, is now incorporated with the Peabody Academy of Science.

The address of Dr. B. A. Gould, the retiring President of the Association, dealt with the Position of Men of Science in America.

Everything which a hearty good will and an intelligent appreciation of science could do was done to promote the happiness and forward the plans of the Association and its members, alike by the city authorities of Salem, the various scientific bodies, and private individuals. We confess we should have been glad to learn that our English scientific men had been represented at the meeting, as America was represented at Exeter by Professors Newton and Lynan.

The Association will meet next year at Troy, New York, under the presidency of Professor Chauvenet, of St. Louis University.

The following, which were among the papers read at the meeting, will give an idea, not only of the great scientific importance of the congress, but of the direction in which many of the most eminent scientific men in America are working at the present time :—

SECTION A. *Mathematics, Physics, and Chemistry.*—On the Total Eclipse of Aug. 1869; B. Pierce.—On Quintuple Algebra; B. Pierce.—Determination of the Mechanical Equivalent of Heat, by means of the modern ice and cooling machines; P. H. Van der Weyde.—The Spectral Bands considered as harmonics of one or more fundamental longer waves, lying beyond in the invisible caloric rays; P. H. Van der Weyde.—On the audible transmission of musical melodies by means of the Electric Telegraph; P. H. Van der Weyde.—Electricity not a self-existent fluid, but a mode of motion of matter; P. H. Van der Weyde.—Flame Temperatures, in their relations to compositions and luminosity; B. Silliman and H. Wurtz.—On the relation between the Intensity of Light produced by the Combustion of Illuminating Gas and the Volume of Gas consumed; B. Silliman.—Causes of the Failure of Lightning Rods; J. Bushee.—Conditions of a perfect Lightning Rod; J. Bushee.—The Laws of the Deflection of Beams tested by experiment; W. A. Norton.—The physical theory of the Principle of the Lever; W. A. Norton.—Planetary Influence on Rainfall and Temperature; P. E. Chase.—The use of the Thermometer to determine the period of Solar Rotation; P. E. Chase.—Some observations on the Solar Eclipse at Montreal, by Dr. C. Smallwood, with Photographs taken by Wm. Notman. Communicated by B. Edwards.—A new method of observing Contacts at a Solar Eclipse by the Spectroscope; C. A. Young.—The Spectrum of the Solar Prominences and Corona, as observed at Burlington, Iowa, in the last Solar Eclipse, and the coincidence between the bright lines of Corona Spectrum and those of the Spectrum of the Aurora Borealis; C. A. Young.—The Solar Eclipse, and the Outlines of the Corona as observed at Des Moins; T. Bassnett.—Remarkable case of freezing Fresh-water Pipes in Salt-water; W. W. Wheilden.—The Thermodynamics of Waterfalls; A. M. Mayer.—On some further evidence of the existence of a System of Arctic Winds; J. H. Coffin.—The present condition of Lighthouse Illumination in the United States; J. Henry.—A new method of rendering the Needle of a Galvanometer definitely astatic; M. G. Farmer.—On an improved construction of the Holtz Electrical Machine, adapted for the analysis of the phenomena of this variety of machine, and for Class-room use; R. E. Rogers.

SECTION B. *Geology and Natural History.*—Comparison of the Coral Faunæ of the Atlantic and Pacific Coasts of the Isthmus of Darien, as bearing on the supposed former connection between the two Oceans; A. E. Verrill.—On certain Peculiarities in the distribution of Marine Life on the Sea-bottom of the Bay of Fundy; A. E. Verrill.—American Phyllopod Crustacea; A. E. Verrill.—The Homologies and general structural relations of the Polyzoa; A. Hyatt.—Observations on a new genus of Polyzoa; A. Hyatt.—New Species of Fishes obtained by Prof. Orton in the valleys of the Maranon and Napo; T. Gill.—Notice of some new Fossil Plants from Gaspé, discovered by Prof. J. W. Dawson; J. S. Newberry.—On some points in the Geology of North Carolina; W. C. Kerr.—Preliminary notice of the Lamellibranchiates of the Upper Helderberg, Hamilton and Chemung Groups; J. Hall.—On the Classification of the Diurnal Lepidoptera; S. H. Scudder.—The Morphology of the Abdominal Appendages of Butterflies; S. H. Scudder.—The value of the characters drawn from the external Armature of Lepidopterous Larvæ; S. H. Scudder.—A classification of the Eggs of Butterflies; S. H. Scudder.—Two new genera of Extinct Cetacea; E. D. Cope.—Discovery of the Ammonoosuc Gold Field; H. Wurtz.—Note upon the Palæotrochis; H. Wurtz.—Notices of some new Tertiary and Cretaceous Fishes; O. C. Marsh.—Metamorphosis of Siredon into Amblystoma; O. C. Marsh.—On some new Mosasauroid Reptiles from the Greensand of New Jersey; O. C. Marsh.—Homologies of the Palæchinidæ; Alex. E. R. Agassiz.—On Surface Changes in Maine indicating the length of time since the close of the Quarternary Period; N. T. True.—Compression as an agent in Geological Metamorphism, with illustrations of distorted pebbles in conglomerates; G. L. Vose.—On the Plasticity of Pebbles and Rocks; W. P. Blake.—Flora and Fauna of the Fresh-water Tertiaries of Oregon and Idaho; J. S. Newberry.—On new species of Fishes obtained by Prof. Orton in the Valleys of the Maranon and Napo; T. Gill.

SUB-SECTION C. *Archæology and Ethnology.*—Conjectural explanation of Uses of the Embankments of the Mound Builders; L. H. Morgan.—Discovery of the Remains of the Horse among the Ancient Ruins of Central America; O. C. Marsh.—Exhibition of a few interesting Implements collected by R. W. Haskins from Indian Graves on the banks of the Ohio, with special reference to the boring of holes in stone implements; F. W. Putnam.

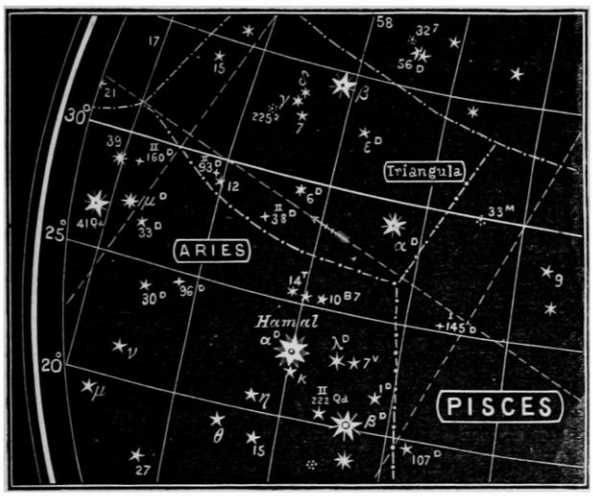
NEW STAR-ATLAS

MR. R. A. PROCTOR has planned a star-atlas on a plan which presents several advantages. The celestial sphere is to be divided according to this plan into twelve equal parts, each pentagonal in shape; but, each map being made circular, there is a slight overlapping, which prevents any star-group from being broken off at the edge of a map, as in all the arrangements hitherto adopted. Owing to the equality of the maps and the choice of a central projection (the equidistant) the distortion is reduced to a minimum. In fact, for the first time in the history of star-mapping, a plan is adopted by which, with a moderate number of maps, there is no appreciable distortion or scale-variation. The woodcut which gives (on a reduced scale and with inverted colours) a portion of Map 2 of the series (where it overlaps Map 4), exhibits some of the principal peculiarities of the new scheme. It will be noticed that though this portion belongs to the outer portion of the map (where the distortion is greatest) the figures between the parallels and meridians are of their proper shape. The arrow indicating precession in direction and magnitude (for 100 years) is a novel and very simple mode of exhibiting this important relation. The way in which the constellation-names are introduced is also new, and seems preferable to the old arrangement, in which the name straggling over the whole constellation at once confused the star-grouping, and was itself almost illegible unless printed in very large letters. The figure also includes instances of the mode of

marking double, triple, and multiple stars, binaries (known or suspected), variables, Messier's nebulæ, Sir W. Herschel's classification of his nebulæ, and so on.

All stars in the B.A. Catalogue down to the sixth magnitude inclusive are to be introduced, besides all the objects in the Bedford Catalogue, Messier's nebulæ, about 100 variables, red stars, and other objects of interest (in all about 1,500 objects). The scale of the maps is to be that of a 20-inch globe, and each map will be rather more than thirteen inches in diameter.

Mr. Proctor's series of gnomonic maps, in which the sphere is divided into the same set of pentagons, which



are arranged into two sets of six (namely, five northern equatorial maps around the north polar map, and five southern pentagons similarly arranged around the south polar map) will be added as index maps. As in these maps the constellation figures (coloured) are introduced, all necessity of adding these figures to the large maps is avoided, and so the clearness of the maps is much increased.

A letter-press introduction, with a list of star-names, will add to the completeness of the maps. Mr. Brothers, of Manchester, will photo-lithograph the maps if it should appear from the receipt (by him) of a sufficient number of names as subscribers, that the scheme is approved of by astronomers. He will supply to subscribers a specimen of Map 2, which alone is yet completed.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents.*]

Personal Equation of Astronomical Observers

CAN any of your readers inform me whether an attempt has hitherto been made to determine the absolute Personal Equation of Astronomical Observers? The most important of all astronomical observations consists in noting the time of passage of a star across the wires of a transit instrument; but it is found that no two observers exactly agree in the time assigned to the passage. From peculiar habit or bodily constitution some observers almost invariably register the passage of a star a fraction of a second before other observers. From the Introduction to the volumes of Greenwich Observations, we learn that it is the practice at the national Observatory to compare the observations of the junior observers with those of the principal observer, and to assume that the latter is correct. All the observations are thus brought into consistency with each other; but it is not known, I believe, whether all the time observations may not be a fraction of a second too soon or too late.

Cannot this question be determined experimentally in a very simple manner? Imagine an artificial star, formed by a minute electric spark, placed at a considerable distance, say three miles, and made to move across the field of a transit instrument at a rate not very different from the average apparent rate of stars observed (say nine inches per second): very simple mechanism might be devised to register upon the chronograph of the observatory the exact moment at which the star is absolutely upon each of the cross wires of the telescope. At the same time the observer, whose error is to be determined, should endeavour to record in the ordinary way the passage of the star, and the difference of time, as shown on the chronograph, would give the required error. Every observer might thus be put through a kind of exercise, which would inevitably show the degree of his proficiency, or detect any change in his habits of observation.

I need hardly say, that however small may be the remaining personal error unallowed for in the Greenwich observations, the time may come when the determination of some most important astronomical question may depend upon that quantity. And though those observations may at any one time be rendered perfectly consistent *inter se*, by reference to one observer's result, yet they cannot be strictly comparable with the observations of other observatories, or those of the same observatory at distant periods of time, because the one same observer would not be present to give the assumed standard. It might be of considerable importance, therefore, to establish a mechanical criterion of the accuracy of time observations which could be appealed to at any observatory, and at any future time. I have not been able to learn that such an experiment has hitherto been tried.

J.

The Fertilisation of Winter-flowering Plants

WILL you permit me to add a few words to Mr. Bennett's letter, published at p. 58 of your last number? I did not cover up the *Lamium* with a bell-glass, but with what is called by ladies, "net." During the last twenty years I have followed this plan, and have fertilised thousands of flowers thus covered up, but have never perceived that their fertility was in the least injured. I make this statement in case anyone should be induced to use a bell-glass, which I believe to be injurious from the moisture of the contained air. Nevertheless, I have occasionally placed flowers, which grew high up, within small wide-mouthed bottles, and have obtained good seed from them. With respect to the *Vinca*, I suppose that Mr. Bennett intended to express that pollen had actually fallen, without the aid of insects, on the stigmatic surface, and had emitted tubes. As far as the mere opening of the anthers in the bud is concerned, I feel convinced from repeated observations that this is a most fallacious indication of self-fertilisation. As Mr. Bennett asks about the fertilisation of Grasses, I may add that Signor Delpino, of Florence, will soon publish some novel and very curious observations on this subject, of which he has given me an account in a letter, and which I am glad to say are far from being opposed to the very general law that distinct individual plants must be occasionally crossed.

CHARLES DARWIN

Down, Beckenham, Kent, Nov. 13

Elimination of Alcohol

ALLOW me to remark on a statement made in one of the chemical notes of last week's NATURE.

A new test for alcohol discovered by M. Lieben is there described, and its alleged value in solving an important physiological problem is dwelt upon. Now the real course of events has been as follows:—Since the year 1860, when MM. Lallemand, Duroy, and Perrin published their researches on alcohol and anæsthetics, the old belief in the combustion of alcohol within the organism has been almost entirely upset; and it was supposed that this substance was entirely eliminated without change. Dr. Anstie was, I believe, the first who publicly criticised the conclusions of these physiologists, and showed, by a number of experiments, that a small proportion only of the alcohol introduced is excreted by the kidneys. [See Dr. Anstie, "Stimulants and Narcotics," Macmillan, 1864; also further researches recorded in his Lectures on Acute Diseases at the College of Physicians, *Lancet*, 1867, vol. ii.]

The question was next taken up by Dr. Thudichum, who estimated the amount of alcohol excreted by a number of men after they had taken a considerable quantity of wine, and proved it to be only one-half per cent. of the total amount swallowed. Finally, the writer of this, during 1866 and 1867, made numerous experiments in the same direction. In these, not only was it shown that alcohol can be detected in the urine secreted during

several hours after the dose had been taken, but it was also quantitatively proved that the total proportion eliminated was an excessively small fraction of what was taken into the body. This was demonstrated both in the case of healthy men, and in that of persons suffering from disease. [See Tenth Report of the Medical Officer of the Privy Council, p. 288.]

Moreover, unknown to either of the above observers, M. Schulinus of Dorpat, in 1866, made elaborate experiments on animals, which also showed conclusively (1) that elimination of alcohol does take place, and (2) that it only represents a fractional part of the alcohol taken. [Archiv. f. Heilkunde, 1866.]

However delicate and useful, therefore, M. Lieben's test may be in itself, it was not needed to decide this question, which was already settled.

A. DUPRÉ, Ph.D.

Laboratory, Westminster Hospital, Nov. 15

NOTES

THE Royal Society commences another session to-night. The communication of the results of the recent dredging expedition in the *Porcupine* will most probably take up the whole of the evening.

THE great "Catalogue of Scientific Papers compiled and published by the Royal Society," has now reached its third volume; a fact which we have much pleasure in announcing. In this the names of authors are carried on from GRE to LEZ inclusive, so that the compilers are nearly half-way through the alphabet. We congratulate them on their good progress, and can promise them the cordial appreciation of scientific men all over the world, to whom the work will prove of inestimable value. Does a mathematician wish to know how many mathematical papers have been written by Grunert, the well-known editor of the "Archiv," he turns to this volume, and finds 343. Guérin Méneville, the naturalist, figures for 326; Hagen, entomologist, for 102; the veteran Haidinger has 286 on minerals and meteorites; while Henwood, a Cornish celebrity, shows 55 papers on geological and mining subjects; and Heer, of Zurich, to whom we are indebted for admirable descriptions of fossil flora of the primeval world, numbers 46; Sir William Hamilton heads a list of 69 papers; Hansen, 103, probing deep into astronomy; Hansteen, the Norwegian, who lives to see in Sir Edward Sabine's researches, a grand outcome of his own early investigations of terrestrial magnetism, has 141 papers; Dr. Hooker appears for 58 papers; his late father for 72; and the late W. Hopkins, who did so much in mathematical geology, for 33. Dr. Hofmann, the eminent chemist, has made himself responsible for 156 papers; Mr. Lassell for 66, and Leverrier for 88. Kummer, recently elected a foreign member of the Royal Society, is down for 51; Leuckhart for 64; the indefatigable Isaac Lea, of Philadelphia, for 106, mostly about shells; and Lamont, of Munich, for 90, on magnetism, meteorology, and various questions in physical astronomy. From this brief selection our readers will see what a rich fund of scientific information has been prepared for their use by the Royal Society.

AMONG the recently published state papers of the American Government, is the annual report of the president of the National Academy of Sciences, from which we make the following extracts. It will be seen that in America there is no mistake about what is considered to be the duty of the Government in regard to scientific research—we wish we could say as much for England:—"The members of the Academy consist principally of professors in our colleges, and a few officers of the army and navy, who, from their social position and moral character generally, have the confidence of the public in a degree surpassed by no other class of the community. They are, however, generally men of limited means, receiving no pecuniary reward for their discoveries, and by law allowed nothing for their labours in the Academy, and who can ill afford the expense of assembling, from a distance, in the city of Washington. A small sum appropriated by Congress for the expense of their annual meetings, by which a full attendance could be secured, would be money well bestowed. It would stimulate higher researches, elevate the character of the association, and be productive of more valuable assistance to the Government. I feel myself more at liberty to urge the claims of the Academy, inasmuch as its members generally, including myself, took no step towards its establishment. Indeed, I must confess that I had no idea that the national legislature, amid the absorbing and responsible duties connected with an intestine war, which threatened the very existence of the Union, would pause in its deliberations to consider such a proposition. But Congress, having expressed its sense of the importance of an organisation of this kind, the members designated accepted in good faith the appointment, and have since endeavoured zealously to discharge the obligations thus devolved upon them. *It is now the duty of Congress to do its part, by furnishing the means to enable the Academy to fulfil its mission with credit to itself and the nation.*"

THE Minister of Public Instruction has given orders for the construction of an Agricultural Map of France, on a novel plan. It will be built up of specimens of the various soils, arranged according to locality.

FROM accounts of the last meetings of the Wellington Philosophical Society and New Zealand Institute which have reached us, it is clear that good scientific work is being done at our antipodes, much of it in Dr. Hector's laboratory. The most interesting result recently obtained is the isolation of the poisonous substance in the Tutu plant. Many experiments made for this purpose during the last six years, both in the laboratory of the Geological Survey and by chemists in Great Britain, failed to discover the poisonous ingredient of the plant. A short time ago, Mr. Henry Travers collected for the Museum a large quantity of ripe seeds of the Tutu (*Coriaria ruscifolia*), and on these Mr. Skey has recently experimented. He has discovered the poison to be a greenish oil, unaffected by, and insoluble in, water and mineral acids, but soluble in acetic acid, ether, alcohol, and chloroform. This oil is combined with a red-coloured resin, which is insoluble in ether, by removing which the poisonous oil was obtained in a pure state. The quantity of the poison contained in the seed is 12 per cent. of the weight. A similar oil has been detected by Mr. Skey to be the active poisonous element in the Karaka seed (*Corynocarpus lævigata*), which will account for its having hitherto escaped detection; and he suggests that the discovery might lead to the detection of the active principle of many poisonous European plants that have hitherto eluded research.

ANOTHER item of New Zealand news is that the result of all Dr. Hector's investigations into the geology of the islands is, that New Zealand must be considered as, on the whole, well supplied with mineral fuel. The most valuable description of coal is certainly confined to limited and not very accessible areas; but still there is nothing to prevent their being profitably worked for the supply of the steam service. The great point for congratulation, however, is, that throughout almost every part of the islands, coal of a practically useful description is to be found within a short distance.

WE are glad to see that the Essex Institute—not our Essex, but the American one—is extending its sphere of action by issuing a Bulletin in addition to their ordinary proceedings. The Bulletin is intended to give to the public such portions of communications made to the Institute at its semi-monthly and other public meetings, as are of popular interest. A brief summary of all the proceedings at each meeting will be given, which will

contain the titles of all written or oral communications, and the names of their authors. A small space in each number will be used to announce the recent correspondence, and donations to the library and museum, and to state deficiencies existing in the collections, and the methods in which its friends may best aid in rendering them more complete. There will also be inserted a list of some of the duplicate volumes, pamphlets, newspapers, &c., in the library, which will be offered for exchange or sale. It is expected that the variety and interesting character of the communications this volume will contain, will make it a favourite with the public, while its low price will bring it within the means of all. The Bulletin can be obtained of Messrs. Trübner & Co.

A REPORT on excisions of the head of the femur for gunshot injury, by Mr. G. A. Otis, assistant-surgeon United States army, is the latest of a series of elaborate reports on important medical and surgical questions, published by the Surgeon-General of the War Department at Washington. The liberality of the Government of the United States in matters of science is, or at least should be, well known; and the handsome form in which these volumes, illustrated by numerous woodcuts, lithographs, and chromolithographs, are issued, deserves notice at our hands, although questions of practical surgery lie outside the province of NATURE as understood by us. In the volume we have, first, an apparently exhaustive historical survey of the operation of excision at the hip, and then the detailed records of the operation during the late civil war, these records being illustrated by figures of the pathological specimens and lithographs of individuals successfully operated on: finally, the records of temporisation are discussed, and the results compared with excision and amputation. Whether the surgical reader will endorse Mr. Otis' conclusions or not, they will, we are sure, agree that his report is in every way creditable to American military medical science.

PROFESSOR GRANT, the director of the Observatory in the University of Glasgow, has printed two letters, which he addressed to M. Leverrier, on the authenticity of the documents respecting Newton, communicated to the Academy of Sciences by M. Chasles. These letters, which are now more than two years old, have since the exposure of the Newton-Pascal forgeries, become specially interesting. They must be read in connection with M. Leverrier's more recently indited brochure.

THE sixty-eighth annual election of office-bearers of the Philosophical Society of Glasgow was arranged to take place last night (Wednesday). Professor Grant retires from the office of senior vice-president, and the Rev. H. W. Crosskey from that of librarian. The following members of council retire by rotation: Mr. Ramsay, of Kildalton, Professor W. J. Macquorn Rankine, Sir William Thomson, and Mr. William Ramsay.

A LETTER from Gross-Gerau in the *Cologne Gazette*, dated last Saturday, quoted in the *Pall Mall Gazette*, says that on the previous Wednesday a gentle rumbling was observed twenty-five times, but only one shock; on Thursday there were twenty-three rumblings, and a shock about midnight. On Friday there were six violent shocks resembling those of the 30th ult., and in the night, up to 7 a.m., there were nine more shocks, accompanied by frequent thunder. During the morning of Saturday there was again a calm, but in the afternoon two violent shocks were felt, the last of which occurred very suddenly at 4.32. It is a very remarkable fact that these shocks have entirely altered in character from the earlier ones, being announced by a single thunderclap similar to the noise of a cannon shot fired at a distance of some miles, but much stronger. Their direction, too, is vertical instead of horizontal as before. The total number of shocks felt at Gross Gerau during the last three weeks is between seven and eight hundred. Most of the clocks and watches in the place have stopped, and the houses have all been more or less damaged, even those which are built of stone. The earthquake has also destroyed sixty-one chimneys. What if the volcanic region of the Eifel should burst open with its old activities, and the beautiful Laacher See and Pulvermaar, and the Mosenberg among others should favour us with phenomena which formerly one has gone at least as far as Vesuvius to see!

THE Royal Society has just issued Part I. of their 159th volume, the bulk of which is in very fair ratio to the importance of its contents. We have first a paper on Solar Physics, by Messrs. De La Rue, Stewart and Loewy, containing a first instalment of the measurements made with a view of making the solar photographs taken at Kew the basis of a new determination of the sun's astronomical elements: the privately-printed papers, with which all astronomers are familiar, are acknowledged to have been preliminary. The great Melbourne telescope is exhaustively described by Dr. Robinson and Mr. Grubb, and the description is accompanied by admirable and numerous plates, so that all may gain a very ample notion of the grand instrument from which so much may be anticipated. Terrestrial Magnetism is the subject of two papers, one by the Astronomer Royal, the other by Mr. Chambers; while prolific Prof. Cayley has three mathematical memoirs—one on Skew Surfaces otherwise Scrolls, another on the Theory of Reciprocal Surfaces, and the last on Cubic Surfaces. The Formation and Early Growth of the Bones of the Human Face, by Mr. Callender; the Osteology of the Solitaire or Didine Bird of the Island of Rodriguez, illustrated by ten exquisite plates by Ford, by Messrs. A. and E. Newton; the Developments of the Semilunar Valves of the Aorta and Pulmonary Artery of the Heart of the Chick by Dr. Tonge, are the papers which appeal to biologists; and Mr. Gore's paper on Hydrofluoric Acid, and one by Mr. Lockyer on Spectroscopic Observations of the Sun, are the other memoirs included in the volume.

WE have to record the death of an astronomer of European reputation, Mr. W. F Donkin, F.R.S., Savilian Professor of Astronomy at Oxford, and Honorary Fellow of University College.

ASTRONOMY

Correction of Atmospheric Chromatic Dispersion

THE Astronomer Royal, in his last communication to the Royal Astronomical Society on the Transits of Venus, adverted to the injurious effect on the observations, which might possibly arise from the chromatic dispersion produced by the atmosphere, and suggested that probably an efficient corrective might be found, in the application of a glass prism of small refracting angle in the eye-piece of the telescope. In a subsequent communication on the same subject, after stating the optical theory, Mr. Airy continues:—Suppose, then, that we have a series of flint prisms ground to the angles 2°, 4°, 6°, 8°, 12°, 16°. And suppose that we use a telescope with power 120 or with power 240. Then the following table, showing the zenith distance at which the atmospheric dispersion is corrected, is easily computed; the refraction being calculated by the formula just given, and the zenith-distance corresponding to the refraction being taken from a common table of refractions:—

	Telescopic power 120.		Telescopic Power 240.	
Angle of Flint Prism.	Atmospheric Refraction.	Zenith Distance.	Atmospheric Refraction.	Zenith Distance.
°	′	° ′	′	° ′
2	1·8	61 58	0·9	43 7
4	3·6	75 16	1·8	61 58
6	5·4	80 15	2·7	70 32
8	7·2	82 52	3·6	75 16
12	10·8	85 34	5·4	80 15
16	14·4	87 3	7·2	82 52

For view with the naked eye it would be necessary to use a prism (of appropriate small angle) with its edge downwards; but, for view with an inverting telescope, the edge of its appropriate prism must be upwards.

The object I proposed is completely attained. It is made possible, by this construction, to examine a celestial body with delicacy and accuracy, under circumstances which would,

without this construction, have rendered nice observation impossible.

The series of angles of the prism which I have given appears to me well adapted to general wants. I propose to furnish each of the principal telescopes to be used for the transit of Venus with a complete series of such prisms, arranged perhaps on a long slider. Care must be taken to make the thickness of the slider-frame as small as possible, inasmuch as it must be accompanied with another slider carrying dark glasses. It will probably be found best to place both sliders between the two glasses of the eye-piece. This slightly disturbs the elements of the calculation above; but in practice the selection of the best prism will always be matter of trial, and the disturbance of calculations will be unimportant.

Before closing this subject I will advert to a remark made by one of the most acute telescope-observers who have ever been known in this Society, the late Rev. W. R. Dawes. He states that, in general, a telescope performs better with one particular point of the edge of its object-glass upwards than in any other position. The explanation of this singular remark will be found, I think, in the combination of the effect of error of centering of the two lenses of an achromatic object-glass, with the effect of atmospheric dispersion. The centre of one lens (using the word "centre" to denote that part in which the tangent-planes of the two surfaces are parallel) ought to be exactly above the centre of the other lens. But it is not easy to make this adjustment perfect; the centre of one lens is frequently above a part of the other lens where the two surfaces have a slight inclination; and the refraction thus created produces in the image of every star a spectrum which rotates as the telescope-tube is made to rotate. In one position of the tube the atmospheric dispersion is opposed to this, and may wholly or in a great measure correct it; in the opposite position the atmospheric dispersion is added to it, and increases its injurious effects.

The atmospheric dispersion between B and G is about $\frac{1}{60}$th of the atmospheric refraction. At zenith-distance 45° it is nearly 1″, at 63° it is nearly 2″, at 80° about 5″. These are the lengths of the visible spectrum.

The Cause of the Incandescence of Meteors

THE incandescence of meteors was at first ascribed to their friction against the air, until in 1854 M. Regnault showed that this was not probable. M. Govi, of Turin, now affirms that the high temperature is due to the heat disengaged by the compression exercised on the air in front of them. This accounts for the fact that the interior of a meteor sometimes shows no signs of excessive heating, and that the hydrogen is not expelled.—[Bul. Association Scientifique de France, t. vi. 305.]

AMONG the points of interest touched upon at the last meeting of the Royal Astronomical Society was the extension to the approaching transit of Venus of Professor Young's suggestion to observe times of contact in solar eclipses by means of the gradual reduction of the length of the lines of the chromosphere, as observed in a spectroscope.

BOTANY

Spontaneous Motion of Protoplasm

PROF. J. B. SCHNETZLER records in the *Archives des Sciences Physiques et Naturelles*, some observations on the spontaneous motion of the protoplasm in the cells of the leaves of the common water-weed, the *Anacharis alsinastrum*. The writer remarks that whether the cause of the motion is found, as some have maintained, in the successive contractions or vibrations of the exterior layer of the protoplasm, which transmit themselves to the interior layers; or whether the successive displacements of the molecules is produced by causes purely mechanical, as others have held, it still remains to be explained what produces these contractions or displacements. It is incontestable that they are found only in living protoplasm. Prof. Schnetzler believes that the principal cause which provokes the motion is the chemical action of oxygen, which passes through the wall of the cell, and of which a portion is probably transformed into ozone under the influence of light, as occurs also in the globules of blood. The most strongly refracted rays of light have a marked influence on these currents, which are also no doubt affected by the currents of electricity which form, under the influence of water, between the surface of the leaf and the contents of the cells. The energy of the motion depends principally on the temperature, showing the greatest vigour between 16° and 20° C. In the point of view of mechanical theory, we have here evidently an example of the transformation of light and of heat into motion. The *Anacharis* is especially favourable for the observation of these motions; as, in consequence of the transparency of its tissue, they can be watched under the microscope without any preparation.

THE Lucerne crops in several parts of the country have recently been attacked by a species of Dodder, the *Cuscuta hassiaca*, allied to the parasitic Clover-dodder and Flax-dodder, which are so destructive to those crops. It is described as being a beautiful plant, with clear orange leafless stems, and abundant pure white and exquisitely-scented flowers.

THE magnificent "Flora Crasiliensis," the *magnum opus* of the late Von Martius, published under the auspices of the Bavarian and Brazilian Governments, is not likely to suffer by the death of that distinguished botanist. Under the able editorship of Dr. Eichler, of Münich, two new parts have recently been published, a most valuable and beautifully illustrated dissertation on the curious parasitic *Balanophoræ* by the Editor, and a monograph of the Brazilian *Convolvulaceæ* by the veteran Meissner. In the course of the ensuing winter we are promised a volume on the Ferns, about 350 species, with nature-printed illustrations, by Mr. J. G. Baker, of the Kew Herbarium; and the most eminent European botanists are engaged on other orders which still remain to complete the work. A. W. B.

CHEMISTRY

Italian Mineral Waters

THE following analyses of Italian Mineral Waters have been made by Prof. Purgotti of Perugia [Ann. di Chim. app. July, 1869, p. 59.]

I. Bromo-ioduretted water which collects in a reservoir, five kilometres from the station of Assisi:—

Carbon dioxide	0·44110
Silica	0·01500
Magnesium bromide	0·00124
Magnesium chloride	0·18830
Magnesium sulphydrate	0·07750
Sodium chloride	0·86370
Sodium sulphate	0·15630
Calcium bicarbonate	0·35800
Magnesium bicarbonate	0·25190
Extractive organic matters	0·02150
Total mineral constituents	2·37454
Water	997·62546
	1000·00000

This water likewise contained free oxygen, ozone, ferrous bicarbonate, and alumina (and iodine?), but in quantities too small for estimation.

II. A ferruginous water collected in a square reservoir about half a kilometre from Cannara, near Collemancio, was found to contain:—

Ferrous bicarbonate	0·0300 grm.
Manganous bicarbonate	0·0036
Free carbon dioxide	
Atmospheric air	
Calcium bicarbonate	
Magnesium bicarbonate	
Magnesium chloride	
Magnesium sulphate	
Silica	
Calcium sulphate	

The temperature of this water is considerably lower than that of the surrounding air.

Sal-ammoniacum Martiale

ANGELO BANIERI has made the following observations on the ammonio-ferric sulphate (*sal ammoniacum martiale*) collected on the lava of Vesuvius. Many naturalists believe that the hydrochloric acid evolved by lavas in their course, unites with the iron of the same lavas, forming ferric chloride, which, together with the ammonia of the air, gives rise to the compound of sal-ammoniac and ferric chloride found in the fumaroles. This view, however, does not appear to the author to be in harmony with facts observed in the Vesuvian lava-current of 1850. It was only in that part of the lava which had overwhelmed a cultivated and manured soil that fumaroles existed, and there they were so numerous as to yield more than 100 measured quintals of sal-ammoniac, whereas, on the other part of the igneous current, which had passed over an older lava of the year 1834, in which there was nothing but dry rock and sterile sand, there were no fumaroles of sal-ammoniac. The silica of the lavas acts at very high temperatures on the common salt contained in the manured soil, liberating hydrochloric acid, which, on the one hand, reacts on the ferric hydrate

contained in the same soils, producing ferric chloride, and, on the other hand, decomposes the ammonium carbonate eliminated from the organic substances of the soil, which are subjected to dry distillation by the heat of the invading lava. The hydrochloric acid which gives rise to the sal-ammoniac of the fumaroles of volcanic lavas, cannot be derived from the lavas themselves, inasmuch as its presence is only transient; but it is derived from the decomposition of the chlorides contained in the invaded lands. An inspection of the lava of 1850 shows indeed that the denuded soil has been completely burnt, and nothing is seen but scoria of a reddish sand, which have evidently been subjected to a very high temperature.—[Ann. di. Chim. app. alla Med., July, 1869, p. 61.]

TIGRI has observed that the flowers of the hop have the power of destroying the vitality of the *Mycoderma vini*. A quantity of this fungus situated at the bottom of a vessel full of wine was found to be so completely disorganised by contact with the hop-flower, that it had no further effect in promoting the fermentation of the wine. Tigri accordingly recommends the use of hops for preserving wine.—(Ann. di Chim. app. alla Med., July, 1869, p. 20.)

M. VICTOR MEUNIER communicates to *Cosmos* the result of an experiment made in a Pasteur's flask. Seventy-five cubic centimeters of urine were introduced into a flask of three hundred cubic centimeters capacity, boiled for five minutes, and sealed. At the end of fifty-seven days two clusters of vegetation appeared; they proved to be a new species of Aspergillus, which the author, with some humour, dedicates to M. Pasteur. In another experiment, to the details of which we need not refer, M. Meunier discovered an additional species of Aspergillus, which he has named *gibbosus*.

PROFESSOR ROCHLEDER has found a new colouring ingredient in madder, in addition to alizarine and purpurine, its well-known constituents. The dye is soluble in both water and alcohol, crystallising from the latter in orange-yellow needles. The boiling aqueous solution, mixed with a little acetic acid, communicates a beautiful golden tint to wool or silk. Madder root contains, unfortunately, too small an amount of this substance to render its industrial extraction profitable.

OPINIONS seem still divided as to the poisonous nature of coralline and solferino red. Two cases are reported in *Cosmos*, from which we learn that wool impregnated with these colours produces loss of appetite, distaste for food, and cephalalgia. The wool became harmless after washing.

M. V. MARCHAND proposes to apply a chemical remedy to the newly-discovered disease of the vine. He thinks it certain that a saturated solution of sulphuretted hydrogen in water, or a mineral mixture which gradually evolves the gas, will effectually destroy the grubs which are now, in many vineyards, busily devouring the roots.

THE second part of the third volume of Dr. Kolbe's "Ausführliches Lehrbuch der Organischen Chemie" has appeared. This work, which will be complete in another volume, is a sequel to the well-known Graham-Otto's Chemie. The portion of it now before us treats principally of petroleum and similar oils, resins and balsams, albuminous bodies, biliary and cerebral products, and the constituents of urine.

GEOLOGY

Steneosaurus

MR. J. W. HULKE has published an elaborate description of the remains of a fossil crocodile from the Kimmeridge clay of Dorsetshire, which he identifies with Cuvier's *Deuxième Gavial d'Honfleur*, named *Steneosaurus rostro-minor* by Geoffroy Saint-Hilaire, and also as belonging to Quenstedt's genus *Dakosaurus*. The last-named genus will therefore be synonymous with *Steneosaurus* (Geoff. St.-Hil.).—[Quart. Journ. Geol. Soc., No. 100.]

On Sphærodus Gigas

IN a paper containing descriptions of two new species of *Gyrodus*, Sir Philip Egerton has described and figured the vomer of *Sphærodus gigas*, the discovery of which is interesting as proving the validity of the genus. In its character it is quite distinct from the same part in *Lepidotus*, to which genus the species has been referred on account of the resemblance of the detached teeth. The specimen figured contains a median row of six circular teeth, on each side of which is a row of seven rather smaller circular teeth. Sir Philip Egerton also describes and figures a beautiful specimen of the vomer of a *Gyrodus* from Kimmeridge, which he ascribes to one of his new species.—[Quart. Journ. Geol. Soc., No. 100.]

The Geology of Thrace

DR. A. BOUÉ, who has been investigating the geology of Thrace, announces some of the results of his expedition. He has traced the cretaceous and nummulitic formations from Jarim Brugas to Adrianople, and found crinoids in the shales and limestones near Eski Sara, one of which he is inclined to identify with the carboniferous limestone. The steep southern declivity of the Balkan represents a great fissure of dislocation, the granitic central stock of the ancient Balkan having sunk down bodily during the enormous porphyritic and trachytic eruptions; hot water flows from the fissures of the sunken granite, and forms numerous baths along the foot of the Balkan. In Mechli ravine, near Kisantik, immediately surrounded by mountains 4,000 feet in height, Dr. Boué discovered, resting directly upon gneiss, an old carboniferous formation, with three beds of good coal; but as no fossils were to be detected in the deposit, he was unable to determine whether it belongs to the coal measures. Coal-beds, probably of Eocene age, occur in the Rhodopi.—[Proc. Imp. Geol., Institute of Vienna, 31st Oct., 1869.]

PHYSICS

The Dynamics of Prince Rupert's Drops

PROFESSOR DUFOUR, of Lausanne, has been engaged in a research on the Development of Heat which accompanies the explosion of Prince Rupert's Drops. The examination of bodies which, in modern language, are said to be in a state of "molecular tension" is of the highest importance to dynamics, and the investigation to which we now refer is an example of the kind of work that is really required.

Every one is familiar with the pulverisation and explosion, so disproportionate to the mechanical force exerted to produce them, which are witnessed on the fracture of the point of one of these drops. M. Dufour finds, in addition, that an appreciable amount of heat is evolved at the same time. The simplest mode of exhibiting this effect is to adjust the drop in the cone of a vertical thermopile in such a manner as to prevent the powder produced by the disruption from projection elsewhere than against the upper face of the pile. This is easily accomplished by means of a caoutchouc cover, through which the point of the drop alone projects; and the entire apparatus, abundantly surrounded with cotton, is left at rest for a day. The pile is then connected with a galvanometer, and, after breaking the point, the required observation is readily made. With drops of 4·8 to 7·7 grammes, M. Dufour obtained a deflection of 5° to 9°. The mere friction of powdered glass gave no deflection. Attempts to determine the heat evolved were also made with the calorimeter, turpentine being the liquid employed. In their original form, these did not succeed; but tolerably concordant results were arrived at by effecting the explosion in a cone of pasteboard, having its base uppermost, and forcing the whole of the fragments to fall through the truncated vertex into the turpentine. In this way, it appeared that a weight of the drops, amounting to 11·40 to 20·42 grammes, caused an elevation of temperature of 0·25° to 0·35°. The internal condition of the glass was found, by these experiments, to vary appreciably in drops of different sizes. Sometimes the product consisted chiefly of large fragments, sometimes it was principally powder. M. Dufour compares the state of the drops to a rigid enclosure bound together by highly-heated bars, themselves mutually connected in every direction. After cooling, the bars would all be under strain, from which, if released at one part, the whole would be set free. Now, Joule and Edlund have shown that a strongly-stretched wire, if allowed to return to its original volume, actually evolves an amount of heat, forcibly reminding one of that developed in the present instances.

In order to discover the part of the drop whence the fragments had been derived, its exterior was coloured. Thus it was found that the largest fragments came from the central, the finest powder from the superficial layer; and the pieces that were examined had, as might thence be expected, the form of a very flat wedge. The evolution of heat during the explosion might have been presumed to be accompanied by an increase in the density of the glass; but although this is a point somewhat difficult to ascertain experimentally, M. Dufour's paper is not without evidence in favour of such being really the fact.

PHYSIOLOGY

Kinship of Ascidians and Vertebrates

THE number of Max Schultze's *Archiv* (v. 4), just published, contains a letter to the editor from Prof. Kupffer, of Kiel, in which that distinguished embryologist asserts that he has been studying the early history of a species of Phallusia, and that his results in large measure agree with those of Kowalevsky touching the startling vertebrate features of the early condition of these invertebrata. He reserves for the present the details about the exact formation of the nervous system, but quite confirms the fact of the existence of a notochord. He says: "At this stage one could not imagine a more beautiful model of a vertebrate embryo, with the neural tube on one side of the axis and a visceral tube on the other." He, moreover, describes in his species of Phallusia the neural tube as not merely an almost spherical vesicle, but as prolonged in the form of a fine hollow thread into the tail above the notochord or axis. He promises full details shortly, and we hope to be able to return to this most important matter.—M. F.

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[1] THE Chloral controversy seems likely to terminate. *Pure* chloral, M. Bouchut informs us, is really a good anæsthetic. On the other hand, M. Laborde says that its frequent administration is attended with danger. Chloral, if mixed with blood outside the body, yields no chloroform until traversed by a current of air.

SOCIETIES AND ACADEMIES

Ethnological Society, November 9.—This society held its first meeting for the present session at the rooms in St. Martin's Place. Professor Huxley, the President, occupied the chair. After some remarks by Colonel Lane Fox, the honorary secretary, on the Megalithic Monuments of Stonehenge, Mr. Gardner, of H.M. Consular Service, China, read a paper before the Society, on the Chinese People, Government, &c. The point on which Mr. Gardner laid most stress—in fact, the leading idea of the whole paper—seemed to be the tenacity with which the Chinese had preserved the usages of antiquity, and the skill with which they had adapted them to the exigencies of modern times. They retain, according to him, the patriarchal theory of government, but make it suitable for an empire of 400,000,000 human beings. And if we allow that the ideographic form of writing is the most ancient of all, then the Chinese, in this nineteenth century, preserve an older principle of expressing thought than is to be found in the most ancient Egyptian hieroglyphics extant, and yet no language in the world is more capable of finding appropriate terms for the latest discoveries in mental and physical science, and the newest inventions of art. Mr. Gardner pointed out some analogies which he fancied existed between Chinese, Egyptian, and Hebrew, leaving it to philologists to decide whether these supposed coincidences were fortuitous, or a confirmation of the theory set forward by Hunter and others, of the original unity of the Aryan and non-Aryan languages. In the Chinese religion, Mr. Gardner stated, that whatever might be the nominal creed of individuals, or even masses, ancestral worship (undoubtedly the most ancient form of religious cult) as an act of devotion is most universally practised in the present day. Underlying all religious forms and creeds, Mr. Gardner stated, was an idea, more or less vague, of one Supreme Being; but he did not express an opinion as to whether this idea is a legacy of ancient times, or one of modern development. Besides this leading idea, Mr. Gardner gave a long account of the Chinese social institutions and benevolent societies: these latter are somewhat remarkable, and though not general enough in their organisation to refute the prevailing idea that the enthusiasm of humanity is peculiar to Christianity, tend to show that the Chinese are more philanthropic than any other heathen nation. Mr. Gardner also read some notes, and gave some anecdotes of personal experience to elucidate his main theories. In conclusion, if Mr. Gardner is correct in his premises, we see no reason to doubt his conclusion, that when the theory of division of labour shall be put in practice with regard to races as well as individuals, the Chinese will play an important part in the world's history as ethical philosophers, merchants, mechanics, and labourers; but that they are unfitted for rulers, soldiers, or the higher walks of art, and will not tend to advance physical or mechanical science.

The President referred to the similarity between certain Chinese customs and those of the Polynesians; such as the exclusion of a word occurring in the name of a great chief. In like manner, the prohibition of marriage between persons of the same surname is a custom common to the Chinese and the Australians. In concluding the discussion, he alluded to the popular but erroneous notion that the Chinese were modified Mongols, and pointed to the fact that, although both had long black hair on the head, and only scanty hair on the face, yet the Chinese had a long skull, with prominent brow-ridges, whilst the Central Asiatic had a broad skull, deficient in brow-ridges.—Captain Sherard Osborn advocated the introduction of railways and the opening of mines; and pointed to the many other advantages which the Chinese would receive from their intercourse with Europeans.—The Rev. Prof. Summers, Dr. Hyde Clark, Dr. Leitner, and others, took part in the discussion.

Additional interest was given to the meeting by the presence of the Yarkandi brought to this country by Dr. Leitner, the only native of Yarkand who has ever visited Europe.

Geological Society, November 10.—Prof. T. H. Huxley, LL.D., F.R.S., President, in the chair. Mr. E. Hartley, of the Geological Survey of Canada, Montreal, was elected a Fellow of the Society. The following communications were read:—"Australian Mesozoic Geology and Palæontology," by Charles Moore, Esq., F.G.S. The author referred to the observations of Professor M'Coy and the Rev. W. B. Clark, on the occurrence of fossils of Mesozoic age in Australia, and then proceeded to notice the species which he had obtained from that region. Fossils of Mesozoic type occur both in Western Australia and Queensland, but the specimens have hitherto been found in apparently drifted blocks, and nothing is known of the bedded rocks from which they are derived. The author stated that the Australian Mesozoic fossils agree, not only in genera, but also in many cases in species with British forms; and he gave a list of species from Western Australia, identical with British species, from the Middle and Upper Lias, the Inferior Oolite, and the Cornbrash. Of the fossils from Queensland also, many are said to be identical with, or very nearly allied to, British species, but the author regards the general type of the Queensland remains as referring them to the Upper Oolite. A gigantic species of *Crioceras* is regarded by the author as possibly indicative of the occurrence of Neocomian deposits in Australia. The fossil evidence upon which Professor M'Coy inferred the occurrence of the Muschelkalk in Australia, was said by the author to be nugatory, his supposed *Myophoria* proving to be a *Trigonia* nearly allied to *T. gibbosa* of the Portland Oolite, and his doubtful *Orthoceras* a small *Serpula*. The author had found no indications of the existence of Triassic or Liassic deposits in Queensland. The blocks from Western Australia, referred by the author to the Middle Lias, contain *Myacites liassianus* (Quenst.), and are quite as highly ferruginous as the English Marlstone. The species identified by the author with British Oolitic species would indicate a range from the Inferior Oolite to the Cornbrash; the author suggests that the species may have had a longer range in time in Australia than in England, or that the subordinate divisions of the Oolite were not clearly marked in the Australian Mesozoic deposits. He is inclined to refer the fossils to the period of the Inferior Oolite. The author inferred from the occurrence of these Mesozoic fossils in drifted blocks, at the two extremities of Australia, separated by 38° of longitude, that an enormous denudation of rocks of the secondary series has taken place over a considerable part of Australia. Descriptions of a great number of new species were appended to the paper.

"On a Plant- and Insect-bed on the Rocky River, New South Wales," by Charles Moore, Esq., F.G.S. The organic remains noticed by the author were found by him in a small block of chocolate-coloured, micaceous, laminated marl, obtained from a bed about ten feet thick, at a depth of 100—110 feet, in the auriferous drifts of Sydney-flats, on the banks of the Rocky River. The author found the leaves of two forms of Dicotyledonous plants, fragments of a flat narrow leaf, which he refers to the Coniferæ, a seed-vessel, and the impressions of several seeds. The insect-remains consist principally of the elytra of beetles, among which Buprestidæ appear to predominate. The vegetable remains seem to indicate that the deposit is of Tertiary age.

Prof. T. Rupert Jones mentioned the discovery of a large *Crioceras* in the Jurassic beds near Port Elizabeth.—Mr. W. Boyd Dawkins suggested that we had hardly a right to apply the European standard in judging fossils from all parts of the world, and doubted whether, if these fossils were examined from the

purely Australian point of view, the same age would be assigned to them.—Mr. Seeley agreed with Mr. Dawkins, and argued from the existence of natural groups in different areas of the globe, that the same must have been the case in former ages.—Mr. R. Tate remarked that if Mr. Moore had compared the Jurassic fauna with those of India, Africa, and Chili, he would have found the same mixture of forms belonging apparently to different horizons. He considered that the Australian fossils probably represented our Middle Oolite. He did not quite agree with the author as to some of the specific determinations.—Dr. Duncan remarked that the same combination of forms separated in Europe was found in the Tertiary fossils of Australia. He thought that further facts were necessary before forming a decided opinion as to the succession of beds in that continent.—The President remarked that when we talked of identity of fauna in Australia and this country, improbable as it might appear, we must remember that at the present time identical species, and, to a great extent, a similar fauna, were to be found in our seas more than 180° apart.—Mr. Moore, in reply, argued that it was the safest plan to follow the well-established standard of Europe even in remote parts of the world. He was inclined to refer the bulk of the specimens rather to the Lower than to the Middle Oolite, but otherwise he agreed in the main with Mr. Tate.

"On *Hypsilophodon*, a new Genus of *Dinosauria*," by Prof. Huxley, F.R.S., President. The author described the characters presented by the skull of a small Dinosaurian reptile obtained by the Rev. W. Fox from a Wealden bed at Cowleaze Chine in the Isle of Wight. One of the most striking peculiarities of this skull was presented by the præmaxillary bone, which seems to have been produced downwards and forwards into a short edentulous beak-like process, the outer surface of which is rugose and pitted. The author remarked upon the known form of the symphysial portion of the lower jaw in the Dinosauria, and indicated that its peculiar emargination was probably destined to receive this beak-like process of the præmaxillaries, which may have been covered either by fleshy lips or by a horny beak. The dentigerous portion of the præmaxilla bears five small conical teeth. The alveolar margin of the maxilla bears ten teeth, which are imbedded by single fangs, and apparently lodged in distinct alveoli. The summit of the crown, when unworn, is sharp, and presents no trace of the serrations characteristic of *Iguanodon*, but it is sinuated by the terminations of the strong ridges of enamel which traverse the outer surface of the crown. The teeth thus present some resemblance to those of *Iguanodon;* but the author regarded the two forms as perfectly distinct, and named the species under consideration *Hypsilophodon Foxii*. Of the lower jaw the right ramus is present, but its distal extremity is broken off, and its teeth are concealed. On the outer surface of the lower jaw the centrum of a vertebra is preserved. The author then referred to a fossil skeleton in the British Museum, which has been regarded as that of a young *Iguanodon*. It is from the same bed as the skull previously described. The author remarked that, in form and proportions, the vertebræ were quite different from those of *Iguanodon*, and apparently identical with those of his new genus, as shown by the centrum preserved with the skull; the animal had at least four well-developed toes; and other peculiarities were indicated, which seem to prove that it was quite distinct from *Ignanodon*. This skeleton the author identified with his *Hypsilophodon Foxii*, and described its characters in detail, dwelling especially upon the peculiarities of the pelvic bones, which are singularly avian in their structure.

"Further Evidence of the Affinity between the Dinosaurian Reptiles and Birds," by Professor Huxley, F.R.S., President. In this paper the author reviewed the evidence already cited by himself and others (especially Prof. E. D. Cope), in favour of the ornithic affinities presented by the Dinosauria; and discusses at length the recently ascertained facts which bear upon this question, some of the most important of which are derived from the species described by him in the preceding paper under the name of *Hypsilophodon Foxii*. He summed up his paper by a comparison of the different elements of the pelvic arch and hinder limb in the ordinary reptiles, the Dinosauria and Birds, and maintained that the structure of the pelvic bones (especially the form and arrangement of the ischium and pubis), the relation between the distal ends of the tibia and the astragalus (which is perfectly ornithic), and the strong cnemial crest of the tibia and the direction of its twist, furnish additional and important evidence of the affinities between the Dinosauria and Birds.

Sir Roderick Murchison, who had taken the chair, inquired as to the habits of the *Hypsilophodon*.—Mr. Hulke mentioned that Mr. Fox had several blocks containing remains of a large portion of the *Hypsilophodon*, all procured from a thin band of sandstone near Cowleaze Chine. On one the pelvis is almost entire, as well as the right femur, the tibia, which is longer than the femur, four long metatarsal bones, and an astragalus. All the long bones are hollow. Portions of at least eight individuals have been found in the same bed.—Mr. Seeley doubted whether these animals should be called Reptiles at all, as they seemed to him to form a group distinct alike from reptiles, birds, and mammals, but occupying an intermediate position. In the hinder limbs of *Pterodactylus* the analogies were closer with mammals than with birds. He thought it possible that the peculiar structure of the hinder limbs of the Dinosauria was due to the functions they performed rather than to any actual affinity with birds.—The President, in reply, stated that *Hypsilophodon*, from the character of its teeth, probably subsisted on hard vegetable food. He expressed a hope that Mr. Fox would allow a closer examination of his specimens to be made. He was unable to agree with Mr. Seeley's views. He was inclined to think that the progress of knowledge tended rather to break down the lines of demarcation between groups supposed to be distinct than to authorise the creation of fresh divisions.

Specimens illustrative of their respective papers were exhibited by C. Moore, Esq., and Prof. Huxley.

Institution of Civil Engineers, November 9.—At the first ordinary general meeting of the session, held on Tuesday, the 9th inst., Mr. Charles Hutton Gregory, the President, made some observations on the action taken by the council with reference to a notification gazetted by the Public Works Department of the Government of India. In this notification it was alleged that the Governor-General in Council was given to understand, that in the civil engineering profession in England it was a recognised practice for civil engineers employed by public companies and otherwise, to receive, in addition to the salaries paid them by their employers, commission on contracts given out, or stores and materials ordered or inspected by them, and other like pecuniary considerations for services done, or intended to be done, which were considered legitimate sources of emolument. The Council had met, and unanimously passed a series of resolutions, emphatically denying that such practices were recognised in the profession, and asserting that any engineer detected in such practices would be held to be guilty of disgraceful conduct, which would disqualify him from being a member of this Institution. Regret was expressed that so grave a charge should have been received and published by the Government of India without proper inquiry, as such inquiry would have shown that the charge was absolutely untrue; and, having reference to the grievous wrong which such an imputation, stamped with such authority was calculated to do to an honourable profession, an appeal was made to the Government of India to cause the scandalous statement to be withdrawn. This protest was transmitted to the Secretary of State for India, who had received a deputation from this Institution, comprising the President and every member of Council then in London. The Duke of Argyll promised to investigate the case, and has put on record that "he regards with implicit confidence the indignant repudiation by the Institution of any recognition of the practice referred to in the notification."

Mathematical Society, November 11.—The first meeting of the present session was held on Thursday, the 11th inst., Prof. Cayley, F.R.S., President, in the chair, when the following gentlemen were elected to be the council for the session 1869-70:—President: Prof. Cayley, F.R.S. Vice-Presidents: A. De Morgan, F.R.A.S., W. Spottiswoode, F.R.S., Prof. Sylvester, F.R.S. Treasurer: Prof. Hirst, F.R.S. Hon. Secretaries: M. Jenkins, M.A., R. Tucker, M.A. Other members: W. K. Clifford, B.A., T. Cotterill, M.A., M. W. Crofton, F.R.S., Olaus M. F. E. Henrici, Ph.D., S. Roberts, M.A., J. Stirling, M.A., A. Smith, F.R.S. L. and E., Prof. H. J. S. Smith, F.R.S., and J. J. Walker, M.A.

The Rev. James White, M.A., was elected a member. Mr. Tucker read a communication from Mr. G. O. Hanlon, on the "Vena Contracta," and Mr. Jenkins a letter from Mr. Clerk-Maxwell, containing the question, "Can the potential of a uniform circular disk at any point be expressed by means of elliptic integrals? Suppose V is the potential of the disk bounded by the circle $z=0$, $x^2+y^2=a^2$.

Then $$\frac{dV}{dx} = 2x \sqrt{\frac{a}{r}} \frac{1}{\sqrt{c}} (E - F)$$

where $$r^2 = x^2 + y^2;$$

and if AB be a diameter parallel to r,

$$c = \frac{PB - PA}{PB + PA}$$

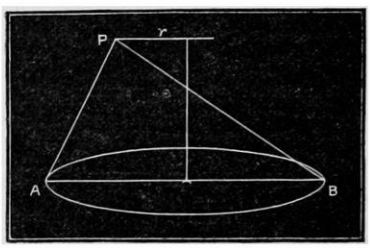
and E, F are complete elliptic functions for modulus c;

also $$\frac{dV}{dy} = 2y \sqrt{\frac{a}{r}} \frac{1}{\sqrt{c}} (E - F)$$

But $$\frac{dV}{dz} = w,$$

where w is the solid angle subtended at P by the circle, that is the area of the spherical ellipse on a sphere of unit radius cut off by the cone whose vertex is P, and base the circle.

We have expressions for $\frac{dV}{dx}$ and $\frac{dV}{dy}$, can $\frac{dV}{dz}$ also be expressed by elliptic functions, and if so, can V itself be so expressed? I am writing out the theory of electric currents in which these quantities occur. The expression for $\frac{dV}{dz}$ for an elliptic disk can be found if we know it for a circular one; for the spherical ellipses in the one case are no more complicated than in the other. Can $\frac{dV}{dx}$, or V itself, be found for the elliptic disk?"



The President and Mr. C. W. Merrifield spoke on the question, but could not decide for or against it impromptu.

Mr. T. Cotterill then gave an account of his paper on Opposite Points on a Curve. The subject bore reference to two former papers read before the society by the author and by Prof. Sylvester, the Theory of Residuals, not yet, to the regret of the society, put into a shape for publication. Mr. S. Roberts and Mr. W. K. Clifford took part in a discussion upon this paper.

Royal Microscopical Society, November 10.—Rev. J. B. Reade, M.A., F.RS., President, in the chair. A communication from Dr. Pigott on high power definition with illustrative examples was read. The paper had special reference to the markings on the Podura scale, of which the writer claimed to have discovered the true nature. As the result of close and protracted observation, Dr. Pigott believes that he has resolved these markings into rows of bead-like bodies essentially differing in their character from the "note of exclamation" markings so familiar to microscopists.—Another paper on a cognate subject, entitled the Scales of certain Insects of the order Thysanura, was read by Mr. S. McIntyre. Mr. McIntyre's examinations of the genus of the family of the *poduridæ* leads him to express conclusions confirmatory of the views hitherto entertained, as to the nature of the markings seen under the microscope; and in the discussion which followed the opinions expressed by the Fellows were entirely in support of Mr. McIntyre's conclusions. Among the donations announced was an interesting specimen of an Amici reflecting microscope, working on the principle of the Newtonian telescope.

Zoological Society, November 11.—Mr. George Busk, F.R.S., V.P., in the chair.—The Secretary made some remarks on the more remarkable additions to the Society's Menagerie during the past summer, amongst which particular attention was called to some Amherst's pheasants, deposited by J. J. Stone, Esq.; an Owen's apteryx, presented by the Acclimatisation Society of Otago, New Zealand; a pair of the newly-discovered Chinese deer (*Elaphurus davidianus*), presented by Sir Rutherford Alcock; and young male Spanish ibex, presented by Major Howard Irby.—Extracts were read from a letter addressed to Mr. Grote by Dr. John Anderson, C.M.Z.S., containing observations respecting the pigmy hog of the Terai (*Porcula salvania*), and other animals which he is endeavouring to procure for the Society's Menagerie.—A letter was read from Dr. G. Bennett, containing an account of the habits of the wood-hen of Lord Howe's Island, as recently observed by Mr. R. W. Fitzgerald.—Mr. Sclater exhibited a specimen of the so-called wood-hen, which had been forwarded in spirits by Dr. Bennett to the Museum of the Royal College of Surgeons, and stated that it was a rail of the genus *Ocydromus*, apparently hitherto undescribed, which he proposed to call *Ocydromus sylvestris*.—A letter was read from Mr. Morton Allport, F.Z.S., containing an account of the successful introduction of the salmon trout (*Salmo trutta*) into Tasmania.—Mr. Quelch exhibited a remarkable specimen of a fish of the genus *Rhombus*, supposed to be a hybrid between the turbot and the brill.—Mr. J. W. Clark, F.Z.S., exhibited some mounted skeletons of the extinct dodo of the Mauritius, and of the male and female solitaire of the Island of Rodriguez, belonging to the Cambridge University Museum.—Mr. E. Ward exhibited a curious melanoid variety of the woodcock (*Scolopax rusticula*).—Professor Flower, F.R.S., read a memoir on the anatomy of the Aard-wolf (*Proteles cristatus*), founded on a specimen recently deceased in the Society's Menagerie. The result arrived at after a careful examination of every part of this animal was that *Proteles* constituted of itself a distinct family of carnivorous animals, allied to the *Hyænidæ* and *Viverridæ*, but more closely to the former than Mr. Flower had previously supposed when he had only the skull of this remarkable animal to judge by. Mr. Flower's paper was illustrated by the exhibition of the stuffed skin, a complete skeleton, and a full series of anatomical preparations of the internal organs of this animal, all taken from the same individual.—A communication was read from Dr. J. G. Gray on the guemul or roebuck, from Tinta in Southern Peru, which Dr. Gray considered to constitute a new genus of deer, proposed to be called *Xenolophus*.—A second communication from Dr. Gray contained a description of *Emys laniaria*, a new species of fresh-water tortoise, from an unknown locality.—A report was read by Dr. A. Günther on two collections of Indian reptiles, recently received by the British Museum, one of which had been formed by Dr. Leith in various parts of Western India; the second by Mr. Barnes in Ceylon. Both were of much interest, and contained various new species, which were characterised in the present paper.—A communication was read from Dr. B. Simpson, containing notes on the habits of *Ailurus fulgens*, as observed by him during his residence in Nepal.—A communication was read from Surgeon Francis Day, F.Z.S., containing the first part of a series of notes on the specimens of fishes in the Calcutta Museum. Mr. R. B. Sharpe read some additional notes on the genus *Ceyx*, in continuation of a former communication on this subject. The principal object of the present paper was to discuss the question of the identification of the true *Ceyx rufidorsa*, Strickland.

BRIGHTON

Brighton and Sussex Natural History Society, November 8.—Mr. T. H. Hennah, President, in the chair. A rare grass, *Gastidium Lendigerum*, obtained in October, in the Weald of Sussex, by Mr. Davies, was presented by that gentleman.—A paper on Mosses was read by Mr. Smith, in which the development, growth, mode of reproduction, and the several parts of mosses were described and illustrated by enlarged drawings and microscopic preparations, while it was pointed out that to the microscopist they opened out fields of research and questions to be settled, unsurpassed by any other branch of natural history. Prior to reading the paper, Mr. Smith handed in complete Bryological Flora of the county of Sussex, comprising 298 species and sub-species, a brief account of the soils in which the rarer species grow, together with an enumeration of those which, at present as regards Britain, have been found only in Sussex. This list will be published in the next annual report.

BRUSSELS

Royal Academy of Sciences, October 9.—M. Schwann reported on the memoir by MM. Masius and Vaulair on the anatomical and functional regeneration of the spinal cord, of which a notice was given in the last number of NATURE. Besides the immediate subject of their memoir, the authors treat of the histology of the *filum terminale* of the spinal cord in the frog, and of the cutaneous and medullary distribution of the spinal nerves.—M. A. Quetelet communicated notes on the meteors observed at Brussels in August, 1869, and on that of the 1st October, 1869; and M. Terby noticed the meteors observed at

Louvain in August last.—Storm observations, from the 1st of June to the end of September, were presented; for Brussels by M. Quetelet, for Louvain by M. Terby, for Malines by M. Bernaerts, for Antwerp by M. C. Coomans, and for Gerpinnes, near Charleroi, by M. V. van Geel. M. J. Cavalier also communicated a note of storms observed at Ostend in August and September last.—M. Zantedeschi communicated a note on the employment of the outer armature of the submarine cable, while the inner armature, or isolated conducting wire, transmits the telegraphic despatch. The author remarks that the submarine cable represents a Leyden jar, and hence that when the conducting wire conveys a message, say from Europe to America, the same message is reconveyed to the European station by means of the wires forming the outer portion of the cable. He proposes to establish an apparatus at each station for the purpose of receiving this return message, so as to enable the operator to see that his message is correctly transmitted.—M. L. de Koninck stated, that on the 2nd October last, the day of the earthquakes in the Rhenish provinces, he experienced a slight double shock in Liège at about 11.40 p.m.

MANCHESTER

Literary and Philosophical Society. *Microscopical and Natural History Section*, Oct. 11.—Mr. John Watson in the chair. The President delivered an address, from which the following are extracts:—"It will interest all naturalists, and especially entomologists and lepidopterists, to hear that there has very lately been received in this country a fine specimen of the magnificent butterfly Papilio Antimachus, of which only one specimen was ever before brought to Europe. The Darwinian theory appears to be making progress among a certain class of naturalists, but its upholders display a disposition to avoid precision of terms, and to enlarge and confuse the meaning of the words they employ, rather than scientifically to limit and define them; they use variability and mutability as having one and the same meaning, instead of distinguishing one as referring to subdivision into varieties, and the other as change of specific forms. Just now, as a development of the theory of natural selection, we hear a great deal from some distinguished entomologists about imitation and mimicry, where resemblance would be the more correct word; and these terms cannot be said to be used figuratively, because it is argued that some species and genera of butterflies mimic the colourings and markings of others for the sake of protection from enemies, and for other aims and ends. Certainly the words imitation and mimicry imply foregone intention. Now it is probable that no butterfly ever saw its parent or ancestor, its offspring or posterity, and it is an absurd stretch of imagination that its own observation could induce and enable it to change the colouring and appearance of its successors; and if it had such ability and reasoning power, it would effect the change for protection from enemies in the larva, and not in the imago. We know that Nature loves to repeat her works, and it is common to find resemblances and repetitions through various and distantly allied families of animals, and they are truly connecting links in the chain of creation. The controversy is still going on between those who affirm and deny the existence of a vital principle of energy or force, and Professor Huxley stands foremost among the latter; very interesting microscopic observations have been made, and ingenious arguments have been deduced from them; but the grand step from the lifeless to the living protoplasm has not been diminished. Physiologists may, perhaps, hereafter discover and explain the difference between organic forms, living and dead; but at present it is not proved that the phenomena of life can be reconciled with the mere functions of matter."

Dr. Henry Simpson exhibited specimens of *Statice spathulata*, gathered by himself this autumn on Hilbree Island, Cheshire.

Mr. Tait sent a portion of the beach from near Alexandria, Egypt, consisting almost entirely of shells. He stated that for many miles along the coast the shore was of a similar character.

Mr. Joseph Sidebotham read a paper on varieties in Lepidoptera, from which the following passage is extracted:—"The questions as to what constitutes a species? where does a species end, and variety begin? and whether a species be a natural or merely an artificial division? are amongst the most difficult of solution in the whole range of natural history, and just at this time are very prominently before the scientific world. With a view to determine the influence which difference of food and light might have in modifying species, the author gives the following as the result of some experiments which he had made. I procured about 2,500 larvæ of the tiger moth, in a young state. I divided them into six lots, keeping each in a separate cage, and feeding them differently. One lot was fed on willow, another on butter burr (*Petasites vulgaris*), another on hawthorn, another on plum, one on dock, and one on nettle, grass, bramble, and various other kinds of food. A considerable proportion of each became perfect insects, and I could detect no difference whatever in the colours, from the food they had lived upon. That is to say, the variations in colour and marking were not to be traced in any case to the food. I kept several batches of eggs, and reared the larvæ carefully through the winter, and then again divided them, giving each lot a different kind of food. Again the same result. I found that one year the larvæ I had brought from the coast had usually the inferior wings more or less of a yellow shade, instead of the bright scarlet of the Cheshire specimens. Having for many years continued these experiments without obtaining any marked results, I this year tried another of a different nature. I selected the tortoiseshell butterfly, as one of the least variable species we have, and I procured several broods of young larvæ just emerged from the egg. These I kept in a dark box until I had all ready, and then I divided each brood into three lots, putting one-third into a box in my photographic room, which is lighted with orange-coloured glass, one-third into a box lighted with blue glass, and the ventilators carefully shaded so that only light of a blue colour could reach the larvæ, the remainder were put into an ordinary cage, in the natural light. The latter fed up and came out into butterflies in the usual time. Those in the blue light were not healthy, and though every care was taken, at least fifty or sixty died before changing, and a considerable number changed into chrysalides, and then died; those that came out into perfect insects were very much smaller than usual. Those lighted by orange-coloured glass fed up very well, but many of the two first lots had come out before one of them changed into chrysalis; scarcely one of them died, and I examined each one before I allowed it to fly, to see what effect had been produced. I retained a few specimens of each lot to exhibit this evening, and now proceed to describe the difference. Those reared in the blue light differ from the ordinary form in being on an average much smaller; the orange brown is lighter in shade, and the yellow and orange run into each other, instead of being distinct and separate. Those reared in the non-actinic, or yellow light, are also smaller, the orange brown is replaced by a salmon colour, the venation more strongly marked, and the blue dashes at the edge of the wings in the usual form, are in these of a dull slatey colour. A series of specimens of these side by side with those reared in ordinary light, are here for exhibition. One evening I found about 60 butterflies out of chrysalis, of those in the photographic room, and taking each one carefully I examined them all and allowed them to fly; shortly afterwards I found the whole of them had settled against the wall of the house, and presented a most remarkable appearance; they remained there more than half-an-hour, the western sun was shining against the wall, and it is not unlikely when, being suddenly brought from the red light, where they had spent all their lives, to the bright daylight, they have been so dazzled as to act in this peculiar manner. The results of this experiment do not show any very startling change in colour, such as one would have expected from the known effects of light on plants and from the occasional occurrence of very much more strange varieties, one now and then meets with, which cannot have been subject to such severe treatment; still, when we consider that even this difference is caused in one generation, and in the course of a month, it is a very suggestive fact, and leads one to think that light has certainly as much or more effect on the colours of Lepidoptera, than the difference of food, and might in a long series of generations lead to very material changes in both form and colour, and perhaps considerably modify our ideas of what constitutes a species."

MONTREAL

Natural History Society, October 25.—An important paper on the Gaspé fossils was read by Principal Dawson. The Peninsula of Gaspé, between the river St. Lawrence and the Bay des Chaleurs, was the first part of Canada explored by the Geological Survey under Sir William Logan, and it contains rocks representing four great geological periods, the Lower Silurian, the Upper Silurian, the Devonian, and the Lower Carboniferous; all admirably exposed in coast cliffs; and in the case of the Upper Silurian and Devonian abounding in characteristic fossils. The visit of Principal Dawson in the past summer had reference to further study of the interesting fossil plants of the Devonian sandstone, many species of which have been described

in his papers in the *Canadian Naturalist*, and in the Journal of the Geological Society. With Messrs. G. T. Kennedy and G. W. Dawson as assistants, he explored the whole of the north side and the greater part of the south side of Gaspé Bay, and has obtained very large and interesting collections of fossil plants. Among these are two large trunks of *Protaxites Logani*, a new and beautiful species of *Psilophyton*, and a species of *Cyclostigma*, a genus hitherto found only in the Devonian rocks of Ireland. Several interesting animal remains were also found, including numerous species of large fishes (Mechæracanthus); and Mr. Kennedy was so fortunate as to find a *Cephalaspis*, the first representative of the genus as yet found in America. The animal fossils have been placed in the hands of Mr. Billings and Dr. Newberry for comparison, and the plant will probably be described in detail in the course of the coming winter. Specimens of some of the more interesting fossils above referred to, were exhibited to the society.—Mr. Ritchie read a paper on the small cabbage-butterfly (*Pieris rapæ*), the caterpillars of which have recently been extremely destructive in Canadian gardens. This insect is not indigenous to America, and was first noticed in Canada some years ago by Mr. W. Couper. Mr. Whiteaves made an interesting verbal communication on dredging in Gaspé, and exhibited a large series of marine invertebrates.

PARIS

Academy of Sciences, November 8.—M. Pasteur presented a note in reply to that of M. Thenard on the preservation of wines by heat. A memoir was read by M. H. Marès on the transformations undergone by powder of sulphur (flour of sulphur and powdered sulphur) when it is spread upon the soil, in which the author states that the sulphur which has been abundantly employed in the vineyards of France of late years becomes converted into sulphuric acid which combines with the lime of the soil to form sulphate of lime. The author has not ascertained whether the sulphuric acid is produced by direct oxidation of the sulphur, or by that of sulphuretted hydrogen formed by it in contact with manure, but he states that no odour of sulphuretted hydrogen is perceptible where the sulphur is used. The employment of sulphur appears to be effectual in preserving the vines from disease.—A note by M. J. Personne on the transformation of hydrate of chloral into chloroform in the animal economy was read. The author remarked that whilst M. Liebruch maintains that hydrate of chloral is converted into chloroform by contact with the alkali of the blood, the French observers have generally held an opposite opinion. In his experiments he found that where hydrate of chloral is added to blood, or administered to a dog, no production of chloroform is perceptible, but he obtained chloroform by the distillation of the blood. To avoid the objection that the heat employed in distillation might produce the conversion, he operated at a temperature of 40°—45° C. = 194°—113° F., conveying the vapour by a current of air through a red-hot porcelain tube into a solution of nitrate of silver. The reaction produced demonstrated the presence of chloroform in the vapour, no reaction being caused by vapour of hydrate of chloral conveyed and decomposed in the same way. Unlike M. Bouchet, the author detected no chloroform in the urine of anmals to which hydrate of chloral had been administered.—M. J. V. Labordi communicated a note on the ill effects attending the administration of chloral.—In a note on chloride of gold, M. H. Debray remarked that although sesquichloride of gold is decomposed by exposure to a temperature of about 200° C. = 392° F., into proto- and per-chloride, it may, nevertheless, be volatilised by a heat of 303° C. = 572° F., in an atmosphere of chlorine. It then crystallises in long reddish needles.—M. A. Riche communicated a note on the bronze of sonorous instruments, relating chiefly to the production of gongs and cymbals similar to those made in China. Chinese metal contains about twenty per cent. of tin. Alloys made with these proportions of metal are very brittle when cold, but the author found that at a dull red heat they may be forged with ease, and produces very sonorous plates.—M. A. Landrin announced that yellow coralline is not poisonous, so that it may be employed for industrial purposes.—M. Petrequin presented a note on the chemical composition and comparative physiology of the cerumen of the mammalia. Its base is potash in man and the ox, lime in the dog, and magnesia in the horse.—M. A. Petit stated that in the melon the rind contains only glucose, as also the flesh whilst still green. During ripening cane-sugar is gradually developed in the latter, its formation commencing in the most acid part of the pulp surrounding the seeds.

DIARY

THURSDAY, NOVEMBER 18.

ROYAL SOCIETY, at 8.30.—Preliminary Report of the Scientific Exploration of the Deep Sea in H.M. surveying vessel *Porcupine*, during the summer of 1869, conducted by Dr. Carpenter, V.P.R.S., Mr. J. Gwyn Jeffreys, F.R.S., and Prof. Wyville Thomson, LL.D., F.R.S. And other papers.

SOCIETY OF ANTIQUARIES, at 8.30—Ancient British Barrows (Round): Dr. Thurnam.

LINNEAN SOCIETY, at 8.—Review of the genus *Hydrolea*, with descriptions of three new species: Mr. A. W. Bennett, F.L.S.

NUMISMATIC SOCIETY, at 7.

LONDON INSTITUTION, at 7.30.—Architecture, or the Fine Art of Building: Prof. Robert Kerr.

CHEMICAL SOCIETY, at 8.—On Namaqualite and Chemical Researches on new and rare Cornish Minerals—No. 6. A new Ferric Silicate: Prof. Church. On Chloranil and Bromanil—No. 2: Dr. Stenhouse.

FRIDAY, NOVEMBER 19.

PHILOLOGICAL SOCIETY, at 8.30.

MONDAY, NOVEMBER 22.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.

LONDON INSTITUTION, at 4.—Elementary Physics: Prof. Guthrie.

TUESDAY, NOVEMBER 23.

ETHNOLOGICAL SOCIETY, at 8.—On some Quartzite Implements of Palæolithic Type from the Drift of the Cape of Good Hope: Sir George Grey, Bart. On the Races and Languages of Dardistan hitherto undescribed: Dr. Leitner.

WEDNESDAY, NOVEMBER 24.

GEOLOGICAL SOCIETY, at 8.—On the Dinosauria of the Trias, with observations on the Classification of the Dinosauria: Prof. Huxley, F.R.S., President. The Physical Geography of Western Europe during the Mesozoic and Cainozoic periods, elucidated by their Coral-faunas: Dr. P. Martin Duncan, F.R.S., Sec.G.S.

THURSDAY, NOVEMBER 25.

ROYAL SOCIETY, 8.30.

LONDON INSTITUTION, at 7.30.—Architecture: Prof. R. Kerr.

LONDON MATHEMATICAL SOCIETY, at 8.

ZOOLOGICAL SOCIETY, at 8.30—Notes on some Spiders and Scorpions from St. Helena, with descriptions of new Species: Rev. O. P. Cambridge. On a small collection of Birds from the Tonga Islands: Dr. O. Finsch and Dr. G. Hartlanb.

BOOKS RECEIVED

ENGLISH.—Transactions of the International Congress of Prehistoric Archæology (Longmans).—The Universe; or the Infinitely Great and the Infinitely Little: F. A. Pouchet (Blackie and Sons).—Physical Atlas (A. K. (Johnston).—Darwinism tested by the Science of Language: Professor A. Schleicher, translated by Dr. A. V. W. Bikkers (Hotten).—The Midnight Sky: Donkin (Religious Tract Society). Æsop's Fables, Illustrated by Ernest Griset (Cassell).

FOREIGN.—Die Befruchtung bei den Coniferen: Dr. E. Strasburger.—Die Maschinenfabrication: H. V. Reiche.—Berichte über die Versammlung der Deutschen Ornithologen-Gesellschaft. (Through Williams and Norgate.)

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