THURSDAY, NOVEMBER 12, 1874

SIR JOHN LUBBOCK AT BIRMINGHAM

SIR JOHN LUBBOCK, in his inaugural address as president of the Midland Institute, gave utterance to some wholesome truths which we sincerely hope the Government and people of the country will take to heart. Sir John, as a member of the Schools Commission and of the Science Commission, has had ample opportunities of ascertaining the exact state of our schools and universities as to the teaching of science; and after all that has been said and done, he comes to the unhappy conclusion that, practically, science is ignored in the vast majority of our educational institutions of all classes—elementary schools, endowed schools, and universities. At the same time he is driven to the conclusion that a widespread interest in science already exists in the country. Of this we think anyone can assure himself who looks around and can read the signs of the times. There is undoubtedly a widespread feeling that the present all but universal system of education is inadequate and unsatisfactory and that science must, sooner or later, be allotted a place in all our schools. Notwithstanding this feeling, the fact undoubtedly remains as Sir John Lubbock stated it, that the great fault of our present system of education is the neglect of science; some few years hence it will be deemed incredible that a boy should be allowed to pass through any good school and yet be entirely ignorant of any one branch of natural knowledge.

Here, then, on one side exists a craving, becoming more and more defined, in the country, that science be given a place in our educational system, and on the other hand the fact that scarcely anything definite has yet been done to give science an established place in our schools and universities. In most cases where science has been admitted into our schools, it has been only on sufferance as a kind of interloper for which any odd corner is good enough. In spite of all that has been said recently—again to refer to the address—about the advantage of science, notwithstanding the reports of Royal Commissions and the action of Parliament, though the importance of science is generally admitted, still it is unfortunately the case that, with a few exceptions, it is either entirely ignored in our endowed schools or has allotted to it a space of time ludicrously inadequate, and, indeed, almost nominal. In some cases it is permitted, but only on condition of being taken out of playtime, which is not fair to the boy, and being paid for extra, which naturally does not recommend it to the parent. It is for parents and for the public to say whether this state of things is satisfactory; and Sir John called attention to it because he thought that parents were in general scarcely aware how little their sons were even now learning beyond the old routine. The present state of matters ought not, therefore, to be tolerated, and the only position in our schools and universities, for the teaching of science, is a position of, at least, equality with all the other old-fashioned means of education. The only principle on which a satisfactory course of education can be constructed is, that it is essential for the well-being of every man and woman that he and she should start in life with a well-trained mind and a fair knowledge of the principles and the main facts of everyday life.

Sir John Lubbock admits the importance of language as a means of education, but he thinks that it has hitherto been given a far too prominent place in our schools, and that the amount of time devoted to linguistic studies is out of all proportion to the results achieved. "We still," he said, "indeed, teach the Latin grammar rather than the Latin language, for a man cannot surely be said to know a language which he cannot speak; and I cannot but believe that if our children were taught Latin and Greek as they are taught French and German, they would learn them in half the time. Mr. Arnold, in his report on German schools, tells us that it is common there for the master to address his boys in Latin, and for the class to speak Latin in reply. The German boys, he adds, have certainly acquired through this practice a surprising command of Latin."

It is well known that scholarship in Germany is far more widespread and accurate than in England, and we see that this scholarship is acquired with a much less expenditure of time. The consequence is, that plenty of time remains in German schools for the teaching of science, which forms so important a part of education throughout that country, and which gives the German a starting-point in life so very much superior to that which the average Englishman has, even when educated at our public schools and universities. No one can deny the increasing importance of a knowledge of science in all departments of human activity, and we fear that if another two generations of boys be allowed to pass through our schools in their present condition, this country will be almost hopelessly behind certain countries on the Continent. This has been recently admitted as a truth by several practical men, whose position as such ought to be of some weight with our trading and manufacturing community. But to this subject we hope to return in an early number.

In the meantime, it is clear to all who have taken pains to inquire into the facts that a radical reform must soon be made in our present system of education, from the elementary schools upwards; that a rearrangement of subjects and a reform in methods must be made, so that science may be allotted a place of equal prominence with other subjects, and that Government must begin the reform by insisting that such a change be made in the programmes of all schools under its control. On this point Sir John said:—

No doubt we had greatly increased the number of our schools and the attendances of the children, but while we had been disputing over the 25th clause and arguing about compulsion, we had somewhat lost sight of the character of the education given; and he was sorry to say that there was abundant evidence, not only that it had not improved, but even that it had fallen off in the last few years. The present system of payment practically confined the instruction given to reading, writing, and arithmetic. No doubt a payment of 3*s.* per head was nominally offered for any two other subjects, but other grants amounted to 18*s.*—namely, 5*s.* for attendance, 1*s.* for music, and 4*s.* each for reading, writing, and arithmetic, which were obligatory. Now, as 15*s.* was the maximum granted, it followed that if three-quarters of the children pass in reading, writing, and arithmetic, the

full grant would be earned, and nothing could be obtained from other subjects. It seemed to him, however, that the passes in reading and writing ought not to be made so difficult, but that three-quarters of the children should pass. No wonder that under those circumstances the Duke of Devonshire's Commission had reported that the present system had "unfortunately narrowed the instruction given in elementary schools, and, together with the lower standard consequently adopted in the training and examination of pupil-teachers, and the curtailment of the syllabus of the training colleges, exercises a prejudicial effect on the education of the country."

As to the question of expense for apparatus, Sir John Lubbock showed that this need be no obstacle; fully recognising that the kind of science to be taught must be no word knowledge, but a practical acquaintance with the actual facts of nature.

Schoolmasters had on more than one occasion said to him that it was impossible for them to teach science, because they had not the funds necessary to purchase apparatus, set up a laboratory, &c. Now, no doubt, much money might be profitably laid out in this way, but it was not necessary to do so. Mr. Tuckwell, who spoke from personal experience, said in a paper read before the British Association in 1871, that "it ought to be more widely known for how very small a sum sufficient apparatus can be obtained to teach natural history and experimental science. A laboratory can be fitted up for twenty boys at a cost of little more than 20*l.*, while each boy's private stock of glass and test solutions need not cost more than 8*s.* per annum. Botanical flower-trays, containing eighteen bottles, may be bought for half-a-crown; electrometers, telescopes, polariscopes, models of pumps, and pulleys, may be made, by a little instruction, by the boys themselves, who will learn in their construction far more of the principles which they involve than could ever be instilled into their minds by the choicest products of the shop."

After quoting the opinions of the late Prof. Faraday, Prof. Henslow, Dr. Hooker, and Prof. Huxley on the importance of early scientific education, Sir John said it was often urged that in science the very methods of teaching were still under discussion. This, however, was an unavoidable incidence of a commencement. It would be remedied by experience, and could be remedied by experience only. Mr. Arnold truly said that "when scientific physics have as recognised a place in public instruction as Latin and Greek, they will be as well taught."

Sir John Lubbock also referred to the miserable pittance which has as yet been allotted to research in science by our Universities; but as we have referred to this point so recently, we need not dwell upon it here. Altogether, we hope that this moderate and wise, but uncompromising address may give one more strong impulse to the already widespread feeling that we cannot with safety delay much longer in giving to science the place which it ought to hold in the educational system of the country.

*THE NATURAL HISTORY OF SPITZBERGEN AND NOVA ZEMBLA**

SO much public attention is now directed to the polar regions and their inhabitants, that we do not hesitate to bring before the notice of our readers the important contribution to our knowledge of Spitzbergen and Nova Zembla, recently published by Von Heuglin as the third part of his "travels" in those countries in 1870 and 1871.

In it will be found a complete *résumé* of the present state of our knowledge of the zoology and botany of those distant and inhospitable regions, and a chapter on what is known of their geology.

The mammals of these northern climes are few in number, consisting chiefly of seals and whales. The terrestrial mammal-fauna comprehends only two species of lemming (*Myodes torquatus* and *M. obensis*): the arctic fox, common fox, and wolf and sea-bear among the carnivores, and a single ruminant—the reindeer—seven species in all. The birds are more numerous, though here again the marine species far predominate, the land-birds being only ten in number out of a total of fifty. Amongst the former we are surprised to see recorded as an accidental visitor the Hoopoe, usually considered as rather an inhabitant of the tropics, but of which a single straggler was captured in Southern Spitzbergen by a merchant-vessel in August 1868. Reptiles are conspicuous only by their absence in Spitzbergen and Nova Zembla, but of fishes thirty species are recorded as having been obtained on various parts of the coast, all belonging to known forms either of the Atlantic or of the waters of Northern Asia.

The invertebrates of Spitzbergen are treated of more concisely by Herr v. Heuglin; but lists are given of the species of the different orders, and many references to previously published papers and works bearing upon this subject are added.

The account of the flora of Spitzbergen is mainly founded on Malmgren's paper, published in 1862, in the Proceedings of the Royal Academy of Sciences of Stockholm, to which, however, additions have since been made by Anderson, Fries, and Nyström. The Phanerogams enumerated are 117, the Cryptogams upwards of fifty. The botany of Nova Zembla and Waigatsch Island is separately treated of. Our knowledge of this subject is based upon the excellent researches of Von Baer and Trautvetter, published at St. Petersburg, and a paper of Blytt's, of Christiania. On these islands 146 Phanerogams and 144 Cryptogams have been discovered. Among the latter a certain number of new species are described in the present work by Prof. Ahle, of Stuttgardt.

The geological chapter, which concludes the volume, is based upon the well-known researches of the Swedish naturalists Lovén, Torell, Blomstrand, and Nordenskiold, who have laboured so long and so diligently upon this subject.

We can recommend Herr v. Heuglin's work as a very convenient handbook for the use of future visitors to the Northern Seas, and of explorers of those newly discovered lands of which we are now hearing so much.

* "Reisen nach dem Nordspolarmeer in den Jahren 1870 und 1871," von M. Th. von Heuglin. In drei theilen. Dritter Theil: Beiträge zur Fauna, Flora, und Geologie. (Braunchsweig, 1874.)

*HÆCKEL'S DEVELOPMENT OF MAN**

Anthropogenie oder Entwickelungsgeschichte des Menschen; gemeinverständliche wissenschaftliche Vorträge, von Ernst Hæckel. (Leipzig: Engelmann, 1874.)

II.

IN tracing the genealogy of our race, Prof. Hæckel, while availing himself of the gradual changes in the fauna of the earth during geological periods, and of the

* Continued from p 5.

gradation of living animal forms, takes as the most important clue in his difficult task the facts of human embryology. This close connection is constantly kept in view, and by its aid not only does he trace, as in the twenty-second chapter of his "Schöpfungsgeschichte," the philogeny of man as a compound organism (*Person*), but extends the same process to the separate organs of the human body and the faculties of the human mind. The chapters which are occupied by this investigation are the most interesting in the book, full of ingenious suggestions, and well repaying the reader who brings a sound knowledge of embryology and comparative anatomy to their study.

The genealogical tree here constructed is briefly as follows:—First, a Cythode (*Moner*), itself the product of inorganic matter, passed in the Laurentian ages from being a component of primordial sea-slime (*Plasson*, represented by existing *Bathybius*) to a separate unicellular or amœboid form. Several of these plastids next formed a colony by cell-division (*Morula*), which in subsequent ages became covered with cilia, differentiated into an ectoderm and entoderm, and provided with a mouth (*Gastræa*), a form represented in sponges and other invertebrates and in Amphioxys, but omitted in the ontogenesis of man, or represented by the Blastosphere. Each of the primitive layers subdivided into two, and between the latter was formed the *cœlum*, or body cavity (vermiform stage, protuchous or aproctous). Next was developed the notochord in a form related to the existing ascidian and amphioxous larvæ. The vertebral character being thus attained, our ancestors passed through stages now represented by the lampreys and the sharks, during the ages which ended the archæolithic period. While the Devonian, Carboniferous, and Permian formations were taking place, the Amphibian stage was passed, and the succeeding development in the Trias epoch was from this to a protamniotic form, distinct from that which gave birth to the sauropsidan stem, and leading directly to the mammalian. When the last strata of chalk had been laid down, a marsupial form was changing into one now represented by the lemurs. Lastly, the Tertiary period witnessed the development of various gradations of catarrhine Primates, from one of which the earliest men directly sprung.

The genealogy thus constructed (which is almost exactly the same as those Prof. Hæckel has before published) is plausible enough, and if such speculations come under what the late M. Elie de Beaumont called "la science mousseuse," they certainly have their use in directing and stimulating inquiry. But is this the way to introduce the results of biology to a popular audience?

In the first place, the theory of evolution itself is neither so certain nor so complete as persons who take their knowledge from these lectures alone would be led to suppose. Our author is astonished at Rütimeyer's comparison of "Darwinism" to a religion. But as held by its illustrious author and by the ablest biologists both in Germany and England, it is very much like a rational theology: for it is a theory which only pretends to be a more or less probable explanation of facts, which is held liable to correction from fresh facts and with tolerance for less probable explanations. But in these lectures evolution is no longer a reasonable belief, but a fanatical and intolerant *Aberglaube*.

Again, granting that evolution by some means has taken place, and that natural selection is a true cause of evolution, it is not the only cause. Modifications of it, like the so-called "Mimicry" of Bates and Wallace, have already been discovered, and no doubt others will be. The effect of Sexual selection, a struggle for existence of the race as distinct from the individual, would not have been guessed had not Mr. Darwin himself proved it: and it often modifies the working of Natural selection.

Lastly, if we accept evolution and so-called materialism in its widest sense, the logical results will not be what Prof. Hæckel assumes. For these, like all other scientific theories, deal only with secondary causes; and when we have traced back mind and matter alike to cosmic vapour, the question still recurs, to what was that matter with its potential functions due? In *Protogenes*, or in the impregnated human ovum,

> The thread of Life untwisted is
> Into its first consistences.

Yet the mysteries of growth, of movement, and of generation are not less but more mysterious than when less nakedly exposed in higher organisms. Scientific investigation, in the hands of Darwin, Fritz Müller, Dohrn, and Hæckel, has told us much and will tell us more of how this world has come about; but when men cease to inquire into its final cause, the human race will have made a step back towards its primordial slime.

Leaving these general considerations, one is reminded by Prof. Hæckel's attempt at a human philogeny of the many fallacies which beset the application of the general theory of evolution to this particular instance.

When the dogma is accepted that "ontogeny is a recapitulation of philogeny," we find that the individual development of man and his ancestors is far from completely known. The embryology, for instance, of Monotremata and the Ganoids, including *Ceratodus*, is a blank. Only the other day Mr. Balfour's admirable observations on the development of sharks came to disturb what seemed to be a universal law of vertebrate embryology, and the origin of the urogenital organs is still confessedly obscure. Yet Prof. Hæckel, while candidly admitting this last difficulty, practically assumes one and not the best-supported view to be correct. On the strength of it he teaches that the kidneys are homologous with sebaceous glands, with the segmental organs of Annulata,* and with the water-vascular canals of other worms; and that sperm-cells belong to the exoderm, germ-cells to the endoderm. Again, the placental classification which forms the basis of the genealogical tree on p. 493 has been always open to grave objection, and has now been decisively contradicted by the researches of M. Alphonse Milne-Edwards and Prof. Turner.

Again, even when the development of an animal is fully made out, it is often so abridged and distorted an epitome of its ancestry, that we may easily interpret it wrongly, and we have at present no signs to tell us when the clue begins to fail.

But a third and still more serious difficulty in constructing philogenies is the well-known incompleteness

* Whether this ingenious hypothesis of Gegenbaur will be confirmed on other grounds is, of course, a different question.

of the geological record ; and, unluckily for the genealogy of man, the very chapter we most need, that of the Worms and primitive Tunicata, is the one most hopelessly lost.

All this does not prove that no attempt should be made to trace back the descent of man and other animals by such lights as we have, but it does seem to show that the results are too uncertain to be set forth as ascertained facts in popular lectures.

Strange as it now seems, a generation ago many of the best zoologists spent their time in arranging animals according to various systems of metaphysical origin. The speculations of Oken and Geoffrey St. Hilaire, of Forbes and Macleay, read now like the controversies of the schoolmen. The archetypal skeleton was drawn in many forms (and often in several colours), and almost as many compound terms were invented as those of Prof. Hæckel ; but all these fancied systems have passed away, or only exist as relics to encumber the ground. Does not their fate suggest misgivings as to the fate of the genealogical trees which are now so luxuriant ?

In conclusion I will quote the words of one who will not be suspected of sharing the prejudices of those ecclesiastical newspapers which appear to be responsible for many of the defects in Prof. Hæckel's lectures.

"Of all kinds of dogmatism the materialistic is the most dangerous, because it denies its own dogmatism, and appears in the garb of science ; because it professes to rest on fact, when it is but speculation ; and because it attempts to annex territories to the domain of Natural Science before they have been fairly conquered."*

P. H. PYE-SMITH

ISMAILÏA

Ismailïa : a Narrative of the Expedition to Central Africa for the suppression of the Slave Trade, organised by Ismael, Khedive of Egypt. By Sir Samuel W. Baker, Pacha, F.R.S., &c. &c. Two vols. (London : Macmillan and Co., 1874.)

IT must be difficult for any unhardened critic to keep his wits about him in reading this fascinating narrative, and we are sure no reader will wish that it had been shorter.

There is not much in the book of directly scientific interest. Sir Samuel went over very nearly the ground he had traversed before, and which he has so well and fully described in his "Albert N'yanza" and "Nile Tributaries of Abyssinia ;" and he kept so faithfully and unswervingly in view the noble errand on which he set out, that he had little opportunity to attend to the interests of science. The heroic Lady Baker, however, made large botanical collections throughout the journey, which she presented to the Khedive on her arrival in Cairo, and Sir Samuel informs us that Lieut. Baker made considerable topographical observations. Moreover, although the expedition had no scientific object in view, its purpose was eminently conducive to the interests of science, seeing that until the demoralising traffic in slaves is suppressed, we can never hope to obtain a thorough knowledge of the interesting region around the Upper Nile—of its geography, its ethnology, and its natural history ; and therefore, although the great object which Baker had in view seems to have been thwarted through the pusillanimity of the Egyptian Government, he deserves the greatest credit for having proved that with skill, determination, and adequate means—and his means were very inadequate—the journey from Cairo to the Albert N'yanza might be accomplished in a very short time.

We think it would be difficult to conceive of a leader better fitted than Sir Samuel Baker to accomplish the task which the Khedive commissioned him to do. His work is a practical commentary on the vigorous and truthful lines of Tennyson :—

> "O well for him whose will is strong !
> He suffers, but he will not suffer long ;
> He suffers, but he cannot suffer wrong :
> For him nor moves the loud world's random mock,
> Nor all calamity's hugest waves confound,
> Who seems a promontory of rock,
> That, compass'd round with turbulent sound,
> In middle ocean meets the surging shock,
> Tempest-buffeted, citadel-crown'd."

Sir Samuel estimates that at least 50,000 persons are annually captured to be sold as slaves, and it would be safe to say that several thousands more are massacred in effecting the capture of these ; the atrocities practised by the slave-hunters are almost incredible. It was to suppress this lamentable state of matters that Sir Samuel Baker was commissioned, on April 1, 1869, by the well-intentioned and enlightened Khedive of Egypt, who gave him full powers as to equipment. To accomplish this purpose it was necessary to annex the whole Nile basin, and to establish a legitimate trade in the barbarous countries which had hitherto been scourged with this infamous traffic. So far as Sir Samuel could carry out his plans, the equipment of the expedition was admirable in every detail, down to the magic lantern, the wheels of life, and the magnetic battery, which last was in constant requisition among the tribes of the Upper Nile, and was a perpetual source of amusement to the members of the expedition and of wonder to the natives.

It would be impossible, in the space at our disposal, to give any adequate idea of the work of the expedition. From the very first Sir Samuel met with obstructions and delays that would have induced any less patient and less determined man to abandon it altogether. The Egyptian Government had undertaken to furnish a large number of boats, besides steamers and an adequate military force, for the expedition, which, it was arranged, would start in June 1869. It was with the greatest difficulty that a start was made on the 29th of August, when two of the parties proceeded up the Nile, one to go direct by river to Khartoum, and the other to land at Korosko and march across 400 miles of desert to the same place ; with the latter was the heavy machinery and sections of steamers carried by a regiment of camels. Sir Samuel himself set out from Suez on Dec. 11 for Souakim, thence to Berber on the Nile, and in a diahbeeah to Khartoum. Here, in accordance with orders which had been sent on months before, he expected a fleet of vessels to be ready

* I have endeavoured to represent the sense of the following passage from Virchow ("Gesammelte Abhandhungen," p. 18) :—"Es giebt einen materialistischen Dogmatismus so gut wie einen kirchlichen und einen idealischen, und ich gestehe gern zu dass der eine wie die anderen reele Objecte haben können. Allein sicherlich ist der materialistische der gefährlichere weil u. s. w."

to convey the expedition up the Nile, but was coolly informed by the Governor-General that "it was impossible to procure the number of vessels required; therefore he had purchased a house for me, as he expected I should remain that year at Khartoum, and start in the following season."

This was certainly disheartening; it was evident that the expedition was unpopular, and that although the Khedive earnestly wished the suppression of the trade, there was scarcely another man in the country but thought it was his interest to support it; thus the queller of the evil had to fight against tremendous odds. After inconceivable difficulty a small fleet was got together, a force of 1,400 infantry and two batteries of artillery mustered, and everything ready for a start by Feb. 8, 1870, although the desert party under Mr. Higginbotham had not yet come up. Out of the military force, Baker selected forty-six men, who were known as the "Forty Thieves," owing to their light-fingered propensity, of which, however, they were soon cured, and became ultimately a loyal band of well-disciplined braves, who contributed greatly to the success of the expedition.

On Feb. 16 the expedition reached the Sobat junction, which river brings an immense body of yellowish water to the Nile, colouring the latter for a great distance. The Bahr Giraffe was reached next day, and here the expedition met with new difficulties which seemed likely enough to compel it to turn back. Sir Samuel says—

"The Bahr Giraffe was to be our new passage instead of the original White Nile. That river, which had become so curiously obstructed by masses of vegetation that had formed a solid dam, already described by me in 'The Albert N'yanza,' had been entirely neglected by the Egyptian authorities. In consequence of this neglect an extraordinary change had taken place. The immense number of floating islands which are constantly passing down the stream of the White Nile had no exit; thus they were sucked under the original obstruction by the force of the stream, which passed through some mysterious channel, until the subterranean passage became choked with a wondrous accumulation of vegetable matter. The entire river became a marsh, beneath which, by the great pressure of water, the stream oozed through innumerable small channels. In fact, the White Nile had disappeared. A vessel arriving from Khartoum in her passage to Gondoroko would find, after passing through a broad river of clear water, that her bow would suddenly strike against a bank of solid compressed vegetation—this was the natural dam that had been formed to an unknown extent: the river ceased to exist.

"It may readily be imagined that a dense spongy mass which completely closed the river would act as a filter: thus, as the water charged with muddy particles arrived at the dam where the stream was suddenly checked, it would deposit all impurities as it oozed and percolated slowly through the tangled but compressed mass of vegetation. This deposit quickly created mud-banks and shoals, which effectually blocked the original bed of the river. The reedy vegetation of the country immediately took root upon these favourable conditions, and the rapid effect in a tropical climate may be imagined. That which had been the river bed was converted into a solid marsh.

"This terrible accumulation had been increasing for five or six years, therefore it was impossible to ascertain or even speculate upon the distance to which it might extend. The slave-traders had been obliged to seek another route, which they had found *viâ* the Bahr Giraffe, which river had proved to be merely a branch of the White Nile, as I had suggested in my former work, and not an independent river."

On Feb. 18 the fleet commenced to push its way against the strong current of the Bahr Giraffe, but had not made much progress when it was met by obstructions which had shut up the original channel; day after day was the river found to be choked up with a mass of vegetation—"sudd," Sir Samuel calls it—which with infinite labour had to be cleared away by all hands working with cutlasses and knives, to allow the vessel to pass through. The cutting through of this was dreadfully trying to the men; the poisonous effluvia permanently disabled many; it was, besides, a sore hindrance to the progress of the expedition. The end of it was that Sir Samuel was compelled to turn back and wait for a more favourable season when the river would be in stronger volume. The retreat was commenced on April 3. The distinguishing feature of the country at this part of the Bahr Giraffe is the innumerable hills of the white ant, rising to heights of 8 and 10 ft., and numerous herds of the antelope *Damalis senegalensis* are met with.

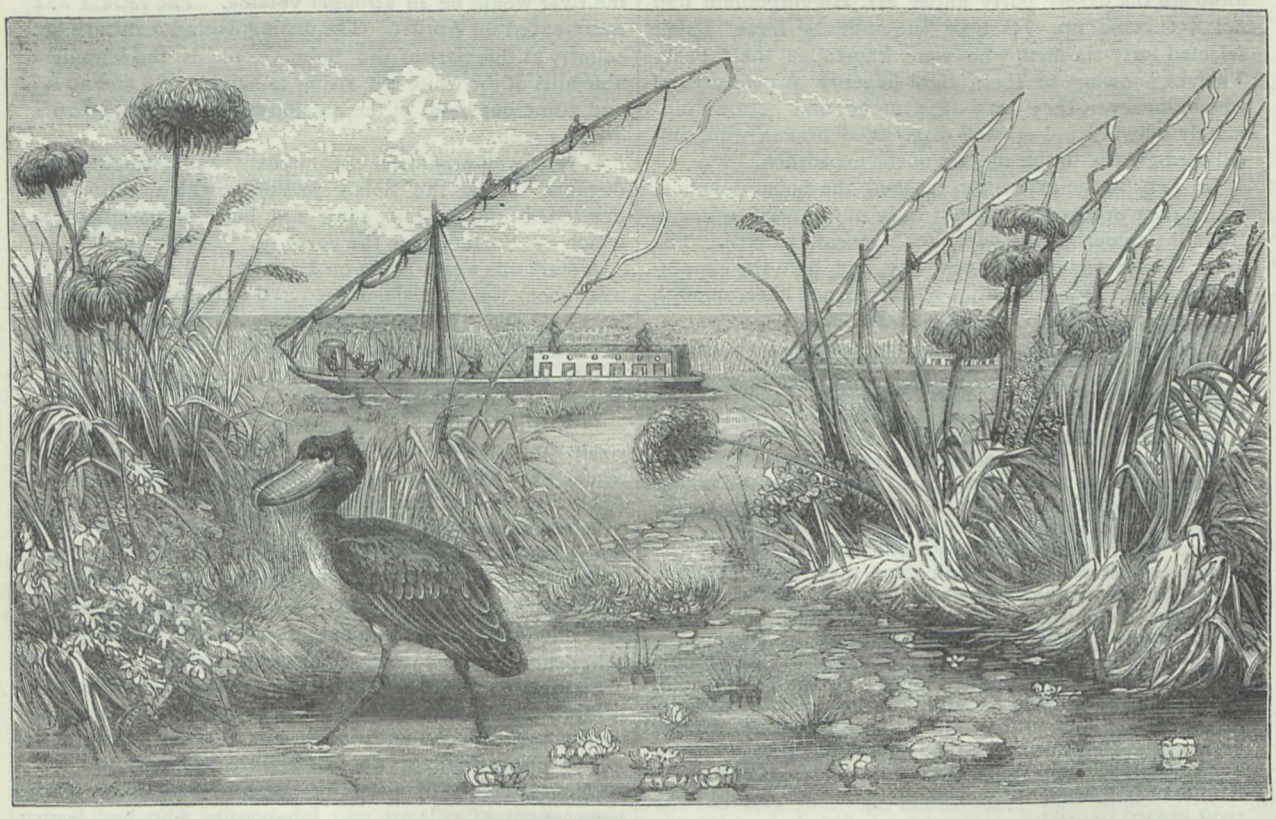
A very well-organised encampment was formed some distance below the Sobat junction, which ultimately developed into a pretty town and busy market-place, to which Sir Samuel gave the name of "Tewfikeeyah."

A start was again made on Dec. 11, and after scarcely less labour, which disheartened and told on the health of nearly everyone but Baker himself, who seems throughout to have had a charmed life, the broad bosom of the great White Nile was reached on March 11, 1871, and the fleet arrived at Gondokoro on April 15, having taken twenty months to do what on Sir Samuel's return journey was easily accomplished in three. The powers of Baker Pacha were by his commission to expire in four years from April 1869, so that he had now only two years in which to accomplish the great purpose of his mission. He had not, however, been idle on his route from Khartoum to Gondokoro, as by various means he had managed to inspire the slavehunters with a wholesome fear of himself, and had liberated several cargoes of slaves, to the great astonishment of the poor wretches themselves.

Sir Samuel found a great change in the river since his previous visit. The old channel was choked with sand-banks, new islands had been formed in many places, and it was impossible for the vessels to approach the old landing-place. The country around had, moreover, been swept of villages and inhabitants, who had been driven for refuge on the numerous low islands of the river. All that remained of the old mission station of the Austrian missionaries was an avenue of large lemon-trees. Sir Samuel landed a little below the site of Gondokoro, and lost no time in making himself and his companions as comfortable as circumstances would permit, forming a large encampment, and instituting an extensive system of cultivation. Indeed, wherever he went he attempted to instil a love of agriculture among the natives, as he did among his own people, giving away large quantities of seeds, accompanying the gifts with instruction as to the enormous benefits to be derived from cultivation. But his troubles multiplied upon him. He found the Baris, whose tribes occupy most of the district around his station, while professing the greatest friendliness, utterly hostile to the objects of the expedition; their minds had been

poisoned against him by the machinations of the demoniacal Abou Saood, the representative of the great slaving firm of Agād & Co. of Khartoum, who had obtained from the Governor-General of Soudan a monopoly of the trade of all the Upper Nile district, extending over an area of 90,000 square miles. The great majority of his own officers and men, moreover, he found to be hostile to the purpose of the expedition, some of them being even secretly in league with the slave-traders. It was only by the exercise of rigid discipline and almost superhuman patience that between the hostile and treacherous tribes around and the "foes of his own house," the whole expedition did not fall to pieces. He was at last compelled in self-defence to fight the native tribes, and one cannot but be struck with admiration at the skill with which he, with a handful of men—and the "Forty Thieves" were the only soldiers he could really depend upon—managed to keep his myriad enemies at bay. Happily he did ultimately succeed in convincing the natives that his intentions were earnest and disinterested, and before his return north he did succeed in thwarting the machinations of his great enemy Abou Saood, and clearing the country for many miles around his route of the slave-hunting brigands.

In January 1872 Sir Samuel started southwards with a small force of only about 200 officers and men; for the 1,200 with which he arrived at Gondokoro had by sickness, death, and desertion dwindled down to 500, 300 of



Arrival at the Stoppage—The *Balaeniceps rex*.

whom he had to leave behind him to garrison Gondokoro. Amid incredible difficulties, the small force reached Fatiko in the beginning of February. Fatiko is on the third parallel N., about seventy miles east of the head of the Albert N'yanza. After a short stay here, Sir Samuel, leaving half of his men behind, marched southwards to Unyoro, the capital of which, Masindi, he reached after disheartening delays and treacheries and equivocations on the part of the native chiefs, on April 25, 1872. The king of the district was Kabba Réga, a son of Baker's wily old friend Kamrasi. He turned out to be a treacherous, greedy, drunken, utterly irreclaimable "young cub," who under the influence of Abou Saood did his best to crumple up the small party which had entrusted themselves to his mercy. Sir Samuel at this, the southern limit of his journey, did his best to plant the seeds of civilisation and a healthy commerce, but we fear succeeded in making little impression on the besotted Kabba Réga, who in the end, we are glad to find, was beaten by his well-intentioned brother Rionga, with the assistance of Sir Samuel. Here the latter endeavoured to obtain news of and to communicate with Livingstone by means of emissaries from M'Tese's country and other districts to the southward; and here he obtained reports which tended to confirm his conjecture that the Albert N'yanza extends south to a great distance, and communicates with Tanganyika. Sir Samuel, in his map, has filled in many names of tribes between the two N'yanzas, and we hope that the result of his expedition will be the more thorough exploration of this interesting district.

At last the determined and cowardly hostility of Kabba Réga and the thousands at his command became so unmistakable and dangerous, that after exercising astonishing forbearance and withstanding bravely several attempts at destruction, the handful of men, having set fire to all their property and their pretty little station, started on their march back to Foweera, the headquarters of Rionga, on June 14, 1872. This march of about fifty miles, we are sure, is unparalleled in history. It was mostly through thick grass reaching far above the head, through a continuous ambuscade of thousands of savage enemies, who kept up an almost continuous shower of spears within a few yards on each side of the short line of weak, hungry, but courageous men, who, notwithstanding, managed to reach Foweera with comparatively little loss. The brave Lady Baker performed most of the journey on foot, and Sir Samuel in the end pays a just tribute to his noble wife, who in many ways showed herself the ever-watchful good genius of the expedition.

We have only space to say further that Gondokoro was reached on April 1, 1873, when Sir Samuel found that his Englishmen had built a beautiful little steamer, and that the engineer, Edwin Higginbotham, was dead. Arrangements having been made to maintain Gondokoro as a station, Sir Samuel started homeward in the new steamer *Khedive* on the 25th of May, and after a swift and easy passage, reached Khartoum on June 29 and Cairo on August 24. Here the Khedive received Sir Samuel and his companions with well-merited honours, although we regret to say that he seems to have been powerless to act with the uncompromising decisiveness necessary to complete what Sir Samuel had so well begun. The latter had rid nearly the whole of the district through which the expedition journeyed, of the iniquitous slave-hunters, and justly expected that an end would have been put to the wickedness of the inhuman Abou Saood. The final sentence of the narrative is almost crushing:—"After my departure from Egypt, Abou Saood was released and was appointed assistant to my successor." We can only hope that this may not turn out so disastrous as it seems, but that Colonel Gordon may succeed, in spite of this suspicious companionship, in completing the work which it cost Sir Samuel and his party so much trouble to initiate.

One shuts the book with but a low idea of the natives whom the courageous Englishman tried to benefit; it would seem as if they had no single characteristically human quality which could be appealed to and used as a basis on which to rear the virtues of civilisation; and one is very much inclined to believe with Sir Samuel that some modification of the method which he found so successful in training the "Forty Thieves" might be more likely to succeed in raising these Africans from their slough than any appeal to their moral natures.

LETTERS TO THE EDITOR

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

Endowment of Research

In the article on "Endowment of Research," in NATURE, vol. xi. p. 2, the following passage occurs:—

"It does not appear from the Report of the Commission that the Cambridge Colleges have yet taken any steps to appropriate definitely any portion of their endowments to the encouragement of scientific research; but it is a matter of common notoriety that at the October election to Fellowships at Trinity College, a candidate was successful whose chief qualification was that he had already accomplished good original work in embryological investigation."

Although it may not appear in the Report, it is nevertheless the fact, that in December 1872 the Master and Fellows of Trinity adopted a revised set of statutes, wherein are distinct provisions for the endowment of research, very like those commended in the case of New College, Oxford. The Privy Council has, however, deferred since January 1873 the consideration of these statutes, until the late Commission should have reported. This delay seems now all the more vexatious and unjustifiable, inasmuch as it appears from the Appendix to the Report, that changes of statutes were proposed at Oriel and New Colleges five months after the date of our proposal, and that these changes were ratified by the Privy Council within a few months in the ordinary manner.

If in the future the Government should desire to make any changes in this direction in the constitutions of the Colleges, it should be remembered to the credit of this College that two years ago a complete scheme was offered which made liberal provision for the endowment of research. It is due to external authority alone, that in the meanwhile vested interests have accrued, far heavier than any which would have arisen under the proposed statutes, and that nearly one-third of the University has been prevented from enjoying during the interval, statutes in accordance with the prevailing opinion inside, and certainly, as to scientific research, meeting with the approval of the outside world.

GEORGE DARWIN

Trinity College, Cambridge, Nov. 8

The University of London

In justice to the graduates of the University of London and to the Annual Committee of Convocation, I trust you will allow me to offer a few remarks with respect to Prof. Foster's opening address delivered at University College and published in your columns, vol. x. pp. 506 and 525.

Prof. Foster very justly complains that in the present regulations for the Matriculation Natural Philosophy Examination there is not "a tittle of internal evidence to show that they were drawn up in the present century," that there is a want of connection between the subjects required from candidates, and that the freedom of teachers in the instruction of their pupils is seriously interfered with, by the necessity of adapting lectures to the requirements of the examination.

None have shown themselves more sensible of the justice of these views than the graduates of the University; and, in a report which was drawn up by a sub-committee and adopted by Convocation, with reference to certain proposed modifications of the matriculation, the attention of the Senate was respectfully called to this portion of the examination. That report states: "Your committee are strongly of opinion that no revision of the matriculation examination would be satisfactory which did not effect some improvement in that part of it which relates to Natural Philosophy. In proposing the following alterations, their objects have been to adapt this examination to the courses of lectures and to the most approved text-books on Physics."

It will be seen from this extract that Convocation was desirous that the examination should be brought into harmony with the best methods of instruction, and that the greatest possible freedom should be left to teachers. It was further suggested that the subjects of examination should include Mechanics, Hydrostatics, Heat, and Light, and that the first only of these subjects should be compulsory.

In the new regulations issued by the Senate, which will come into operation in June 1875, some improvements in this examination have been effected. The antiquated syllabus of subjects has been retained, but the whole character of the examination has been modified. Heat has been introduced; and it has been resolved that in the Natural Philosophy paper double as many questions shall be set as are required to be answered, and that candidates shall be free to choose *any* of them up to the required number. This alteration will effect a great improvement on the old system, which encouraged superficial knowledge by requiring candidates to answer one question at least out of certain

groups into which they were divided. The independence of teachers will, by these new regulations, be greatly increased; for they will no longer be compelled to hurry as rapidly as possible over the elements of various branches of physics, but will be free to teach certain portions of the subject with greater thoroughness, and will secure at the same time for their pupils a better chance of passing. Thus, supposing the questions to be equally apportioned, a candidate fairly acquainted with the elements of mechanics only would have no difficulty in succeeding.

The examinations for the Science degree are at present under the consideration of the Senate, and we may hope, therefore, that before long many of Prof. Foster's grounds of complaint will have been removed.

London, Nov. 9 PHILIP MAGNUS

Gresham Lectures

IN NATURE, vol. xi. p. 2, appeared a very just and interesting article on the Gresham Lectures. I wish to endorse the opinion therein expressed of the misapplication of that institution.

Last Friday evening, at twenty minutes past seven, I entered Gresham College from curiosity. The two superb beadles to whom you allude were seated in the hall in all the glory of official gold lace. I walked into the lecture theatre, which to my surprise was more than half filled. A jerky lecturer in scarlet silk M.D. robes was unfolding the mysteries of sound. He was explaining that sound consisted of vibrations *like those of light*. He said that the lowest note appreciable to human ears was produced by 16, the highest by 24,000 vibrations per second. Prompted by his assistant (in whom I recognised the professor of chemistry at one of our metropolitan hospitals, and a talented lecturer), he said the velocity of sound was 1,125 feet per second, but did not allude to the variations in the same medium under different conditions of temperature and pressure. Light, he said, travelled 135,000 miles per second. He probably mistook an 8 for a 3 in the book from which he obtained his information. The velocity of sound in water, he said, had been determined by an English gentleman, who fixed a bell in a boat at one side of the Lake of Geneva and stayed on the other side himself; then he set the bell ringing by electricity, and plunged his head under the water at the same instant! This lucid explanation was received with all the seriousness with which it was delivered. He proceeded to explain the human voice, which he said resembled the harmonium; and he showed what he meant by the harmonium, namely, a small *harmonica*, or instrument in which plates of glass suspended on tapes are struck with a hammer consisting of a piece of cork on a whalebone. This information was also received with self-satisfied gullibility. Choking with indignation, I left the building, never having heard in all my life, either in sermon or lecture, so many false statements publicly uttered in the space of half an hour.

I am no physicist myself, but the fact that I have heard such men as Tyndall, and seen such experimenters as Frankland and Guthrie, probably accounts for my non-appreciation of the Gresham lecturer, who I understand is a classical scholar—*cela s'explique.* MAURICE LICHTENSTEIN

Clyde Wharf Sugar Refinery, Nov. 8

Insects and Colour in Flowers

THE true Darwinian answer to my letter in NATURE, vol. x. p. 503, has been fairly given by Mr. Boulger and Mr. Comber (vol. x. p. 520); but if that answer had appeared to me to be sufficient, the letter would not have been written.

Mr. Boulger correctly attributes to me the opinion that the development of beauty is an "object in nature." He thinks it a fallacious opinion: so I suppose does Mr. Darwin. I hold that opinion advisedly, however, and believe that the rejection of it is a constant source of error in Mr. Darwin's books, for which otherwise I have the profoundest respect and admiration.

I do not dispute that colour may be attractive to insects, or that the reproduction of plants may be assisted by it; but I reject the doctrine that the colour would have no *raison d'être* if insects were exterminated, and I believe that Mr. Darwin's theories upon this point are not sufficient to explain his own facts, or such other facts as are revealed by Mr. Comber's curious researches into the dispersion of coloured flowers.

I do not see any reason to doubt that if all flowering plants had been propagated by buds and stolons only, as some plants practically are, the world at this epoch would still have known the beauty of flowers, although probably with less variety of form and colour. It is part of the natural development of the wave of life, as sure to be produced when the total conditions are ripe for it, as leaves in the spring, or as lycopods in the coal-age and conifers in the oolite.

The law of natural selection expresses truly enough the interaction of forces in the great heaving life-sea, but the forces are not increased or diminished by it, only modified in their lines of motion, the course made clear for one and obstructed for another: here a union of similars, and there a neutralisation of opposites; while each works out a destiny of its own as an individual wave, and shares the common destiny of some larger wave of which it is a constituent part.

What insects do in relation to the colour of flowers is to modify the conditions, so that the force, which has already begun to show its tendency to develop colour, may get freer play, and in each generation approach nearer to its climax.

The many instances in which colour is developed independently of insects seem to me to show quite conclusively that the colour-producing force which exists in the plant will break through all obstructions whenever the opportunity is presented. Sometimes increased richness of soil will furnish the necessary condition; sometimes a higher temperature; sometimes cross-fertilisation; sometimes the care and selection of man.

This law holds good throughout the organic world, and accounts for colour wherever it is found. The Darwinian doctrine of mere utilitarianism is driven to the strangest devices in its attempts to do the same thing.

Mr. Boulger speaks of the development of corolla at the expense of stamens as a "degradation of organs," and regards it in the light of a disease. Many botanists would agree with him, no doubt. But where is the proof of this? Is a plant produced for the mere purpose of *re*-production? Is that even its highest purpose? Whatever *beauty* may be, the reproductive process is assuredly a means, and not an end.

There is some ground for the hypothesis that the flower of a plant represents its nervous centre, that it is the analogue, perhaps even the homologue, of the brain and countenance of the higher animals. In vegetables the reproductive organs are associated with this nervous centre. But they are not so placed in animals, and if they had been otherwise arranged in vegetables the blossom might still have been the crowning beauty of the plant.

I do not admit that the metamorphosis of stamens into corolla is a degradation at all. I am not sure whether the production of perfectly double and perfectly barren flowers ought not to be regarded as the final goal of every species of plant—the point at which reproduction becomes no longer necessary, because the life-wave of that species has reached its climax and needs no further to be carried forward from generation to generation.

Finally, the point at issue amounts to this: Is colour in flowers a mere expedient for getting them cross-fertilised? or is it a natural and necessary phase in the development of plant-life, which serves also the secondary purpose of securing the advantage of cross-fertilisation; as the brain of man, which is primarily the great organ of thought and sentiment, serves also the secondary purpose of selecting wholesome food?

I hold to the latter view, which includes and accounts for all that the other does, and much besides. F. T. MOTT

Leicester

LORD RAYLEIGH, in NATURE, vol. xi. p. 6, questions whether the colour-sensations of insects are analogous to ours. As tending to illustrate this subject, let me quote the following paragraph from the scientific column of the *Illustrated News* of April 2, 1870, p. 362:—

"The spectrum of the light of the firefly has been examined, and it is found to be perfectly continuous, without traces of lines either bright or dark. It extends from about the line C in the scarlet to F in the blue, and is composed of rays which act powerfully on the eye, but produce little thermal or actinic effect. In other words, the fly, in producing its light, wastes but little of its power."

This, it is true, tells nothing as to the colour-sensations of the insect, but it appears to show that the same rays are luminous to its eyes which are luminous to ours.

JOSEPH JOHN MURPHY

Old Forge, Dunmurry, Co. Antrim, Nov. 8

Locomotion of Medusidæ

I DO not think that the following remarkable observation has hitherto been made—or at least recorded—by anyone; but as I am at present deprived of access to books, it is possible that I may be mistaken upon this point. It will be observed that it tends experimentally to confirm the opinion of Agassiz, M'Crady, and Fritz Müller, as to the presence of ganglionic centres in the situations they describe.

Slabberia conica is, as its specific name implies, a medusid of a conical form, and its size is about that of a fully-developed acorn. Its polypite, which is of unusual proportional length, is highly contractile; and its swimming-bell (*nectocalyx*) supports four short slender tentacles, which are likewise highly contractile. These tentacles take their respective origins from four minute vesicular-like bodies (*marginal vesicles*), which are so situated in the margin of the nectocalyx as to mark off this circular margin into four exact quadrants. If any one of these vesicular-like bodies be excised, immediate and total paralysis ensues in the segment of the cone in which it is situated; *i.e.*, a fourth part of the entire animal ceases to contract. If two adjacent vesicles are excised, one half of the entire animal becomes paralysed, the loss of motion being quite as decided, and the area of its occurrence quite as well defined, as in the case of hemi-section of the spinal cord. If two opposite vesicles are removed, cross paralysis results; if three of these bodies are cut out, only one quarter of the cone continues to contract; and lastly, if they are all taken away, every vestige of contractility immediately disappears, not only in the nectocalyx, but also in the polypite. Now, as the bodies in question are not so large as are the dots over the letter "i" in this printed description, the extreme localisation of stimulating influence thus shown to exist cannot but be deemed a highly remarkable fact, more especially as no amount of mechanical or chemical irritation will cause the slightest contraction in any part of the animal subsequent to the removal of these four almost microscopical points; while, contrariwise, so long as any portion of tissue (no matter how small) is left united to one of these points, it will continue its rhythmical movements for an indefinite period of time. Thus, for example, when a section is made through the equator of the animal, while the upper half at once ceases to move, the lower half—now converted into an open ring—continues its contractile motions for days with unimpaired energy, notwithstanding the thus mutilated organism is, of course, unable to progress.

It is well known that when the entire margin of the nectocalyx of a medusid is removed, the contractility of the remairing portion is destroyed. This fact is usually explained by supposing that the severance of all the contractile fibres produces what may be called mechanical paralysis, just as a man could not move his arm if all its muscles were divided. Experiments I have made on other species of *Medusidæ* have led me to doubt the truth of this explanation—at all events as the whole explanation; but it is unnecessary to detail these at present. The instance above given is enough to show that in the case of this species, at any rate, such an explanation is clearly insufficient, and my object in now writing is to request that if any of your readers are acquainted with observations (whether published or not) similar to those described, they should kindly let me know, either through your columns, or by writing to Gonville and Caius College, Cambridge.

GEORGE J. ROMANES

Dunskaith, Ross-shire

Suicide of a Scorpion

I SHALL feel obliged if you will record in NATURE a fact with reference to the common Black Scorpion of Southern India, which was observed by me some years ago in Madras.

One morning a servant brought to me a very large specimen of this scorpion, which, having stayed out too long in its nocturnal rambles, had apparently got bewildered at daybreak, and been unable to find its way home. To keep it safe, the creature was at once put into a glazed entomological case. Having a few leisure minutes in the course of the forenoon, I thought I would see how my prisoner was getting on, and to have a better view of it the case was placed in a window, in the rays of a hot sun. The light and heat seemed to irritate it very much, and this recalled to my mind a story which I had read somewhere, that a scorpion, on being surrounded with fire, had committed suicide. I hesitated about subjecting my *pet* to such a terrible ordeal, but taking a common botanical lens, I focused the rays of the sun on its back. The moment this was done it began to run hurriedly about the case, hissing and *spitting* in a very fierce way. This experiment was repeated some four or five times with like results, but on trying it once again, the scorpion turned up its tail and plunged the sting, quick as lightning, into its own back. The infliction of the wound was followed by a sudden escape of fluid, and a friend standing by me called out, "See, it has stung itself; it is dead;" and sure enough in less than half a minute life was quite extinct. I have written this brief notice to show (1) That animals may commit suicide; (2) That the poison of certain animals may be destructive to themselves.

Bridge of Allan, N.B., Oct. 23 G. BIDIE

THE AMÚ EXPEDITION

WE give some extracts from a letter relating to the hydraulics of the Amú, sent us by an English engineer who was with the expedition; the letter is dated "Nukus, at the head of Amú delta, Sept. 10, 1874:"—

The expedition only arrived in the delta at the end of June; it is impossible, therefore, to say at what date the first spring flood of the river takes place, but probably between the 1st and 15th of May. The level of the river on June 23 was what may be called a low-level full river: it fell about twelve centimetres till June 29, and then rose rapidly till July 11, when it was 145 centimetres above the level of June 23. It then fell fifty centimetres up to July 17, and rose again to nearly the previous height on Aug. 4. Since that date the river has fallen steadily, and is to-day some fifty centimetres below the level of June 23. I judge the heights of July 11 and Aug. 4 to be the extreme flood level of the Amú. At that flood level, the discharge at Toyu-boyin, "The Camel's Neck," 160 miles above the head of the delta, cannot be far short of 140,000 cubic feet per second. It is difficult to say what the low-water discharge is, but I should think it is at least 70,000 cubic feet per second.* On Aug. 25, by a rough observation, it was 110,000 cubic feet a second, the river then being 25 centimetres above the level of June 23. At Toyu-boyin the river has cut its way through a bed of shelly limestone of the age of the chalk. The limestone is very compact and hard, full of small shells, turritella and bivalves. Here the river is 1,000 ft. broad. The height to which the limestone bed has been tilted is about 25 ft. The river expands in breath immediately afterwards to 2,000 ft. or more, for about five miles; it then begins to contract again, having on its left a high bank of hard clay passing almost into an argillaceous schist. This high bank extends for above five miles, and ends in an eminence of 50 or 60 ft. in height, crowned with sand. From Toyu-boyin downwards on the right bank, are ridges (of clay, I imagine) crowned with sand: no cultivation on that bank, but opposite and downwards from Toyu-boyin irrigation canals are taken off, excepting where the high clay bank occurs. At the eminence spoken of the river immediately widens to 5,000 ft. or so; this is caused by the first *large* irrigation canal Polwán. As these canals have a great effect on the river all the way down to the delta, I will here try and explain my theory on the subject. As the Amú runs in a soft soil from the south to north nearly in the direction of the meridian, I imagine what the Russians call the law of Bär (from his observations on the Volga) comes into action. The stream has therefore the tendency to run along the right bank, and, as a matter of fact, the deep-water channel is there found. If, then, an irrigation canal be opened on the left bank, the stream is disturbed and a subsidiary deep channel is formed towards the head of the canal (Fig. 1.) The head of the canal is only open during flood, say half the year. When it is shut, the river will run as in Fig. 2: silt will be found at the shaded parts. The river by Bär's law will edge away to the right and become broader, and if this process is continued

* Perhaps this is too high—I cannot make out from Wood's "Oxus" more than 45,000 cubic feet or so per second for winter discharge.

year after year, the river bed is filled with islands. The deep-water channel is generally found on the right bank, but of course circumstances occasionally cause it to pass between two islands. Figs. 3 and 4 are two rough cross sections of the river.

In the latter case the river has a breadth between its banks, sometimes from 5,000 ft. to 8,000 ft., especially opposite New Urgens and Shah Abbas Wali. The state of matters described has the effect of turning the river into a series of large pools, connected by short portions of stream; and this again probably has the effect of causing irregular floods in the river; for as the quantity of water decreases and the velocity also decreases, silt is deposited and a *quasi* natural dam (Fig. 5) is formed, until

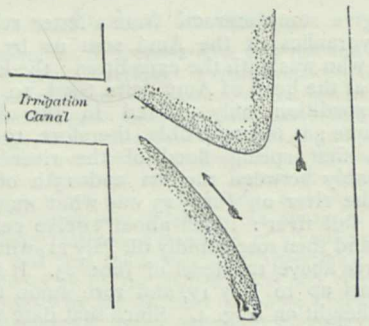


FIG. 1.

such time as sufficient water has been dammed up to burst through and sweep away this silt dam. Of the 140,000 cubic feet of flood-discharge, it is probable that the irrigation canals take, at most, 30,000 cubic feet per second; so that at Khodjeili, the head of the delta, say of a high flood, 110,000 cubic feet arrive. Of this quantity, 30,000 cubic feet flow by Kuwar Jerma, 30,000 by Chertambye, 20,000 by the next two branches, and the balance by Taldik. But of the whole quantity not more probably than 60,000 cubic feet at the most reaches Aral. The remainder floods the delta and Abougir.* Of the winter discharge, I should suppose not more than 40,000 cubic feet passes Khodjeili. I cannot account for the difference, unless it is ponded up in the upper reaches of the river. The irrigation canals are closed in winter. About 12,000 pass along Kuwar Jerma, and the same quantity along Chertambye. The rest passes mostly along Taldik; not more than 1,000 cubic feet a second passes along Ulkun Darya from Kungrat. In winter there is ice to a thickness of 15″ on the

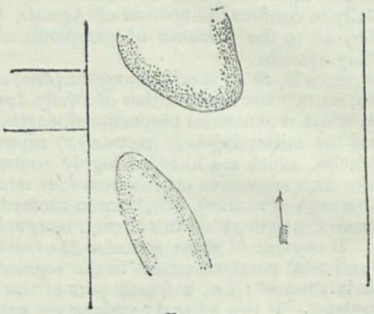


FIG. 2.

river, but certainly not everywhere; there is a thaw generally about the end of January, then a second severe winter in February. In the sketch (Fig. 6), 1, 2, 3, 4 are old branches of the river which flowed into the Caspian * at different times; 5 is an old bed which met a branch from Syr, on the east of Aral. These combined waters probably formed the delta Herodotus speaks of; but I am going to take a look at this during my ride across the steppe to Fort Peroffsky. The river, I believe,

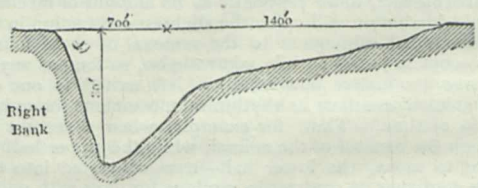


FIG. 3.—Ordinary Section—no irrigation canals.

will naturally flow to the Caspian if it is allowed to do so; but the questions concerned are too large to be more than alluded to here. The Russian idea, following Humboldt, is that the whole country east of the Caspian has been upheaved, and that this has

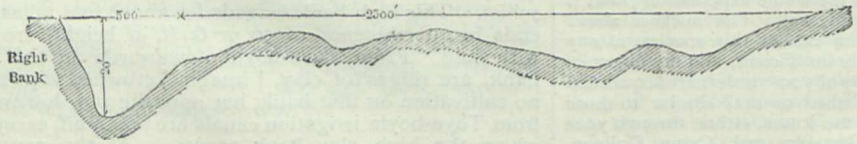


FIG. 4.—Ordinary Section, with irrigation canals.

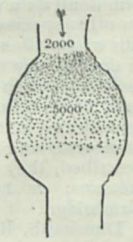


FIG. 5.

changed the course of the river. M. Barbot de Morny has recently examined the Usturt plateau, and, as far as I can gather, confidently asserts that Usturt has never been upheaved at all, but that it formerly formed an island in the united Caspian and Aral. As regards the eminences in the delta, and the ridge of Bish'yabye, which is a continuation of Shaikjaili to the north, along the right bank of the river, he also says that there is not the least trace of any geological action having taken place in recent or historic times, so that it seems probable that here is an additional laurel for Lyell, plucked from the brow of Humboldt. If, therefore, the river will flow naturally to the Caspian, what Russia must do is to take, say, two-thirds of the Amú water for a canal to the Caspian, running west from Toyu-boyin, for irrigating the country as well as for forming a line of water communication. The remaining third she must project along the old bed No. 5, or somewhere in that direction, to meet a branch from Peroffsky on the Syr. The water for this branch from Peroffsky must be obtained by reclaiming the swampy district of Karaouzak. This swamp was formed by the river breaking into an irrigation canal taken from the right bank. The water feeding the swamp is that which formerly fed the Djani Darya flowing south-west from Peroffsky towards the point where I suppose the old delta mentioned by Herodotus to have been.

I can tell you nothing about Shaikjaili, as I could

* And is used in irrigation near Kungrat. In my opinion the level of the Aral is rising, but others say not.

* There is an old bed running due west to the Caspian from a point a little north of Tchardjui. A Russian officer, who spent many years between the Caspian and that place, is my informant. The river must have flowed in it before Arrian's day.

not find an opportunity of going there. However, M. Barbot de Morny is at the present moment on a visit to those hills. They are supposed to be of the same formation as the country adjacent to a place called, I think, Beresoff, in Siberia, where gold is found; perhaps this is the key to the problem of the Russian annexation of the Amú Darya district, which does not cost them less than 100,000*l.* per annum.

In Khiva, all along the left bank, and between Petro Alexandros'kiya and Shah Abbas Wali on the right bank (Russian), there is a good deal of cultivation. Trees are cultivated all along the irrigation canals: willows, aspens, mulberries, planes, black poplars, apple-trees, peaches, &c., fruit of all kinds in great variety, and very good. Crops are maize, wheat, barley, cotton, madder, tobacco, poppy, lucerne, sesamum, &c. Everything is irrigated and raised with great labour. The islands in the river are grazed, the banks and islands are covered with the tall reedy grass (*Lasiagrostis splendens*), tamarisk, dwarf willow (*Elæagnus* * *hortensis*), an acacia, called, I think, *Halimodendron*, and a creeper. The sandy tracts on the right bank have a sparse vegetation of *Lycium*, *Halostachys*, and *Aristida pennata*. I do not think much of any consequence has been done in the botanical way. I found on an island in the central delta a fern which must have had its origin in some distant glen of the north slope of the Hindoo Koosh. M. Smyrnoff, the botanist of Kazan University, found a specimen of Sak Saul further to the south than it was supposed to grow. The flooded parts of the delta and the islands have a dense growth of *Arundo phragmitis* and *Typha;* the Arundo grows to a height of 20 ft. or so, in places.

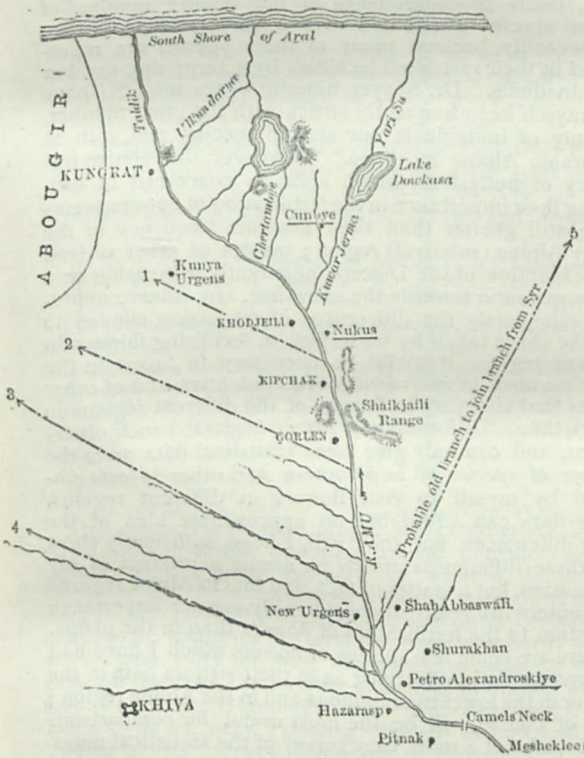


FIG. 6.

* *Elæagnus* is cultivated, and the fruit is probably the *Ponticum* of Herodotus. Yule says Baker mentions incidentally the palm as growing on the banks of the Oxus. I have not Baker to refer to, but it would be interesting to know what word he uses; it is probable that he uses some word equivalent to *date*, and I cannot help thinking he means *Elæagnus*, the fruit of which is like a date. I have some fruit preserved in spirit—for Sir H. Rawlinson if he would like it. Curiously enough, the Russians call *Elæagnus, pheneke*, i.e. date, instead of its proper name, *Jidda*.

As to the name of the river Oxus, is it settled what was the meaning of this word? The legend on the map attached to the Grand Charter, compiled 1584–1598 A.D., translated by the Russian historian Karemzin, says: "And 170 versts (old versts of 700 sag.) from Bokhara, from Lake Oguz (which is *ox* in our language), flows a river towards Khoralim (Caspian)." Here Lake Victoria is Lake Oguz—*Lake of the Ox*. Yule, in his Oxus Essay, has a note, p. lxxxvi.: "It is worthy of notice that what has been regarded as a Yak, figured on the obelisk" (I suppose the one in the British Museum—the black obelisk) "of Nimroud is described in the accompanying inscription as Alap-Nahr-Sakiya, the ox of the river Sakiya, a title which may probably characterise the Upper Oxus, rising among the hills of the *Sakiya* or *Sacæ*." Did the name of the river come, then, from the Yak, which may have existed in Pamir, and is a sufficiently interesting animal to give its name to a stream it frequented? *Vide* note on p. lxiv. of Yule's Oxus Essay.

Cimbye, Mikus, and Petro Alexandroskiya are the three Russian posts or camps in the Amú Darya district.

By the way, I forgot to mention that in the high ground of the delta I found beds of conglomerate, formed of bivalve shells chiefly with sharks' teeth, cemented together in the vein. Thin beds of sandstone also occur in the masses of sedimentary clay of which these hills and the Bish'yabye ridges are formed. At Bish'yabye I found very large ammonites (18″ diam.) and similar univalves, as well as large bivalves. The crests of these hills and ridges are generally crowned with a shallow bed of ferruginous sandstones, the fragments of which strew the flanks and feet of the elevations. Selenite occurs in great quantity and in large pieces, in the clay.

I think I have sent you pretty nearly all of any interest. I have written this letter in a great hurry, as I am just about starting for my trip across the steppe to Peroffsky, along the old course of the Djani Darya.

I look upon the canalisation of the Amú (somewhat in the way before suggested) as capital for the canalisation of Central Asia. It is a scheme which will certainly cost money, but the beneficial results will be so enormous to Russia herself, that I think it is all but certain to be entered on sooner or later. The climate is superb.

MEMORIAL TO JEREMIAH HORROCKS

IN reply to the petition recently published in NATURE, the Dean and Chapter of Westminster have signified their willingness to permit the erection of a tablet within the Abbey, and in consideration of the very exceptional circumstances of the case, have reduced the fee ordinarily payable to the Chapter to the sum of 25*l.*

A subscription, which it has been thought well to restrict to the sum of one guinea for each subscriber, has been set on foot to defray the expenses incidental to the erection of the tablet and the fee of the Chapter.

Should there be any surplus, it is proposed to invest it in the names of trustees, and to devote the interest to the purchase of books to be deposited in the library of the Royal Astronomical Society, the fund to be called "The Horrocks Library Fund."

Subscriptions have already been received from—

	£	s.	d.
J. Couch Adams, Esq., M.A., F.R.S., Lowndean Prof. of Astronomy in the University of Cambridge, President of the Royal Astronomical Society	1	1	0
Sir George Biddell Airy, K.C.B., V.P.R.S., &c., Astronomer Royal	1	1	0
The Hon. Mrs. Henry Arundell	1	1	0
J. B.	1	1	0
The Rev. A. Brickel, B.A., Rector of Hoole	1	1	0
W. H. M. Christie, Esq., M.A., &c., First Assistant at the Royal Observatory, Greenwich	1	1	0
The Baroness Burdett Coutts	1	1	0
Warren De la Rue, Esq., D.C.L., F.R.S., &c.	1	1	0
The Duke of Devonshire, Chancellor of the University of Cambridge, F.R.S., &c. &c.	1	1	0
Edwin Dunkin, Esq, Secretary of the Royal Astronomical Society	1	1	0
Kenedy Esdaile, Esq., J.P., M.A., F.R.A.S.	1	1	0
Prof. Gladstone, Ph.D., F.R.S., &c.	1	1	0
Robert Grant, Esq., LL.D., F.R.S., Regius Professor of Astronomy in the University of Glasgow, &c.	1	1	0

Edward Hermon, Esq., M.P. for Preston	£1	1	0
Capt. J. Herschel, F.R.S., &c.	1	1	0
The Parish of Hoole	5	5	0
The Right Hon. Lord Houghton, F.R.S., &c.	1	1	0
William Huggins, Esq., D.C.L., LL.D., F.R.S., Foreign Secretary of the Royal Astronomical Society	1	1	0
Sir J. Kay-Shuttleworth, Bart.	1	1	0
William Lassell, Esq., F.R.S., &c.	1	1	0
Lord Lindsay, M.P., &c.	1	1	0
J. Norman Lockyer, Esq., F.R.S., &c.	1	1	0
The Right Rev. the Bishop of Manchester	1	1	0
Mrs. Charles Orme	1	1	0
Mrs. G. M. Patmore	1	1	0
William Pollard, Esq.	1	1	0
The Rev. Charles Pritchard, M.A., F.R.S., Savilian Professor of Astronomy in the University of Oxford	1	1	0
Richard A. Proctor, Esq., B.A., &c. &c.	1	1	0
A. Cowper Ranyard, Esq., M.A., Secretary to the Royal Astronomical Society	1	1	0
The Earl of Rosse, F.R.S., &c. &c.	1	1	0
Henry J. S. Smith, Esq., M.A., F.R.S., Savilian Professor of Geometry in the University of Oxford	1	1	0
F. Styles, Esq.	1	1	0

General Treasurer—Prof. ADAMS, the Observatory, Cambridge.

The Rev. R. Brickel, the Rectory, Hoole, Preston, Lancashire; Prof. Grant, the Observatory, Glasgow; Mrs. G. M. Patmore, 81, Avenue Road, N.W.; and A. Cowper Ranyard, Esq., 25, Old Square, Lincoln's Inn, W.C., have kindly promised to receive and acknowledge subscriptions.

FERTILISATION OF FLOWERS BY INSECTS *

VII.

Butterflies the most frequent visitors of Alpine flowers.

IN the following article I wish to recommend for further inquiry a subject of peculiar interest which, in the environs of the Ortler, in Tyrol, forced itself on my attention last summer, but which, during my short stay in the Alps (8—25 July), I had not time to investigate so thoroughly as it deserves. Whilst occupied, along with my son, in observing the Alpine flowers and their fertilisation by insects, we were struck with the very small number of Apidæ met with in higher Alpine (subnival) localities, and with the predominant part which butterflies play in this region in relation to the fertilisation of flowers. In the environs of "Piz Umbrail" and "Quarta Cantoniera," 3,000—2,400 metres above the sea-level, we observed only four humble bees, and not a single individual of any other genus of Apidæ during a sojourn of five days, and in spite of very fine weather, whilst numerous Coleoptera (Dasytes, Anthobium, Anthophagus), many Diptera (especially Muscidæ and Syrphidæ), and very numerous specimens of some species of Lepidoptera were found in the flowers of this region.† Between 2,400 and 2,100 metres (descending towards Bormio and in the environs of Franzenshöh and Trafoi) the number and variety of Apidæ, other Hymenoptera, Coleoptera, and Diptera proved to be much greater; but, at the same time, the number and variety of Lepidoptera increased to such a degree that this order of insects was in unmistakable preponderance also in this region.‡ In the plain, near Lippstadt, on the contrary, and in the lower mountainous region of Sauerland, Thuringia, and Fichtelgebirge, Diptera, but more especially Apidæ, are the most frequent visitors of flowers, although in the latter region a considerable increase in the proportion of Lepidoptera may be remarked.

Consulting our highest authority on the geographical distribution of butterflies in Germany and Switzerland, Dr. Speyer, of Rhoden, I heard that the fact alluded to would be in direct opposition to the general distribution of the species of Lepidoptera in altitude, the number continually decreasing from the lower mountainous to the higher Alpine (subnival) region; only the plain, as it seems, being somewhat poorer. This contradiction, however, may be, and, as I am convinced, from my observations, is, only an apparent one; for, notwithstanding the smaller number of species, the absolute frequency of Lepidopterous individuals, and perhaps also of species, is considerably greater in favourable Alpine localities than in equally large tracts of the lower mountains and of the plain, firstly in consequence of the smaller number of Alpine species distributed over a very restricted area; and secondly, because many of these species are represented in their restricted localities by a surprising number of individuals. Dr. Speyer himself writes me: "I have also myself been frequently struck with the great number, not only of individuals, but also of species, met with in favourable Alpine localities." Moreover, the relative frequency of butterflies, which alone is concerned in estimating their importance in the fertilisation of flowers, seems to be still greater than their absolute frequency in the higher Alpine (subnival) region; insects of other orders, with exception of the Diptera, apparently decreasing in a still larger ratio towards the snow-line. In order to appreciate adequately the differences of frequency alluded to and the share taken by butterflies in fertilising flowers in different regions, it would be necessary to ascertain the exact number of *individuals* of Lepidoptera and of other insects that visit certain flowers of the different regions in a given time. Unfortunately I have neglected such observations, and can only give some statistical data as to the number of *species* of Lepidoptera and other insects observed by myself to visit flowers in different regions. These data can afford but an approximate idea of the above differences, but they will, I hope, sufficiently show that these differences are by no means a product of my imagination, but a matter of fact, and that in Alpine regions Lepidoptera are really of considerably greater importance in relation to the fertilisation of flowers than in the plains.

There are some few species of flowers which I have had the opportunity of observing as to their visitors both in the plain or in the lower mountainous and in the Alpine region; these, of course, will be the most useful for comparison. For the sake of a more easy survey of the statistical notes I shall make use of the following abbreviations: *a* = in the plain, near Lippstadt; *b* = in the lower mountainous region of Sauerland, Thuringia, Fichtelgebirge; *c* = in the Alpine region, near Trafoi, Franzenshöh, Quarta Cantoniera; *Ap.* = Apidæ; *Lep.* = Lepidoptera; *O.I.* = other insects.

The following is a list of the visitors to different plants, so far as I have observed.

1. *Helianthemum vulgare* :—

b.	Ap.	5,	Lep.	1,	O.I.	16	species;	Ap.	23,	Lep.* 5,	O.I. 72 per cent.
c.†	,,	1,	,,	7,	,,	3	,,	,,	9,	,, 64,	,, 27 ,,

2. *Lotus corniculatus* :—

a.	Ap.	19,	Lep.	5,	O.I.	2	species;	Ap.	73,	Lep. 19,	O.I. 8 per cent.
b.	,,	17,	,,	7,	,,	2	,,	,,	65,	,, 27,	,, 8 ,,
c.	,,	2,	,,	4,	,,	0	,,	,,	33,	,, 66,	,, 0 ,,

3. *Prunella vulgaris* :—

a.	Ap.	8,	Lep.	4,	O.I.	0	species;	Ap.	66,	Lep. 33,	O.I. 0 per cent.
b.	,,	4,	,,	2,	,,	0	,,	,,	66,	,, 33,	,, 0 ,,
c.	,,	1,	,,	4,	,,	1	,,	,,	17,	,, 67,	,, 17 ,,

* Continued from vol. x. p. 130.

† Rhopalocera: *Pieris callidice* Esp., *Lycæna orbitulus* Prunn., *L. semiargus* Rott., *Melitæa merope* Prunn., *M. parthenie* Bkh. var. varia. M.D., *Argynnis pales* W.V., *Erebia tyndarus* Esp. Geometræ: *Psodos alpinata* Scop., *Pygmæna fusca* Thbg. Crambina: *Hercyna schrankiana* Hoch. (*Holosericalis* H.), *H. phrygialis* H., *H. rupestralis* H., *Crambus luctiferellus* H.—according to Dr. Speyer's determination.

‡ We found here Rhopalocera 33, Sphingidæ 4, Bombyces 5, Noctuæ 3, Geometræ 3, Crambina 6, Tineina 2, Pterophorina 1, altogether 57 species of Lepidoptera visiting flowers.

* It should be noticed that as the flowers of *Helianthemum vulgare* do not secrete honey, Lepidoptera must either obtain a little of the juices of the flowers by boring, or are altogether deceived.

† In the Alpine region my observations have been made on the *var.* grandiflorum.

4. *Thymus serpyllum* :—

a. Ap. 7, Lep. 5, O.I. 17 species ; Ap. 24, Lep. 17, O.I. 58 per cent.
b. ,, 5, ,, 17, ,, 23 ,, ,, 11, ,, 38, ,, 51 ,,
c. ,, 2, ,, 17, ,, 0 ,, ,, 10, ,, 89, ,, 0 ,,

5. *Taraxacum officinale* :—

a. Ap. 58, Lep. 7, O.I. 28 species ; Ap. 62, Lep. 7, O.I. 30 per cent.
c. ,, 0, ,, 2, ,, 1 ,, ,, 0, ,, 66, ,, 33 ,,

6. *Valeriana officinalis* :—

a. Ap. 3, Lep. 0, O.I. 19 species ; Ap 14, Lep. 0, O.I. 86 per cent.
c. ,, 3, ,, 2, ,, 2 ,, ,, 43, ,, 28, ,, 28 ,,

All these species show evidently the predominant part which Lepidoptera play as visitors of flowers in the Alpine region. The same result is arrived at by comparing sister-species or sister-genera of flowers, provided with nearly the same contrivances and growing one or some of them in the Alpine region, another or some others in the lower mountainous region, or in the plain.

7. *Geranium pratense* (a, b), and *sylvaticum* (c) :—

a. Ap. 9, Lep. 0, O.I. 1 species ; Ap. 90, Lep. 0, O.I. 10 per cent.
b. ,, 13, ,, 1, ,, 3 ,, ,, 76, ,, 6, ,, 18 ,,
c. ,, 3, ,, 8, ,, 3 ,, ,, 21, ,, 57, ,, 21 ,,

8. *Veronica chamædrys* (a), and *saxatilis* (c) :—

a. Ap. 5, Lep. 1, O.I. 7 species ; Ap. 38, Lep. 8, O.I. 54 per cent.
c. ,, 0, ,, 4, ,, 3 ,, ,, 0, ,, 57, ,, 43 ,,

9. *Jasione montana* (a), and *Phyteuma michelii* (c) :—

a. Ap. 47, Lep. 7, O.I. 47 species ; Ap. 47, Lep. 7, O.I. 47 per cent.
c. ,, 7, ,, 13, ,, 4 ,, ,, 29, ,, 54, ,, 16 ,,

10. *Carduus crispus* (a), *acanthoides* (b), and *defloratus* (c) :—

a. Ap. 9, Lep. 3, O.I. 3 species ; Ap. 60, Lep. 20, O.I. 20 per cent.
b. ,, 32, ,, 5, ,, 9 ,, ,, 70, ,, 11, ,, 19 ,,
c. ,, 4, ,, 8, ,, 7 ,, ,, 21, ,, 42, ,, 37 ,,

11. *Chrysanthemum leucanthemum* (a), *corymbosum* (b), and *alpinum* (c) :—

a. Ap. 12, Lep. 8, O.I. 49 species ; Ap. 17, Lep. 12, O.I. 71 per cent.
b. ,, 3, ,, 3, ,, 18 ,, ,, 12½, ,, 12½, ,, 75 ,,
c. ,, 0, ,, 4, ,, 5 ,, ,, 0, ,, 44, ,, 55 ,,

12. *Senecio Jacobæa* (a), *nemorensis* (b), *abrotanifolius*, *Doronicum* and *nebrodensis* (c) :—

a. Ap. 15, Lep. 2. O.I. 19 species ; Ap. 42, Lep. 5, O.I 53 per cent.
b. ,, 7, ,, 8, ,, 2 ,, ,, 41, ,, 47, ,, 12 ,,
c. ,, 1, ,, 20, ,, 14 ,, ,, 3, ,, 57, ,, 40 ,,

The predominant part played by Lepidoptera in the Alpine region would doubtless appear considerably less striking if the more southern or eastern districts of Germany had been compared with the Alps ; for, according to Dr. Speyer,* the number of species of Lepidoptera continually increases in Germany from the north southwards, and from the west eastwards, to such an extent that, for instance, the number of species of diurnal butterflies (Rhopalocera) amounts, near Hamburg, to 72, near Dantzig to 89, near Freiburg (Baden) to 100, and near Vienna to 130. Hence Lippstadt, in consequence of its north-west situation, ranges among the poorest localities of Germany with respect to butterflies ; and the environs of Vienna would possibly have afforded nearly double the number of Lepidoptera as visitors of the above-named flowers. But if even in *a* and *b* of the above statistical notes the number of Lepidoptera be doubled, in all cases, with the sole exception of *Senecio nemorensis*, the Alpine region would retain a decided preponderance as regards the frequency of butterflies that visit flowers, and even *Senecio nemorensis* is not an exception to the general rule, as my observations on this species have not been made near Lippstadt, but in the "Waldstein," one of the summits of the "Fichtelgebirge."

Hence, though further observations may be necessary, I cannot doubt that the increasing proportion of Lepidoptera which visit flowers in the higher Alpine region will hold good, even after the most extensive and thorough examination of the whole of Germany. Some peculiarities of the Alpine flora to be discussed in my next article, will, I hope, confirm this opinion.

HERMANN MÜLLER

* Die geographische Verbreitung der Schmetterlinge Deutschlands und der Schweitz. Von Dr. Adolph Speyer und August Speyer. Leipzig, 1858, p. 29.

THE CHEMISTRY OF CREMATION

IN a paper recently published in a German periodical,* on the chemical bearings of cremation, Prof. Mohr calls attention to a point which, so far as we know, has not yet been considered.

He remarks that, in the first place, it is necessary that the combustion of the body should be *complete*. Anything of the nature of distillation gives rise to the production of fetid oils, such as were produced when in early times dead horses were distilled for the manufacture of sal-ammoniac. Such a revolting process is surely not compensated by the small commercial value of the products obtained. To effect complete combustion we must have a temperature such that the destruction is final, nothing remaining but carbonic acid, water, nitrogen, and ash ; for which purpose a complicated apparatus consuming large quantities of fuel will be necessary. The gases produced can only be destroyed by being passed through red-hot tubes to which excess of atmospheric air can gain access.

On comparing the substances produced by such a total decomposition of the body with those produced in the ordinary course of subterranean decay, it will be seen that one compound is totally lost by burning —the ammonia which results from the decomposition of the nitrogenous tissues. This ammonia, escaping into the air or being washed into the soil, is ultimately assimilated by plants—goes to the formation of nitrogenous materials, and thus again becomes available for animals. In the ordinary course of nature a continuous circulation of ammonia between the animal and vegetable kingdoms is thus kept up : if we stop one source of supply of this substance, we destroy the equilibrium—we draw upon the ammoniacal capital of the globe, and in the course of time this loss cannot but react upon animal life, a smaller amount of which will then be possible. There is no compensating process going on in nature as is the case with the removal of atmospheric oxygen by breathing animals—we deduct from a finite quantity, and the descendants of present races will, in time to come, have to bear the sin of our shortsightedness, just as we have had to suffer through the shortsightedness of our ancestors, who destroyed ruthlessly vast tracts of forests, thereby incurring drought in some regions and causing destructive inundations in others.

Another loss of ammonia is entailed by civilisation in the use of gunpowder. Nitre results from the oxidation of ammonia, and is a source of nitrogenous compounds to plants, which again reduce the nitrogen to a form available for ammonia. The nitrogen liberated by the explosion of gunpowder adds to the immense capital of the atmosphere, but is no more available for the formation of plants. Every waste charge of powder fired represents a certain loss of life-sustaining material against which the economy of nature protests. The same is to be said of nitro-glycerine, gun-cotton, &c., which contain nitrogen introduced by the action of nitric acid.

Wood and coal are other illustrations of finite capital. Every pound of these substances burnt in waste—consumed, that is, without being made to do its equivalent of work—is a dead loss of force-producing material, for which our descendants will in the far-distant future have to suffer. The changes brought about by the cessation of one large supply of ammonia may be compared with geological changes which, though of extreme slowness, produce vast changes in the lapse of ages. R. M.

A NEW MATERIAL FOR PAPER

THE grass known as Canada Rice (*Zizania aquatica*, Lin., *Hydropyrum esculentum*, Link) is well known to American botanists as a cereal. Linnæus names it, as long ago as 1750, in his "Philosophia Botanica," under the

* *Daheim*, No 44.

class of Cerealia; it is mentioned under that name by Lindley in his "Vegetable Kingdom;" and in the "Treasury of Botany" it is stated that "the large seeds yield a considerable amount of food to the wandering tribes of Indians, and feed immense flocks of wild swans and other aquatic birds. It grows well in Britain when it is once established, but it is liable to die away if not cared for." It is asserted, indeed, that many of the wandering tribes of native Indians depend on the harvest of Zizania, known by them as "Tuscarora," as their principal source of food during the winter; and that so palatable is the grain that people who, at the period when it is ripe, make their way into the region where it grows, never fail to bring home a sackful as a present to their friends.

It is not, however, as an article of food that we now call attention to the plant, but in consequence of its alleged value as a material for the manufacture of paper.* If all that is stated respecting it is confirmed, it will be a formidable rival to Esparto in the manufacture of the various kinds of printing paper, yielding fully as much of the raw material, and possessing the great and peculiar merit of being comparatively free from silicates; it is claimed, indeed, that paper made from it is quite as strong and flexible as that made from rags. It is easily bleached, economical in respect of chemicals, pure in colour, and the paper presents a surface of perfect evenness remarkably free from specks and blemishes. The paper has the further merit of receiving a very clear impression from the printer's types. It would appear, indeed, to possess all the merits, without any of the defects, of Esparto.

The Zizania belongs to the tribe Oryzeæ, closely resembling the rice-plant both in structure and habit, except that the flowers, instead of being perfect, are unisexual, but monœcious. The number of stamens in both plants is six. It is an aquatic plant, growing in swamps, ponds, and shallow streams, filling them up, during summer, with a dense annual growth. The average height is from 7 to 8 ft., but it not unfrequently reaches 12 or 14 ft. The district in which it appears to flourish most abundantly is the Canadian territory, on the shores of Lakes Erie, St. Claire, and Ontario, from whence it can easily be transported to Montreal, and shipped to any European port. It is stated that there will be no difficulty in obtaining an annual supply of 100,000 tons; but that the chief obstacle to its conveyance to Europe is the great bulk it occupies, and the consequent heavy freight, which seems at present to act as an almost entire prohibition on its importation.

NOTES

PROFESSOR MASKELYNE has offered to give a short course of lectures on Crystallography to those members of the Chemical Society who may be desirous of studying this subject. It is proposed, if a sufficient number of members intimate their intention of attending, that the lectures be delivered on Mondays and Fridays, at 8.30 P.M. during the months of November, December, and January, commencing on the 23rd inst. Professor Maskelyne hopes it will be understood that gentlemen attending those lectures will be prepared to devote some of their leisure to working at the subject in the manner to be indicated by the lecturer. Crystallography cannot be studied without geometrical reasoning, but it will be Mr. Maskelyne's endeavour to treat his subject with as small an amount of mathematical detail as is consistent with its due development. The lectures will be open to anyone introduced by a Fellow of the Chemical Society. It is particularly requested that members intending to attend these lectures will communicate their intention, previously to the 20th inst., to Dr. Russell. We congratulate the Chemical Society in having initiated such a movement. We hope the lectures will be largely taken advantage of, and that other societies will soon follow this excellent example.

* For the majority of the following particulars we are indebted to an article in the *Gardener's Chronicle*.

NEWS has been received from the *Challenger* up to Sept. 8, giving an account of the voyage between the Fiji Islands and Torres Strait. Occasional squalls were met with, and the usual sounding, dredging, and trawling operations were carried on. Shortly after leaving Api Island, New Hebrides, soundings were taken in 2,650 fathoms, giving a bottom temperature of 35°7, the same temperature being obtained at 1,300 fathoms. The same phenomenon occurred for some distance, leading to the conclusion that a valley exists at the place, surrounded by a ridge. Several new specimens of fish were found, and the naturalists explored Raine Island. From Cape York the ship proceeds through Torres Strait and Arafura Sea, visiting Manilla and other places, and arriving at Hong Kong about the middle of the present month, where she will stay till the end of December. Letters should be addressed to Singapore till the mail of Jan. 22, 1875; then to Yokohama, Japan.

ON Tuesday evening the winter session of the Royal Geographical Society was opened by an address from the president, Sir H. C. Rawlinson, who reviewed the progress of discovery during the past year, and expressed a confident hope that a new polar expedition would be despatched under the auspices of her Majesty's Government in the course of the coming year. Lieut. Payer was present, and the secretary read his narrative of the Austrian Polar Expedition, the main details of which have appeared in NATURE. A letter was also read from Dr. Petermann, strongly urging upon her Majesty's Government the expediency of starting another polar expedition: this will be found in another column.

THE following, we learn from the *Times*, is the list of the new Council to be proposed for election at the anniversary meeting of the Royal Society on St. Andrew's Day, 30th inst.:—President, Joseph Dalton Hooker, C.B., M.D., D.C.L., LL.D.; treasurer, William Spottiswoode, M.A., LL.D.; secretaries, Prof. George Gabriel Stokes, M.A., D.C.L., LL.D., and Prof. Thomas Henry Huxley, LL.D.; foreign secretary, Prof. Alexander William Williamson, Ph. D.; other members of the Council—Prof. J. C. Adams, LL.D., the Duke of Devonshire, K.G., D.C.L.; John Evans, Pres. G.S., F.S.A.; Captain Frederick J. O. Evans, R.N., C.B.; Albert C. L. G. Günther, M.A., M.D.; Daniel Hanbury, Treas. L. S.; Sir John Hawkshaw, M.I.C.E.; Joseph Norman Lockyer, F.R.A.S.; Robert Mallet, C.E., M.R.I.A.; Nevil Story Maskelyne, M.A.; C. Watkins Merrifield, Hon. Sec. I. N. A.; Prof. Edmund A. Parkes, M.D.; Right Hon. Lyon Playfair, C.B., LL.D.; Andrew Crombie Ramsay, LL.D.; Major-General Sir H. C. Rawlinson, K.C.B., and J. S. Burdon Sanderson, M.D.

THE Cambridge Board of Natural Sciences Studies have nominated Mr. F. M. Balfour, B.A., Fellow of Trinity College, and Mr. A. W. Marshall, Scholar of St. John's College, as students in the Zoological Station at Naples until the end of next summer.

THE Worshipful Company of Clothworkers have offered to the Board for Superintending Non-collegiate Students at Cambridge three exhibitions of the value of 50*l.* per annum each, to be awarded to non-collegiate students for proficiency in physical science, each exhibition to be tenable for three years, so that one will be available for competition annually. There will be an examination for one of these exhibitions on Thursday, January 14, 1875, in the Censor's Room, at 9 A.M. The exhibition will be open to all non-collegiate students who have already commenced residence, or those not in residence, provided they commence not later than Michaelmas Term 1875. Each candidate will have to satisfy the examiners in at least two of the following subjects:—Statics and dynamics, hydrostatics and pneumatics, heat; and may be examined in not more than two of the following:—Chemistry, botany, physical geography, including meteorology. Candidates

must send their names to the Rev. R. B. Somerset, Cambridge, on or before December 1, of whom further particulars may be obtained.

THERE will be an examination for Scholarships and Exhibitions at Christ's College, Cambridge, on April 6, 1875, and three following days, open to the competition of students who intend to commence residence in October 1875. Scholars will be elected for proficiency in one or more of the following subjects :—(1) Chemistry and chemical physics ; (2) geology and mineralogy ; (3) botany ; (4) zoology, with comparative anatomy and comparative physiology. A candidate may select his own subjects, but will be required to show such knowledge of classics and mathematics as to afford reasonable expectation that he will pass the Previous Examination without difficulty. Every candidate must send his name to the tutor (Mr. John Peile, M.A.) on or before March 30, 1875, and if a candidate in natural science, must state the subject in which he is desirous of being examined.

WE regret to have to record the death at Chiswick on the 2nd inst. of Dr. Thomas Anderson, late Professor of Chemistry in the University of Glasgow. Dr. Anderson was born in 1819, and was educated at the University of Edinburgh. On leaving college he visited Stockholm, where he studied for some time under Berzelius, and afterwards went to Giessen and studied under Liebig. Returning to Edinburgh, he acquired considerable reputation by teaching chemistry in the Extra Academic Medical School at Edinburgh, and whilst so engaged received the appointment of Consulting Chemist to the Highland and Agricultural Society. In 1852 he succeeded Dr. Thomas Thomson as Professor of Chemistry in the University of Glasgow, and discharged the duties of the chair with great acceptance until 1869, when he was incapacitated from work by a paralytic seizure. Having had another attack of paralysis in May of the present year, he resigned his professorship in July last. Dr. Anderson was the author of several papers on the organic bases, especially those bases obtained from opium and coal-tar, and in the destructive distillation of animal substances. In a paper on "The Chemistry of Opium," read before the Chemical Society in 1862, he described a valuable method of extracting the alkaloids of opium, and determining their relative qualities.

DR. J. H. SLACK, one of the leading fish-culturists of the United States, and also well known both as a physician and naturalist, died at Bloomsbury, New Jersey, on the 27th of August last.

THE first part is just issued of the "Proceedings of the Physical Society of London," forming a volume of fifty-two pages, illustrated by two plates, and comprising reports of eleven papers read between March 21 and June 20, 1874. Among them is the very important one by Mr. Crookes, "On attraction and repulsion accompanying radiation." The Society meets fortnightly in the Physical Laboratory of the Science Schools at South Kensington, and now numbers about 130 members.

THE Society of Arts commences its winter session next Wednesday, and a busy and useful session it promises to be. There are the general evening meetings of the Society, the Cantor Lectures, the African, Chemical, and Indian Sections, and the Christmas Juvenile Lectures. This Society, as all societies should, seems to be getting more vigorous the older it grows, and between its lectures, its technological examinations, and its prizes, must be doing a great amount of good.

THE New Zealand Government has sent special agents over to England for the purpose of collecting a quantity of small birds of various kinds, and a colony of humble-bees, for introduction into that country. It is expected that the consignment will be ready for despatch in a few days. Another attempt will also be made this year to send a quantity of salmon over to the antipodes, only 135 salmon being now alive out of the 120,000 salmon eggs which were despatched two years ago.

THE production of opium in Asia Minor, which in former years averaged annually from 2,000 to 3,000 baskets or cases, each containing 150 lbs., has of late years much increased, and the crop now averages from 4,000 to 6,000 baskets. Out of this quantity, which is shipped at Smyrna, the United States take above 2,000 cases. England at one time consumed a large proportion. The Dutch East India Company also for many years have purchased large quantities annually to send to the islands of Java, Batavia, and Sumatra, and of late years the consumption generally has largely increased, especially for North and South America and the West Indies. Turkey opium is always preferred in England before that of India, as it contains a much higher percentage of morphia than either Indian or Persian ; it is on this account that the greater portion of the opium used for medicinal purposes both in Europe and America is the production of Asia Minor. The price of this opium in the market has advanced much of late ; fifteen years ago the average price was about 15*s.* per lb., and it now realises about 1*l.* per lb., though the fair character even of this product has been tarnished by a system of adulteration which has prevailed during the past two years. About 300 cases of this adulterated opium have been sold in the period mentioned, so that purchasers are now very careful from whom they obtain the drug.

OLIVE oil is produced in large quantities in Tunis. The olive crops during the past two years have been so abundant that there is still a great deal of oil in the country, notwithstanding the immense quantities, amounting in all to 3,472 tuns, of the value of 125,893*l.*, that have been shipped during the past year to Great Britain, France, and Italy. It is said that without a great reaction takes place in the oil trade in Europe, vendors in Tunis will be puzzled to know what to do with the supplies they will have on hand. The deposits, or tanks, in the town are said to be capable of containing 6,000 tuns of oil, but they were not clear of the old supplies before the new was ready to be brought in. So far as the working of the native oil-mills is concerned, it is stated that no improvement has taken place. An Italian company contemplates the introduction of a steam mill. For this purpose the British vice-consular house and its premises have been bought, and are to be converted into a mill. Some years ago one was tried at Mehdia, but did not answer. A second was erected near Susa, with the view of buying up the refuse or oil-cake after passing the native mills, and submitting it to further pressure ; but this in the hands of the natives blew up.

IT seems to be very probable that the cultivation of sugar in Porto Rico, which has to a great extent succeeded that of cotton, will eventually give place to the growth of coffee on a large scale. Referring to this subject the British Consul says :—"The geographical configuration of the island would almost lead to the anticipation that some less succulent plant than the cane should supersede it in the district of Guayama. Some of the most fertile lands of the island are situated in it, and in favourable seasons no other part of Porto Rico can rival its fecundity ; but the island is divided from east to west by a range of mountains, the highest of which, Laquillo, is at the extreme east, and at the southern foot of this mountain Guayama is situated. The trade winds blowing from the north-east cause the rain clouds to strike the northern side of Laquillo, and they are carried along the northern face of the Sierra, a limited portion passing over their summits to the south side. Thus Guayama and Ponce are subject to drought. In the rich and populous district of Ponce this natural impediment has been overcome by an efficient system of irrigation, but Guayama is less favourably situated in all respects ;

its position immediately south of Laquillo too often occasions the drought to continue, the soil is burnt up and divested of all fertility, and the residents are neither sufficiently rich nor sufficiently numerous to artificially irrigate their lands as their neighbours in Ponce have done. The consequence is, that the crops are very uncertain in their yield, and it is expected that if something is not done to ensure irrigation, there will very soon be no produce at all."

WE have received a copy of the rules of the Metropolitan Scientific Association, the object of which is announced to be "the investigation and promotion of the study of the Physical Sciences, including Astronomy, Geology, Chemistry, the various departments of Natural History, and Biology." Lectures are to be given, and meetings for discussion to be held. The subscription is fixed at 5*s.* a year for members and 3*s.* 6*d.* a year for associates. Mr. W. R. Birt, F.R.A.S., is the president, and the hon. sec., to whom all communications respecting the Association should be addressed, is Mr. C. W. Stidstone, 13, Moorgate Street, E.C.

THE ash of the better coals of the American carboniferous age appears to be derived wholly from the plants which formed them. According to analyses by many chemists (quoted by Prof. Dana, in the last edition of his "Geology"), made on lycopods, ferns, equiseta, mosses, conifera, &c., there is in them an average quantity of silica and alumina, such that if the plants were converted into coal it would amount to 4 per cent. of the whole, and the whole ash would be 4·75. Many analyses of bituminous coal show but 3 per cent. of ash and 4·5 is an average. Hence it follows:—(1) That the whole of the impurity in the best coals may have been derived from the plants; (2) the amount of ash in the plants was less than the average of modern species of the same tribes; (3) the winds and waters for long periods contributed almost no dust or detritus to the marshes. In that era of moist climate and universal forests there was hardly any chance for the winds to gather dust or sand for transportation.

THE *Medical Press* draws attention to a new tonic medicine under the name of *Boldo*. The tree is said to be found on isolated mountain regions in Chili; the bark, leaves, and blossoms possessing a strong aromatic odour, resembling a mixture of turpentine and camphor. The leaves contain also a large quantity of essential oil. The alkaloid obtained from the plant is called "Boldine." Its properties are chiefly as a stimulant to digestion and having a marked action on the liver. Its action was discovered rather accidentally—thus: some sheep which were liver diseased were confined in an inclosure which happened to have been recently hedged with boldo twigs. The animals ate the leaves and shoots, and were observed to recover speedily. Direct observations prove its action: thus, one gramme of the tincture excites appetite, increases the circulation and produces symptoms of circulatory excitement, and acts on the urine, which gives out the peculiar odour of boldo. Though we have not seen any specimens of the boldo as imported, there seems little doubt but that it is the *Boldoa fragrans*, a Monimiaceous tree, the Chilian name of which, however, is usually written *Boldu*. The leaves, which are rough, are opposite, ovate, and are borne on short stalks. The plant is dicœcious, and the flowers are borne in axillary racemes. All parts of the tree are fragrant; hence its specific name. The little berries are eaten, the bark is used for tanning, and the wood is considered by the natives superior to any other for making charcoal.

A LARGE monumental fountain, ornamented by the celebrated sculptor Carpeaux, has been erected on the Observatoire Place at Paris. It represents Europe, Asia, Africa, and America rotating the globe, which they carry on their heads, and is very effective; but in spite of M. Le Verrier's protestations, they are rotating the globe from east to west, according to the Ptolemean theory.

THE Khedive of Egypt has given his cordial support to the English Government Transit of Venus Expedition in Egypt. He has furnished the principal station on Mokattam Heights, 600 ft. above Cairo, with tents, a guard, and a mounted escort, and is making a telegraph line to connect that station with Greenwich, through the Submarine, Gibraltar, and Malta Cable. His Highness has also sent a steamer to tow the Thebes branch of the expedition to their destination, and he has brought all the huts and instruments up by special train from Suez.

SIR DOUGLAS FORSYTH'S Yarkand curiosities, illustrative of the ethnology of the regions he visited, will be shortly sent from India to South Kensington.

WE are glad to see that Mr. T. H. Ince, furrier, of Oxford Street, has entered the lists as a technical educator, having just issued a neat booklet containing well-compiled, and on the whole trustworthy, information concerning the animals whose skins he makes use of in his trade. Many who read Mr. Ince's *brochure* will be surprised at the great variety of animals, both British and foreign, whose skins are, in one way or another, turned to the uses of an advanced and luxurious civilisation.

AT its last sitting the Council of the Paris Observatory declared that the Meridian Service is not in a good condition. M. Leverrier, therefore, has written to the Minister for Public Instruction, advising him to ask M. Lœwy, a member of the Institute, and the head of the Meridian Service, to resign if he does not give up the direction of the *Connaisance des Temps*—both offices being too much for one man, however zealous and learned.

AN immense number of errors have been discovered by M. Leverrier in the stellar observations, which were ready for printing, and which were made before the reorganisation of the Paris Observatory was completed. All these observations will be subjected to a most careful scrutiny, and many will be rejected altogether. The correct observations will not be printed before further reductions are made. A special credit of 15,000f. will be asked from the National Assembly for that special purpose, and will certainly be granted.

THE several French public administrations have received instructions to favour men who have been non-commissioned officers in the army in making subsidiary appointments in their offices. In some cases competitive examinations will be established for these places.

THE tanks of the Manchester Aquarium have just been enriched by a remarkably fine specimen of the Angler (*Lophius piscatorius*), over 4 ft. in length. The fish is in the best possible condition, and was obtained by the curator, Mr. W. Saville Kent, from the Royal fish weirs at Colwyn Bay. It is the first and only example of the species on exhibition at any of the many aquaria now established, and many interesting data will no doubt be derived from the observation of its habits for the first time in confinement.

THE additions to the Zoological Society's Gardens during the past week include a Nisnas Monkey (*Cercopithecus pyrrhonotus*) from Nubia, presented by Dr. R. F. Mayne; a Bengalese Leopard Cat (*Felis bengalensis*) and an Egyptian Cat (*Felis chaus*) from India, a Leadbeater Cockatoo (*Cacatua leadbeateri*) from Australia, deposited; a pair of Bar-headed Geese (*Anser indicus*) from India, and three Night Parrots (*Stringops habroptilus*) from New Zealand, purchased. These last-named birds form the finest collection of the species ever seen in this country.

THE EXPLORATION OF THE ARCTIC REGIONS*

TEN years ago, when arctic exploration was sought to be revived by the Royal Geographical Society, all, I think, were agreed as to the main points of the subject, while a diversity of opinion arose regarding one point, which appears to me only of secondary importance now—namely, the route to be chosen. There was a great deal of discussion upon this point, and whether it would be more advisable for a new English expedition to proceed west of Greenland up Smith Sound, or east of it, anywhere in the wide sea between Greenland and Novaya Zemlya.

From the results arrived at by actual exploration since 1865, and the light shed by it upon the subject, it appears to me that a real ground for any such diversity of opinion no more exists, as the most noteworthy fact brought out by the various recent polar expeditions is a greater navigability in all parts of the arctic seas than was formerly supposed to exist.

For my part, I readily admit that the Smith Sound route has turned out to be a great deal more practicable and navigable than could formerly be surmised from the experience of Kane and Hayes. Certainly both these attempts were made with insufficient means, Kane's *Advance* being only a sailing brig, heavily laden and blown about by unusually strong gales, and Hayes' schooner, the *United States*, a mere sailing vessel of 133 tons, not fit for navigation in the arctic seas. When, therefore, Hall in 1871 tried this route with the *Polaris*, he achieved most astounding results, for he sailed and steamed from Tessiusak without interruption in one stretch through the ill-famed Melville Bay, Smith Sound, Kennedy Channel, and into new seas as far as 82° N. lat., a distance of 700 miles, with the greatest ease in seven days, and even reached beyond the 82nd parallel. Yet his vessel, the *Polaris*, was only a small, weak-powered steamer, by no means well fitted for the work, and manned by a motley crew, hampered by Eskimo families and little children.

While I thus readily admit my expectations to have been far exceeded by recent experience, similar progress has also been made on all the other routes into the central area of the arctic regions, and a great deal has been achieved, even with small means. From the results already arrived at, it is evident that with appropriate steam-vessels, making use of the experience gained, that central area will be penetrated as far as the North Pole, or any other point.

As I cannot but think that an English exploring expedition will soon leave for the arctic regions, I take this opportunity to state to you explicitly that I withdraw everything I formerly said that might be construed into a diversity of opinion on the main points at issue, and that I now distinctly approve beforehand of any route or direction that may be decided on for a new expedition by British geographers.

For those expeditions which I myself have been able to set on foot since 1865, the most direct and shortest routes and the nearest goals seemed the most advisable, as only very small means could be raised, and these chiefly by promising to break new ground and open new lines of research never before attempted. With the same small means at our command, we could not have done as much as we did elsewhere. At my instance, more or less, seven very modest expeditions and summer cruises went forth. The first one, a reconnoitring tour in 1868 under Captain Koldeway, consisted of a little Norwegian sloop of only about sixty tons, no bigger than an ordinary trawling smack; she was purchased at Bergen, received the name of *Germania*, and went towards East Greenland, then to the east of Bear Island, on to the north of Spitzbergen beyond the 81st parallel, and surveyed portions of East Spitzbergen not before reached by English or Swedish expeditions. Next year, 1869, started the so-called second German expedition, consisting of two vessels, a screw steamer of 143 tons, called the *Germania*, and a sailing brig of 242 tons, called the *Hansa*, as a tender; they went again to East Greenland, explored this coast as far as 77° N. lat., and discovered a magnificent inlet, Franz-Joseph Fjord, extending far into the interior of Greenland, navigable, and the shores of it enlivened by herds of reindeer and musk oxen. It was also shown that the interior of Greenland in this region consists not of a slightly elevated table-land, as formerly supposed, but of splendid mountain masses of Alpine character. The account of this expedition, which also wintered on the coast of East Greenland in 72½° N. lat., is before you in an English dress.

* A letter addressed to the President of the Royal Geographical Society, a copy of which has been forwarded to us by Dr. Petermann.

Besides this, I got my friend Mr. Rosenthal, a shipowner, to allow two scientific men, Dr. Dorst and Dr. Bessels, to accompany two of his whaling steamers, one to explore the seas east of Spitzbergen, the other those east of Greenland; both made highly interesting and valuable scientific observations, which have not yet been published. In 1870 my friends Baron Heuglin and Count Zeil went from Tromsö in a small schooner of thirty tons to East Spitzbergen, and collected most interesting information on a region never before visited by scientific men; and when Baron Heuglin had been out a second time, the next following year (1871), again with one of Rosenthal's expeditions, he published a valuable work in three volumes. In the same year Payer and Weyprecht went in the *Isbjörn*, a sailing vessel of forty tons, from Tromsö, to explore still further northward than Bessels the sea east of Spitzbergen, which was done with great success as high up as 78° 43′ N. lat. (in 42½ E. long. Gr.) and as far east as 59° E. long. The scientific results of this cruise have also not yet been fully worked out.

Thus from the interior of Greenland, in 30° W. long. to 59° E. long. east of Spitzbergen, a width of about ninety degrees of longitude has been explored, and highly interesting results obtained. The cost of these seven expeditions and cruises was about 140,000 thalers, or altogether 20,000*l*., of which 5,000 thalers, or 750*l*., were contributed by the Government of Germany; all the rest by private individuals, my friend Rosenthal spending upwards of 30,000 thalers. Half of the results of these expeditions have not yet been published, but the work of the second German expedition in four volumes, and that by Baron Heuglin in three volumes, are finished, and are, I think, a credit to the explorers.

I have mentioned these details in order to show that such endeavours to extend human knowledge, improve the spirit of the navy, and foster a taste for the progress of science, are not necessarily expensive. A really effective expedition will cost more, but also accomplish more; in this respect a reviewer in the *Athenæum*, in reviewing our second expedition, says that "to start on expeditions such as these in vessels ill-adapted, ill-strengthened, ill-found, and ill-provisioned, is but to court failure;" to which I say Amen.

One well-appointed English expedition of one or two strong steamers may well be able to penetrate to the furthest points of our globe. Even the whaling ships, now furnished as they are with steam, penetrate as a rule to where it was thought impossible for such a fleet to pursue their valuable fisheries; the ill-famed middle ice of Baffin's Bay is to them no more impenetrable, and extreme points reached by former discovery expeditions in the course of a long series of years are now visited and passed by one whaling vessel in the course of a few summer months.

Up to 1869 the general opinion was that from Bear Island in 74½° N. lat. there extended the line of heavy impenetrable pack-ice eastward as far as Novaya Zemlya; that, working along this coast, the furthest limit of navigation was at Cape Nassau; and that the Kara Sea was entirely and always filled with masses of ice, totally impracticable for any navigation. But the Norwegians, with their frail fishing-smacks of only thirty tons at an average, have for five consecutive years every year navigated all those seas hitherto considered as totally impenetrable; they have repeatedly circumnavigated the whole of Novaya Zemlya, crossed the Kara Sea in every direction, penetrated to the Obi and Yenisei, and shown beyond the shadow of a doubt that navigation can generally be pursued there during five months of the year, from June to October, and moreover, that the whole of the Kara Sea and the Siberian Sea far to the north are every year more or less cleared of their ice, both by its melting and drifting away to the north. I have had the journals of many of these cruises sent to me from Norway, containing a mass of good observations made at the instance of the Government Meteorological Office under the superintendence of Prof. Mohn, at Christiania. If another proof of confirmation were wanting, it has been furnished by Mr. Wiggins, of Sunderland, who this summer also navigated through the Kara Sea as far as the mouth of Obi.

As to the sea between Novaya Zemlya and Spitzbergen, the very first time in our days its navigation was attempted, namely, by Weyprecht and Payer in 1871, it was found navigable even in a small sailing vessel of forty tons up to 79° N. lat., and in the eastern half of it no ice whatever was met with. The experience of their last expedition in 1872 certainly has been the reverse, as they encountered much and dense ice, at least in the direction of Cape Nassau; but it would lead to erroneous conclusions, if it were not taken into account that the Norwegians at

the same time found the western half of that sea quite free of ice.

I am not going to make any remark upon the late Austrian expedition, as its results and observations are not sufficiently before us, but I am authorised by a letter of Lieut. Weyprecht, the nautical commander, dated the 1st November, to state that, before he has published his extensive observations, he warns against all premature conclusions, and concludes the letter which I shall publish in the next part of the *Mittheilungen*, and in which he expresses his own views on the arctic question for the first time, with the sentence "that he considers the route through the Siberian Sea as far as Behring Strait as practicable as before, and would readily take the command of another expedition in the same direction."

I believe myself that the navigability of the seas to the north of Novaya Zemlya can as little be called in question by this one drift of the Austrian expedition, as the navigability of Baffin's Bay by the drifts of De Haven, M'Clintock, and the crew of the *Polaris*. These drifts by no means prevent others from penetrating the same seas.

And here I may be allowed to refer in a few words to the other end of this route, the seas north of Behring Strait. Capt. Cook in 1778, and his second in command, Capt. Clerke, in 1779, believed to have reached the extreme limit of navigation by attaining Icy Cape (in 70½° N. lat.) on the American, and North Cape (in 69° N. lat.) on the Asiatic side, and they considered further attempts there as madness as well as to any practical purpose useless. Capt. Beechey, however, with his lieutenant, the present Admiral Sir Edward Belcher, penetrated already in 1826 as far as Point Barrow, and expressed the result of his experience in the weighty sentence: "I have always been of opinion that a navigation may be performed along any coast of the Polar Sea that is continuous." * And, true enough, many a follower has sailed along the whole of the northernmost coast of America, though exposed to the pressure of the immense pack-ice masses from the north impinging upon these coasts. Capt. Kellett, with the *Herald*, a vessel not intended for ice navigation, penetrated in 1849 with ease to 72° 51′ N. lat. into the Polar Sea so much dreaded by Cook and Clerke, discovered Herald Island, and what is now called by some Wrangel Land, and found the ice not at all so formidable as supposed previously. Going over the similar experience of Collinson, Maclure, Rodgers, and others, we come to the time when the Americans established a highly profitable whale fishery in seas considered entirely useless by Cook and Clerke, gaining as much as $8,000,000 in two years. It was in one of these years that a shipmaster went as far as 74° N. lat., nearly due north of Herald Island, and saw peaks and mountain ranges far to the northward of his position. Another, Capt. Long, went a considerable distance along the Siberian coast to the west, and did more in a few days with a sailing vessel than Admiral Wrangel had been able to accomplish with sledges in winter in the course of four years, in the same region. In a letter dated Honolulu, 15th January, 1868, he says:—"That the passage from the Pacific to the Atlantic Ocean will be accomplished by one of the routes I have indicated I have as much faith in as I have in any uncertain event of the future, and much more than I had fifteen years ago in the success of the Atlantic Telegraph. Although this route will be of no great importance to commerce as a transit from one ocean to the other, yet could the passage along the coast as far as the mouth of the Lena be successfully made every year (which I think probable) it would be of great benefit in developing the resources of Northern Siberia." †

To the north-east of Spitzbergen, also, an interesting cruise was recently made by Mr. Leigh Smith, who in 1871, with only a sailing schooner of 85 tons, reached as far as 27° 25′ E. of Greenwich in 80° 27′ N. lat., 4° of longitude further than any authenticated and observing navigator before him. At this point he had before him to the east—consequently in the direction of the newly-discovered Franz-Joseph Land—nothing but open water on the 6th of September, 1871, as far as the eye could reach.

That land would be found in the locality where the Austrian Expedition actually found it, I have long predicted. Gillis Land, after Keulen's map generally considered to be situated in 80° N. lat., 30° E. long., by the Swedish explorers erroneously put down in 79° N. lat., I have from the original text concluded to be in 81½° N. lat. and 37° E. long. Greenwich. This approaches to within eighty nautical miles of Franz-Joseph Land, which was sighted westward as far as 46° E. long.; but in this longitude there was not as yet any limit of the land. The flight of immense numbers of brent-geese and other birds in the same direction has long been observed by various voyagers, and it has also been noticed that not only migrations of birds but also of mammals take the same direction; the Norwegian fishermen on the north of Spitzbergen have repeatedly caught immense numbers of walrus and ice-bears at the Seven Islands, and especially on their north-eastern side, whereas at Spitzbergen the walrus is now very scarce and the ice-bear almost extinct.

I consider it also highly probable that that great arctic pioneer and navigator William Baffin may have seen the western shores of Franz-Joseph Land as long ago as 1614, for in that year he proceeded to 81° N. lat., and thought he saw land as far as 82° to the north-east of Spitzbergen (which is accordingly marked in one of Purchas's maps. * It is true the account of this voyage is very meagre, but so is the account of his voyage and still greater discovery of Baffin's Bay two years after, which Sir John Barrow calls "the most vague, indefinite, and unsatisfactory," and on his map leaves out Baffin's Bay altogether, and this, be it observed, in the year 1818! † Barrington and Beaufoy, though inserting Baffin's discoveries in their map dated March 1, 1818, describe them in the following words:—"Baffin's Bay, according to the relation of Mr. Baffin in 1616, *but not now believed!*" With Barents's important voyages and discoveries it is exactly the same. The Russians, who only navigated as far as Cape Nassau, also tried to erase Barents's discoveries from the map and cut off the north-eastern part of Novaya Zemlya altogether. ‡ But old Barents has been found more trustworthy and correct than all the Russian maps and pilots put together. Even the identical winter hut of that great Dutch navigator, nearly 300 years old, has been found by the Norwegian Capt. Carlsen on Sept. 9, 1871, and many interesting relics brought home by him; so that the truth and correctness of those famous old Dutch voyages has been proved beyond all doubt. In like manner, Baffin's voyage to within sight of the western shores of Franz-Joseph Land may be considered trustworthy until some substantial proof of the contrary is brought forward. Nay, it even appears to me that the report given of another remarkable voyage of a Dutch navigator, Cornelis Roule, merits attention and is to be considered in the same way as Baffin and Barents; so that if it be as true as the voyages of these navigators, it may yet be found that Franz-Joseph Land was already discovered and sailed through up to 74½° or 75° N. lat. nearly 300 years ago. This report runs thus:—"I am informed with certainty that Capt. Cornelis Roule has been in 84½° or 85° N. lat. in the longitude of Novaya Zemlya, and has sailed about forty miles between broken land, seeing large open water behind it. He went on shore with his boat, and from a hill it appeared to him that he could go three days more to the north. He found lots of birds there and very tame." § Now, the mean longitude of Novaya Zemlya is 60° E. Greenwich, and passes right through Austria Sound and Franz-Joseph Land; the latter is a "broken land" also, behind which Lieut. Payer saw "large open water," and found "lots of birds!"

Be this as it may, we now come to Sir Edward Parry's voyage north of Spitzbergen, regarding which it is an undoubted fact that he reached 82° 45′ N. lat., the furthest well authenticated point yet reached by any navigator, and a feat unsurpassed to this day.

There is, however, no doubt that the northern coast of Spitzbergen lies just in the teeth of one of the most formidable ice-currents, and one that summer and winter is sweeping its ice masses just towards these coasts. If, therefore, an English expedition should take Spitzbergen as a basis to start from, it would require two vessels, one of which ought to go up the west coast, the other up the east coast; for when northerly and westerly winds prevail, the first vessel would probably be hampered by ice, and the second vessel find it navigable up the east coast, and if easterly and southerly winds prevailed, the reverse would be the case.

* Beechey: Voyage, vol. ii. p. 297.
† *Nautical Magazine*, 1868, p. 242.

* Barrington and Beaufoy, pp. 40 and 41.
† Barrow, "Chronological History," p. 216 and map.
‡ This was actually attempted by a pilot of the "Russian Imperial Marine," and found its way also into vol. viii. of the Journal of the R. G. S., p. 411, where the map is spoken of as "showing the *actual* outline of its works, as traced by the pilot Ziwolka, from the latest examinations, by which it will be seen that more than the eastern half represented on our maps has no existence in reality!"
§ Wilsen, N. and O. Tartarye, folio 1707, 2 decl., p. 920. See also Proc. R. G. S. ix. p. 178.

It is by way of Smith Sound, however, that navigation has hitherto been pushed furthest, and here an English expedition, so long projected, may well operate. At the same time the east coast of Greenland seems still worthy of attention. The second German expedition did not proceed far to the north, it is true, but it was easy enough to reach the coast, and Lieut. Payer told me this was merely somcthing like a "cab drive." Capt. Gray, of Peterhead, a most experienced arctic navigator, wrote already in 1868 thus:—"Having for many years pursued the whale fishery on the east coast of Greenland, and observed the sides, the set of currents, and the state of the ice in that locality at various seasons of the year, I think that little if any difficulty would be experienced in carrying a vessel in a single season to a very high latitude, if not to the pole itself, by taking the ice at about the latitude of 75°, where generally exists a deep bight, sometimes running in a north-west direction upwards of 100 miles towards Shannon Island, from thence following the continent of Greenland as long as it was found to sound in the desired direction, and afterwards pushing northwards through the loose fields of ice which I shall show may be expected to be found in that locality. The following are the reasons on which that opinion is founded:—In prosecuting the whale fishery in the vicinity of Shannon Island there are generally found loose fields of ice, with a considerable amount of open water, and a dark water sky along the land to the northward; the land water sometimes extending for at least fifty miles to the eastward; and, in seasons when south-west winds prevail, the ice opens up very fast from the land in that latitude. The ice on the east coast of Greenland is what is termed field or floe ice, the extent of which varies with the nature of the season; but it is always in motion, even in winter, as is proved by the fact that ships beset as far north as 78° have driven down during the autumn and winter as far south as Cape Farewell. Thus there is always the means of pushing to the northward by keeping to the land ice, and watching favourable openings."*

And quite recently, in communicating the result of his experience the present year, he writes:—"During the past season I had too many opportunities of observing the drift of the ice. In May, June, July, and August, its average drift was fully fourteen miles a day; in March and April it must have been driving double that rate. I calculate that nearly the whole of the ice was driven out of the arctic basin last summer. I went north to 79° 45′ in August, and found the ice all broken up, whereas down in 77° the floes were lying whole in the sea, clearly showing that the ice in 80° must have been broken up by a swell from the north, beyond the pack to the north, which I could see over; there was a dark water sky reaching north until lost in the distance, without a particle of ice to be seen in it. I was convinced at the time, and so was my brother, that we could have gone up the pole, or at any rate far beyond where anyone had ever been before. I bitterly repent that I did not sacrifice my chance of finding whale and make the attempt, although my coals and provisions were wearing down. Although I have never advocated an attempt being made to reach the pole by Spitzbergen, knowing well the difficulties that would have to be encountered, my ideas are now changed from what I saw last voyage. I am now convinced that a great advance towards the pole could occasionally be made without much trouble or risk by Spitzbergen, and some of our amateur navigators will be sure to do it and pluck the honour from the Royal Navy. I do not know if the *Eclipse* will be sent to the Greenland whale fishery next year; if I go I shall be able to satisfy myself more thoroughly as to the clearing out of the ice this year, because it will necessarily be of a much lighter character than usual."†

If this important information should be considered worthy the attention of the British geographers and the Admiralty, there would, perhaps, be two steamers sent out to make success doubly certain, one to proceed up the west coast of Greenland by way of Smith Sound, the other up the east coast of Greenland.

But whatever may be decided on, I trust that the British Government will no longer hold back to grant what all geographers and all scientific corporations of England have been begging for these ten long years, and afford the means for a new effective expedition to crown these, our modest endeavours, of which I have given an outline. We in Germany and Austria have done our duty, and I am happy to have lived to see that our humble endeavours, the work of our arctic explorers, have gained your approbation—that of the Royal Geographical Society of Great Britain. We have done all we could in the private mannner we had to do it; for, as a nation, we Germans are only now beginning to turn our attention to nautical matters. We have had no vessels, no means, and our Government has had to fight three great wars these ten years. But, nevertheless, we have had in this interval German, Austrian, American, Swedish, Norwegian, Russian polar expeditions, of which even an Italian officer took part at the instance of the Italian Government. And England, formerly always taking the lead in these matters, is almost the only maritime power that has kept aloof. When, nearly thirty years ago, one man of science proposed that magnetical observations should be extended, it was at once answered by the Government then by sending out to the antarctic regions an expedition of two vessels, the *Erebus* and *Terror*, under that great navigator, Sir James Clarke Ross, which has never yet been eclipsed as to the importance of its results and the lustre it shed on the British Navy. I do not know the views held in England now, but I know that to us outsiders the achievements and work of a man like Sir James Clarke Ross or Livingstone has done more for the prestige of Great Britain than a march to Coomassie, that cost nine millions of pounds sterling. That great explorer, Livingstone, is no more; his work is going to be continued and finished by German and American explorers; we shall also certainly not let the arctic work rest till it is fully accomplished, but it surely behoves Great Britain now to step in and once more to take the lead.

AUGUSTUS PETERMANN,
Hon. Cor. Member and Gold Medallist,
Gotha, Nov. 7, 1874 Royal Geographical Society.

* Proc. R. G. S., vol. xii. p. 197

† Letter of Capt. David Gray to Mr. Leigh Smith, dated Peterhead, Sept. 21, 1874.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, Nov. 4.—Dr. Odling, president, in the chair.—The following papers were read:—On methyl-hexyl-carbinol, by Dr. C. Schorlemmer; On the action of organic acids and their anhydrides on the natural alkaloids, Part I., by Dr. C. R. A. Wright; On the action of bromine in the presence of water on bromopyrogallol and on bromopyrocatechin, by Dr. J. Stenhouse; The action of baryta on oil of cloves, by Prof. A. H. Church; Observations on the use of permanganate of potash in volumetric analysis, and on the estimation of iron in iron ores, by Mr. E. A. Parnell; Further researches on bilirubin and its compounds, by Dr. J. L. W. Thudichum.

Zoological Society, Nov. 3.—Dr. A. Günther, F.R.S., vice-president, in the chair.—The secretary read a report on the additions that had been made in the Society's menagerie during the months of June, July, August, and September, 1874.—Mr. Sclater gave an account of some visits he had recently made to several zoological gardens and museums in France and Italy, and made remarks upon some of the principal objects noticed therein.—Mr. G. Dawson Rowley exhibited and made remarks upon some rare birds from New Zealand, amongst which were fine examples of *Apteryx haasti*, and a living pair of *Sceloglaux albifacies*.—Mr. A. R. Wallace exhibited some rhinoceros horns obtained in Borneo by Mr. Everett, proving that this animal was still found living in that island.—Mr. J. Gould exhibited a new parrot, of the genus *Aprosmictus*, recently obtained on the Darling Downs, in Queensland. Mr. Gould proposed to call this bird *Aprosmictus insignissimus*.—A letter from Mr. Swinhoe was read respecting some bats obtained by him at Ningpo.—A communication was read from M. L. Taczanowski, conservator of the museum at Warsaw, in which he gave a list of the birds collected by M. Constantine Jelski in the central part of Western Peru. Amongst these were eighteen species described as new to science.—A communication was read from Mr. Frederick Moore, giving descriptions of some new Asiatic Lepidoptera.—A communication was read from Mr. George Gulliver, containing measurements of the red corpuscles of the blood of *Hippopotamus amphibius*, *Otaria jubata*, and *Trichecus rosmarus*.—Mr. R. Bowdler Sharpe read a paper entitled "Contributions to a history of the Accipitres, or birds of prey." The first of this series contained notes on the females of the common and South African kestrels.—A communication was read from Mr. Henry Adams, giving the descriptions of some new species of shells from various localities, also of a new genus of Bivalves from Mauritius.—Mr. A. H. Garrod read a paper on points in the anatomy of the parrots which bear on the classification of the sub-order. This

memoir was based upon the examination of a large number of individuals belonging to seventy-nine species, chiefly from the Society's living collection, and contained a new arrangement of the group based principally upon the arrangement of the carotid arteries, and the presence or absence of the *ambiens* muscle, the furcula, and the oil-gland.—A communication was read from Mr. G. B. Sowerby, jun., giving the descriptions of five new species of shells from different localities.—A communication was read from Mr. E. P. Ramsay, wherein he described five new species of Australian birds, and of the egg of *Chamydodera maculata*. The birds described were—*Cypselus terræ-reginæ*, *Ælurædus maculosus*, *Ptilotis frenata*, *Eopsaltria inornata*, and *Rhipidura superciliosa*.

Royal Microscopical Society, Nov. 4.—Chas. Brooke, F.R.S., president, in the chair.—A paper by Dr. Jas. Fleming, On microscopical leaf-fungi from the Himalayas, was taken as read; it was illustrated by drawings, and many of the species described had been identified by Mr. M. C. Cooke as being the same as those known in Europe.—A paper by the Rev. W. H. Dallinger and Dr. Drysdale, in continuance of their series. On the life history of Monads, was read by the secretary. It minutely described a form repeatedly met with in macerations of the heads of codfish and salmon, and traced the development and reproduction in all stages, and was illustrated by drawings, which were enlarged upon the black board by Mr. Chas. Stewart. The observations had extended over several years, and had been conducted with the greatest care under various powers up to $\frac{1}{50}$ in. The results of experiments were also given, and conclusively showed that exposure to temperatures of 220° and 300° F. had failed to destroy the germs of these organisms. Some interesting living objects, stated to be larval forms of the common cockle, were exhibited and described by Mr. Wood; but the similarity of these forms to some which were exhibited at the previous meeting, and presumed to be *Bucephalus polymorphus*, having been pointed out by Mr. Stewart, an interesting discussion followed. *Perryia pulcherima*, Kitton, was exhibited under one of the Society's instruments.

PARIS

Academy of Sciences, Oct. 26.—M. Bertrand in the chair.—The following papers were read:—Note on Dr. Zenker's cometary theory, by M. Faye. The theory commented upon supposes that comets owe their movements in part to the attractive force of the sun and in part to the evolution of gases from the surface of the comet by the action of the sun's heat. The gases are supposed to consist of water vapour, and a hydrocarbon, and the motion produced by their rapid generation from the surface of the comet nearest to the sun is regarded as of an opposite nature to that produced by gravitation. M. Faye dissents from these views, and promises a further examination of the question in a future paper.—Note on the average ration of the French countryman, by M. Hervé Mangon. The author concludes, from a statistical inquiry into the subject, that the daily ration of the French labourer is not sufficiently high, and that for the welfare of the country this ration should be increased.—On the composition and physical properties of the products from coal-tar, by M. Dumas. The analyses and experiments were undertaken by the author with a view to test the insecticidal properties of coal-tar as applied to the destruction of Phylloxera. The hydrocarbons appear to have the most energetic action, the portion boiling below 110° causing death in five minutes.—Presentation of the geographical programme forming part of the new plan of studies for the colleges, by M. E. Levasseur.—On the analytical theory of Jupiter's satellites, by M. Souillart. The author had given, in a previous memoir, the formulæ for calculating the inequalities of longitude and of the *radii vectores* of the satellites. In the present memoir the problem has been solved for the latitudes and the secular equations of the longitudes.—Eighth note on the electric conductivity of bodies which are imperfect conductors, by M. Th. du Moncel.—On the fermentation of apples and pears, by MM. G. Lechartier and F. Bellamy. The experiments described have been carried on since 1872, and are considered by the authors as a veritable demonstration of Pasteur's deduction from his theory of fermentation, that "the formation of alcohol is due to the fact that the chemical and physical life of the fruit-cells is continued under new conditions in a similar manner to those of the cells of the ferment."—Absorption of gas by iron wire heated to redness and thinned by immersion in dilute sulphuric acid during the operations of wire-drawing, by M. D. Sévoz. The author has not yet determined the nature of this gas.—On the isomerism of acetylene perbromide and the hydride of tetrabrominated ethylene, by M. E. Bourgoin. The last-named substance is obtained by the action of bromine and water on bibromsuccinic acid, and is described as a crystalline substance melting at 54·5°. Perbromide of acetylene is a liquid formed when acetylene is passed into bromine heated to 50° under a layer of water. The author considers acetylene perbromide to be an additive compound of the acetylene series, while the other substance is derived by substitution from ethylene or ethyl hydride.—Researches on the decomposition of certain salts by water; second note, by M. A. Ditte. The author has now studied the decomposition bismuthous and bismuthic nitrates and of antimonious chloride.—On electro-magnets; a note by M. Deleuil. This paper refers to the use of electro instead of ordinary magnets for removing iron from the paste employed in the manufacture of porcelain.—Researches on the fleece of merino sheep, by M. A. Sanson.

Geographical Society, Oct. 21.—President, M. Delesse.—Dr. Hamy communicated the result of his researches on the geographical distribution of the human race in Eastern Melanesia. He showed that the penetration of the Papuan populations by the Polynesians is much less exceptional than has been hitherto believed. It has been long known that there has been a considerable immigration of Tongans into Viti. Ouvea, in the Loyalty Islands, was invaded at the beginning of this century by Kanakes from the Wallis Isles, the eastern coast of New Caledonia containing a very large number of Melano-Polynesian Metis, the yellow variety of M. Bougarel, who perhaps found them on Isabella Island, in the Solomon group. The recent discoveries of Captain Moresby show the Polynesians strongly established in the southern extremity of New Guinea. According to M. J. Verreau they had penetrated as far as Australia, where a small tribe having all the characteristics of Polynesians has been established for about thirty years in the neighbourhood of Cape Capricorn.

BOOKS AND PAMPHLETS RECEIVED

BRITISH.—Tables for Travellers: Admiral Bethune (W. Blackwood).—Out of Doors: Rev. J. G. Wood, M.A., F.L.S. (Longmans).—Charts of Meteorological Data (Meteorological Office).—Remarks on Charts of Meteorological Data (Meteorological Office).—Insects Abroad: Rev. J. G. Wood, M.A., F.L.S. (Longmans).—The Races of Mankind, vol. ii.: Robert Brown, M.A. (Cassell, Petter, and Co.)—The Earth as Modified by Human Action: G. P. Marsh (Sampson Low and Co.)—The German Arctic Expedition of 1873-74: Capt. Koldeway (Sampson Low and Co.)—The Sheep: W. C. Spooner, M.R.V.C. (Lockwood and Co.)—A Year's Botany: Frances Anna Kitchner (Rivingtons).—The Safe Use of Steam. By an Engineer (Lockwood and Co.)—Observations of Magnetic Declination: J. A. Brown, F.R.S. (H. S. King and Co.)—The Elements of Psychology: Robert Jardine (Macmillan and Co.)—Winter and Spring on the Shores of the Mediterranean: James H. Bennet (J. and A. Churchill).—Physiological Chemistry: S. W. Moore (Smith, Elder, and Co.)—Philosophy of History: Hugh Doherty, M.D. (Trübner and Co.)

AMERICAN.—Proceedings of the Boston Society of Natural History, vol. xvi. Part IV.—Memoirs of the Boston Society of Natural History, vol. ii. No. 3.—Address of Ex-President Joseph Lovering, American Institute for the Advancement of Science at Hartford.

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