THURSDAY, APRIL 24, 1890.

THE REVISED INSTRUCTIONS TO INSPECTORS.

LAST year it was a matter of considerable complaint against the Education Department that the Draft Code was presented to Parliament unaccompanied by the new instructions to inspectors, without which it could neither be satisfactorily interpreted nor adequately discussed. No such complaint can be made this year. The issue of the new Code, which promises to place elementary schools under what is practically a new system of regulations, has been followed within a few days by a revised edition of the instructions to inspectors, in which the changes are correspondingly large. Indeed, more than half of the document consists of new matter.

On the whole, the approbation which has greeted Mr. Kekewich's Code may be extended to the instructions by which it is explained. So far as we can see, there is no shuffling, no attempt to minimise or to alter the practical effect of the reforms which are conceded on paper in the Code.

The main alterations occur in those parts of the instructions which are to guide the inspector in awarding the Parliamentary grant under the new *régime*. It will be remembered that the system of payment on the results of individual examination disappears almost completely, and is replaced by a grant made up of three parts—a "principal grant" of 12*s*. 6*d*. or 14*s*., a grant of 1*s*. 6*d*. or 2*s*. for discipline and organization, and a payment as before on results of examination in the so-called "additional subjects." The mode of examination to be adopted in future in the elementary subjects on which the "principal grant" depends is substantially that already in use for "class subjects." That is to say, there will be a collective examination by sample, a certain proportion of children out of each class being chosen at random for examination by the inspector, the teacher being always invited to add a few of his most forward scholars, so that the school may not be injured by any accident in the selection. Several alternative modes of selection are suggested, and the inspector is expressly asked to vary his method from time to time, rather than to adopt any uniform plan. Teachers and managers may hear the oral examination and see the papers, but they are to be warned that "it is not by studying past questions, nor by trying to forecast the kind of questions likely to be set hereafter, but by teaching the subject with good sense and thoroughness that the requirements of the Department will be best fulfilled, and the truest educational success achieved."

The higher "principal grant" is not to be awarded unless a high standard of proficiency is reached in all three elementary subjects. If the scholars do not reach the standard required for the lower "principal grant," the managers are to be warned that next year the grant may be discontinued; and, in all cases where the higher grant is not awarded, the points in which the school is deficient are to be clearly indicated to the managers.

These regulations, if wisely carried out, must be a great improvement on those under which the grant is at present assessed. The old barbarous system of bleeding a bad school to death by diminishing its grant below the minimum required for its efficient maintenance will be discontinued. In place of this a school, so long as it receives anything, will receive enough to enable it to be efficient if the teachers and managers are up to their work. If such a school fails to reach the required standard, though supplied with public aid on as liberal a scale as that on which multitudes of schools do contrive to be efficient, it will simply be removed from the list of grant-earning schools. This is the rational course, if carried out in practice, but very much will depend on the inspector. It is sincerely to be hoped that the instructions will be carried out in such a way as to ensure that the "liberal grant now offered to comparatively humble schools shall serve as an aid and stimulus to improvement, and not as a pretext for remaining content with a low standard of duty."

With the disappearance of payment on individual results in the elementary subjects, the necessity for many of the minute regulations as to the exact meaning of a "pass" in each subject disappears also. But the necessity still remains for the inspector to keep in mind the standard of an individual pass for such purposes as that of the scholar requiring a "labour pass" either for half-time or whole-time exemption.

A few modifications are made in the instructions respecting the three elementary subjects. The justice of the oft-repeated complaints which have been made of the excessive time devoted to English grammar is recognized, not only in the altered regulations for English, but in a great reduction in the "spelling" requirements. As regards reading, it is suggested that a class of older scholars should be set to read a passage to themselves while another class is being examined, and then be questioned as to its matter. Writing will be partly tested by examination of school copy-books, not merely by a piece of writing executed during the anxious and nervous hours of the inspector's visit.

But the most important changes bearing on the school curriculum—indeed, perhaps, on the whole, the most important changes in the whole document—are those passages in which an attempt is made to link the instruction of the school to the life of the home. On the one hand, the co-operation of the parents is to be expressly invited; on the other hand, their special wants are to be more directly consulted. For example, it is pointed out that "in some good schools the aid of the parents has been successfully enlisted, and they have been urged to hear their children read aloud from a newspaper or from a book for a few minutes at home in every day. The amount of oral practice which any one child can obtain in a large class is obviously insufficient; and a little home exercise in reading aloud is often found to have an excellent effect." On the other hand, the elder girls are to be allowed to bring from home garments that want mending, and to repair them in school under the teachers' supervision—an arrangement which will "connect the school-work usefully with the every-day life of the scholars." There are other hints to a similar effect, as in the concluding paragraphs of the instructions, which enumerate the ways in which, besides conforming to the requirements of the Code, a school may seek "to render

service to the children who attend it and to their parents." Taken one by one, the suggestions may seem unimportant; collectively, however, they indicate a policy of taking the parents frankly into confidence, and so, if possible, of establishing a new link of interest between the parent and the school, besides the mere "cash-nexus" of the school pence, which are destined so soon to disappear.

Under the head of "class subjects" an explanation is given of the object of the great changes in Schedule II., which, we learn, have been introduced in order to allow of greater freedom to teachers of different tastes and capacities, and to localities of different industries and requirements. "One good teacher of geography may attach special value to physical facts and phenomena; another who lives in a manufacturing or maritime town prefers to make commercial and industrial geography and the interchange of productions the leading features of his lessons." The same standard is, so far as possible, to be kept in view, in estimating the teaching of all the various alternative courses; but, subject to this one consideration, complete freedom of choice and treatment is to be given to teachers and managers. "In sanctioning any modification of the printed schemes it will be necessary to have regard to the experience and qualifications of the teacher, and to any special opportunities afforded in the town or district for instruction by a skilled demonstrator, who visits several schools in succession, or who gives collective lessons at suitable centres."

The instructions further confirm the view we expressed when commenting on the Code, that the policy of the Department will be to encourage class teaching at the expense of specific subjects. "Those managers and teachers who desire to continue the object-lessons of the infant school in due order through all the lower standards, and so to lead up to the regular study of natural history or physics in the higher, will probably think it better to treat science as a class subject than to postpone specific instruction until the fifth standard."

The recognition of continuity, and the idea of the school course as a connected whole, strikes us as a new and valuable feature in the instructions. From the infant school the child is to be led on through a series of object-lessons to the scientific class-teaching of the upper school, and thence in some cases to specific instruction in the higher standards. But all this is but the beginning. "Teachers should not be satisfied unless the instruction in specific subjects awakens in the scholar a desire for further knowledge, and makes him willing to avail himself of such opportunities as are afforded locally by a Science Class, a Polytechnic Institute, a course of University Extension Lectures, a Free Library, or a Home-Reading Circle." All this is a truism, it may be said; but it is unusual language for an official document, and carries us forward in imagination to the time, which must come sooner or later, when such fragmentary and scattered institutions as are here enumerated will take their proper place as parts of a great scheme of national education.

We fear that the realization of the aims of the Department may be materially impeded if a literal construction is to be placed on the clause providing that the same subject may not be taken both as a "class" and as a "specific" subject. Does this restriction merely mean that no child is to be presented in the same subject under both heads—an obviously reasonable stipulation—or that no children in a school may take as a specific subject any branch of study which is taken as a class subject by any other children in the school? If the latter is the case, we are informed that, in some cases at least, managers will find themselves seriously hampered.

Provision is made for the assistance of experts in the examination of scholars, in cases where the managers choose an "additional" subject with which neither the inspector nor his assistants are fully conversant. But unfortunately this assistance, which will be given by a colleague, on application to the chief inspector, will be confined to the framing of suitable questions, and marking the answers, and hence will be inapplicable to the case of oral examination, in which it is most wanted.

Those interested in manual instruction will turn with interest to the thirty-fifth section, which lays down the duties of inspectors with respect to this newly recognized branch of instruction. It explains that the difficulty which has hitherto prevented the recognition of manual instruction as part of the ordinary course of instruction in a public elementary school has been removed by the alteration in the terms of Art. 12 (*f*), though how such a change in Departmental regulations can alter the sense of an Act of Parliament we are left to conjecture. The instructions suggest such exercises as "modelling, the cutting, fixing, and inventing of paper patterns, the forming of geometrical solids in cardboard, and the use of tools and instruments," which are in use in some foreign schools, and are found to be "not without a useful reflex influence on all the ordinary school studies." The inspector is to report on the working of any system of manual instruction which may be adopted, though "no special grant is made *by this Department*." The words we have italicized clearly tend to confirm our impression as to the intention of the Science and Art Department to include manual instruction in their next Directory.

It is rather strange that under the head of "drawing" no reference is made to the change by which in future drawing will be made compulsory in boys' schools and optional in infant departments. It is true that drawing in ordinary schools will, as now, be paid for by the Science and Art Department, but power is given by the new Code to Her Majesty's Inspector to exempt schools from the necessity of taking the subject where the means of teaching it cannot be procured. We should like to know what standard the inspector will adopt in using this dispensing power. Will the standard be the same in all districts?

This is the question to which we return again and again after examining in detail the various changes in the Code and the instructions. All will depend on the inspectors. What will their action be? We agree on the whole in the praise accorded in the instructions to the "ability, discretion, and fairness with which Her Majesty's Inspectors discharge their arduous duties," but nevertheless, in particular cases, complaints of their action have not been wanting. The inspectors have hitherto been burdened with an amount of routine work which has to some extent hindered them from forming a really intelligent estimate of the value of the school work which they have to assess. This burden is now lightened, more visits may be paid without notice, and thus more intimate knowledge may be acquired of the real work of the school. "It will be

largely owing," we read, "to your influence if all who are concerned with the management of schools habitually regard the officers of this Department not merely as critics and examiners, but as advisers and helpers, in the performance of an important public work." That is the ideal to aim at, though there is a good deal of lee-way to make up before it is realized.

ORANGES IN INDIA.

The Cultivated Oranges and Lemons of India and Ceylon. By E. Bonavia, M.D. Pp. 384, with an Atlas of 259 Plates 7 inches long by 9 inches broad. (London: W. H. Allen, 1890.)

FOR twenty years past Dr. Bonavia has been distinguished in India as a horticulturist. He has been in charge of the Horticultural Gardens at Lucknow, where he has conducted many valuable experiments. Of late years he has tried oranges, and he has also collected information concerning oranges from various parts of India. India, taken as a whole, is very poorly supplied with fruit; really good mangoes and litchis are nearly everywhere dear, and remain in season but a short time. Oranges in several parts of India are cheap and excellent; improvement in their cultivation and extension in their circulation are matters of importance. The book of Dr. Bonavia contains his own experiences and notes, which are valuable. His second-hand information, which he has collected in the fashion of an Indian Secretary to Government or Minister of Agriculture, is of very small value, but is certainly superior to many secretarial compilations about hemp, jute, cotton, &c.

The first ninety pages treat of the various groups of oranges, lemons, limes, citrons, &c., with their sub-varieties; the next fifty pages treat of their cultivation in India; fifteen pages treat of their uses; eleven of the orange trade in India; twenty-one of the morphology of Citrus; forty of the origin of the Citrus and the derivation of its Indian names. Then follow 120 pages of appendix, containing a miscellaneous collection of "cuttings" relating in some way to the subjects in the book, with a translation of the chapters relating to Citrus in Rumphius's "Herbarium Amboinense." The greater part of this appendix appears of small importance; while Dr. Bonavia has by no means exhausted what first-rate authorities have written regarding oranges. The atlas of plates gives hardly anything but outline drawings of oranges and their leaves; a very small selection of these would have served every useful purpose.

Dr. Bonavia has summed up for us the conclusions of his book under seven heads (p. 245):—

(*a*) The pummelo (*Citrus decumana*, Willd.), is not specifically separable from the orange (*C. Aurantium*, Linn.).—This is a point of no possible importance, when naturalists know no line between a well-marked variety and a dubious "species"; but Lowe ("Fl. Madeira," p. 73) agrees with Dr. Bonavia.

(*b*) The sweet orange of Europe (*C. Aurantium*, Linn.) is a distinct race from the Mandarin orange (*C. nobilis*, Lour.).—This is correct, and well brought out by Dr. Bonavia; but it is also done very clearly by Lowe ("Fl. Madeira" [1857], pp. 73, 74).

(*c*) The India name "suntara," for *C. nobilis*, is not a corruption merely of Cintra.

(*d*) The European words "lime," "lemon," are probably derived from Malay words.

(*e*) Huge forms of Citrus fruit may have risen from a fusion of two ovaries [p. 187, "My view would require that the Citrus fruit should have originated in *two* whorls of carpels, the outer or *rind-whorl* and the inner or *pulp-whorl*"].

(*f*) The true lime (*C. acida*, Roxb.) has more probably descended from *C. hystrix*, Kurz, than from *C. medica*, Linn.

(*g*) The juice-vesicles of the Citrus pulp are probably homologous with the oil-cells of the rind and leaves, and perhaps with the ovules.

It will be best to reverently draw a veil over the conclusions (*e*) and (*g*) and over the whole chapter on morphology. And the other five "conclusions," except (*b*), do not conclude anything. The foregoing is Dr. Bonavia's own summary of what he has proved, but he has done more than he claims; his account of his own horticultural observations is of value, and his deductions very generally correct. Of these only a few can be given here.

(1) The *Khatta* or *Karna* orange of Upper India produces two kinds of fruit on the same tree and on the same branch, viz. (1) the regular crop, of smooth oranges, ripe at the end of the dry season, and (2) the after crop, of grossly-warted oranges, ripe at the beginning of the rains.

(2) The European orange (*C. Aurantium*) is only known in India as a cultivated foreign orange, and is not common. It has been probably introduced into India in modern times—possibly from the West.

(3) The *C. nobilis* is the sweet orange of India; it has been in India from ancient times, and is possibly indigenous on the north-east frontier. It has only been brought to Europe in modern times. The Tangerine orange is a small form of it. (This *C. nobilis* is a more slender tree than *C. Aurantium*; its oranges are depressed at the poles; the rind is very full of large oil-glands, and separates easily from the pulp, which lies more or less loosely in the rind as in a bag.)

(4) The pummelo (*i.e.* Pompel-moes) of India and Ceylon is in flavour, structure of carpels, colour of pulp, &c., very distinct from the Syrian shaddock, *i.e.* the shaddock of English fruit-shops.

(5) In the plains of Upper India (Delhi, Lucknow, &c.) the Indian orange (*C. nobilis*) can be successfully cultivated, but requires irrigation (well-water being better than canal-water), budding, trenching, shade, special preparation of the soil by lime or manure, &c.

Every page of Dr. Bonavia's book offers opportunity of comment: the remaining space here available is devoted to the practical subject of the Indian sweet orange, *C. nobilis*, which we shall call the "Mandarin," and, for shortness, state first our own beliefs concerning it.

There are (according to Dr. Bonavia) three great centres of cultivation of the "suntara" in India, viz. (1) Sylhet, *i.e.* South Khasia; (2) Central India; (3) Delhi and Oudh. From Khasia (*fide* Bonavia) about 4000 tons, worth £4 a ton, are exported to Bengal, mainly to Calcutta. From Central India about 800 tons go by rail

to Bombay. The export from Delhi is small. Besides this many stations have a few orange orchards for local consumption—"a mere nothing."

It is evident from this that Khasia is the most important orange centre, and unfortunately Dr. Bonavia has had to treat this part of the subject second-hand. He hardly says anything about the Central Indian cultivation, except the remark (p. 127), "I do not know what the composition is of the black soil of the Central Provinces." This soil, which produces such excellent Mandarins, everybody knows to be disintegrated trap, *i.e.* the same soil which alone produces them in Khasia.

Dr. Bonavia spends much space in attempting to show that the suntara orange is not a Mandarin; he maintains that the suntara and Mandarin are nearly allied, and together form the distinct race (or species) *C. nobilis*. He admits that people in Ceylon and elsewhere *will* call the suntara the Mandarin, but he strongly denies that the Mandarin is a suntara; he may as strongly deny that the greengage is a plum. The best Khasi oranges run very close on the true Mandarin. The *C. nobilis* now grows as if wild from the hills of Southern China, probably to Assam (Khasia); it is also scattered along the outer Himalaya of Sikkim and Nepal. The centre of this area is almost certainly its "origin." Dr. Bonavia speaks of the Butwal (south of Nepal) orange as the sweetest orange in India: he has not tasted from the tree the Khasi orange at the end of January, which is considered *too* sweet by many Europeans. The Khasi orange is in fact larger than the Butwal; and for a *sweet* orange there is no finer in India or elsewhere.

Dr. Bonavia lays stress on the fact that the true Mandarin is when dead ripe a "varnished green," while the suntara is "from orange-yellow to lobster-red"; he found that the green oranges of Ceylon in travelling to Etawah (21 days' journey) had turned or were turning yellow; and he decides triumphantly that "the *green* orange has no *locus standi*." The fact is otherwise: the best Khasi oranges when dead ripe on the tree are an intense "varnished green." Picked somewhat unripe, and carried in a native boat (21–30 days) to Calcutta, they arrive a dull yellow or turning yellow. And perhaps Dr. Bonavia could prove by prolonging the journey that their true colour is black. The withered, unripe-picked, dull yellow, mawkish, Calcutta orange is a very different thing from the orange ripe on the tree above Chela.

The Mandarin grows best in steaming valleys just within the hills (and above all on disintegrated trap) at an elevation of 250–2000 feet: here it grows from seed without any trouble. In the plains, the fruit is worse the farther you recede from the hills, and great pains must be taken with the culture. Dr. Bonavia was unfortunate in having to experiment with the orange at Lucknow; free-trade principles would suggest that the most promising plan would be to improve the communications between the orange districts and the great centres of consumption. It was not the fault, however, of Dr. Bonavia that he had to try to grow oranges where they naturally will not grow. But Dr. Bonavia does not seem, with all the extensive cuttings in his appendix, to have got from the literature the help in his task that he should have got. He hazards, for example, a speculation (p. 116) that "the stock on which the Mandarin is grafted may have some influence"; apparently unaware that the regular practice is to graft the Tangerine on the common orange, as it then becomes a larger tree giving a more certain crop of larger fruit.

Quite apart from the question of oranges, it is well worth while to examine in some detail the method of Dr. Bonavia in obtaining information about the Khasi orange and its results, because it throws a flood of light on Indian reports in general. Dr. Bonavia appears to have tried three sources of information, viz. (α) a description of the orange-groves by Mr. Brownlow, (β) the answers to his questions returned by the Deputy-Commissioner of Sylhet, (γ) similar answers from the Rev. Jerman Jones. Dr. Bonavia does not refer to the "Himalayan Journals" of Sir J. D. Hooker, vol. ii; nor to Medlicott in Mem. Geol. Survey Ind., vol. vii. Art. 3. From these two latter sources, a very fair idea of the circumstances of the orange-groves of Khasia can be gained. Dr. Bonavia appears not to have the wildest notion of the country, climate, or soil.

Turning to Medlicott's map, we see that there are three large valleys (Chela, Umwai, and Sobhar), at the south extremity of the Khasi Hills, which are occupied by the "Sylhet trap." This trap extends in the Chela valley from the debouchement of the river at Chela up to 2800 feet at the head below Mamloo. This trap decomposes into a reddish earth, and there occur soft ashy beds very like forms of the Deccan trap. All three valleys are excessively steep, the undecomposed trap standing in huge masses. The rain-fall varies from 300 to 500 inches per annum. These valleys are thus rough and broken, and full of precipices inaccessible but by ladders and ropes. Intensely hot and steamy, and protected from winds, they exhibited a richer vegetation to Sir Joseph Hooker than he had seen in the Himalaya.

In the Chela valley, at the present time, the Mandarin orange occupies the whole area of the trap. The two other valleys are less completely occupied. There is also an orange-grove on a small trap area a few miles east, behind Jynteapore.

The Khasi cultivation is simple. The pips of the orange are raised without difficulty in a damp seed-bed, often in a nook shaded by a boulder of trap. A piece of the jungle is half cleared (*i.e.* most of the larger trees, some of the smaller); and the young orange-trees, 3–5 feet high, are stuck out promiscuously in the partial shade left; the root of each is pushed if possible under the heel of a block of trap. When the young trees have got hold enough to bear the sun, the *other* half of the jungle is roughly cut. The trees require no further labour. The orange-groves in the cold weather form a monkeys' paradise, and it is necessary to destroy these. Sometimes two or three villages unite, enclose the monkeys, and drive them down to an angle of the main stream, where they are slaughtered pitilessly. The sight of a single monkey is always sufficient to exasperate a Tyrna man to fury.

The crop is enormous; the river at Chela flows sometimes covered apparently with oranges. Before the season is half over, the pigs are so surfeited that their oranges have to be peeled for them. The valley has enormously increased in wealth in the last half-century. It is a Khasi saying that a man here may work for three days and eat for a month.

Now let us see what Dr. Bonavia says. He has the specimen soil collected by Mr. Brownlow analyzed by a trustworthy chemist, who finds no lime in it. Dr. Bonavia argues (p. 94) "that either Mr. Brownlow took his sample from one particular spot, or did not reach the calcareous soil." "Orange wood requires considerable lime. In Chela oranges grow very well; therefore the soil of Chela contains lime. Moreover, it is incredible as the district exports lime that no lime detritus is ever washed down by the floods which flood the orange-groves of Chela to the depth of 6 feet."

Nothing can be wider of the mark. Mr. Brownlow would have had to go very deep into the Sylhet trap, a very hard rock, to get any lime. It is true that there is limestone at Mamloo, and that the water that comes down has some lime in it—but very little. The floods at Chela rise sometimes 60 feet (instead of 6), but they cannot inundate even then much of the orange groves which run up to 2000 feet. Perhaps tbe most extraordinary statement in Mr. Brownlow's description is that (above Chela) "no vacancies are left in the planting of the orange-trees." The trap boulders are as big as cottages all over the valley.

We turn to the second source of information—the Deputy-Commissioner of *Sylhet*. Fifty years ago "Khasia" was attached to Sylhet, and known as North Sylhet; and the oranges are still known as Sylhet oranges. Dr. Bonavia applies, therefore, to the Deputy-Commissioner not of the Khasi Hills, but of Sylhet. The Deputy-Commissioner cannot possibly leave his own Sylhet government and his own station; but, being a very amiable man, he sends Juggaish Babu, Deputy-Magistrate of Chunamgunj, to collect the information for Dr. Bonavia. This gentleman commences his report, "I met with the greatest difficulty in compiling these statistics. The Khasis received my inquiries with suspicion, and tried to mislead me as much as possible." The Khasis would doubtless be most hostile to a Bengali Babu from Sylhet. But a Bengali Babu is not exactly the man to collect scientific information anywhere. Juggaish Babu commences, "The soil must be sandy." "The gardens being situated on river-sides, their soil naturally retains some moisture even in the dry season. Hence, perhaps, artificial irrigation becomes unnecessary." How the idea of the possibility of artificially irrigating the Chela valley can have occurred to the Babu's mind is marvellous; unless his report is in reply to some leading question by Dr. Bonavia.

"The garden is never hoed or harrowed before receiving the orange plants." It would not be possible to harrow such a country at any season. The Babu finally speaks of the land tenure. He does not mention the fact that Chela and its 12 associated villages form a republic under the protection of the English Government; their administrative Government consists of 4 councillors elected for four years by universal manhood suffrage. This constitution was established half a century ago by a Bengal civilian, and is unique.

We now turn to the third source of information to Dr. Bonavia, viz. the Rev. Jerman Jones, a missionary who has been in Khasia more than 25 years, and could have told much. But he appears only to have been consulted about the *names* of oranges in Khasi, and he replied that the name (for the Khasi Mandarin) is *U soh niam-tra*; which Dr. Bonavia writes *Usoh niamtra*; and states (p. 228) that *Usoh* is the generic Khasi name for oranges. [In a footnote, backed up by an appendix, No. 43, Dr. Bonavia carefully and amusingly notes that the word he got from the Deputy-Commissioner of *Sylhet* was *santra*, not *niamtra*. Dr. Bonavia evidently thinks the testimony of a missionary doubtful as against that of a Deputy-Commissioner. But the excellent Deputy-Commissioner in question has an extremely limited knowledge of Khasi, and would certainly not set himself up against Mr. Jerman Jones.]

Dr. Bonavia having got the word *usoh* for orange in Khasi, goes on to connect it with the Amboina words *aussi* and *ussi*. He proceeds (in tracing the origin of the Mandarin), p. 229:—

"We have here, I think, something tangible to go by. The community of the generic name *usoh*, *ussi*, or *usse* to the Khasi Hills and the Malay Archipelago indicates, &c., &c."

In Appendix No. 58, the affinity of *usoh* is pushed further with the aid of Prof. Dr. T. de Lacouperie.

Now we come to the smash of the whole. *Soh* means "fruit" in Khasi, as see Hooker, "Himalayan Journal," vol. ii. p. 268, in note; in which language every noun *must* have the article prefixed, and *soh* being masculine, takes the masculine article U. Throughout Khasia, *usoh* so far from being the generic term for orange, would be understood to be *potatoes*. It is probable that, *at Chela*, if an Englishman pointed at a basket of oranges and said "*usoh*," they would guess which fruit he meant; but it is not Khasi. (Not the least curiosity in this book is that Mr. Jerman Jones should say that he had never found a Khasi who could offer the remotest suggestion as to the derivation or meaning of *niam-tra*. *Some* Khasis have an explanation; it might be worth Dr. Bonavia's while to ask Mr. Stevens of Chela, or Mr. Roberts of Nongsowlia, about it before publishing the corrected edition.)

The sum of the matter is that, if Dr. Bonavia had confined his book to his own observations and his own part of the country, with half a dozen plates showing properly the main types of Indian oranges, it would have been a handy inexpensive book of 200 pages at most. But, unfortunately, in Indian style, Dr. Bonavia's ambition has been to include all India in his book, to put forward his own extremely peculiar views of morphology, and to revel in linguistic and ethnological speculations, some of which are absolutely bad, and many of which can be but of little use. On top of the book thus weighted come the 120 pages of appendix, with the final result that the work bears a painful resemblance to the ordinary Secretarial Report, though it possesses really an amount of original observation and experience which such Reports often entirely want.

In one respect, Dr. Bonavia hardly comes up to the Secretarial Report: he spells, on one page, Shalla, Mhowmloo, Mostock, though those words were correctly spelt Chela, Mamloo, Mousto, as long ago as 1854 by Sir J. D. Hooker; or Dr. Bonavia might have referred to the fine map of the district by Godwin-Austen. Similarly, Dr. Bonavia states (p. 30), "The Bengalis have no *v* in their language." It is true that in vulgar

Bengali the *v* is often degraded into *b*—a linguistic change that runs from Hebrew to Spanish. But Dr. Bonavia might as well maintain there is no *h* in English because a Cockney pine-grower "eats is ouses by ot water."

Turning lastly to the question how far Dr. Bonavia's book assists the cultivation of the orange in India, we may doubt, with every admission of his horticultural skill and assiduity, whether he is on the right tack. The Khasi Mandarin can be grown almost without labour, and of a quality that is not likely to be approached by any horticultural skill and labour on non-volcanic soil in the plains. These oranges are now picked unripe, and occupy a month (often more) in reaching Calcutta in a native boat. A fruit-steamer would take them down in 2 or 3 days from Chattuck to the rail at Goalundo. Bombay would surely take many more oranges from Nagpore if the railway rates were lowered, and the "perishable fruit" accelerated in transit.

Mr. Medlicott made only a hurried march across the Khasi Hills when he laid in his three patches of Sylhet trap, and he only visited a very narrow strip of country. More of this trap certainly exists—perhaps at a low level, suitable for oranges; and the Government Geologist at Shillong might, in the cold weather, possibly discover some more patches. For the present, however, the known area of Sylhet trap is by no means nearly covered with oranges, except in the Chela valley, where the boundary of the orange-groves coincides very closely with the outcrop-line of the trap. C. B. CLARKE.

A NATURALIST AMONG THE HEAD-HUNTERS.

A Naturalist among the Head-hunters. Being an Account of Three Visits to the Solomon Islands in the years 1886, 1887, and 1888. By Charles Morris Woodford, F.R.G.S., &c. (London: George Philip and Son 1890.)

TILL within the last twenty years the Solomon Islands were almost unknown to Europeans, and their inhabitants were considered to be exceptionally uncivilized and treacherous. Whatever they may have been originally, they were not likely to be improved by their first contact with civilization, in the form of chance visits of whalers and vessels engaged in the "labour trade"—which in its early days meant kidnapping and slavery, often leading to murder or to wholesale massacres. With such experiences of the resources of civilization we are not surprised to hear from Mr. Woodford that they are "suspicious of strangers," or that they are "treacherous when they see their opportunity"; yet the fact that he lived among them for several months, often quite alone and unprotected, and that Mr. Lars Nielsen, a trader, lived on good terms with them for ten years, leads us to suppose that, under more favourable circumstances, their character might have been found to compare not unfavourably with that of the Fijians. There is now, however, no chance for them, as they are certainly doomed to speedy extinction. The numerous distinct tribes found on each of the islands live in a state of chronic warfare, incited by the ordinary causes of the quarrels of savages, intensified by a general mania for head-hunting and in some cases by the habit of cannibalism. So long as they fought with native weapons, spears and wooden clubs, the destruction of life was not very great; but the traders have armed them all with Snider rifles and steel tomahawks, the result being that entire villages and tribes are sometimes massacred; and this wholesale destruction, aided by infanticide and other causes, is leading to a steady decrease of the population.

The excellent reproductions of photographs with which the book is illustrated show that the Solomon islanders are typical Papuans, hardly distinguishable physically from those of the western and central portions of New Guinea. Their state of civilization appears to be about the same. They cultivate the ground assiduously, growing chiefly yams, taro, and plantains, and they even terrace whole hill-sides for the taro, a stream of water being admitted at the top, and conducted down from level to level with considerable ingenuity. As domestic animals they keep dogs, pigs, and fowls, and they had all these animals when first visited by the Spaniards in 1568. The dog Mr. Woodford believes to be the dingo of Australia; the pig the *Sus papuensis* of New Guinea; while the fowl was no doubt derived from the Malays. They build excellent canoes, fifty or sixty feet long, of planks hewn out of solid trunks, beautifully fitted together and fastened with rattan. Their houses are fairly built and comfortable; and they construct baskets, shields, wooden bowls, and various weapons and ornaments, with the usual savage ingenuity.

Mr. Woodford's chief occupation in the islands was the collection of specimens of natural history, and his account of the zoology of the group presents several points of interest. It is here we find the eastern limit of the marsupials, which are represented by a species of Phalanger hardly distinguishable from one inhabiting New Guinea. Bats are numerous, seventeen species being described, of which six are peculiar; and there are four species of native rats, one of which is the largest species known. About the two large rats, *Mus imperator* and *Mus rex*, Mr. Oldfield Thomas, who described them, makes the following interesting remarks:—

"It is, however, in their relation to each other that their chief interest lies, for they seem to be clearly the slightly modified descendants of one single species that, once introduced, has been isolated in Guadalcanar for some considerable time, while it has apparently died out elsewhere. Of this original species, some individuals would have adopted a terrestrial and others an arboreal life, and their respective descendants would have been modified accordingly. In this way I would explain the fact that at the present time we have in Guadalcanar two genuine species, agreeing with each other in their essential structure, and yet separated by a considerable number of characters, all having a more or less direct relation to a climbing or non-climbing habit of life. Of these, of course, by far the most striking are the broad foot-pads and the long rasp-like probably semi-prehensile tail of *Mus rex* as compared with the smaller pads and short smooth tail of *Mus imperator*."

This description well illustrates the fact of the importance of insular faunas as showing us how species may be modified under the least complex and therefore most easily understood conditions. On a continent the modification to an arboreal mode of life would have brought the species into competition with a number of other arboreal organisms, and would have exposed it to the attacks of a distinct

set of enemies, requiring numerous modifications of form, structure, and habits, the exact purpose of which we should have found it difficult to interpret. But here, where both competitors and enemies are at a minimum, we are able distinctly to see the few and simple modifications which have adapted the species to its changed mode of life. We have here, too, a case in which the isolation supposed to be essential in the production of new species has been effected solely by a change of habits within the same limited area, and it is evident that this mode of isolation would be equally effective in the case of a continental as of an insular species.

Lizards, snakes, and frogs are tolerably abundant, and the proportion of species peculiar to the islands is in the order in which they are here named; and this also indicates the increasing difficulty of transmission across an ocean barrier. Birds seem to be fairly abundant, parrots and pigeons forming the most conspicuous groups, while birds of paradise appear to be absent. Although insects decrease in number of species as we go eastward from New Guinea, yet two of the grandest of butterflies—*Ornithoptera Urvilleana* and *O. Victoria*—are found in the Solomon Islands, and were among the greatest treasures of Mr. Woodford's collections. The latter species was only known by a female specimen obtained by Macgillivray, the naturalist to the *Herald*, in 1854, till Mr. Woodford again found it in 1886, and discovered also the beautiful green and black male. Many fine Papilios are also found, among them a splendid blue and black species allied to the well-known *P. Ulysses* of the Moluccas. Here, as elsewhere in the tropics, some striking cases of mimicry occur, three species of Euplæa being so closely imitated by three species of Diadema, as to be undistinguishable on the wing; and each pair appeared to be confined to a separate island.

The following is an interesting observation on the habits of pigeons:—

"The small islands on the reefs are much frequented by pigeons. They resort to them during the day, but mostly towards sunset, when, at some islands that I know of, the pigeons may be seen arriving by twos and threes, or in flocks of ten or a dozen each, to roost on the islands, until each tree is crowded with birds. The only reason that I can assign for this habit is, that on these small islands the pigeons are freer from the attacks of the large monitor lizards that abound on all the large islands. I do not consider this at all a satisfactory reason, but it is the only one I am able to suggest. Certain it is that this habit of the pigeons plays an important part in the distribution of seeds from island to island. On any of these small islands the large seeds of the Canarium nut tree may be found, after being disgorged by the pigeons, while young trees in different stages of growth may often be seen."

Mr. Woodford's explanation of the pigeons' roosting on the small islands appears to be a highly probable one, and quite in accordance with other facts relating to this tribe of birds. They are exceptionally abundant in tropical archipelagoes, and most so in those where, as in the Antilles, the Mascarene group, the Moluccas, and the Pacific islands, arboreal carnivorous mammals are very scarce or altogether wanting. An analogous fact to that noted by Mr. Woodford is, that although the beautiful Nicobar pigeon has an enormous range, from the Nicobar Islands to New Guinea, it is almost unknown in the larger islands, especially in the western half of its area where mammals abound, but is more especially confined to the smaller islets and reefs, where it is comparatively free from enemies.[1]

Although the natives of the Solomon Islands are well supplied with Bryant and May's wax vestas in metal boxes—the only kind of matches that can be kept in the damp atmosphere—they still make fire in the native way, by friction, on certain ceremonial occasions, or at other times when matches are not forthcoming; and their method of proceeding is well described by Mr. Woodford. It consists in rubbing a hard piece of wood in a groove formed on a soft dry piece—the method used in the Moluccas and Australia—and he tells us that, though a native will usually produce fire in less than a minute, he has himself rubbed till his elbows and shoulders have ached without ever producing more than smoke.

The following extract gives a fair idea of the author's style:—

"It is amusing to see a mere child paddle alongside in a crazy trough of a canoe, only just capable of supporting its weight. The water splashes into the canoe at every stroke of the paddle, and at intervals the small child kicks it overboard with its foot—a novel kind of baler. Three or four mouldy-looking yams, ostentatiously displayed, are rolling about in the water at the bottom of the canoe. The unsuspecting stranger takes pity on the tender years, and apparent anxiety of the small native to trade, and gives him probably four times the proper price for his rusty yams. The child eagerly seizes the coveted stick of tobacco, and immediately stows it for safety through a hole in his ear, where at least it will be in no danger of getting wet. He next whisks aside a dirty-looking piece of matting that has apparently got accidentally jammed in one end of the canoe, and displays some more yams, of a slightly better quality than the last. For the sake of consistency you cannot well offer him less than you did before, and another stick of tobacco changes hands, and is transferred to the other ear. You think now that he must have finished, as there is no place in the canoe to hide anything else, but with a dexterous jerk that nearly upsets the canoe he produces a single yam that he has been sitting upon. How it managed to escape notice before is a puzzle. For this he demands a pipe, but is not satisfied with the first or second that is shown him. No; he must have a *piala tinoni* or have his yam back. The *piala tinoni* is a pipe with a man's face upon the bowl. But again the young trader is particular, it must also have a knob at the bottom or he will have none of it."

The book is well got up, well illustrated, and very pleasantly written. It is full of information as regards the natives, the scenery, and the natural history of these little-known but very interesting islands, and can therefore be confidently recommended to all who care for books of travel in little-known countries.

A. R. W.

OUR BOOK SHELF.

Recherches sur les Tremblements de Terre. By Jules Girard. (Paris: Ernest Leroux, 1890.)

THE scientific study of earthquake phenomena has of late years made great progress, and we are glad to welcome a book which brings together the new matter

[1] See "The Malay Archipelago," p. 350.

which has hitherto been published only in various Journals and Transactions of Societies. The book commences with a chapter on ancient traditions, giving a chronological table of the more important shocks which have occurred since 79 A.D. The second chapter briefly discusses the connection between earthquakes and volcanoes, a subject of which we have apparently a good deal still to learn. Then follow descriptions and illustrations of various seismometers and seismographs, including the latest forms devised by Profs. Gray and Milne. In this chapter there are given several interesting comparisons of earthquake curves automatically recorded by the instruments, and curves artificially produced by the application of forces of known direction and magnitude. The propagation of shocks through land and water, and their destructive effects, are also considered, the latter being illustrated by sketches of some of the more remarkable fractures and displacements which have been observed. The last chapter summarises the suggestions which have been made as to possible connections between earthquakes and astronomical and meteorological phenomena. In conclusion, M. Girard points out the necessity for continued systematic observations, and enumerates the chief points on which further information is required.

To those who know little or nothing of the subject, M. Girard's little book will form an admirable introduction; and to the initiated it will be a handy book of reference to its latest developments.

La Photographie à la Lumière du Magnésium. By Dr. J. M. Eder. Translated by Henry Gauthier-Villars. (Paris: Gauthier-Villars and Son, 1890.)

THIS is a translation of a very interesting little German work on the employment of magnesium light for the purposes of photography, and will form a useful addition to our photographic literature. The author first gives a brief account of the earlier stages of the subject, taking us back to the time when Bunsen and Roscoe, in the year 1859, indicated the considerable advantages the light of magnesium presented for photo-chemical studies and lighting. He then shows how Crookes afterwards employed the light for photographic purposes.

Amongst the very first attempts of artificial lighting, the wire of magnesium was used. It was burnt in a specially-made lamp, and the light thus produced answered fairly well for interiors, but was useless for portrait work, being too harsh. The next advance was the employment of a mixture consisting of the powder of magnesium, chlorate of potassium, and a sulphide of antimony; the light was produced by igniting the mixture, which flared up instantaneously. The chief drawback to this method was the great precaution that had to be taken during the mixing, as the slightest blow caused an explosion. Saltpetre in place of potassium was sometimes used so as to lessen the chances of explosion.

The methods described in chapters v. and vi. were those which gave the best results. They consisted in blowing powdered magnesium through a tube and allowing this powder to come out at the other extremity into a gas or candle flame; the light thus produced was extremely actinic, and did not present any danger. The lamps of Schirm and Loehr, illustrations of which are given in these chapters, were on this principle, and gave great satisfaction for portraiture, being worked by means of a pneumatic india-rubber ball. Chapter vii. treats of the combustion of magnesium in oxygen, and in it is described Piffard's apparatus for the production of this light, which was found to be enormously increased by the presence of the oxygen. The remaining chapters deal with methods of taking groups by this artificial light; and there is a very interesting illustration of the pupil of the human eye, photographed in a dark room by means of the flash light, the exposure of which was so short that the pupil had no time to contract. The book concludes with some hints on the precaution necessary to insure successful development of the negatives taken by these processes, and with a short appendix by M. Alexandre.

LETTERS TO THE EDITOR.

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Panmixia.

BUT for his statement that I "cannot be sincere," I should not have deemed it necessary again to answer Prof. Lankester; anyone who is read in the literature of Darwinism must already have perceived that a further reply on my part is needless. An accusation of insincerity, however, ought not to pass unnoticed; and therefore I will ask your more general readers to observe the ground on which it has been made.

In my answer to his original criticism I endeavoured to show that Prof. Lankester "fails to distinguish between the cessation and the reversal of selection," or, more particularly, between panmixia and the economy of growth; and this is the point with regard to which insincerity is charged. Yet this is just the point—and the only point—in dispute. I have always represented that the cessation of selection is *per se* a cause of degeneration, whether or not it be associated with the economy of growth. Prof. Lankester, on the other hand, represented that the cessation of selection is not *per se* a cause of degeneration; but merely a "state," which is precedent to, and contemporaneous with, the economy of growth—the latter being the cause, while the former is but a condition to the occurrence of this cause. Such, at any rate, appeared to me the only meaning that could be gathered from his paragraph at the top of p. 488; and it is now over and over again repeated in his last letter. For instance:—"Cessation of selection *must be supplemented by economy of growth* in order to produce the results attributed to 'panmixia.' And inasmuch as economy of growth as a *cause* of degeneration involves the *condition* of cessation of selection, Mr. Darwin *in recognizing the one recognized the other*. . . . It is true that Mr. Darwin did not recognize that such unrestricted variation must lead to a diminution in size of the varying part *without the operation of the principle of 'economy of growth.'* This was no strange oversight: *he would have been in error had he done so*. . . . The term ['panmixia'], like its correlative 'cessation of selection,' *does not indicate a principle, but a natural condition:* it does not involve the inference that a dwindling in the size of the organ must result from inter-breeding; but *simply points to a precident condition*" (p. 559: italics mine).[1]

Where, then, is the insincerity in saying that Prof. Lankester does not perceive the distinction between the cessation of selection and the economy of growth as two totally different causal "principles"? Or what remains for me but to repeat, with all sincerity, "he confounds the 'idea' of panmixia with that of the economy of growth," and "fails to perceive the 'essence of the idea' in the all-important distinction between selection as withdrawn and selection as reversed"?

It is true that at the close of his last letter Prof. Lankester admits, "when we consider shape and structure, and not merely size, it is clear that panmixia without economy of growth would lead to a complete loss of that complex adjustment of parts which many organs exhibit, and consequently to degeneration without loss of bulk." But how was it possible to surmise from his first letter that he had in his mind such reservations as to "shape" and "structure?" Or, indeed, how is it possible to reconcile such reservations with the passages above quoted from his last letter, to the effect that the cessation of selection is "not a principle at all," but merely "a condition which alone cannot produce any important result"? Are we to conclude that in Prof. Lankester's opinion neither "a complete loss of complex

[1] I may remark that the term "cessation of selection" is not the "correlative," but the *synonym* of the term "panmixia." And I may further remark that the term "reversal of selection" is not, as Prof. Lankester supposes, the synonym of the term "economy of growth." Economy of growth, where useless structures are concerned, may determine a reversal of selection; but the reversal of selection may also be determined by many other causes and conditions, which are equally potent—or even very much more potent—in this respect.

adjustment," nor any amount of change as to "shape," deserves to be regarded as "any important result"? Must we not rather conclude that when he first wrote upon "the state of panmixia," he had not sufficiently considered the subject; and, in now endeavouring to trim, ends by contradicting himself?

The only issue being as to whether panmixia is itself a cause, or merely the precedent condition to the occurrence of a totally different cause, nothing more remains to be said. As a result of his further consideration, Prof. Lankester now admits "it is clear" that, "without economy of growth," panmixia *is* a cause of degeneration where "shape" and "structure" are concerned. And, when he considers the matter a little more, he will doubtless perceive the contradiction in saying that, where degeneration as to "size" is concerned, "it is absurd to attribute the result, or any proportion of it, to the panmixia or cessation of selection alone." Variations round an average mean occur in "size" or "bulk," just as they do in "shape" and "structure": therefore, if on this account panmixia is conceded to be a true cause of degeneration as regards the latter, it must likewise be so as regards the former. The fact that in the former case—as I showed in 1874—it must always be more or less associated with the economy of growth, is no proof that it then loses its due "proportion" of causal agency; while, with the now single exception of Prof. Lankester, everyone who has since written upon this "principle" takes the same view as I did—viz. that the phenomena of "dwindling" in our own domesticated animals furnish as good evidence of the operation of panmixia as is furnished by the other forms of degeneration to which he now alludes. Therefore, if he really believes it is in this case "absurd to attribute the result, or any proportion of it, to the panmixia," he becomes opposed, not only to me, but to Galton, to Weismann, to Poulton, and to everybody else who has ever considered the subject. In short, it is now a matter of general recognition that what he calls my "unreal separation between 'cessation of selection' and 'reversal of selection,'" is a separation so fundamentally real, that it is the means—and the only means—of abolishing the evidence of Lamarckian factors where this once appeared to be most conclusive; seeing that "with highly-fed domesticated animals *there seems to be no economy of growth, nor any tendency to the elimination of superfluous details.*"[1]

April 19. GEORGE J. ROMANES.

IN NATURE of April 3 (p. 511) Mr. Herbert Spencer suggests an interesting subject for discussion on the effects of use and disuse of organs, asking for an explanation on the theory of panmixia of the well-known tendency of domesticated animals to droop the ears. Many of the ruminants in a wild state have their ears set on horizontally with an inclination to droop; for instance, the gnu, sable, antelope, zebu, gaur (Central India), Cape buffalo, &c. The American bison has completely drooping ears; there is also at the Natural History Museum, South Kensington, in Case 57, a specimen of a smooth-haired sheep from Turkey in Asia, *Ovis aries*, which has dependent ears. Pathologically, though as yet not physiologically proved, the discussion of the transmission of acquired characters possesses a deep interest.

Evolution seems impossible without variation, and until the latter can be explained on other grounds than those of the inheritance of accumulated minute changes in character acquired through ages of slowly varying climate and conditions of life, preserved by natural selection, this transmission would seem a reasonable conclusion so long as the characters acquired were of service to the inheritor in the struggle for existence.

Though Weismann disbelieves most of the evidence Darwin collected on heredity, and doubts the possibility of the communication of external influences by the somatic cells to the germ cell, he suggests no other hypothesis to account for the phenomena of change, beyond the vague expression "predisposition of the germ-plasm." R. HAIG THOMAS.

April 5.

[1] Darwin, "Variation, &c.," ii. p. 289. Seeing the importance of "the idea of panmixia" in this connection, I must still be permitted to regard it as "unfortunate" that it was not present to Mr. Darwin's mind before the publication of his last edition of the "Origin of Species." But this does not mean, as Prof. Lankester "affects to suppose," that I regard the unfortunate nature of such a circumstance as due to the fact that I happened to be the first who perceived it. One can only assign so petty a form of "*badinage*" to the same argumentative level as "pointing out the oversight" that in my first letter I "omitted to credit Mr. Darwin with the recognition of the economy of growth." Prof. Lankester has committed about as grave an oversight in his own letter, by omitting to credit Mr. Darwin with the recognition of natural selection.

The "Rollers" of Ascension and St. Helena.

YOU probably know that the United States Scientific Expedition under Prof. Todd has had occasion to stop here during the past two weeks. I have resided during this time continuously at the signal station on Cross Hill (altitude 870 feet), studying the clouds and winds with many important results. I have had an excellent opportunity to observe the "rollers" for which Ascension and St. Helena are famous, and I have been able to demonstrate convincingly to myself their nature and origin. I should be obliged to anyone who will tell me whether my following views have perhaps been arrived at by previous observers.

The south-east trade blows with very various intensities over different parts of the South Atlantic, and the regions of light trade, no trade, fresh and strong trade, vary from day to day, as shown by comparing the logs of vessels. A limited region of strong south-east trade is a region whence spreads in all directions the corresponding strong south-east swell of the ocean surface—very distant storm winds or very near regions of high south-east winds produce similar results on the ocean swell: the locality of these winds will determine whether any point shall be experiencing a light or heavy swell. What causes the variations in the south-east trades, and in what direction the regions of strong trade move, are questions for further study. My present data would show that these latter regions move against the trade winds, *i.e.* from Ascension towards St. Helena, but there need be no uniformity in this respect.

Now if a south-east swell surrounds such an island as Ascension it is not directly felt on the lee side, but the long rectilinear swells, that advance faster in deep than in shoal water, are seen from my elevated station to assume the new curved shapes that result from the retardations on the shoals. So that finally in typical cases we have off the lee of the island a series of crossing and interfering swells producing at one point a quiet spot, at the next a double swell and great breakers.

The rollers are a magnificent example of deflection by shoals, and of interference and of composition of waves. Their severity at St. Helena and Ascension is apparently due to the proportions of the dimensions of the swell to that of the islands, just as in the interference phenomena of sound and light everything depends on the size of obstacle and length of wave. I have a number of measures that will, I hope, enable me in the future to give more accurate details, but for the present I can only inquire as to the bibliography of the subject. The correct explanation of the rollers, and of the swell on the West African coast, will undoubtedly lead us to further steps in marine meteorology. CLEVELAND ABBE.

U.S.S. *Pensacola*, Ascension, April 2.

Self-Colonization of the Coco-nut Palm.

WITH reference to Mr. Hemsley's note on this subject to NATURE (p. 537), I regret to have to inform him that the two young palms found on Falcon Island were placed there by a Tongan chief of Namuka, who, in 1887, had the curiosity to visit the newly-born island, and took some coco-nuts with him. This information I received from Commander Oldham, who had been much interested at finding these sprouting nuts at some 12 feet above sea-level and well in from the shore of the island, but who found out the unexpected facts in time to save me from making a speculation somewhat similar to Mr. Hemsley's.

W. J. L. WHARTON.

Nessler's Ammonia Test as a Micro-chemical Reagent for Tannin.

IN most cases the presence of tannin is immediately shown by all the ordinary reagents used by the botanist for its discovery. This does not happen sometimes, however; as, for instance, in the tannin-cells found in the epidermis on the dorsal side of the leaves of some plants. As a good typical example the common primrose may be cited. Of all the ordinary tests, including iron salts, potassium bichromate, Möll's test (copper acetate and iron acetate), ammonium molybdate, and osmic acid in 1 per cent. solution, the latter alone acts immediately upon the tannin in the primrose leaf's epidermis. It may hence be worth while recording the discovery of a second reagent capable of acting rapidly and effectively; and one which is easily made and will keep for some time should be especially valuable Such a reagent is Nessler's test for ammonia.

Nessler's test is made, as all the world knows, by saturating a solution of potassium iodide with mercuric iodide, and adding an excess of caustic potash. Ammonia gives with this a reddish precipitate; tannin a brown, and when in considerable quantity a deep black one; but if little tannin be present, the brown may tend towards purple. It goes without saying that much experiment must be undertaken before one can be sure of the substance giving the brown precipitate being really tannin. To be conclusive, such experiment should be carried out in four different directions:—

(1) The reaction ought to be given in all cases when the ordinary reagents make their presence immediately felt.

(2) Cells which will not immediately give the tannin reaction with ordinary tests, but which will do so with Nessler's test, must also do so under the former conditions if time be allowed.

(3) Tissues which will not yield the reaction with Nessler's test, must not give it with any other reagent even after the lapse of some time.

(4) Solutions of tannin must give a brown precipitate with Nessler's test.

Under the first of these headings may be mentioned growing shoots of the garden rose. On laying a radial longitudinal or a tangential section of this in Nessler's fluid a copious black-brown precipitate is obtained, and the same thing occurs with the beautiful tannin-sacs of *Musa sapientum*. In all other instances where tannin has betrayed its presence by the use of ordinary reagents, the brown colour has been obtained upon treatment with Nessler's test.

The primrose leaf may be again cited as an example of the time sometimes necessary to show up tannin with the usual reagents, of which it must here suffice to particularize ammonium molybdate. On laying in the molybdate a small piece of epidermis torn off the lower side of the leaf, one first sees a cell here and there coloured the characteristic and beautiful yellow given by this test: these coloured cells are usually situated among the elongated more or less rectangular cells overlying the vascular bundles. Re-examination after half an hour or so shows several more of the cells similarly coloured, but it is usually not till after a couple of hours that one can safely declare all the tannin-containing cells to have been stained. With variations in respect of time, and with the sole exception of osmic acid, all the other tests act in precisely the same way; even Möll's, preferred to all others by some of our Continental *confrères*, being as unsatisfactory as the rest. But sooner or later its characteristic colour is imparted to these cells by every reagent, thus proving tannin to be present.

For the negative experiment—the absence of the brown colour from tissues treated with Nessler's fluid, and its absence from the same tissues when acted upon by ordinary tannin reagents—recourse was again had to epidermis. The experiment succeeded in all cases: among these may be cited *Fatsia japonica*, wallflower, box, *Stellaria media*, and *Pelargonium zonale*. In none of these did tannin show up, although twenty-four hours were allowed to elapse before the preparations were destroyed.

Lastly, Nessler's fluid gives a rich brown precipitate with solutions of tannin. Moreover, with gallic acid a grey-green one is thrown down, thus affording an easy means of distinguishing between these bodies.

For these reasons, therefore, viz. the rapidity, certainty, and distinctness of its action; the ease with which it can be made; its permanence when made; and lastly, the difference in its behaviour towards tannin and towards gallic acid—for these reasons I am bold enough to anticipate the time when, to adapt a hackneyed expression, Nessler's fluid will be regarded as a reagent which no botanical laboratory should be without.

SPENCER MOORE.

The Moon in London.

SOME years ago a weekly paper represented a young rustic asking his mother, "Be that the same moon they have up to Lunnon?" to which question the mother evasively replied, "You leave the moon alone and go to bed." The boy was satisfied by retorting, "I baint a touching on it." But his question is this month brought once more to the front by the following passage, which will be found in one of our most important monthly magazines. "But if," says the writer, "there is an abuse of the deductive method of reasoning, there is also an abuse of the inductive method. One who refused to believe that a new moon would in a month become full, and, disregarding observations accumulated throughout the past, insisted on watching the successive phases before he was convinced, would be considered inductive in an irrational degree." We cannot, of course, presume to dictate to or for the moon "up to Lunnon," but here in the country the new moon becomes full in half a month, and we have convinced ourselves by watching the successive phases that a new moon will in a month become a new moon again. Nevertheless we willingly admit that life is far too short and too encumbered to allow of any man's repeating more than a small fraction of the accumulated observations on which his scientific beliefs are founded. Yet, on the other hand, taking things for granted is probably the source of nine-tenths of the errors that fill our minds, while the men of genius seem to be just those who know best what and how to observe for themselves, and how much to trust in the observations of others.

T. R. R. STEBBING.

Tunbridge Wells.

Foreign Substances attached to Crabs.

THERE is, of course, no analogy between whiffing for mackerel with red flannel, and fishing for cod on the bottom with any kind of bait.

If Actinians are offensive to fish, it is a singular fact that, when a cod-line is baited with mussels, herring, sand-eels, and anemones (viz. *T. crassicornis* and *A. mesembryanthemum*), the latter prove by far the most successful baits.

Impalement on a hook by no means kills an anemone, whose powers of offence are, perhaps, little lessened thereby; and under natural conditions the tentacles are not always expanded. Though the full-grown cod does not affect the tidal waters of the coast, yet the "rock" cod, by no means the youngest of its species, ventures close inshore; and the largest cod abound amongst the tidal waters of the Bell Rock.

The cnidæ of an anemone seem very efficient weapons against a soft-skinned Cephalopod, but they are not necessarily so against a tough-skinned fish.

Prof. McIntosh, in the work referred to in a previous letter, records *Tealia* and *Peachia* from the stomach of the cod, and *Edwardsia* (in swarms) from that of the flounder. He also informs me that he has found *Stomphia* in the stomach of the cod. I may add that the practice of baiting here with anemones is much more recent than the work referred to.

Of all British Cœlenterates, *Cyanæa* is, perhaps, the most deadly; yet many trustworthy observers have found young cod sheltering themselves beneath its umbrella—a fact which seems to indicate that they hold its stinging powers in some contempt; and Dr. Collingwood, in "A Naturalist's Rambles in the China Seas" (p. 150), has recorded the discovery of an immense fish-sheltering anemone.

ERNEST W. L. HOLT.

St. Andrews Marine Laboratory.

The Relative Prevalence of North-east and South-west Winds.

IN a note at p. 470 (NATURE, March 20), attention is drawn to the statement by Mr. Prince contained in his meteorological summary of observations taken at Crowborough, Sussex, in 1889, concerning the greater prevalence of north-east as compared with south-west winds which he finds to exist in recent years. The writer of the note mentions that this is not borne out by the Greenwich observations, but some definite statistics as regards Greenwich, and distinct comparison with the Crowborough numbers, may perhaps not be unacceptable to your meteorological readers.

Mr. Prince remarks that in previous years he finds only two years in which north-east winds have been in excess of south-west. In the first, 1864, the days of north-east wind were 104, of south-west wind 89; in the second instance, 1870, the days of north-east wind were 107, of south-west wind 88. The corresponding Greenwich numbers were, in 1864, 43 and 108; and in 1870, 65 and 96.

On the average of the years 1859 to 1883 Mr. Prince gives north-east wind on 63 days, south-west wind on 99 days. The corresponding Greenwich values are 43 and 111 respectively. For the years 1885 to 1889 he gives the average frequency of different winds as follows, to which I have added the values for Greenwich. C. indicates Crowborough, and G. Greenwich.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.	
C.	41	102	21	22	38	72	50	17	—	days.
G.	49	52	35	23	37	100	40	19	10	days.

He further gives the averages for 47 years, to which I have added those for Greenwich for 49 years.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.	
C. (47 y.)	33	63	29	27	28	91	59	35	—	days.
G. (49 y.)	40	45	27	22	35	106	46	22	22	days.

The Greenwich values are determined from numbers derived from the records of the self-registering Osler anemometer of the Royal Observatory as given in the annual Greenwich volumes. The preponderance of south-west wind over north-east seems to have been, throughout, less at Crowborough than at Greenwich. But it is only in recent years that the difference has become so pronounced, the Crowborough numbers for each year 1885 to 1889 being largely in excess for north-east wind, whilst the Greenwich numbers are greatly in excess for south-west, as in former years. At Greenwich during the first 24 years of the 49 years series, the average number of days of north-east wind was 46, of south-west wind 107; during the last 25 years, of north-east wind 44, of south-west wind 106.

It would be very interesting if a similar comparison could be made with some other station in the south of England.

Greenwich, April 16. WILLIAM ELLIS.

Science at Eton.

IN the *Illustrated London News* for March 29 I find an account (with illustration) of an astronomical lecture at Eton. It appears that the scholars "were allowed" to listen the other day, in the new lecture-room, to a lecture by Major-General A. W. Drayson, R.A., on the second rotation of the earth and its effects.

General Drayson has written some books on this subject which possibly no one has answered, for the simple reason that they answer themselves; but it seems now, that he is permitted, under the auspices of their teachers, to urge his paradoxes on the students of our largest public school.

Is Eton without any science teacher? or is the so-called teacher incapable of preventing absurdities being put forward with authority? Are the lecture-rooms of Eton College open to "Parallax" and the circle-squarers? J. F. TENNANT.

MODIGLIANI'S EXPLORATION OF NIAS ISLAND.

ABOUT two years ago, on his return to Florence, I gave a brief account of Dr. Elio Modigliani's very successful and interesting exploration of Pulo Nias (NATURE, vol. xxxv. p. 342). We have now before us the general results of that exploration, embodied in a portly volume most elegantly got up, rich in maps and illustrations, and, what is better, full of interesting facts, carefully collated notices, and well pondered and carefully drawn deductions; in short, one of the best books of its kind.[1]

Judging from what he has done, Dr. Modigliani is evidently made of the stuff which produces the best explorers. Resolute and persevering, moved by what we in Italy call *il fuoco sacro*, ever ready to put up with privations of all kinds, although accustomed to a very different sort of life, a quick and keen observer, he has indeed done wonders; and considering that he has not had the advantage of any special training in natural science, he has shown himself to be a good geographer and ethnologist, and a clever naturalist.

Dr. Modigliani's choice of the island of Nias as the field of his explorations was a singularly happy one, in which he was guided by no less a man than Odoardo Beccari. Few indeed of the hundreds of islands of that wonderland, the Malayan Archipelago, present such an accumulation of interesting problems as Nias. Lying off the ocean seaboard of Sumatra, and partaking naturally of the characteristic features of its big neighbour, it has a flora and fauna with a remarkable number of special characteristics, whilst its human inhabitants show strange affinities with people of other races and of distant lands.

I shall now endeavour to give a concise account of Dr. Modigliani's exploration of Nias, and of the results he obtained, as given in his book. Dr. Modigliani left Italy at the end of 1885; he paid a rapid visit to India, crossing overland from Bombay to Calcutta, *viâ* Delhi and Agra, and visiting Darjiling; he touched at Rangoon, and after a short stay at Singapore and a lengthened one in Java, where at Batavia and Buitenzorg he prepared his local equipment, and engaged Javanese hunters and collectors, he reached Siboga, Sumatra, early in spring, 1886. Thence he started for Gunong Sitoli, the only civilized port of Nias, on one of the Dutch Government *Kruis* boats on April 14. Dr. Modigliani spent five months on the island, which he left in the middle of September. On his way back to Italy he completed the tour of Sumatra, touching at Kota Rajah and Olelek (Acheen), visited Singapore again, touched at Colombo, and crossed India a second time from Madras to Calicut, visiting the Todas and some of the hill tribes of Southern India, which had a special interest for him in his researches on the origin and affinities of the people of Nias. Dr. Modigliani brought back with him from Nias extensive and important collections—ethnological, zoological, and botanical—and whilst these were being studied by specialists, he actively set to work arranging and sorting his notes and the material for his book. Undertaking to deal with all the ethnological part himself, he visited the more important ethnographical museums of Europe, and even the minor ones where he knew that specimens from Nias were to be seen. To complete his historical and geographical researches regarding Nias, Dr. Modigliani paid a lengthy visit to Holland, working in the Libraries and Government Archives at the Hague and Leyden. I, who have had many opportunities of observing and admiring his untiring energy and activity, could hardly feel surprised, on reading his book, to find it so full of information and so excellently well done.

Dr. Modigliani has divided his work on Nias into two parts. The first contains three chapters, and is entirely introductory and historical; the second, in twenty-three chapters, with appendices and bibliography, contains the narrative of his sojourn in Nias, and his own personal observations and studies on men and things in that island. I have little to say on the first part of Dr. Modigliani's book except that it embodies the results of much erudition and careful and patient collation. From the earliest semi-fabulous notices of Al-Neyan, El-binan, Neya, Niha, Nia, in ancient Arabic and Persian manuscripts, we are brought to European intercourse with Tano Niha, as the natives call their island, and thence on through the modern vicissitudes of Dutch domination, which to this day is little more than nominal, except at Gunong Sitoli and in the northern portion of the island, where, however, German missionaries appear to have done more to spread the influence of civilization than the colonial authorities.

Part II. occupies by far the greater portion of Modigliani's bulky volume. After telling us how he travelled to Nias from Siboga—an adventurous crossing with a Malayan crew, a bad boat, and dirty weather—Dr. Modigliani devotes a chapter to the geography, meteorology, and geology of Nias. The island is hilly, but can hardly be called mountainous. A notable feature is the frequency of earthquakes, easily explained by the proximity of the volcanic chain of Sumatra. Rivers and watercourses are numerous, but few are of notable size. Geologically, Nias is evidently of recent formation; a collection of rock samples brought together by Dr. Modigliani might have shed much light on this interesting subject, but it was unfortunately lost. Madreporic limestone and clams (*Tridacna*) were noted on the hill-tops; true lignite has, however, been found in various parts. The Dutch colonial authorities deserve much praise for their

[1] Elio Modigliani, "Un Viaggio a Nías." Illustrato da 195 incisioni, 26 tavole tirate a parte e 4 carte geografiche. Pp. xv.–726. (Milano: Fratelli Treves, 1890.)

widely-spread and efficiently organized service of meteorological observations; even in the less important stations these are regularly recorded, and this has been the case for a long series of years at Gunong Sitoli. This is at present the residence of the Dutch civil and military authorities in Nias; the principal magistrate is a *Controleur*, who, with the officer in command of the native garrison, the medical officer, and the missionaries and their wives, form the sum-total of the European residents at Nias. Gunong Sitoli is mostly peopled with Malays, Klings, and Chinamen, the trade of the island being chiefly in the hands of the latter. Here, overcoming not a few serious difficulties, Modigliani made his preparations for visiting the southern parts of Nias, freer from external contact, and therefore more interesting; and for this purpose, a Malay boat—*pencialàng*—was chartered. Whilst these preparations were being completed, Dr. Modigliani visited a large cave near Hili Sabegno, and, besides other interesting animals, collected specimens of a bat (*Emballonura semicaudata*) previously known only from Polynesia. Meanwhile, his hunters were not inactive, and, amongst other interesting specimens, four new species of birds, a singular new earthworm, and several new insects were collected in the neighbourhood of Sitoli; the birds have been recently described by Salvadori as *Gracula robusta*, *Calornis altirostris*, *Miglyptes infuscatus*, and *Syrnium niasense*.

Tobacco is the principal article for barter with the wilder inhabitants of Nias, therefore Modigliani provided himself with a large stock, mostly Sumatra grown, and called *mussi*; Javanese tobacco, called *giau*, has a greater value. He provided himself, besides, with cotton cloth of different colours, and brass wire, also much sought by the Nias people.

At last the *pencialàng* was ready, and Modigliani sailed in her to the south end of the island, and anchored in the Luàha Vára Bay. His first sight of the Nias Southerners was rather forbidding, and seemed to confirm decidedly the many stories he had heard of their indomitable hostility and ferocity. A large number of warriors, armed with lances and rattling their big shields with a peculiar movement of the hand on the forearm, crowded on the beach at his landing, to the no small alarm of his followers. With much pluck and presence of mind, Modigliani overcame the momentary anxious suspense, and in a few minutes he was on his way to the village of Bàwo Lowaláni, surrounded and followed by the excited warriors. Here he soon made friends with Faòsi Aro, the chief, the tallest and most crafty of Southern Niassers, who appeared with two immense earrings resting on his right shoulder. A liberal distribution of tobacco soon made Modigliani popular all round. Bàwo Lowaláni is a good type of a South Nias village, placed on a height and defended by a stout stockade; the incessant wars between village and village render such precautions necessary. Our traveller passed several days here, having taken up his quarters in the house of Faòsi Aro, built as usual on stout piles; he was thus able to gather much information on the ways and manners of the Niassers. His Javanese collectors, although much afraid of the natives, who were constantly armed and on the alert, being then at war with two neighbouring villages, did some good work, and some new and rare insects and a new species of bird (*Cittocincla melanura*, Salvad.) were added to the collections.

At Bàwo Lowaláni, Dr. Modigliani received a special invitation to visit Hili Dgiòno, a village further inland to the west. A deputation awaited him outside Bàwo Lowaláni, not trusting themselves inside; a live fowl packed in a singularly neat manner (see Fig. 1) was presented to him, and the knife of the chief of Hili Dgiòno—the latter to be returned. Faòsi Aro did all in his power to dissuade Modigliani from going, telling him he would certainly be killed, as the Hili Dgiònans were a bad lot; but our traveller decided to keep his promise, and the evening of the next day saw him at Hili Dgiòno, where he met with a most cordial reception, especially from the old chief, Sidúho Ghèo. At this place Modigliani passed pleasant days, was able to take a fine series of photographs, and saw more of the natives and learnt more of their customs than anywhere else. The women alone, as in most parts of Nias, kept aloof, and would not be photographed. Here Modigliani saw palpable proofs of the well-known head-hunting propensities of the Niassers. The big council house, or *osalè*, was adorned

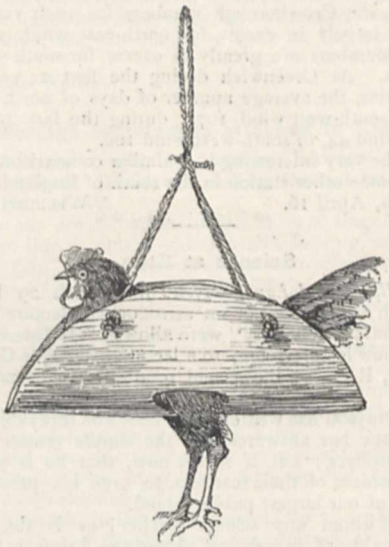


FIG. 1.—How a fowl travels.

with numerous skull trophies, hanging under the low roof. Heads are taken not only in war, but on many other occasions, for reasons amply given in Modigliani's book, most of which are similar to those which send the Dayaks of Borneo on their head-hunting expeditions; neither age nor sex are spared. No youngster in Nias is proclaimed a man and a warrior until he has cut off a head; he then assumes the prized *calabúbo* (Fig. 2), a beautiful collar made of thin circular sections cut out of the double nut of the *Lodoicea seychellarum* (which is often cast by the sea on the island), neatly strung on a brass wire with a circular

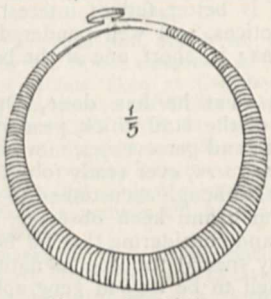


FIG. 2.—A *calabúbo*.

brass disk at the junction. The sections of the nut diminish gradually from about an inch in diameter to less than half at both ends, where the circular collar is closed with the disk; they are polished so as to present a uniform surface. None of the trophy skulls seen by Dr. Modigliani were in any way ornamented, but in his book he gives the drawing of a very singular one with artificial hair, beard, and ears, communicated by the late Baron von Rosenberg, who saw it in a house in Nias; I should fancy that it represents a European (Dutchman), for the beard hardly grows on a Niasser's chin in such luxuriance

(Fig. 3). When old Sidúho Ghèo heard that Modigliani desired skulls (for his anthropological collection), he of course concluded that he wanted to get fresh ones as trophies, and at once offered to organize an expedition

FIG. 3.—Ornamented trophy skull.

with chosen warriors; he would not give away any of those hung under the *osalè*.

At Hili Dgiòno, Modigliani was able to add largely to his ethnological collections, especially weapons. The defensive armour of the Niassers is peculiar. Formerly they made singular helmets of rotang and arenga-fibre, with beard and mustachios; now the chiefs are provided with curious iron helmets, pot-shaped, ornamented with a large plume or palm-leaf cut in a thin iron lamina, usually gilt; they wear, with this, curious iron spur-like mustachios passing under the nose and secured to the ear. The head-dress of the warrior of "old Japan" was a very similar contrivance; to complete the parallel I will add that the ceremonial war-jacket, often a regular cuirass in buffalo-leather, pangolin-skin, and scales or twisted rope tissue of tough *Gnetum* fibres, usually projects widely over each shoulder. It is thus with the war-jacket of some of the Dayak tribes, and was thus with the ceremonial *kamiscimo* of the Nippon *samurai*. The Nias shield, *balúse*, is peculiar, and made in a single board of tough light wood; in the northern parts of the island a heavier one, called *dagne*, more akin to Bornean and Celeban shields, is used. The characteristic weapons of the Niassers are the spear (*tòho*) and sword (*ballátu*), the latter not unlike the Dayak *parang*. The iron spear-heads are generally small and narrow, simple, or more or less provided with barbs; the wood is from the Nibóng palm, and usually ornamented with rings of rotang, brass, or wire, and often with tufts of hair from an enemy's head. The sword is still more characteristic. Its sheath is made with two halves neatly fitted and bound together with plaited rotang; the big sword (*ballátu sebúa*, "number one") is, especially in the south of Nias, the favourite weapon; much trouble is taken in ornamenting it, and the carved handle is often a remarkable specimen of wood-carving. Modigliani was fortunate enough to secure a series of these swords with carved handles, giving a most interesting instance of modification of a figure, in this case a boar's head, in the opposite directions of a simplified and a complicated conventionalism (Fig. 4). Moreover, the *ballátu sebúa* of the Southern Niassers is

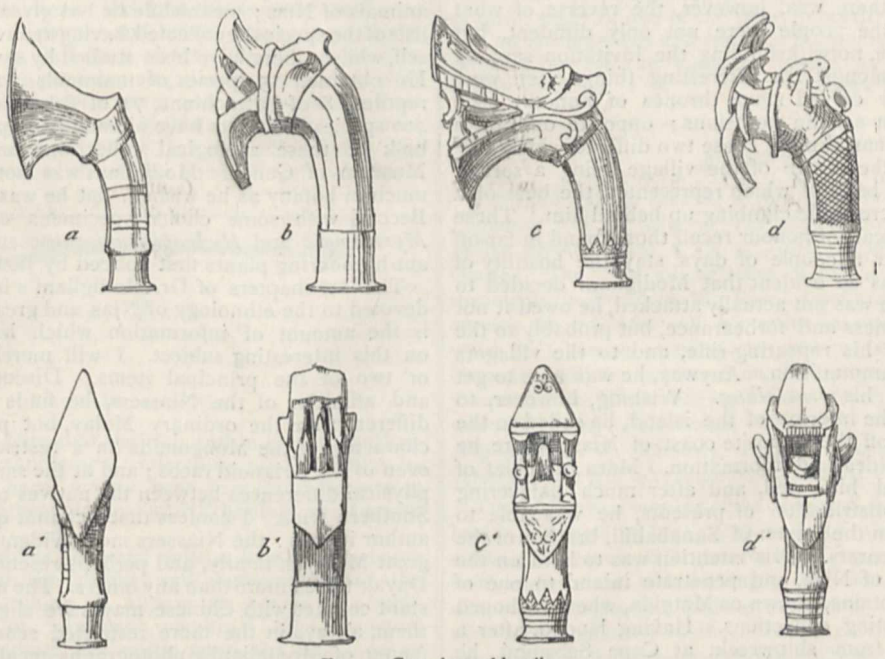


FIG. 4.—Carved sword-handles.

always provided with a singular appendage, with which the owner never parts willingly: it is an amulet and idol-bearer in the shape of a spherical basket of twisted rotang, with various and heterogeneous contents, such as teeth, pieces of stone and bone, &c., always several small idols roughly carved and anthropomorphous. All these are tied together and more or less wrapped up in a bit of cotton-cloth; their spherical hoeldr is securely fastened to the scabbard. Dr. Modigliani has given some highly interesting details on this subject; the *erè*, or "medicine

man," of the Niassers possesses a special talismanic sword with special idols and charms attached to the scabbard. Quite a number of old flint-lock muskets have found their way to Nias, but are fortunately often rendered useless from want of ammunition. The Niassers are able smiths, but they receive the iron and brass they use from Chinese and Malay traders.

On his way back, at Bàwo Lowaláni, Modigliani was able to buy from Faòsi Aro eleven human skulls. He next sailed to Luàha Gúndre Bay, wishing to visit the important village of Hili Sendrecheási, and possibly to proceed thence inland. He was well received by the chief and notabilities, who, however, promised much and did little. Another new bird was obtained here—*Terpsiphone insularis*, Salvad. Meanwhile, the head-man of another neighbouring village, Hili Simaetáno, sent messengers to invite him to go there, promising that he might stay and collect as much he liked. The death of a warrior at Sendrecheási gave Modigliani an opportunity of witnessing the funereal ceremonies of the Niassers, on which subject he gives much important information. He was not able, however, to confirm Piepers's assertion (*Bat. Genoot. v. Kuns. en Wettensch.*, 1887) regarding the horrid and singular custom of putting the body upright in a hollow tree, tapping this below, inserting a bamboo tube, and forcing a slave to drink the putrid liquid which flowed. The unfortunate man's head was afterwards cut off, and hung to the tree as an offering to him whose body was inclosed therein. I may mention that a similar custom is attributed to certain Dayak tribes of Borneo by Perelaer, and that it recalls the ancient Javanese *sétra*. It appears, however, that human lives are still sacrificed at the death of a chief. The author has also brought together highly interesting information as to "animism," belief in a future state, and ancestor-worship amongst the Niassers.

Although lamed, and suffering from a bad foot, he left Luàha Gúndre for Hili Simaetáno on June 1. His reception there was, however, the reverse of what he expected: the people were not only diffident, but evidently hostile, notwithstanding the invitation sent by their chief. Amongst the interesting things seen were two elaborately carved stone thrones of honour, used by the chief on solemn occasions; opposite one, on a pole, was a human skull. These two differed widely, the smaller one in the centre of the village being a sort of arm-chair, the back of which represented the bust of a warrior with a crocodile climbing up behind him. These singular stone seats of honour recall those found in far-off Ecuador. After a couple of days' stay, the hostility of the villagers was so evident that Modigliani decided to leave; and if he was not actually attacked, he owed it not only to his firmness and forbearance, but probably to the fear caused by his repeating-rifle, and to the villagers being short of ammunition. Anyway, he was able to get safely back to his *pencialàng*. Wishing, however, to penetrate into the interior of the island, he sailed to the Nácco Islands off the opposite coast of Nias, where he hoped to get guides and information. Mára Ali, chief of Nácco, received him well, and after much palavering and a liberal distribution of presents, he was able to obtain a guide in the person of Sanabahíli, brother of the local *erè*, and bearers. His intention was to land on the opposite coast of Nias, and penetrate inland to one of the higher mountains, known as Matgiúa, where he hoped to make interesting collections. Having landed, after a narrow escape from shipwreck, at Cape Serombú, he proceeded boldly inland. There were no roads, and his progress was not easy or pleasant; moreover, his guide was hardly up to the office he had undertaken, and conducted him by mistake to the village of Idáno Dôwu. Thence he marched to Mount Buruássi, before reaching which most of his bearers had deserted; small villages were passed, and the sites of bigger ones which had been destroyed during the incessant wars. Halambáva, a strongly fortified village, was next visited; here he found a singular and grotesque idol, *Adú Fangúru*, carved in a cocoa-palm trunk on the occasion of an epidemic which had decimated the village. Crossing next the nearly unknown district of Iraòno-Una, peopled by ferocious head-hunters, he continued on to Hili Lowaláni; here he came to the conclusion that Mount Matgiúa had been purposely missed, or more probably was sadly out of place even in the best maps of Nias, and decided to return to the north. Travelling on by Hili Hôro, he came again to Hili Simaetáno, where he was well received this time, and able to buy some skulls. At the Luàha Gúndre he was rejoined by his *pencialàng*—not until after long waiting, anxious moments, and the risk of starvation, having finished his provisions—and sailed back to Gunong Sitoli. This voyage across the south-west end of Nias was an adventurous one, but hardly equal in results to the trouble it had cost.

After his return to Sitoli, Modigliani decided to spend what time he had left to remain in Nias in some favourable locality in the north, where, amongst quieter people, he might better complete his observations and collections. He selected the village Ombaláta, or rather the neighbouring hill called Hili Zabòbo; here he passed pleasant days and was able to do much. Amongst the interesting species collected I may mention: *Pteropus nicobaricus*, *Chiropodomys gliroides*, a rare and singular rodent lately collected by Fea in Burma; *Macropygia modiglianii*, Salvad., and *Carpophaga consobrina* Salvad., new pigeons; a rare and beautiful lizard, *Gonyocephalus grandis*, and the hitherto unknown *Aphaniotis acutirostris*, Modigl.; and several new species of Coleoptera and ants. It is worth notice that in more than 4000 specimens of Lepidoptera collected by Dr. Modigliani no novelties were found, but he secured some fine specimens of the rare and peculiar *Hebomoia vossi*, Maitl. Dr. Modigliani purposes publishing complete lists of the animals of Nias; meanwhile he has given in an appendix lists of the species he collected, having determined some himself, whilst others have been studied by several specialists. He obtained 15 species of mammals, 62 of birds, 39 of reptiles, 8 of batrachians, 71 of fishes, and lists of over 400 species of insects have already been published. The bulk of these zoological collections are in the Civic Museum of Genoa. Modigliani was not able to do as much in botany as he wished, but he was able to gratify Beccari with some choice specimens of his favourite *Myrmecodia* and *Hydnophytum*, those strange epiphytal ant-harbouring plants first noticed by Jack at Nias.

The last chapters of Dr. Modigliani's book are entirely devoted to the ethnology of Nias, and great and important is the amount of information which he has gathered on this interesting subject. I will merely mention one or two of the principal items. Discussing the origin and affinities of the Niassers, he finds them not only different from the ordinary Malay, but partaking of the characters of the Mongoloids (in a restricted sense) and even of the Arianoid races; and at the same time he notes physical differences between the natives of Northern and Southern Nias. I confess that I cannot quite follow our author in this: the Niassers most evidently belong to the great Malayan family, and perhaps resemble some of the Dayak tribes more than any others. The ancient and constant contact with Chinese may have slightly *mongolized* them, always in the more restricted sense of that term (some of Modigliani's photographs recalled to my mind portraits of Kwei-yings of North Formosa shown to me years ago by my lamented friend Robert Swinhoe). But I fail to see traces of Arianoid features in any of the Niassers photographed by Dr. Modigliani. At the same time, I can quite understand how he found points of resemblance between them and natives of Southern India, who evidently have Malayan blood in their veins.

Modigliani mentions seeing in South-West Nias natives with Arianoid Semitic features and curly or wavy hair, but he himself suspects in such cases the influence of Arabo-Malay immigrants from Acheen.

Amongst the many peculiarities of the inhabitants of Nias, is the custom of the women going about with a long slender stick called *sio;* it is of Nibong palm wood, has a heavy leaden knob, and is more or less ornamented with rings of lead and brass; it is found only in the possession of women. Great is the variety of ornaments worn by the Niassers, male and female. They often denote distinctions of rank and sex. Ear-rings and bracelets are especially varied; singularly beautiful are the bracelets (Fig. 5) carved and polished by a long and tedious process out of a solid block taken from the stony shell of the giant clam (*Tridacna*), more elegant in shape than the equally notable armlets of the same material made by the in-

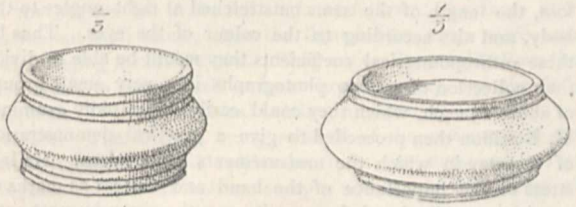


FIG. 5.—Bracelets cut in Tridacna shell.

habitants of the Solomon Islands. The Niassers also carve big solid ear-drops out of the *Tridacna* shell. Their principal articles of dress are still made with the beaten and manipulated inner bark of a *Ficus* or *Arctocarpus*, a kind of *tappa* or *masi*, called by them *sambò salówo*.

Dr. Modigliani did not find or hear of stone or shell implements in Nias; possibly the first men who peopled that island were already provided with iron tools. Yet one of the commonest amongst these, the axe, *fáto*, has a singularly archaic form: the iron blade, very similar to the earlier forms of copper and bronze implements of the kind, is let into a slot in a short club-shaped wooden handle (Fig. 6). A yet more singular fact is that the *fáto* of the Niassers is a typical axe, and quite distinct from the adze used right across Malesia from the Nicobar Islands to New Guinea, being, instead, remarkably like the iron axe of some of the wilder tribes of Central Africa.

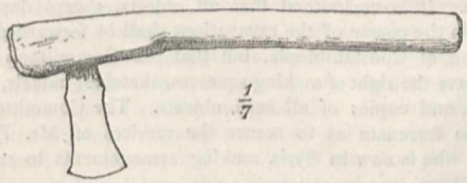


FIG. 6.—Iron axe of Nias.

I may mention here that the rich and important anthropological and ethnological collections made at Nias by Dr. Modigliani have mostly been presented by him to the National Anthropological and Ethnological Museum in Florence.

Dr. Modigliani has collected quite a host of interesting facts relating to the myths and superstitions of the natives of Nias, which all appear to centre in a well-developed form of "ancestor worship." The ancestors more or less remote are spirits good and evil, and as mediators between them and the living are numerous *adú*, or idols (Fig. 7). Amongst the numerous spirits more or less divine venerated by the Niassers is *Sangaròfa*, the sea-god, and Modigliani justly calls attention to the strange similarity in name and attributes to *Tanga-roa*, the sea-god of the Maories and other Polynesians. The principal good spirit is *Lowaláni;* the bad ones are classified in two grades as *Bèchu'* and *Bèla*, these being, however, generic terms. The *adú* or idols, whose Nias name, by the way, is singularly like the equivalent Polynesian term *atua*, are very numerous; those which represent dead relations or immediate ancestors are called generically *Adú zatúa*. They appear to have great affinities with similar carved wooden anthropomorphic figures common throughout Papuasia and Melanesia, and known as *karwars* in Western New Guinea.

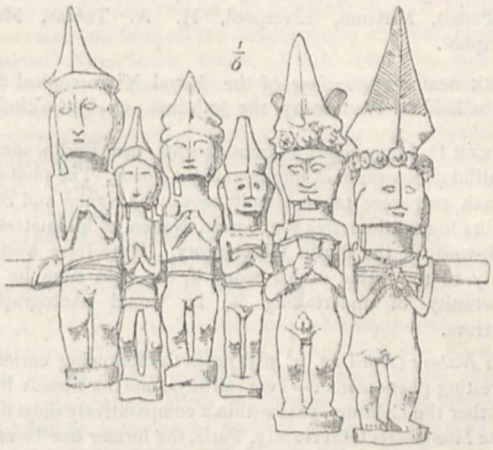


FIG. 7.—Images of ancestors.

In one of the last chapters of his book, Modigliani gives an account of the spoken language of the Niassers, which has many peculiarities; adding an alphabetically arranged collection of words with their Italian equivalents.

But my task, which has been to endeavour to give an idea of the work done by Dr. Modigliani, must now come to an end. His book, containing a very complete monographic study of one of the most interesting islands of the Indian Archipelago and its inhabitants, is, and will long remain, one of the standard works on that beautiful region Malesia. HENRY H. GIGLIOLI.

NOTES.

THE next general meeting of the Institution of Mechanical Engineers will be held on Thursday evening, May 1, and Friday evening, May 2, at 25 Great George Street, Westminster. The chair will be taken at half-past seven on each evening by the President, Mr. Joseph Tomlinson. On Thursday evening the President will deliver his inaugural address, after which the following paper will be read and discussed, and the discussion will be continued on Friday evening:—Research Committee on Marine-Engine Trials: Report upon Trials of three Steamers, *Fusi Yama*, *Colchester*, *Tartar*, by Prof. Alexander B. W. Kennedy, F.R.S., Chairman. The anniversary dinner will take place on Wednesday evening, April 30.

THE first annual meeting of the Museums' Association will be held in Liverpool on June 17, 18, and 19. The business of the meeting will consist of (1) the reading of papers on the management, arrangement, and working of Museums; (2) the discussion of the objects set forth by the meeting of June 20, 1889, with special reference to the following points: the means of interchange of duplicates and surplus specimens; schemes for a general supply of labels, illustrations, &c.; the indexing of the general contents of Museums; concerted action for obtaining Government publications, and also specimens on loan or otherwise; and the issue of a journal devoted to the discussion of practical topics. At this meeting the scheme for the constitution of the Association will be submitted. All engaged or interested

in Museum work are cordially invited to join the Association. The conditions of membership are as follows:—Each Museum contributing not less than one guinea a year becomes a member of the Association, and can send three representatives to the meetings. Individuals interested in scientific work are admitted as Associates on payment of 10*s.* 6*d.* annually. The following are the officers of the Association:—President: Rev. H. H. Higgins; General Secretaries: H. M. Platnauer, Museum, York, T. J. Moore, Museum, Liverpool; Local Secretaries: R. Paden, Museum, Liverpool, H. A. Tobias, Museum, Liverpool.

THE next *conversazione* of the Royal Microscopical Society will be held on Wednesday, the 30th inst., at eight o'clock.

HERR O. JESSE sends us from Steglitz, near Berlin, some very beautiful photographs of luminous night clouds. The photographs of each pair were taken simultaneously at Nanen and Steglitz. Steglitz lies 8 kilometres south-west, Nanen 38 kilometres west-north-west, of the Berlin Observatory. Herr Jesse would add greatly to the value of his work if, the next time he has an opportunity of undertaking it, he would photograph the spectrum.

La Nature (April 12, p. 303) notes the following curious and interesting phenomena:—Two railways, one the Sceaux line and the other the Ceinture, pass within a comparatively short distance of the Montsouris Observatory, Paris, the former line being about 80 metres distant, and the latter but some 60 metres. During the passage of trains on the Ceinture line, which is nearest to the Observatory, the bifilar magnet is found to be disturbed, and its oscillations are registered photographically; indeed the movements are so regular that the curve clearly indicates the exact time of each train passing the Observatory. This phenomenon is due to the fact that as the line crosses the direction of the magnetic meridian the wheel-tires of the carriages become magnetized by induction, and so produce, in consequence of the laws of magnetism, a deviation of the bifilar magnet. The trains on the Sceaux line give rise to a phenomenon not less curious. Whenever the engine-driver blows off steam, the electrometer is partly discharged, the electrical potential of the air falling to about one-half of its original value. These disturbances are brought forward by the Director of the Paris Observatory in order to oppose the scheme which is now proposed of extending the railway from Sceaux to la Place de Médicis.

ON Tuesday evening, M. Jacques Bertillon (head of the Municipal Bureau of Statistics in Paris) delivered a lecture before the Anthropological Institute of Great Britain and Ireland, on the method now practised in France of identifying criminals by comparing their measures with those of convicted persons in the prison registers. Mr. Bertillon, who spoke in French, said that the system which he had come there to explain had for its object the recognition of a person 10, 15, 20, or even 100 years after he had been measured, for by that method it was possible to recognize a person after death, if access could be had to his skeleton. Photography was now used only as an aid to identification established by other means. The basis of the anthropometic system was to obtain measurements of those bony parts of the body which underwent little or no change after maturity, and could be measured with extreme accuracy to within so small a figure as to be practically exact. These parts were the head, the foot, the middle finger, and the extended forearm from the elbow. To clearly illustrate the system, let them suppose 90,000 photographs of men to have been collected. These would be divided into three groups of 30,000, according to the height of the men. There would be short men, men of medium height, and tall men. That these three classes might be approximately equal, it was evident that the limits of the class of men of medium height must be restricted more than those of the other two classes. Each of these primary divisions should again be divided on the same principle, without taking any further notice of the height, into three classes, according to the length of the head of each individual. The three classes of short, medium, and long heads would each again be subdivided into three, according to the width of the heads, and would contain narrow, medium, and wide heads. Experience had proved that with most people the breadth of the head varied independently of the length—that was, given that an individual had a certain length of head, it by no means followed that the breadth of his head could be determined *a priori*. The length of the middle finger gave a fourth and still more precise indication by which to divide again each one of the packets of photographs; and these might be divided again according to the length of the foot, the length of the arms outstretched at right angles to the body, and also according to the colour of the eyes. Thus by these anthropometrical coefficients they would be able to divide their collection of 90,000 photographs into very small groups of about 15 each, which they could easily and rapidly examine. M. Bertillon then proceeded to give a practical demonstration of the way in which the measurements were taken. He laid stress on the importance of the hand and the ear as marks of cogniti on. The hand, because it was the organ in most constant use in almost every calling and in many trades and professions, became modified according to the particular character of the work which it had to do. The ear was the precise opposite to this. It changed very slightly, if at all, except perhaps in the case of prize-fighters, who developed a peculiarity of the ear which it was easy to recognize. The ear, therefore, was an important organ to measure, inasmuch as the results were not likely to be nullified by a change in its conformation.

THE following telegram was sent through Reuter's agency from New York on April 21:—"Despatches from Mexico state that observations show that the height of the active volcano of Popocatepetl has decreased by 3000 feet since the last measurement was taken."

IN the new quarterly statement of the Palestine Exploration Fund, the Committee announce that they have obtained a firman granting permission to excavate at Khŭrbet 'Ajlân, the Eglon of Joshua. It is understood that all objects, except duplicates, found in the course of the excavations shall be forwarded to the Museum at Constantinople, but that the Committee's agents shall have the right of making squeezes, sketches, models, photographs, and copies of all such objects. The Committee have been so fortunate as to secure the services of Mr. Flinders Petrie, who is now in Syria making arrangements to start the excavations.

THE death of Dr. Gottlob Friederich H. Küchenmeister is announced. He was a great authority on Entozoa.

IN the official outline of the principal arrangements at the Crystal Palace for the summer of 1890, reference is made to the International Exhibition of Mining and Metallurgy which is to be held there from July 2 to September 30. The subjects embraced within the scope of the Exhibition comprise machinery in motion and at rest; gold, silver, diamond, iron stone, and iron ore mining; manufacture of iron and steel; lead mining and manufacture; tin mining and smelting; copper and coal mining; the petroleum and salt industries; mining for precious stones, &c. There is every reason to expect, through the co-operation of colonial and foreign Governments, many valuable exhibits from abroad.

THE *Engineer* and *Engineering* of last week publish long illustrated accounts of the recent disaster to the City of Paris

This accident is without a parallel in the history of steam navigation; the circumstances were so remarkable that many conflicting explanations of the cause have been suggested. The ship is propelled by twin screws, and the engines are placed side by side in separate compartments. When she was off the coast of Ireland, at half-past five on the evening of the 25th ult., the low-pressure cylinder, with the whole of its gear, of the starboard engine, went to pieces, and fell to the bottom of the engine-room in a confused mass, the *débris* of the top cylinder cover being apparently at the bottom of the wreck. The smashing of the condenser allowed an enormous rush of water to flood the starboard engine-room, and the longitudinal bulkhead between the engines, being also damaged, allowed the port engine-room to become flooded, and of course stopped that engine from working. Our contemporaries say that, in the opinion of experts in Liverpool, the accident did not originate in the engine, but in the tail shaft, as follows: the brass liner on the tail shaft burst; then the lignum-vitæ strips were torn out, bringing metal to metal. This, naturally, would allow the steel shaft to grind itself and the bracket away, and the shaft dropped. Then the continual bending of the shaft resulted in its fracture. The engines, being relieved of the resistance of the screw, raced, with the result shown in the engravings. The *Engineer* at present neither accepts nor rejects this theory of the cause of the disaster.

THE Manchester Field Naturalists' Society opened the summer excursion session on the 19th inst., by a visit to the well-known herbaceous garden of Mr. Wm. Brockbank, Withington, near Manchester. The grounds, of about six acres in extent, are laid out in woodland, shrubbery, rockeries, and fernery, with a patch of wilderness, and are entirely devoted to the growth of the native flowers, and the horticulturists' modifications, so far as they will thrive. The special feature, at the time of the visit, was the display of daffodils, over a hundred varieties being included in the gardens, several of them locally raised. Mr. Brockbank explained that the double variety of the daffodil is not obtained by the absorption of the essential organs, as generally supposed; the pistils and stamens remain, and specimens were shown, in vigorous health, obtained from their seeds.

IT has been suggested that the epidemic of influenza was in the last resort due to floods in China. The fertile land in the valley of the Yellow River, it has been said, was covered with a deposit of alluvial mud, and in this mud countless numbers of organic spores were developed from the refuse of a dense population. These germs were carried by merchandise to Russia, whence they spread to Europe generally. Dealing with this theory, the *Shanghai Mercury* points out (1) that there has been no epidemic of influenza in China. (2) There is no valley whatever of the Yellow River, the peculiarity of that stream being that it flows on the surface of the ground, which actually slopes down on both sides from the river bed, so that in case of a breach of either embankment the river is free to flow to the sea almost anywhere between Tientsin in the north, and Shanghai in the south. (3) The plain of the Yellow River is by no means fertile, and is rapidly deteriorating. (4) So far from the deposit left after a breach being alluvial mud, it is unmitigated sand, and for years refuses to grow any crops whatever; and it is only after an exposure of some fifteen or twenty years that the phosphates which enter sparingly into its composition begin to break up, and the land is restored to cultivation. (5) There are no exports of any sort from the plain of the lower Yellow River. Almost the only product exported to Europe from districts anywhere near the river is straw braid, which is shipped not to Russia but to England and the United States; and this not from the plain, but from the highlands of Shantung, far removed from any communication with the river.

THE Ballarat School of Mines, in the University of Melbourne, presented its annual report at a meeting of governors and subscribers on Monday, January 20. The general efficiency and usefulness of the school have been greatly promoted by extensive additions to the buildings and plant, and the numerous improvements effected in connection with the mining and metallurgical departments. That the institution now affords a superior training in scientific and mining subjects is shown by the attendance of a more advanced class of students, and by the better results obtained at the examinations. It attracts to its classes students from all the neighbouring colonies, including Queensland, New South Wales, South Australia, and Tasmania, as well as from distant places within Victoria. The total number of enrolments in the various classes held during the year was 982, and of individual pupils who attended the elementary science lectures delivered in the State schools, 723. The mean average number of students in attendance at the school classes for the whole year was 526, whilst during the same period 286 lectures on elementary chemistry were delivered in nine of the State schools in the city and town, with an average attendance of 53 at each lecture.

MR. A. J. CAMPBELL has returned to Melbourne after a three months' trip in Western Australia. The *Victorian Naturalist* says he has been very successful in his observations and collections. He obtained about 80 different species of eggs, 13 of which it will be necessary to describe as new. The number of eggs obtained altogether was about 400. About 100 skins of birds were collected, though Mr. Campbell made no special effort to secure them. With regard to geographical range of birds he was particularly successful in his observations. No less than 17 species will be recorded as new for Western Australia. Possibly one or two may be deemed new varieties, while others will be restored, having been omitted from a lately issued tabular list. Baron von Mueller has examined the plants, and finds that two ferns, *Asplenium marinum* and *A. trichomanes* (both British species, by the way) are recorded for the first time from the western colony. Of 30 lichens collected, the Rev. F. R. M. Wilson has identified 20 as new for the same colony. Specimens of characteristic lizards and frogs (*e.g.*, *Heleioporus albo-punctatus*) were secured. About three dozen photographs turned out fairly well, those of the remarkable flights of sea-birds being of great interest. Mr. Campbell considers that he brought nearly 1000 natural history specimens back to Melbourne.

IN the latest of his series of instances—printed in the *American Naturalist*—of the effect of musical sounds upon animals, Mr. R. E. C. Stearns mentions the case of a canary "who is particularly fond of music." This interesting bird belongs to the Rev. Mr. James, who writes as follows:—"Immediately I begin to play upon the flute she chirps about as if enjoying the music. If I open the cage-door and leave her, she will come as near to me as possible, but not attempt to fly to the music; but if I put her upon my desk, and lay the flute down, she will perch upon the end, and allow me to raise the instrument and play. I often take her into the church and play there upon the organ, and she will perch upon my fingers, notwithstanding the inconvenience of the motion of the hands, and chirp in evident delight at the sweet sounds."

LAST week Prof. Stricker submitted to the International Medical Congress at Vienna a new electrical lantern which will, it is expected, be of great service to lecturers and medical students. According to the Vienna correspondent of the *Times*, Prof. Stricker, by an ingenious combination of lenses, contrives to project the magnified images of objects on a white screen in their natural colours, so that, for instance, a small pimple on a patient can be shown in its real appearance to an audience of many hundred students.

At the seventh Congress of the American Ornithologists' Union, Dr. R. W. Shufeldt read a report on progress in avian anatomy for the years 1888–89. Towards the end of this report, which has now been reprinted separately, Dr. Shufeldt said he had greatly felt the need of a good hand-book to the muscles of birds. In looking about him, he soon found that there was no such manual in the English language; at least, there was not the kind of work that the thorough dissector required. To meet this want he undertook the preparation of a volume devoted to the subject. A thoroughly cosmopolitan form, or rather a form well representing a cosmopolitan group of birds, the raven, was selected. He carefully dissected out on many specimens every muscle of this type, and figured them in a careful series of drawings. These he supplemented by a series of drawings of the skeleton of the same form, and on the bones indicated the origin and insertion of all the muscles. Full descriptions were written out, and the groups of muscles classified; and finally some comparative work was added. Both the drawings of the muscular system, as well as the skeleton, were life-size, which made the parts very clear and convenient for use. "To my surprise," says Dr. Shufeldt, "when it was all completed, the manuscripts for a small volume were on my hands." The work is now in the press, and will be published shortly by Messrs. Macmillan and Co.

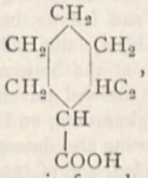
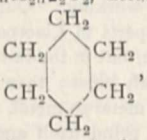
Two volumes of the *Internationales Archiv für Ethnographie* have now been completed. With the current number, just issued, the third volume begins. In a prefatory note, the editor, Dr. Schmeltz, refers with satisfaction to the help he has received from eminent contributors; and he is able to promise that the periodical shall be not less instructive and interesting in the future than it has been in the past. In the present number there are several valuable papers. One of them, by Dr. Franz Boas, deals with the use of masks and head-ornaments on the north-west coast of America. Herr Strebel, of Hamburg, contributes the first of a series of "studies" on a peculiar kind of stone implements found in Mexico and Central America. Hitherto it has been generally supposed that these implements were put on the necks of human victims destined for sacrifice. The author undertakes to show that this view is mistaken.

The Journal of the Anthropological Institute (vol. xix. No. 3) contains an elaborate and most interesting paper, by Prof. A. C. Haddon, on the ethnography of the western tribe of Torres Strait. The other contributors to this number are Dr. Beddoe, who writes on the natural colour of the skin in certain Oriental races; and the Rev. James Macdonald, who has a paper on the manners, customs, superstitions, and religions of South African tribes.

The *Photographic Quarterly*, of which three numbers have been published, meets a need which must often have been felt by those who specially devote themselves to photography. It includes among its contributors many eminent students, and deals freely with all important questions in which photographers are interested. The third number opens with an article on photography of the sky at night, by Captain W. de W. Abney. Among the other contents are papers on the limits and possibilities of art photography, by George Davison; photogravure and heliogravure, by P. G. Hamerton; the optical lantern as an aid in teaching, by C. H. Bothamley; and a phase of naturalistic focussing, by H. Dennis Taylor.

A complete index of the papers printed in the Proceedings of the London Mathematical Society has been issued. It will be of great service to all who have occasion to refer to the series, which now includes twenty volumes.

A catalogue of the books in the library of the Indian Museum has been issued by the trustees. It has been compiled by Mr. R. Leonard Chapman. The number of separate works in the library is about 3500, and every facility is given to students consulting them. In a prefatory note Mr. J. Wood-Mason, superintendent of the Indian Museum, says that most of the books are on zoology and kindred subjects, and he has no doubt that "the gradual spread of scientific education in India will largely extend the field of usefulness of the Museum library in the future."

A new acid,  , the first member of a series possessing the generic formula $C_nH_{2n-2}O_2$, derived from the saturated hexa-hydride of benzene,  , the so-called naphthene and its homologues of the generic formula C_nH_{2n}, has been isolated by Dr. Ossian Aschan, of the University of Helsingfors, from the natural oil of Baku (*Berichte*, 1890, No. 6, p. 867). The acid may be considered as a saturated hexa-hydride of benzoic acid; it is a very stable liquid substance of strongly acid properties, readily decomposing calcium chloride with evolution of hydrochloric acid and formation of a calcium salt. The raw mixture of acids obtained by treating the oil with alkali, and subsequent decomposition of the sodium salts by dilute sulphuric acid, was first distilled and the lower boiling portion specially examined. Upon partially saturating this fraction with caustic soda solution, and again decomposing with sulphuric acid, a colourless oil separated. In order to separate the various acids contained in this oil, they were converted into methyl esters by the action of methyl alcohol and strong sulphuric acid. These esters were then submitted to fractional distillation, when a large quantity of an ester boiling constantly at 165°·5–167°·5 C. was eventually isolated, possessing the composition $C_6H_{11}.COOCH_3$. This was, in fact, the methyl ester of the new acid, the first member of the series, of which other higher members have previously been obtained by Markovnikoff and others. The methyl ester is a highly refractive colourless oil of pleasant fruit-like odour. By saponification with alcoholic potash, crystals of the potassium salt of the acid itself were obtained. On acidification of the aqueous solution of these crystals, the free acid separates as an oil, which after rectification boils constantly at 215°–217°. It is a colourless thick liquid of unpleasant and very persistent odour, and does not solidify at − 10°. Its strength as an acid has already been alluded to as evidenced by the turning out of hydrochloric acid from chlorides of the alkaline earths; moreover, the calcium and barium salts are not decomposed by carbonic acid. Strong sulphuric acid readily dissolves it, with decomposition upon heating. Its specific gravity at 18°·4 is 0·95025. This acid is isomeric with the methyl pentamethylenic acid synthesized by Messrs. W. H. Perkin, Jun., and Colman, the latter boiling a little higher, at 219°–219°·5, and possessing a higher specific gravity, 1·02054 at 15°. The potassium salt $C_6H_{11}COOK$ is a soft soap-like substance, which may sometimes be obtained in distinct crystals. It is readily soluble in water and alcohol and is strongly hygroscopic. The sodium salt much resembles its potassium analogue, and may be obtained crystallized in flat prisms from alcohol. It likewise deliquesces very rapidly in the air. The calcium salt dissolves readily in alcohol, but is more difficultly soluble in water. If an aqueous solution is allowed to evaporate over oil of vitriol, the salt, $(C_6H_{11}COO)_2Ca + {}_4H_2O$, is obtained in long needles. If a solution saturated at the ordinary temperature is heated to boiling, it becomes turbid and viscous drops begin to separate; these

again dissolve on cooling. This behaviour is very characteristic of the acid, the barium salt showing the phenomenon also in a striking manner. It is due to the different amounts of water of crystallization in the salts separating at different temperatures. The chloride of the acid radical, the amide, and the anilide of the acid have also been prepared, and found to resemble the corresponding derivatives of the fatty acids.

THE additions to the Zoological Society's Gardens during the past week include two Indranee Owls (*Syrnium indranee*) from Ceylon, presented by Mr. A. R. Lewis; two Lataste's Frogs (*Rana latasti*) from Italy, presented by Mr. G. A. Boulenger, F.Z.S.; a Common Moorhen (*Gallinula chloropus*), British, two Moorish Toads (*Bufo mauritanica*) from North Africa, presented by Mr. Cuthbert Johnson; an Indian White Crane (*Grus leucogeranos*), two Black-gorgeted Jay Thrushes (*Garrulax pectoralis*), an Indian Muntjac (*Cervulus muntjac* ♂) from India, deposited; a Pacific Fruit Pigeon (*Carpophaga pacifica*) from the Solomon Islands, four Madagascar Weaver Birds (*Foudia madagascariensis*, 2 ♂ 2 ♀) from Madagascar, six Common Cormorants (*Phalacrocorax carbo*), European, two Adelaide Parrakeets (*Platycercus adelaidæ*) from South Australia, purchased; a Puma (*Felis concolor*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on April 24 = 12h. 11m. 30s.

Name.	Mag.	Colour.	R.A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G.C. 2838	—	—	12 13 13	+15 7
(2) G.C. 3035	—	—	12 25 15	+12 59
(3) G.C. 3092	—	—	12 29 50	− 3 11
(4) 3 Canum Venat. ...	6	Yellowish-red.	12 14 23	+49 35
(5) o Virginis	4	Yellow.	11 59 36	+ 9 29
(6) η Virginis	3	White.	12 14 18	− 0 3
(7) B.D. + 1°·2694 ...	8	Red.	12 13 7	+ 1 27
(8) S Ursæ Majoris ...	Var.	Strong red-yellow.	12 39 7	+61 42

Remarks.

(1, 2, 3) Although the constellation Virgo is so exceptionally rich in nebulæ, comparatively few of them have been submitted to spectroscopic examination. Smyth remarks that "the situation of the extraordinary conglomerate of nebulæ and compressed spherical clusters which crowd the Virgin's left wing and shoulder is pretty well pointed out to the practised naked eye by ϵ, δ, γ, η, and β Virginis, forming a semicircle to the east, whilst, due north of the last-mentioned star, β Leonis marks the north-west boundary." As it is not possible to give anything like a complete list, three of the brighter ones which have not yet been spectroscopically observed have been selected. No. 1 is the remarkable spiral nebula 99 M Virginis, and is thus described in the General Catalogue:—"A very remarkable object; bright; large; round; gradually brighter in the middle; three-branched spiral." No. 2 is 87 M Virginis, and is described as "Very bright; very large; round; much brighter in the middle." No. 3 is described as "Very bright; considerably large; pretty much elongated in a direction about 63°; very suddenly much brighter in the middle to a nucleus." It is a remarkable fact that all the nebulæ in Virgo, which have so far been examined, exhibit so-called "continuous" spectra. D'Arrest observed the nebulæ G.C. 2930 (84 M Virginis), 2961 (86 M), 3021 (49 M), and Lieutenant Herschel observed G.C. 3021, 3132, 3227, 3229, and 3397. Some of these may be re-examined for bright maxima in the continuous spectra.

(4) The spectrum of this (Group II.) star is thus described by Dunér:—"The bands 2–8 are well marked by strong lines which terminate them on the violet sides. But, with the exception of 2 and 3, they are rather narrow, and the spectrum approaches to the type of Aldebaran." The star is obviously at a transition stage between Groups II. and III., and a special detailed study of the lines and bands should be made.

(5, 6) The spectra of these two stars have been observed by Vogel, who states that the first has a spectrum of the solar type, whilst the second is one of Group IV. The usual further observations are required in each case.

(7) Notwithstanding the small magnitude of this star, it has, according to Vogel, a magnificent spectrum of Group VI. The star is not included in Dunér's Catalogue, and Vogel gives no particulars as to the number and character of the bands present. Further detailed observations are obviously required. The intensity of the carbon band near λ564, as compared with the other bands, should be particularly noted.

(8) This variable will reach a maximum about April 27. Its period is about 225 days, and it varies from 7·2–8·2 at maximum to 10·2–12·8 at minimum. According to Dunér, the spectrum is one of Group II., but very feebly developed. As no details of the spectrum are given, it seems probable that the observation was made near minimum, and the present maximum may afford an opportunity of securing further observations. As in similar variables, bright lines may also be looked for.

A. FOWLER.

MATHEMATICAL STUDY OF THE SOLAR CORONA.—The Smithsonian Institution, Washington, has published a paper by Prof. Frank H. Bigelow in which the solar corona is discussed by spherical harmonics. The subject is treated by this theory on the supposition that the phenomenon seen is similar to that of free eleectricity, the rays being lines of force and the coronal matter being discharged from the body of the sun, or arranged and controlled by these forces. In order to give the solution a general foundation the important parts of the theory of harmonics specially relating to the case are recapitulated, and the corresponding geometrical solution given in a notation adapted to the sun. An analysis of the lines of force demonstrates the applicability of the formulæ of statical electricity to the coronal structure, hence some repulsive force must exist on the surface of the sun which acts upon the corona according to the laws of electric potential. It is shown how the concentration of potential at each pole throws vertical lines of force at the polar region, which gradually bend each side, and finally close on the equator at a certain distance from the centre. Similarly other lines are traced which leave the sphere at various angles to the vertical axis and have diminished potentials; these therefore close on the equator at a less distance from the centre than the high potential vertical lines thrown out at the polar region.

Applying these electrical principles to the solar corona, the author thinks that the straight polar rays of high tension carry the lightest substances, such as hydrogen, meteoritic matter, *débris* of comets and other coronal material away from the sun, and they soon become invisible by dispersion. The strong quadrilateral rays which form the appendages conspicuously seen at periods of great solar activity are produced by four lines of force having potential 0·9, 0·8, 0·7, and 0·6, of the potential at each pole, and the explanation of the long equatorial wings, with absence of well-marked quadrilaterals, seen at periods of minimum, is that they are due to the closing of the lines of force about the equator. The theory is tested by applying it to two photographs taken by Messrs. Barnard and Pickering on January 1, 1889, and Prof. Langley submits it to astronomers and physicists as a possible clue to the explanation of the corona and as suggesting the direction to be taken in future observations and investigations.

SOLAR OBSERVATIONS.—The following is the *résumé* of solar observations made at Rome, by Prof. Tacchini, during the first three months of this year:—

Spots and Faculæ.

1890.	No. of days of observation.	Relative frequency of spots.	Relative frequency of days without spots.	Relative magnitude of spots.	Relative magnitude of faculæ.	Number of spot-groups per day.
Jan. ...	20	1·40	0·55	2·35	33·50	0·60
Feb. ...	23	0·13	0·95	0·09	13·26	0·04
Mar. ...	20	1·00	0·70	2·75	25·75	0·30

Prominences.

1890.	No. of days of observation.	Mean number.	Mean height.	Mean extension.
			"	"
Jan. ...	12	1·92	33·6	1·7
Feb. ...	16	1·69	37·8	0·9
Mar. ...	14	2·21	35·5	1·1

ASTRONOMICAL SOCIETY OF FRANCE.—The following officers have been elected for the session 1890-91:—President, M. H. Faye, Member of the Institute. Vice-Presidents: MM. Bouquet de la Grye, Member of the Institute; Camille Flammarion, Laussedat, and Trouvelot, of Meudon Observatory. Secretaries: MM. Ph. Gérigny, Armelin, and Bertaux.

The Society meets at the Hôtel des Sociétés Savants, 28 Rue Serpente, Paris, and there is an Observatory and a Library open to the members.

D'ARREST'S COMET.—The following ephemeris for the search for this periodic comet on its return this year is given by M. G. Leveau in *Astr. Nach.*, No. 2959:—

Ephemeris for Paris Mean Time.

1890.	R.A. h. m.	N.P.D. ° ′	1890.	R.A. h. m.	N.P.D. ° ′
April 26	16 47·4	84 30	June 1	16 31·1	78 3
30	16 47·3	83 39	5	16 27·7	77 43
May 4	16 46·8	82 48	4	16 24·2	77 31
8	16 45·9	81 58	13	16 20·7	77 27
12	16 44·5	81 10	17	16 17·3	77 33
16	16 42·6	80 24	21	16 14·2	77 49
20	16 40·2	79 41	25	16 11·4	78 14
24	16 37·4	79 3	29	16 9·0	78 48
28	16 34·4	78 30			

INFLUENZA AND WEATHER, WITH SPECIAL REFERENCE TO THE RECENT EPIDEMIC.[1]

IN this inquiry the authors deal only with deaths recorded by the Registrar-General as due to, or caused by, influenza in London between the years 1845–90. The statistics for London are selected because there is there a vast population in a small area, all subject to the same climatic conditions, and because there is also there a weekly record of deaths and their causes for a long period, which they discussed with some fulness of detail some years ago.

After making allowance for certain errors to which such an inquiry is liable, arising chiefly from the methods of registration, it is found that the figures recorded disclose certain phenomena with such emphasis that the lessons taught by the phenomena stand altogether unaffected. Thus, as regards the distribution of deaths over the year, during the 45 years, the results show a strongly marked winter maximum and an equally marked summer minimum; along with which there is also a small secondary maximum in the second half of March and first half of April. Thus, broadly considered, the distribution of deaths from influenza is inversely as the temperature, being at the maximum during the winter months when temperature is lowest, and at the minimum in the summer months when temperature is highest. Hence the curve showing the distribution of deaths from influenza is closely congruent with the curve for diseases of the respiratory organs, with the addition of a slight rise in spring, thus suggesting a connection between influenza and diseases of the brain and the nervous system.

During the last 45 years, 4690 deaths are registered as having occurred from influenza, or 104 per annum. There is no year in which there has not been some deaths recorded as due to influenza; but during the 12 years ending with 1889, the registered deaths have been decidedly fewer than during the preceding 33 years, the mean number for these 12 years being only 6½, falling in some of the years as low as 3. There have been five periods during these years in which the figures point to the prevalence of an epidemic of influenza, the exact periods of which, with the number of deaths registered as due to influenza, are these:—

	Deaths.
December 1847 to April 1848	1631
March to May 1851	258
January to March 1855	130
November 1857 to January 1858	123
January to March 1890	545
Total	2687

Thus the five epidemics yielded 2687 of the 4690 deaths registered, or about 57 per cent. From a discussion of the details of each epidemic and the weather which prevailed during each of them, it was shown that in each case the rise to the maximum was strikingly rapid after the disease was recognized as existing. It was further concluded that the epidemics of influenza in this country were not, though they occurred during the winter, connected with exceptionally cold weather, especially at their commencement, but on the contrary rather with exceptionally warm weather, which manifested itself generally both before and during the epidemic. In no case that has occurred was any exceptionally cold weather intercalated in the period of the epidemic, accompanied with an increase of deaths from influenza, or even with an arresting of the downward course of the curve of mortality, if the cold occurred at the time the epidemic was on the wane. This fact presents influenza under widely different relations to temperature as compared with all diseases of the respiratory organs.

During the first four weeks of 1890, when the mortality from influenza was at the maximum, the total mortality from all causes was 2258 above the average of these weeks, and of this number influenza only accounted for 303, thus leaving 1955 deaths due to other causes; and it is here to be noted that during the time there were no weather conditions, such as excessively low temperature or dense persistent fogs, which could account for this very large increase of the death-rate. It thus became a point of interest to ascertain what the diseases were which had an exceptionally high mortality during the period, and on the other hand whether there had been any diseases with a mortality for the time much under the average.

The statistics from the various diseases were minutely examined, from which it was shown that those which yielded an exceptionally high death-rate during the influenza epidemic were diseases of the respiratory organs, phthisis, diseases of the circulatory system, rheumatism, and diseases of the nervous system. These diseases, particularly those of the respiratory organs, produced a very large excess above their averages, in spite of the fact that on the whole temperature had been particularly high, and dense fogs absent, which, being contrary to all rule, plainly indicated that during the period something of an exceptional character had been operating to increase the deaths from diseases of the respiratory organs. The strong manifestation of nervous symptoms in the severe headaches and prostration which attended the attacks of influenza, make the increase of deaths from diseases of the nervous system and of phthisis deeply interesting, as suggestive of a relation to the secondary spring maximum. So, also, the increased number of deaths from rheumatism is interesting in connection with the muscular pains which were so constant a symptom of influenza.

The diseases which yielded a mortality under the average during the prevalence of the epidemic were diarrhœa and dysentery, liver disease, measles, scarlet fever, typhoid fever, and erysipelas. It is, however, necessary to remark that the figures refer only to London, and that in other places where epidemics of measles and scarlet fever prevailed at the time these epidemics might show a mortality above the average.

On the question of age, the point of interest centred in the fact that the death-rate of all persons above the age of 20 rose considerably above the average during the four or five weeks immediately preceding the commencement of the registration of deaths due to the epidemic. Thus, though deaths from influenza were not registered in November and December, there appeared to have been something then present, apart from weather, which increased the mortality of all persons above the age of 20 much above the mean. At ages under 20 years, the death-rate rose above the mean only in the first three weeks of the year.

From a list of twenty-three recorded epidemics of influenza since the year 1510, it appeared that spring epidemics were more frequent and better marked than they would be if the figures for the past forty-five years were accepted as revealing the whole truth; and it also appeared that the epidemic of influenza has occurred in early summer and continued to the end of July. Facts, however, are too scanty to show whether the increased mortality during this early summer epidemic extended to the classes of diseases which have their annual maximum mortality in early summer, in a manner similar to the greatly increased mortality from diseases of the respiratory organs or of the nervous system according as the epidemic falls during the winter or the spring months.

In conclusion it was remarked that in discussions regarding

[1] Abstract of a Paper, by Sir Arthur Mitchell and Dr. Buchan, read at the half-yearly meeting of the Scottish Meteorological Society, March 31, 1890.

the spread of the germs of diseases from one country to another by the intervention of winds, it had been perhaps universally assumed that it is only the winds blowing over or near the surface of the earth which were concerned in the dissemination of these germs. Generally it has been concluded that, if the surface winds do not account for the successive appearances of the epidemic at different points, the germs have not been transported by the winds. This, however, is only a mode of looking at the subject which ignores the recent developments of meteorology and its teachings regarding atmospheric circulation through cyclones and anticyclones. As is now virtually proved, the winds in a cyclone are drawn inwards towards its centre, and thence ascend in a vast aërial column to the upper regions of the atmosphere, whence again they flow as an upper current towards any anticyclone or anticyclones that may be in the surrounding region. Thereafter they slowly descend down the centre of the anticyclone to the earth's surface, over which they are carried in every direction. Thus, for example, from a cyclone in Russia, a vast column of air rises from the surface, carrying with it particles of dust, germs, and other light impurities. These are then conveyed by the upper current to the anticyclone that may at the time overspread Western Europe, and thereafter descend to the surface, and are then distributed over Western and Central Europe by winds from all points of the compass. Owing to the rapidity of these aërial movements, two or at most three days are amply sufficient for this distribution.

MATHEMATICAL TEACHING AT THE SORBONNE, 1809–1889.

THE following brief sketch of the illustrious Professors who have during the last eighty years occupied the mathematical chairs at the Sorbonne is founded upon an interesting address by the veteran mathematician, M. Ch. Hermite.[1]

The occupants, in 1809, of the respective chairs, were Lacroix (Differential and Integral Calculus), Poisson (Mechanics), Biot (Astronomy), Francœur (the Higher Algebra), and Hachette (Descriptive Geometry). Each, in his respective department, has left traces of his power which are still in evidence. "Nous évoquons le souvenir de ces hommes éminents qui ont honoré la Faculté des Sciences à son origine ; nous voulons rendre l'hommage qui est dû à leur mémoire, et dans cette circonstance rappeler leurs titres à la reconnaissance du pays." M. Hermite then proceeds to analyze in turn the work of the above Professors.

(1) Of Lacroix, he says: "La constante préoccupation de l'auteur a été d'établir entre tant de théories qu'il expose, sur des matières si diverses, une succession naturelle, un enchaînement qui en facilite l'étude et contribue à l'intelligence générale de l'analyse." He was well followed by Lefébure de Fourcy.

(2) Francœur occupied his chair down to 1847 ; he was the author of a long list of works. "La concision que s'est imposée l'auteur pour réunir tant de matières dans un court espace ne porte jamais atteinte à la clarté." A sketch of the "Uranographie" is furnished by M. Tisserand.

(3) Biot was also a long occupant of his chair, "dont il est resté titulaire jusqu'en 1846." M. Wolf furnishes a note (pp. 36–40) which gives a full account of the "Traité Élémentaire d'Astronomie physique." "Biot était un érudit et un écrivain," in M. Hermite's judgment.

(4) Poisson is a Colossus :—"Il figure parmi eux à côté de Laplace, de Lagrange, et de Fourier. C'est surtout de l'auteur de la 'Mécanique Céleste' qu'il se rapproche par la nature de ses travaux, son génie analytique, sa puissance pour mettre en œuvre toutes les ressources du calcul. Lagrange, à qui l'on doit la 'Mécanique Analytique,' et de grandes découvertes dans la théorie du son et la mécanique céleste, avait consacré une part importante de ses efforts aux mathématiques abstraites ; après avoir fondé le calcul des variations, il a laissé la trace de son génie dans l'algèbre et la théorie des nombres. Pour Laplace et Poisson, l'analyse pure n'est point le but, mais l'instrument ; les applications aux phénomènes physiques sont leur objet essentiel, et Fourier, en annonçant à l'Académie des Sciences les travaux de Jacobi, a exprimé le sentiment qui dominait à son époque, dans ces termes que nous reproduisons : 'Les questions de la philosophie naturelle qui ont pour but l'étude mathématique de tous les grands phénomènes sont aussi un digne et principal objet des méditations des géomètres. On doit désirer que les personnes les plus propres à perfectionner la science du calcul dirigent leur travaux vers ces hautes applications, si nécessaires aux progrès de l'intelligence humaine.' Mais, en ayant un autre but, Poisson et Fourier contribuent au développement de l'analyse, qu'ils enrichissent de méthodes, de résultats nouveaux, de notions fondamentelles. Nous allons essayer de montrer l'importance des découvertes de Poisson dans la domaine de la physique mathématique, en jétant un coup d'œil rapide sur quelques-uns de ses mémoires."

(5) Poisson was succeeded by Sturm, whose reputation is founded upon his well-known theorem in the theory of equations. M. Hermite alludes to Prof. Sylvester's discovery in this branch.

(6) In 1838, a Chair of Mécanique Physique et Expérimentale was founded, of which the first occupant was the illustrious Poncelet. Commencing with an account of the "Traité des Propriétés Projectives des Figures," the writer goes on to describe the other contributions of this eminent mathematician, who was succeeded (7) in 1851 by Delaunay. Here, again, M. Tisserand comes to the help of his colleague with an account of Delaunay's astronomical work.

(8) A short and highly appreciative account follows of Le Verrier. "Il a été donné à l'illustre auteur de ne point laisser son œuvre inachevée ; Le Verrier a corrigé sur son lit de mort les dernières feuilles de la théorie de Neptune, léguant à l'astronomie un monument impérissable qui sera l'honneur de son nom et de la science de notre pays."

(9) The various works of Lamé come next under review. "Lamé est un des plus beaux génies mathématiques de notre temps. Des découvertes capitales qui ont ouvert de nouvelles voies dans la théorie de la chaleur, la théorie de l'élasticité, l'analyse générale, le placent au nombre des grands géomètres dont la trace reste à jamais dans la science."

(10) Liouville ; (11) Serret ; and (12) Duhamel are rapidly examined, the notice of this last being contributed by M. Bertrand.

(13) "Chasles est l'une des plus grandes illustrations de la Faculté ; ses découvertes en géométrie, les ouvrages qu'il a publiés sur cette science l'ont placé au premier rang parmi les savants de l'Europe, et rendu son nom à jamais célèbre. De grandes et belles découvertes en mécanique se sont ajoutées à son œuvre principale, ainsi que des recherches d'érudition sur les mathématiques et l'astronomie des Indiens et des Arabes ; nous indiquerons succinctement ces travaux qui ont jeté tant d'éclat, et sont présents à toutes les mémoires." The notice closes with the following touching sentence : "il nous reste à dire que ses amis et tous ceux qui ont connu notre cher et vénéré collègue gardent l'inaltérable souvenir de la bonté qui, chez le grand géomètre, était la compagne du génie."

(14) Cauchy is also treated at some length. "La vie du grand géomètre, remplie par des découvertes immortelles qui sont l'honneur de la science française, l'a été aussi par les œuvres de la charité chrétienne et une inépuisable bienfaisance."

(15), (16), and (17). In a few words are summed up the principal results obtained by other colleagues : "Nos collègues Puiseux, Briot, et Bouquet, morts il y a peu d'années, et dont nous gardons si affectueusement le souvenir, se sont inspirés de son génie, et ont consacré des travaux de premier ordre à poursuivre dans le domaine de l'analyse les conséquences de ses découvertes."

The speaker had a grand theme, and perhaps does not exalt too highly the very distinguished mathematicians who have preceded, or been associated with, him in his labours at the Sorbonne. One can pardon an occasional high-flown expression of his admiration for them and for their achievements : to ourselves the perusal of his discourse has furnished much pleasure, and we trust there will be as distinguished a roll of Professors to be celebrated when the work of the new Sorbonne has to be narrated by M. Hermite's successor. We conclude with the closing words of the address :—

"Nous venons d'évoquer le souvenir de nos prédécesseurs, nous avons voulu rendre hommage à leur mémoire, rappeler leurs travaux, leurs découvertes, les grands exemples qu'ils nous ont laissés. Notre mission est de continuer leur œuvre, et d'ajouter à leur glorieux héritage ; ce devoir nous est rendu plus sacré par le don magnifique que nous tenons du pays, par sa généreuse assistance pour notre enseignement et nos travaux. Tous, maîtres

[1] "Discours prononcé devant le Président de la République, le 5 Août, à l'inauguration de la nouvelle Sorbonne, par M. Ch. Hermite, Professeur à la Faculté des Sciences, Membre de l'Institut," *Bulletin des Sciences Mathématiques*, January 1890 (pp. 6–36). (Paris : Gauthier-Villars.)

de conférences et professeurs, nous y consacrerons notre dévouement, nos efforts : nous avons la confiance que, pour l'honneur de la Science et de la France, nous saurons fidèlement le remplir."

SCIENTIFIC SERIALS.

The American Journal of Science, April 1890.—On the æolian sandstones of Fernando de Noronha, by John C. Branner. These sandstones lie upon the eastern or south-eastern sides of the island, at an elevation of 70 feet on Ilha do Meio, 90 feet on São José, and about 100 feet on the Ilha Rapta, and at the base of Atalaia Grande. The author has closely investigated the formation, and finds that the material was originally deposited in the form of sand-dunes blown up by winds from the south or south-east. Analyses of several specimens of the rock are given.—A mountain study of the spectrum of aqueous vapour, by Charles S. Cook. The author has devised a means of producing an artificial line whose intensity can be varied at will alongside the line whose intensity is required. The variations in the blackness of the artificial line are effected by the use of a micrometer screw, the readings of which constitute an arbitrary value of intensities. It is found, (1) that the spectroscope studies vapour height primarily, and humidity only secondarily; (2) during stormy weather vapour ascends to altitudes greater than is usually supposed; (3) the great absorption of storm clouds is due to their great thickness, or to extensive strata of damp air associated with them, more than to any peculiar behaviour as clouds.—On the occurrence of basalt dykes in the Upper Palæozoic series in Central Appalachian Virginia, by Nelson H. Darton; with notes on the petrography, by J. S. Diller.—Additional notes on the tryolite from Utah, by W. F. Hillebrand and E. S. Dana. The composition and crystalline form of this mineral are considered.—W. S. Bayley, on the origin of the soda-granite and quartz-keratophyre of Pigeon Point, Minnesota. These rocks have been previously described by the author (*Amer. Journ.*, January 1889). In the present note the reasons are pointed out which lead to the conclusion that the red rock is of contact origin, and produced by the action of the gabbro upon the slate and quartzites.—Frank Waldo, in recent contributions to dynamical meteorology, gives a general idea of the nature of each of fourteen papers on meteorology; most of the papers being by German physicists. The attitude of the writers towards meteorology is also indicated by reference to other work done in the same direction.—Two methods for the direct determination of chlorine in mixtures of alkaline chlorides and iodides, by F. A. Gooch and F. W. Mar.—On the occurrence of polycrase, or of an allied species, in both North and South Carolina, by W. E. Hidden and J. R. Mackintosh. The analyses, so far as they go, show that a mineral previously noticed (*Amer. Journ.*, November 1888) is very closely allied to, if not identical with, the polycrase from Hitteroe, Norway, analyzed by Rammelsberg.—Origin of some topographic features of Central Texas, by Ralph S. Tarr.—On the formation of silver silicate, by J. Dawson Hawkins. A simple method for the preparation of this compound is described. The reaction made use of is $Na_2SiO_3 + 2AgNO_3 = Ag_2SiO_3 + 2NaNO_3$.

SOCIETIES AND ACADEMIES

LONDON.

Royal Society, April 17.—"Preliminary Note on Supplementary Magnetic Surveys of Special Districts in the British Isles." By A. W. Rücker, M.A., F.R.S., and T. E. Thorpe, Ph.D., B.Sc. (Vict.), F.R.S.

During the summer of 1889 we carried out additional magnetic surveys of the Western Isles and the West Coast of Scotland, and of a tract of country in Yorkshire and Lincolnshire.

Both districts were selected with special objects in view. We had found that powerful horizontal disturbing forces acted westwards from the Sound of Islay, from Iona, and from Tiree, and we had deduced a similar direction for the disturbing force at Glenmorven from Mr. Welsh's survey of Scotland in 1857-58. The whole district presents peculiar difficulties, partly from the fact that local disturbance is likely to mask the effects of the regional forces, partly because the normal values of the elements must be especially uncertain at stations on the edge of the area of our survey.

If, then, the general westward tendency of the horizontal disturbing forces was due to some source of error, stations in the extreme south of the Hebrides would in all probability be similarly affected. If the directions of the forces were due to a physical cause, such as a centre of attraction out at sea to the west of Tiree, then the disturbing forces in the Southern Hebrides would almost certainly be directed southwards towards it.

The observations made last summer prove (1) that the direction of the disturbing horizontal force at Bernera, which is the southernmost island of the Hebridean group, is due south; and (2) that, as this point is approached from the north, the downward vertical disturbing attraction on the north pole of the needle regularly increases, which exactly agrees with the supposition that a centre of attraction is being approached.

There is, therefore, now no doubt that there is a centre of attraction on the north pole of the needle to the south of the Hebrides and to the west of Tiree.

(2) In one of the maps communicated to the Society last year we drew two lines, bounding a district about 150 miles long and 40 miles broad, in Yorkshire and Lincolnshire, and gave reasons for the belief that a ridge line or locus of attraction lay between them.

This conclusion has now been tested by means of thirty-five additional stations, with the following results :—

(1) At all stations (with one exception) on or near the two lines, the horizontal disturbing forces tend towards the centre of the district they bound.

(2) The downward vertical disturbing forces are greater in the centre of the district than at its boundaries. In particular, there are two well-marked regions of very high vertical force.

(3) The greatest vertical force disturbances occur at Market Weighton, where the older sedimentary rocks are known to approach the surface, and at Harrogate, which is on the apex of an anticlinal.

(4) The central ridge line runs from the Wash parallel to the line of the Wolds to Brigg. Thence it appears to turn west, and reaches Market Weighton *viâ* Butterwick and Howden. One or two additional stations are, however, required to determine whether this bend is real, or whether the line runs direct from Brigg to Market Weighton. From the latter town it passes to the limestone district of Yorkshire and traverses its centre. It has not yet been traced west of the line of the Midland Railway between Settle and Hawes, but there is ground for believing that it continues to the Lake District.

Although, therefore, one or two points of detail remain for further investigation, the existence of a line of attraction 150 miles long is proved beyond the possibility of doubt, and for about 90 miles its position is known to within 5 miles.

There are, then, even in those parts of England where the superficial strata are not magnetic, regions of high vertical force comparable in size with small counties, and ridge lines or loci of attraction as long and almost as clearly defined as the rivers. Their course is closely connected with the geology of the districts through which they run.

Royal Meterological Society, April 16.—Mr. Baldwin Latham, President, in the chair.—The following papers were read :—The cold period at the beginning of March 1890, by Mr. C. Harding. At the commencement of the month a rather heavy fall of snow was experienced in many parts of England, and very cold weather set in over the midland, eastern, and southern districts, the temperature on the 3rd and 4th falling to a lower point than at any time in the previous winter. The lowest authentic thermometer readings, in approved screens, were 5° at Beddington, 6° at Kenley in Surrey and Hillington in Norfolk, 7° at Chelmsford and Beckenham, 8° at Addiscombe, 9° at Reigate and Brockham, and 10° in many parts of Kent and Surrey. At Greenwich Observatory the thermometer registered 13°, which has only once been equalled in March during the last 100 years, the same reading having occurred on March 14, 1845. During the last half century the temperature in March has only previously fallen below 20° in three years, whilst during the whole winter so low a temperature has only occurred in eight years.—Note on the whirlwind which occurred at Fulford, near York, March 8, 1890, by Mr. J. E. Clark. A sharp and heavy thunderstorm occurred at York about 2.30 p.m. At the same time, or shortly afterwards, a whirlwind passed a little to the south of the city, from Bishopthorpe to Heslington, a distance of about

4 miles, its width varying from 3 or 4 to 250 yards. The author made a careful survey of the track of the whirlwind, and described the damage done by it to trees, buildings, &c.—On the possibility of forecasting the weather by means of monthly averages, by Mr. A. E. Watson. The author is of opinion that the average values of meteorological phenomena are constant quantities, and that any variation from them is sure to be met by a compensating variation in the opposite direction.

Zoological Society, April 15.—Mr. G. A. Boulenger, in the chair.—Mr. A. Smith-Woodward, read a paper on some new fishes from the English Wealden and Purbeck Beds, referable to the genera *Oligopleurus*, *Strobilodus*, and *Mesodon*. Detailed descriptions of several fossils of these genera, now in the British Museum, were given. *Oligopleurus* was stated to be represented by a single species in the Wealden of the Isle of Wight, occurring also in the Purbeck of Dorsetshire; and the latter formation had yielded at least one species both of *Strobilodus* and *Mesodon*. Previous researches had already indicated a close connection between the fish-fauna of the English Purbeck Beds and that of the Upper Jurassic Lithographic Stones of France, Bavaria, and Würtemberg; and the new forms now described tended to demonstrate that alliance even more clearly.—Mr. G. A. Boulenger read the second of a series of reports on the additions to the Batrachian Collection in the Natural History Museum. Since 1886, when the first report was made on this subject, examples of 74 additional species of Batrachians had been acquired. Amongst these was a remarkable new form allied to the family Engystomatidæ, proposed to be called *Genyophryne thomsoni*, based on a single specimen obtained by Mr. Basil Thomson on Sudest Island, near South-East New Guinea. The form was stated to be unique in having teeth in the lower, but none in the upper jaw.—Mr. Frank E. Beddard read a paper on the structure of *Psophia*, and on its relations to other birds. The author was inclined to consider *Psophia* most nearly allied to *Cariama* and *Chunga*, and more distantly to *Rhinochetus*, but entitled to stand as a distinct family in the group of Cranes and their allies.—Mr. Henry Seebohm gave an account of a collection of birds from the northern part of the province of Fokien, South-Eastern China. Several interesting species were represented in the series, amongst which was a new *Hemixos*, proposed to be called *H. canipennis*.

Linnean Society, April 3.—Mr. Carruthers, F.R.S., President, in the chair.—Prof. P. Martin Duncan exhibited a transverse section of a coral, *Caryophyllia clavus*, showing septa and irregular theca between them.—Mr. B. D. Jackson exhibited some seeds of *Mystacidium filicornu*, an epiphytic Orchid forwarded from South Africa by Mr. Henry Hutton, of Kimberly.—A paper by Prof. W. H. Parker, on the morphology of the *Gallinaceæ*, in the unavoidable absence of the author was read by Mr. W. P. Sladen; and a discussion followed, in which Dr. St. George Mivart, Prof. Duncan, and Mr. J. E. Harting took part.

PARIS.

Academy of Sciences, April 14.—M. Hermite, President, in the chair.—On the theory of the optical system formed by a telescope and a plane mirror movable about an axis, by MM. Lœwy and Puiseux. One of the problems studied is to determine the exact co-ordinates of a star with a telescope and a plane mirror placed in front of the object-glass.—On the elements of peritoneal serum, by M. L. Ranvier. The humour was obtained from the domestic rabbit, the rat (*Mus decumanus*), and the cat. Microscopical examination of the preparations showed the presence of red globules of blood (hæmatics) whatever precautions were taken. It is therefore considered as a normal element, physiological, not accidental, of peritoneal serum. Colourless spherical lymphatic cells, having dimensions from 20μ to 100μ, are also described; the volume, structure, and reactions of these cells from the three animals, however, is found to vary.—On the artificial production of silk, by M. Emile Blanchard.—*Résumé* of solar observations made at the Royal Observatory of the College of Rome during the first three months of the year 1890, by M. P. Tacchini.—Observations of sun-spots made in 1889 at the Lyons Observatory, by M. Em. Marchand. The first three months of this year are also included in the list. Tables are given showing the number of days without spots, the duration and latitude of spots, and their mean total surface (umbra and penumbra) expressed in millionths of the sun's visible surface.—Approximate rectification of an arc of a curve, by M. A. E. Pellet.—Construction for the radius of curvature of symmetrical triangular curves, of plane anharmonic curves, and of asymptotic lines of Steiner's surface, by M. G. Fouret.—A paper by M. A. Ditte, on the action of nitric acid on aluminium, shows that this acid acts upon aluminium in much the same way as sulphuric acid. The slowness of the reaction is due to the formation of a protecting covering of gas. As in the case of zinc, when weak nitric acid is employed the gases produced consist of nitric oxide and nitrogen, together with some ammonia; with 3 per cent. acid in presence of a little platinum chloride, ammonia is almost the sole product. Just as with the sulphate, the nitrate forms with aluminium in presence of water a basic nitrate with liberation of hydrogen.—On the preparation of hydrobromic acid, by M. A. Recoura. The author passes a stream of H_2S through bromine, and washes the gaseous HBr produced by passing it through a solution of HBr containing a little red phosphorus in suspension. The method admits of the production of gaseous HBr at any desired rate, and without the necessity of the continual watching required by the methods formerly employed.—On the oxidation of hypophosphorous acid by hydrogenized palladium in the absence of oxygen, by M. R. Engel. In the precipitation of palladium by hypophosphorous acid according to the method followed by Wurtz and Graham, the author finds that the product, contrary to the statements of those investigators, contains hydrogen. The spongy palladium produced decomposes an unlimited quantity of phosphorous acid, hydrogen being evolved.—M. P. Cazeneuve contributes a paper on the oxidizing and decolorizing properties of charcoal.—M. E. Jungfleisch, in a note on camphoric acids, shows that the separation of several acids is possible when advantage is taken of their differing solubilities.—A note on the acid malonate, the quadromalonate, and the quadroxalate of potassium, by M. G. Massol, gives the thermal properties of these salts, and an analysis of the quadromalonate.—M. L. Lindet describes a method for the extraction of raffinose from molasses, and for the separation of raffinose from saccharose, the separation depending upon the greater solubility of raffinose in absolute methyl alcohol, and its much inferior solubility in 80 per cent. ethyl alcohol, as compared with the solubility in each medium of saccharose.—On a pseudo-typhoid bacillus found in river water by M. Cassederat. The author has found in Marseilles drinking-water a bacillus having a great resemblance to that of typhoid fever. The investigations, so far as they have gone, seem to fully establish the identity of the two bacilli.—On the microbes of hæmoglobinuria of the bull, by M. V. Babes. An examination of the character of this organism shows that it has no well-established place in the classification of microbes, and that the conditions of culture are not yet well determined. Nevertheless, its special reactions, its localization in the red globules, and its transmissibility to animals, leave no room for doubt as to its pathological significance.—Nutrition in hysteria, by MM. Gilles de la Tourette and H. Cathelineau. It is noted that in hysteria, notwithstanding nervous pathological manifestations other than permanent affections, nutrition is effected normally.—On operation for strabismus without tenotomy, by M. H. Parinaud.—On the function of air in the physiological mechanism of hatching, sloughing, and metamorphosis among Orthopterous insects of the family Acridides, by M. J. Kunckel d'Herculais.—On a new Lycopodium of the Coal-measures (*Lycopodiopsis Derbyi*), by M. B. Renault.—Pebble impressions, by M. Ch. Contejean. The paper refers to Tertiary pudding-stones found near Montbéliard.

BERLIN.

Physiological Society, March 28.—Prof. du Bois-Reymond, President, in the chair.—Prof. Salkowski spoke on fermentative processes which occur in animal tissues, employing chloroform-water to discriminate between the action of ferments (organized) and enzymes (unorganized). He had thus found that a fermentation (zymolysis) occurs in yeast-cells, by which their cellulose is partly converted into a lævo-rotatory sugar and the nuclein into substances of the xanthin series. He had further isolated from yeast-cells, apart from their cellulose, two other carbohydrates, one belonging to the gum series and one resembling glycogen; either of these might have been the source of the above-mentioned sugar. In a similar way he had studied the fermentative changes which take place in liver and muscle, and found them to yield a series of distinct products which could be determined both qualitatively and quantitatively. He concluded from his researches that fermentative (zymolytic) processes are continually taking place in living tissues, and play a most

important part in the chemistry of their metabolism.—Dr. Rosenberg demonstrated a new reaction of uric acid. When urine is made faintly alkaline, it yields a dark blue colouration on the addition of phosphotungstic acid, which he had satisfied himself was due to the presence of uric acid alone among the other constituents of the excretion.—Dr. Goldscheider gave an account of some experiments which he had made some five years ago, to show that the principle of "specific nerve energy" holds good for the sense of taste. By isolated stimulation of separate taste-papillæ he succeeded in showing that there exist, in all, four kinds or qualities of taste—sour, sweet, bitter, and salt; and that specific end-organs exist for each kind of taste. By electrical stimulation there arises at the anode not only the sensation of sour, but also of bitter and sweet; at the kathode purely sensory impulses are aroused in addition to the gustatory, and to the fusion of these two is due the "alkaline" taste of which some authors speak. It appeared from his researches that the hard palate contained end-organs chiefly for the perception of sweet tastes.—Dr. I. Munk spoke on muscular work and nitrogenous metabolism. He criticized the recent work of Argutinsky, according to which the work done in climbing a mountain, and the heat produced, are the outcome of a breaking down of nitrogenous material. Having recalculated Argutinsky's results, he came to the conclusion that (1) his body was not in nitrogenous equilibrium even during rest; (2) the amount of carbohydrate which he took was insufficient to account for the heat-production during rest. As is well known, both these factors lead to an increased nitrogenous metabolism when extra work is done, the energy required for the excess of work being obtained from the breaking down of proteids; hence no conclusions as to what normally takes place can be drawn from Argutinsky's experiments. He further pointed out that Oppenheim's experiments have shown that dyspnœa leads to increased nitrogenous metabolism, and that hence dyspnœa may very probably have played some part during the exertion of excessive climbing. While not doubting the accuracy of the experiments, he did not feel that the conclusions which Argutinsky had drawn from them were justifiable.

GÖTTINGEN.

Royal Society of Sciences, Oct. 15, 1889.—On the granular pigments occurring in man, by Dr. F. Maas. Two chemically distinct groups of pigments occur: (1) melanin, (2) the granular colouring matters here referred to. The latter are found at all periods of life, but increase in quantity and in the size of the granules with age. They are normal products, not morbid. They are not only transformed but produced by the corpuscle-carrying cells. They are not wholly derived from the blood: the pigment found in the heart is derived from a fatty body. The several pigments can be distinguished by their reactions with hydrochloric and acetic acids, and with caustic potash.—On the analogue of Kummer's surface for $p = 3$, by W. Wirtinger. The author investigates the continuum obtained by taking, as the eight homogeneous point-co-ordinates of a 7-dimension space, eight linearly independent squares of theta-functions of three variables. It appears that this possesses collineations analogous to the system for Kummer's surface, as also the corresponding system of reciprocal transformations into itself.

October 23, 1889.—Determination of the elastic constants of Iceland spar, by W. Voigt. The author uses the refraction observations of G. Baumgarten, and gives elaborate tables of his own measurements. He discusses the property of spar by which the crystal can be forced by shearing into its twin form, and gives diagrams illustrating the changes in the traction and torsion coefficients.—Determination of the elastic constants of certain dense minerals, by W. Voigt and P. Drude. The minerals are dense fluor spar, Solenhofen stone, and dense barytes.

December 3, 1889.—On thermo-electric currents in crystals, by Th. Liebisch. The author confirms some of Bäckström's results, and finds that, in a rectangular parallelepiped of homogeneous conducting crystal of the triclinic system, embedded in homogeneous isotropic "normal" metal, "the thermo-electric force in the direction of the steepest temperature gradient is represented by the squared reciprocal of the parallel radius vector of a certain ellipsoid E."—On contrast-phenomena resulting from suspended attention, by Dr. F. Schumann. Psycho-physical experiments on the estimation of short periods of time, &c.

December 25, 1889.—On the fertilization of the ova of *Agelastica alni*, L., by Dr. H. Henking. In this insect it is observed that in ova taken from the oviducts a number of spermatozoa penetrate deeply among the yolk-masses as far as the level of the female pronucleus. Peculiar karyokinetic appearances are described.—Contribution to the theory of the even Abelian sigma-function of three arguments, by Ernst Pascal. This is a continuation of the author's previous work on the odd sigma-function. The terms of the developments are combinants of a net of quaternary quadratic forms.—On a hyperelliptic multiplication equation, by H. Burkhardt. This equation for hyperelliptic functions ($p = 2$) is the generalisation of Jacobi's equation for elliptic functions.

AMSTERDAM.

Royal Academy of Sciences, March 29.—Prof. van der Waals, Vice-President, in the chair.—M. H. A. Lorentz dealt with the molecular theory of diluted solutions. He showed how the known formula for the vapour-pressure of such solutions may be derived from considerations on molecular motion and attraction, and how a similar theory applies to a conceivable mechanism of osmotic pressure.—M. Baehr gave some observations on the herpolhodie of Poinsot, and explained that this cannot have any points of inflexion, unless the ellipsoid be not a central one.—M. Pekelharing spoke of "the destruction of anthrax spores by rabbits' blood."

STOCKHOLM.

Royal Academy of Sciences, April 9.—On the researches in zoology made at the Zoological Station of the Academy during 1889, by Prof. S. Lovén.—On the possibility of the triangulation of Spitzbergen, by Prof. Rosén.—An analysis of the liquid inclosures in topaz, or the so-called Brewsterlinite, by Otto Nordenskiöld.—On the use of invariants and seminvariants for the solution of common algebraic equations of the four lowest degrees, by Dr. A. Bergen.—On the structure of the fruit-wall in the Labiatæ, by Miss A. Olbers.—Some researches on accidental double refraction of gelatinous substances, by Dr. G. Bjerkén.—On the action of iodohydric acid on 1-5 nitronaphthalin-sulphon-acid-amid, by A. Ekbom.

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