THURSDAY, OCTOBER 26, 1871

SCIENCE IN AMERICA

Proceedings of the Essex Institute. Vols. I.-V. *Proceedings and Communications of the Essex Institute.* Vol. VI. *Bulletin of the Essex Institute.* Vols. I. and II. (Salem, Massachusetts. Published by the Essex Institute, 1856-1871.)

WE have, on various occasions, alluded to the large amount of encouragement to the pursuit of science afforded by the governing powers of the United States, both by the Central Federal Government at Washington, and by those of the individual States. The sums of money voted for such purposes by our American relations would make the hair of our economical Government officials in this country stand on end, and would be certain to provoke angry comment in our House of Commons; while the number of scientific men paid for carrying on investigations and preparing reports on various subjects of great practical value for the welfare of the country, would almost bear comparison with the number we pay for doing nothing or for obstructing all rational improvements.

When men of culture and science in this country attempt to advocate the claims of Science to national support from the Government, one of the arguments most relied on by their opponents is that such a course would have the effect of checking all scientific enterprise and research that was not paid for by the State. We should like these objectors to look over the publications now lying before us; and we think, if they were able to derive any lesson from it, it might have a tendency to modify their opinion.

New England is acknowledged to be the most highly educated portion of the United States, and among the New England States none occupies a more honourable position than Massachusetts for its high standard of cultivation, and for the public-spirited manner in which its citizens tax themselves for the support of education and the spread of knowledge, scientific and otherwise. The early New England settlers had a loving habit of perpetuating in their new settlements the names of familiar places in the old country, and thus we find one of its counties called Essex, with an area about equal to that of our Middlesex, possessing a scientific institute located in the thriving town of Salem. A sketch of the history of the Essex Institute since its foundation may convey some idea of the manner in which voluntary scientific effort is carried on in Massachusetts.

The Essex Institute was formed in 1847 by the union of the Essex Historical and the Essex County Natural History Societies; and the Institute, thus organised, consisted of three departments—the historical, having for its object the collection and preservation of whatever relates to the topography, antiquities, and civil and ecclesiastical history of Essex County; the natural history, for the formation of a cabinet of natural productions in general, and more particularly of those in the county, and for a library of standard works on the natural sciences; and the horticultural, for promoting a taste for the cultivation of choice fruits and flowers, and for collecting works on horticulture and agriculture in connection with the general library.

From 1848 to 1866 the Essex Institute published five volumes of "Proceedings," containing reports of papers read before the Institute on the various subjects included in the programme. Among the more important papers contained in these volumes may be mentioned the following:—List of Infusoria found chiefly in the neighbourhood of Salem, by Thomas Cole (1853); Catalogue of the Birds of Essex County, by F. W. Putnam, 235 species (1856); Account of the life, character, &c., of the Rev. Samuel Parris, of Salem Village, and of his connection with the Witchcraft delusion of 1692, by Samuel P. Fowler (1856), reminding one exceedingly of a history that will probably one day be written of certain similar delusions not unknown in our own day; On Indian Relics from Marbleshead (1857); Noticeable traits of the Flora of Nahant, by C. M. Tracy (1858); On the changes produced by Civilisation in the habits of our common Birds, by S. D. Fowler (1860); Catalogue of the Birds found at Norway, Oxford County, Maine, by A. P. Verrill (1862); Report of the Army Worm (*Leucania unipuncta*, Ham.), by Carleton A. Shurtleff (1862); Catalogue of Birds found at Springfield, Mass., with Notes on their migrations, habits, &c., by J. A. Allen (1864); The Humble Bees of New England and their Parasites, by A. S. Packard, jun. (1864); A classification of Mollusca, based on the principle of Cephalisation, by Edward S. Morse (1865); Synopsis of the Polyps and Corals of the North Pacific Exploring Expedition under Commodore C. Ringgold and Captain John Rodgers, U.S.N., from 1853 to 1856, by A. P. Verrill (1805-06); Flora of the Hawaian Islands, by Horace Mann (1866).

From 1867 the Transactions of the Institute have been published in a slightly different form, under the title of "Proceedings and Communications of the Essex Institute," its contents consisting to a considerable extent of continuations of some of the elaborate and important papers commenced in the earlier volumes, especially of Prof. Verrill's "Synopsis of the Corals and Polyps of the North Pacific Exploring Expedition," and of the "Flora Hawaii," by Mr. Horace Mann, whose early death was an irreparable loss to American botanists. There are also a number of papers by Mr. A. S. Packard, whose services to embryology are so well known, and the very valuable contribution by Dr. Elliott Coues, "Catalogue of Birds of North America contained in the Museum of the Essex Institute; with which is incorporated a list of the Birds of New England, with brief critical and field notes." The following quotation from this paper will interest ornithological readers:—"Within the area of New England are represented portions of two faunæ, the Canadian and Alleghanian, which differ in many respects from each other. There seems to be a natural dividing line between the birds of Massachusetts and Southern New England generally, and those of the more northern portions of the Eastern States. Numerous species which enter New England in spring, to breed there, do not proceed, as a general rule, farther north than Massachusetts, and many others, properly to be regarded as stragglers from the south in summer and early autumn, are rarely, if ever, found beyond the latitude of this State. In like manner, many of the regular winter visitants of Maine are of rare and only occasional occurrence, and are not found at all much farther south. Again, many species hardly known in Massachusetts and southward, except as migratory species passing through in spring and autumn, are in Maine regular summer visitants, breeding abundantly. Other minor differences, resulting from latitude and physical geography, will readily be brought to mind by attentive consideration of the subject, and therefore need not be here detailed. It will be evident that a due regard for these important points has necessitated, in the case of almost every species in the list, remarks elucidative of the special part it plays in the composition of the avifauna."

The later numbers, especially of the Proceedings, are illustrated by admirably executed lithographs illustrative of the natural history pages, and a considerable amount of space is occupied by reports of the Field meetings of the members. It is interesting to read that the idea of these excursions, which have been productive of such valuable practical result, originated from a perusal of the Transactions of the Berwickshire Naturalists' Club.

While thus affording a medium for the publication of papers of sterling scientific value, the Essex Institute has not been unmindful of the no less imperative duty of scientific bodies, that of promoting a taste for science among the educated but unscientific public. We in this country have perhaps erred in too much ignoring the *profanum vulgus*. It becomes, however, yearly more and more manifest that science must be no esoteric religion, but that it must grasp, in its all-including embrace every section of the community. It is doubtful, indeed, which class of scientific men deserves best of the republic, those who devote the whole of their time to actual work in the laboratory or the dissecting-room; or those who of the riches of their knowledge impart to the ignorant crowd in the lecture-room or by the popular treatise. With the names of the former will doubtless be connected the most important discoveries of the age; the latter will have the satisfaction of knowing that they have done their part towards making science really popular, towards spreading its blessings among the masses. The danger is when the instruction of the public is undertaken by those who have not practically made themselves masters of the mysteries which they presume to communicate to others.

Commencing with January 1869, the issue was commenced, in addition to the publications named above, of the "Bulletin of the Essex Institute," the object being to give to the public such portions of communications made to the Institute as are of popular interest. We find here, in language intelligible to non-scientific readers, reports of such proceedings and papers read at meetings of the Institute, in Natural History, Philology, and History, as are likely to interest the inhabitants of the county generally; and we look upon this as not the least valuable of its publications.

An interesting publication in connection with the Essex Institute is "The Naturalists' Directory," which is intended, when complete, to form a list of the addresses of the workers in each department of science all over the world. If ever the proposed union of our scientific societies is effected, we may get something of the kind in this country.

The above account of the Proceedings of the Essex Institute since its foundation may serve to show the zeal displayed by workers in Natural History in the United States, and may also be useful in pointing out some hitherto unrecognised fields of usefulness to similar bodies at home.

OUR BOOK SHELF

Contributions to the Flora of Mentone, and to a Winter Flora of the Riviera, including the Coast from Marseilles to Genoa. By J. Traherne Moggridge, F.L.S. 100 coloured plates. (London: L. Reeve and Co., 1871.)

MR. MOGGRIDGE has collected in this splendid volume drawings and descriptions of one hundred of the most striking plants of the Mediterranean coast of France. We have no preface to inform us on what principles the selection has been made, nor are they self-evident. But few of the species are new, though some of them are doubtful plants of which precise characters were much wanted. Mr. Moggridge is well known to English botanists as an accurate and careful observer, who has paid great attention to the botany of this district; and he has here produced a volume which is not only a useful contribution to science, but is surpassed by few that we know as a *livre de luxe* to lie on the drawing-room table. The illustrations are beautifully drawn by the author himself, and are exquisitely coloured. Mr. Moggridge has made himself thoroughly acquainted with the beautiful but difficult species or varieties of Orchis of the south of France related to our Bee-orchis. It is remarkable that, while on our chalk-hills the bee and fly orchis, *Ophrys apifera* and *muscifera*, remain perfectly distinct, in the south of Europe they approximate to one another by innumerable intermediate forms, which may all be considered as varieties of Linnæus's *O. insectifera.* These are here worked out with great care, and we have plates of a number of the most interesting forms. A. W. B.

Zeitschrift der österreichischen Gesellschaft für Meteorologie. Redigirt von Dr. C. Jelinek und Dr. J. Hann, v. Band, mit 3 lithographirten Tafeln, pp. 644; vi. Band, pp. 1—224 (Wien, 1870-71.)

THE fifth volume of the Journal of the Austrian Meteorological Society, published fortnightly, and extending in one year to 644 octavo pages, shows at once the extraordinary energy with which this society conducts its operations, and the high estimation in which meteorology is held in Austria. What strikes one as the most remarkable feature of this periodical is the broad and catholic spirit in which the science is treated. Whilst the articles are mostly written by members of the society, the pages of the journal are open to meteorologists in all parts of the globe. Reprints or abstracts, accompanied where necessary with tabular matter, of the more important meteorological papers which have been published in other journals, appear from time to time. A few of the more important of these are the following, viz:—Dove's "Non-periodic Changes of the Distribution of Temperature over the Earth's Surface," D. Milne Home's "Increasing the Supply of Spring Water at Malta, and Improving the Climate of the Island," Glaisher's "Temperature of the Air at Different Heights," Buchan's "Mean Pressure and Prevailing Winds over the Globe," Wojeikof's "Mean Temperature of Russia," Raulin's "Rainfall of Algiers," Rayet's "Climates of the Isthmus of Suez," Jelinek's "Distribution of Thunderstorms in Austria," Petermann's "Monogram on the Gulf-Stream," Mohn's "Temperature of the Sea," and Angus Smith's "Composition of the Atmosphere." The abstracts are not bald productions, but ably written and readable articles. Another admirable feature is the papers on the climates of places in different parts of the globe, by Dr. Hann, one of the editors and unquestionably one of the greatest of the younger meteorologists on the Continent. These papers are accompanied by tables giving the mean pressure, temperature, humidity, rainfall, wind, and cloud; and their very great value will be recognised when it is stated that they embrace places whose meteorology was little, if at all known, such as Rio Janeiro, Parana, Mendoza, Monte Video, Buenos-Ayres, Punta-Arenas, Puerto Montt, Santiago, Valdivia, Valparaiso, Serena, Copiapo, and Lima, in South America; Bagdad and Samaua in Mesopotamia; Kuldscha in West China; St. Anna, near Manila, Philippine Islands; and Said, Ismailia, and Suez. Since broad and just views of the atmosphere and its movements can be attained only through the accumulation of such facts and an intelligent discussion of them, our best thanks are due to the Austrian meteorologists for these invaluable contributions. If meteorology were prosecuted more in this spirit than, unhappily, has been the case, it would be marred by fewer crude and hastily-formed theories; and particularly inquiries into local climates and weather over limited portions of the earth's surface would be conducted on sounder principles, and be productive of results which could be accepted as solid contributions to science. We heartily recommend this journal, especially since in this country we have nothing to compare with it,—no periodical which so well puts meteorologists and physicists *au courant* with this rapidly-advancing science.

Das Leben der Erde: Blicke in ihre Geschichte, nebst Darstellung der wichtigsten und interessantesten Fragen ihres Natur- und Kultur-lebens. Ein Volksbuch von A. Hummel. (Leipzig: F. Fleischer; London: Williams and Norgate, 1870.)

It is always a question of doubtful expediency whether it is wise to compress into one work by one writer a complete history of Nature, even in a popular treatise. This has been attempted by Herr Hummel in this volume of 424 pages, and, as far as such an attempt can succeed, not unsuccessfully. We have first a glimpse of the origin of the earth, and of its relations to the solar system. Then follows a chapter on the physical geography of the land, describing the main physical features of the solid crust of the globe. Next we have a treatise on water, and the part it has played in the formation of the existing surface of the earth. To this succeeds a chapter on the atmosphere and its phenomena. In conclusion we have a general sketch of the vegetation of the earth, and of the forms of animal life, in which the author declares against the Darwinian theory of the origin of species. Written occasionally in the inflated language in which continental popular writers too much indulge, the work is, nevertheless, a good one to put in the hands of young people with the double purpose of giving them some knowledge of natural science and of German. It was published on the hundredth birthday of Alexander von Humboldt, as a tribute to the memory of the great naturalist.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

The Sun's Parallax

Is there nobody who will perform an act of justice, and ask those who seem to have never known or to have forgotten my doings, to be kind enough not to deprive me of my just claims? When, A.D. 1857, my old method of determining the sun's parallax was again publicly proposed, I thought it somewhat strange, and wondered what could be the reason that it should be treated as if it were some new and not a very old acquaintance of Science. When, some time later, a stir was made about what was represented as a new method of investigating the motion of the solar system in space, and, instead of a new, there was brought forward an old acquaintance (known to Science since the times of your grandfathers), only dressed anew, and engaged to perform some truly "astounding" antics, I wondered indeed that no friendly hand should have prevented such an exhibition, but I also comprehended the true state of affairs. And since then I have had to shrug my ghostly shoulders so often when learning further news about your curious knowledge of Science, and your strange opinions, and your queer notions of honour, and justice, and fairness, that I have long ceased to wonder at anything some of you may say or do. However, as it is only right that I should be allowed to retain what belongs to me, and as nobody appears to remember my claims, you will probably raise no objection, if I, myself, enlighten you a little, and remind you how, A.D. 1672, I determined the sun's parallax.

Read in the History of my Life (Baily's Account, &c. p. 32):—

"Whilst I was inquiring for the planets' appulses to the fixed stars by the help of Hecker's ephemerides, I found that, in September 1672, the planet Mars, then newly past his perihelion and opposition to the sun, would pass amongst three contiguous fixed stars in the water of *Aquarius*; and that by reason he was then very near the earth, this would be the most convenient opportunity that would be afforded of many years for determining his, and consequently the sun's, horizontal parallax. I drew up a *monitum* of this appearance, and sent it with a letter to Mr. Oldenburg, who printed it in his *Transactions*, No. 86, August 19th, 1672, having before sent my admonition into France, where the gentlemen of their Academy took care to have it observed in several places. My father's affairs caused me to take a journey into Lancashire the very day I had designed to begin my observations, but God's Providence so ordered it that they gave me an opportunity to visit Townley, where I was kindly received and entertained by Mr. Townley, with whose instruments I saw Mars near the middlemost of the three adjacent fixed stars. My stay in Lancashire was short. At my return from thence I took his distances from two of them at distant times of the night. Whence I determined his parallax then 25″, equal to his visible diameter; which, therefore, must be its constant measure, and, consequently, the sun's horizontal parallax not more than 10″. This I gave notice of in the *Transactions*, No. 96; and the French soon after declared that from their observations they had found the same. Whether they will give you such exactness I leave to those who are skilled in these things to determine."

This extract is, I hope, sufficient, and I will leave it to you to search further. Perhaps you may consider my language a little quaint, but then, remember, I lived two centuries ago.

Now, the planet Mars performs 109 sidereal revolutions in 205 sidereal years and $3\frac{1}{4}$ days, so that its appearance in the year 1877 will not be very different from what it was in 1672. Accordingly I enjoin you to make then the most of your opportunity, and do your best to prove the goodness of my old method, and I wish you thorough success. And when you watch the planet pass amongst the stars in the water of Aquarius, you will, perhaps, remember with kindly feelings an old astronomer, who in life had to endure great injustice and sore trials, and will bless and honour his memory.

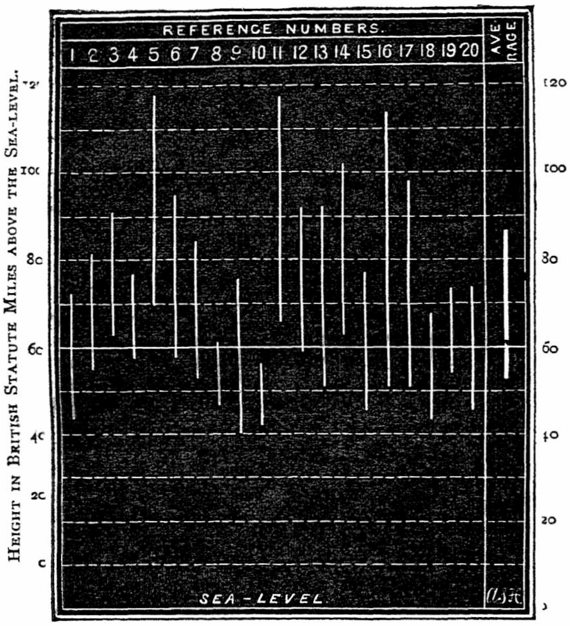
THE GHOST OF JOHN FLAMSTEED, M.R.

Walhalla

The Marseilles Meteorite

It will probably occur to most of your readers, as it immediately suggested itself to me, on reading in your journal of the 5th inst. a description from *Les Mondes* of a remarkable meteorite observed at Marseilles by M. Coggia, on the 1st of August last, that the bright object having an apparent diameter, at first of about 15′, and at last of a little over 4′, whose uncertain course was noted for eighteen minutes by the stars, was really nothing more extraordinary than a fire-balloon; or it may, possibly, have been some description of brighter signal-light. The planet Saturn, and the other stars named in the description, were all at the low altitude above the horizon, at which a fire-balloon, and other bright signal-lights of ordinary size, floating at an ordinary height in the air, would have about the apparent diameter of the "meteorite." Its apparent diminution in size was, also, perhaps, either the effect of its increasing distance, or of its gradually fading light. After alternately remaining stationary, and changing its apparent course two or three times, it at last fell rapidly in a perpendicular direction. The burning tow, or other inflamed substance with which it was inflated, appears to have detached itself from, or, it may be, to have set fire to the balloon, since it was remarked that during its perpendicular fall to the horizon it gave out vivid scintillations.

It is difficult, from the exaggerated language of native narratives in the East, to suppose that the destruction of life and property described, from the *Times of India*, as an unprecedented catastrophe in Sind, in the next paragraph of NATURE, was occasioned by an unusual fall of meteorites. In the absence of



HEIGHTS OF TWENTY SHOOTING-STARS DOUBLY OBSERVED AT EIGHT BRITISH ASSOCIATION STATIONS IN ENGLAND ON THE NIGHTS OF THE 9TH TO 12TH OF AUGUST, 1871.

any evidence that a loud report, and other aërolitic phenomena perceived at a great distance, accompanied the occurrence, its unusually disastrous effects may rather, doubtless, be ascribed to devastations produced by lightning of extraordinary violence.

On the accompanying diagram the real heights of some shooting stars are represented which were simultaneously recorded by observers of the annual meteor-shower in August last, at eight British Association stations in England. A. S. HERSCHEL

Newcastle College of Physical Science, Oct. 16

Exogenous Structure in Coal-Plants

PROF. WILLIAMSON criticises my want of certainty with respect to the exogenous mode of growth of extinct Lycopodiaceæ. But surely his reference to the Dixonfold trees does not prove more than that the diameter of their stems was greater near the roots than higher up. The same thing is true of many palms, but I think Prof. Williamson would be the last person to say that it was evidence of *their* being exogenous. Nevertheless, as I have already said, I am inclined to think that Prof. Williamson is right in supposing that the stems of extinct arborescent Lycopodiaceæ increased in thickness, although I do not see my way to asserting off hand that this was the case. Even admitting, with all Prof. Williamson's confidence, that it was so, I can see no classificatory value in the fact to justify overriding reproductive characters in his new classification.

I said in my former letter (and the argument still appears to me a good one) that this increase was in any case "nothing more than an adjustment to an arborescent habit dropped when the arborescent habit was lost." Prof. Williamson finds some difficulty in understanding this, and believes me to imply "that these exogenous conditions were merely adventitious growths assumed for a season and thrown off at the earliest opportunity; that they had no true affinity with the plants in which they were found." He confesses that he sees no ground for so remarkable a conclusion, and I may certainly say that as far as I comprehend it, neither do I.

What I did mean to imply was, that in comparing the stems of existing with those of extinct Lycopodiaceæ, allowance must be made for such adaptations of structure as would be likely to be correlated with enormous size. To make the matter clearer by an illustration:—Suppose we compare a nearly allied woody and herbaceous plant, say a lupin and a laburnum, we shall find in their stems (both "exogens") the same kind of differences as exist between the stem of a herbaceous *Selaginella* and that of the nearly allied arborescent *Lepidodendron*. The lupin may have had arborescent ancestors; if so, it has dropped all such adaptations of the structure of its stem to an arborescent habit as we find existing in laburnum. Assuming (what is of course *only* an assumption) that *Selaginella* is a descendant of *Lepidodendron* or its allies, the parsimony of nature has also suppressed in it all those peculiarities of stem structure which were merely correlated with vast size, and in *Selaginella* and recent *Lycopodiaceæ* we have the residuum. In *Isoetes*, which is only a few inches high, there is a kind of lingering reminiscence of circumferential growth.

Prof. Williamson says that "herbs if they belong to the exogenous group are as truly exogenous in their type as the most gigantic trees of the same class. Size has nothing to do with the matter." With these statements I altogether disagree. I look upon the terms exogen, endogen, and acrogen as altogether obsolete from a classificatory point of view. Mohl pointed this out more than twenty years ago. Compare the following remarks from one of his memoirs with Prof. Williamson's: "The course of the vascular bundles in the palm stem and in the one-year-old shoot of the dicotyledons is exactly similar, and the conception of a different mode of growth, and the division of plants into endogens and exogens formed on it is altogether opposed to nature."

Size, in fact, has everything to do with the matter. It is the persistent growth of the ends of the branches which makes the strengthening of the main stem by circumferential growth a mechanical necessity. Palms not being branched do not require the voluminous stem of an oak, and they exhibit on an enlarged scale only the structure of a one-year-old herbaceous shoot. But in the dragon-tree of Teneriffe an "endogen," which becomes extensively branched, there is a true circumferential growth of the main stem, which increases *pari passu* with the development of the branches. All herbaceous stems, on the contrary, among flowering plants, whether belonging to the exogenous or endogenous group, have practically the same type of structure. Where is the exogenous type in the stem of the common artichoke, or in *Ferula communis*, figured by De Candolle in his "Organographie Végétale," pl. 3, fig. 3, "pour montrer à quel point elle simule les tiges de monocotylèdones" (endogens)?

I think these remarks make it plain that circumferential (which is a preferable expression to exogenous) growth in stems is simply a necessary accompaniment of a branched arborescent habit. As far as the affinities of plants are concerned, it is purely accidental and of no classificatory value. *Lupinus* being herbaceous and *Laburnum* arborescent does not prevent their being placed in the same tribe of a natural family. Since Mohl has shown that one-year-old (herbaceous) stems conform to the endogenous type, while such woody stems as *Laburnum* possesses are of course exogenous, it is clear that Prof. Williamson's views would overthrow all the work of modern systematists, and bring us back, as I pointed out in my former letter, to the primitive division of plants into trees and herbs (not trees and *shrubs* as Prof. Williamson makes me say).

The interpretation of the actual structure of the stems of the extinct Lycopodiaceæ is of course another matter. Prof. Williamson illustrated his views at Edinburgh by referring to *Lepidodendron selaginoides*; every botanist who took part in the discussion, however, objected to his explanation. It may be true that this is only one form of such stems, but of course I can hardly be expected to be acquainted with the unpublished material which Prof. Williamson still has in hand. There is, I think myself, good reason for believing that *Lepidodendron*, *Sigillaria*, and *Ulodendron* all belong to a common type of stem structure; differences in fragments of different age of growth must be expected and allowed for. Of course, as I do not accept the existence of a pith in these plants, the pith or medullary rays must be rejected as well. Mr. Carruthers has shown, I think, conclusive reasons for disagreeing with Dr. Hooker with respect to the spaces which he identified with those structures. I was already familiar with the view of these stems taken by Prof. Williamson in his last paper. Those who are interested in the matter must judge for themselves who is right.

This communication has run on to so great a length that I am unable to touch upon other points in which I find myself totally disagreeing with Prof. Williamson. I cannot, however refrain from expressing my astonishment at the persistence of the histological views implied by the description of the "cambium," or growing cellular tissues of plants, as "some protoplasmic element," or again as "some protoplasmic layer." Similar expressions were used by Nehemiah Grew about 200 years ago, and employed for some time by writers subsequent to him. At the present I imagined their interest was wholly historical.

W. T. THISELTON DYER

THE points at issue between Prof. Williamson and myself remain in the same position as at first. He has not yet answered one of my objections. He still holds that in Lepidodendron we have a vascular medulla, outside which is a series of fibro-vascular bundles which are not closed, but go on forming new tissues by means of a cambium layer like a dicotyledonous stem. From my own observations, and from the study of recent Continental authorities, I have no hesitation in stating that the central "medulla" of Prof. Williamson consists of the united closed fibro-vascular bundles, while the investing cylinder is the modified primitive tissue which increases in diameter by means of the *meristem* layer of Nägeli. If Prof. Williamson will refer to Sachs' Lehrbuch, Ed. 2, p. 397. he will find good reasons given for the statement there made, that *Isoëtes* contains *no cambium* in the stem; but that the stem increases in the same way as *Dracæna, i.e.* by a meristem layer in the primitive tissue. As long as Prof. Williamson believes in a central vascular medulla in these Lycopodiaceous stems, all his other conclusions must likewise be false.

W. R. M'NAB

Royal Agricultural College, Cirencester, Oct. 21

[*** We would suggest that this controversy be now closed, until the publication of Prof. Williamson's new material.—ED.]

Blood-Spectrum

IN the account of the Progress of Science in Italy in NATURE for October 12, Mr. W. Mattieu Williams says that Prof. C. Campani has shown that the spectrum of an ammoniacal solution of carmine is undistinguishable from that of blood, and that perhaps I should be able to tell whether any difference can be distinguished by more minute examination. In my first paper on this subject, so long ago as 1865*, I alluded to this similarity, and in subsequent papers† I have shown how the colouring matter of blood can be distinguished from that of cochineal, and even a small quantity recognised when mixed with a relatively considerable quantity of that dye. I have always argued that in such inquiries we must not rely on the spectrum, but compare the action of various reagents. On adding a little boric acid to an aqueous solution of blood, no change takes place in its spectrum, whereas that of cochineal is completely altered. This effect is not produced in the case of carmine suspended in water, but the absorption-bands of blood are at once removed by deoxidising the solution with a ferrous salt, which, on the contrary, has no effect in the case of carmine or cochineal. Weak acids decompose hœmoglobin into hæmatin, which gives entirely different spectra, but they do not cause any permanent change in the colouring matter of cochineal or carmine. In my opinion there is no more probability of an experienced observer mistaking these substances for blood, because the ammoniacal solutions give nearly the same spectrum, than of a chemist confounding aluminium bronze with gold, because they are of nearly the same colour.

H. C. SORBY

Broomfield, Sheffield, Oct. 23

Are Auroras Periodical?

THE following note on auroras is transcribed from the *Iowa Instructor and School Journal* for April, 1866. As it suggests a hypothesis similar to that proposed by Mr. Wilson, in your journal for September 7, it may not be destitute of interest.

DANIEL KIRKWOOD

Bloomington, Ind., Oct. 4

"*The Aurora Borealis of February* 20, 1866

"Those who witnessed the grand auroral display of the 20th inst., and especially those who have kept a record of similar exhibitions, may have remarked the frequency with which the phenomena have occurred about the same epoch, viz., from February 15 to February 23. Some of the most brilliant that have occurred at this period during the last century are the following:—

1773	February	17	1848	February	20
1784	"	23	1851	"	18
1794	"	15	1852	"	18
1838	"	21	1866	"	20

Besides the February epoch, any extended list of auroras will indicate two or three others, the most remarkable of which is that of November 13—18 (See Olmsted's paper in the 'Smithsonian Contributions,' vol. viii.) Fifty-three brilliant auroras have been observed since 1770. Of these, an accidental distribution would assign but *one* to the interval between the 13th and 18th of November; whereas *eight* of the number have actually occurred at that epoch. Are such coincidences accidental, or do they warrant the conjecture that, as in the case of shooting stars, there are particular periods at which the grand displays of the phenomenon most frequently occur?"

Forms of Cloud

THE form of cloud represented by Prof. Poëy in his figure *a*, in this week's NATURE, is very similar to that described by the Rev. C. Clouston, LL.D., in his "Explanation of the Popular Weather Prognostics of Scotland," published by A. and C. Black in 1 67, and also in Dr. Mitchell's paper "On the Popular Weather Prognostics of Scotland," Edin. New Phil. Journal, Oct. 1863.

Dr. Clouston says that, "when properly developed it was always followed by a storm or gale within twenty-four hours. It is called 'pocky cloud' by our sailors."

He gives a sketch from which, as he says, "it will be seen that this is a series of dark, cumulus-looking clouds, like festoons of dark drapery, over a considerable portion of the sky, with the lower edge well defined, as if each festoon or 'pock' was filled with something heavy, and generally one series of festoons lies over another, so that the light spaces between resemble an Alpine chain of white-peaked mountains. It is essential that the lower edge be well defined, for a somewhat similar cloud, with the lower edge of the festoons fringed, or shaded away, is sometimes seen, and followed by rain only."

Dr. Clouston concluded his notice by saying, "this cloud is well known, and much dreaded by Orkney sailors."

ROBERT H. SCOTT

Meteorological Office, London, Oct. 20

Elementary Geometry

IT is scarcely worth while for an anonymous writer to defend his opinions; but since a sentence in my letter of September 21 still continues to elicit remarks, I may be allowed to add an explanation of my meaning. I stated that "no child is capable of taking in a subject, especially if it involves logical thought, except by very slow degrees; and must at the beginning commit much to memory which he does not comprehend." And I called this "a fact." Mr. Wormell says in reply, that the purpose which geometry serves is not the exercise of the memory, and that it is useless if not understood. I entirely agree with him, and my words, if fairly interpreted, do not convey the contrary opinion.

In your last issue Mr. Cooley writes, that my principle, that "a child must of necessity commit much to memory which he does not comprehend," appears to him totally erroneous, and not entitled to be called a fact. But surely the order of Nature with children is to possess themselves of empyrical knowledge by the exercise of memory, and subsequently to get to comprehend what they have thus acquired. Would Mr. Cooley wait until he had made a child comprehend the principles of the decimal scale, before he taught him to add up two rows of figures, and to say, "five and seven are twelve; put down two, and carry one"? If he condescends to the usual course of a "hearer of lessons" in this one instance, he acts upon the admission of my principle.

To apply this to geometry (and perhaps I may be borne with if I use Euclid in illustration): I fancy that many a boy *at the beginning* understands the three first propositions, but not the whole of the fourth. My plan would be, not to keep him at it till he did, but to let him learn it fairly well by rote, and go on, applying the results of the fourth by an act of faith. The second time he went through the book, if he had been decently taught,

* *Quat. Journ. of Science*, vol. ii. p. 208.
† *Medical Press and Circular*, New Series, vol. xii. p. 67; *Monthly Micros. Journ.*, vol. vi. p. 15.

his difficulties would vanish, and he would already know the proposition.

All that I contend for is, that the new book on geometry ought to be capable of such usage. If it contains little more than the chief steps of the solutions, and those disguised (to the unpractised and tottering mind) under symbols, it will not satisfy the want now felt.

A FATHER

The Beef Tapeworm

As an entozoologist and correspondent of the Academy of Natural Sciences of Philadelphia, I request permission to correct an error recorded in the report of the Academy as given in your columns (at p. 500) this week. Dr. Leidy is represented as having stated that "the minute acetabular pit or fovea at the summit of the head [of *Tænia mediocanellata*] is not mentioned by Kuchenmeister and subsequent observers as a character of that species." I beg to remark that I both figured and described this supplementary sucker-like structure in the first edition of my small work on "Tapeworms," published in 1866 (p. 33 *et seq*.). At least two other observers have figured and described this central depression, not only in the adult but also in the measle or cysticercal stage of the worm. Even Bremser recognised it, but his description was for a time overlooked.

84, Wimpole Street, London, Oct. 21 T. S. COBBOLD

Winter Fertilisation

IN the first number of NATURE, (for Nov. 4, 1869,) I ventured on a hypothesis, founded on a series of observations, that plants which flower in the winter have their organs of reproduction specially arranged to promote self-fertilisation. The following fact, which has just come under my notice, appears to confirm this theory. Plants belonging to the order *Caryophyllaceæ* are, as a rule, strongly protandrous (see my paper in the *Journal of Botany* for October 1870), the anthers discharging their pollen at so long an interval before the maturing of the stigma as to render cross-fertilisation almost inevitable. The other day, Oct. 21, I came across a late flowering patch of *Stellaria aquatica* Scop., in which the anthers were discharging their pollen simultaneously with the maturing of the stigmas, each of the five styles being curled in a singular manner round one of the stamens, so as to bring the stigmatic surface in actual contact with the dehiscing anther. This occurred in several flowers that were just opening, and there was abundance of seminiferous capsules on the plants.

ALFRED W. BENNETT

Velocity of Sound in Coal

YOUR correspondent will find in Prof. Tyndall's beautiful work on "Sound" the data required for the exact determination of its velocity in different media. I believe that in coal it will be found to be between six and seven times that in air, or about 7,000 feet per second.

If Mr. D. Joseph places his ear against the solid coal of the "rib" or side of the "heading" or gallery, at a distance of some twenty to thirty yards from a collier at work, he will hear two sounds for each blow of the workman's pick or mandril—the first being transmitted through the coal, the second more slowly through the air, the impression being almost irresistible that two persons are at work.

This is probably the origin of the legend, common in more than one coal district, of a collier who always worked alone, did more work than his fellows, and whose diabolical assistant was often heard but not seen.

C. J.

Changes in the Habits of Animals

YOUR correspondent Mr. Potts in the last number of NATURE furnishes us with a few interesting facts regarding the *Kea*. In a paper which I read about three years ago to the Dumfries Natural History Society, entitled "The Influence of the Human Period on the Sagacity of Animals," and subsequently in a letter published in NATURE, vol. i., on the "Mental Progress of Animals," I endeavoured to show from general considerations, and from the few facts which we possessed on this subject, that the habits and instincts of animals were not so fixed and definite as might be supposed. The general principle for which I contended was that whether we considered the globe to have received its human inhabitants according to the laws of evolution, or in some miraculous manner, the arrival of the human race produced great modifications and changes of surrounding circumstances. These changes were in the direction of increasing the fertility of all vegetable productions capable of sustaining life, and at the same time securing their use entirely for the human family. Hence arose, in the vicinity of man, two new factors; the superior attraction of better food for all kinds of animals, and at the same time the extinction of such animals whose greed was not overruled by sufficient wariness or cunning to become successful thieves. Hence a probable gradual increase in these qualities in the animals maintaining themselves against man.

Since my attention was drawn to this subject, we have had some interesting observations on modifications of swallow's nests by Pouchet, and a discussion as to the validity of his conclusions by Noulet, and now I have read with pleasure Mr. Potts's observations. Most likely the progress of development in the carnivorous habits of the Kea will meet with a check now that shepherds are alive to its depredations; but without the influence of the human period we can scarcely suppose that such development would have begun. I recollect a case of change of habits in weasels. They multiplied so thickly in a parish in the south of Dumfriesshire that some hungry philosopher among them took the initiative in sucking the blood from the cattle. Suspicion having been aroused, the fact was proved, but its discovery was fatal to the weasels, for the whole country-side arose against them, and all but extirpated them in that quarter. It is very interesting to observe what modifications are being produced in the habits of various species of sea-gulls since Glasgow, by its enormous increase of commerce, has wrought great changes in the River Clyde, filling it with all kinds of garbage. The conditions of existence having been favourable, the gull is steadily passing more and more time inland; ascending tributaries of the Clyde, and alighting in flocks on fields that used to have him very seldom.

A new amusement within my own recollection has been afforded the river passengers during the summer months in feeding these sea mews, &c., by throwing overboard food to them, and their increased tameness and boldness of approach in following the river steamers within the last thirty years have been frequently commented on.

J. SHAW

Oct. 23

A Plane's Aspect

MR. LAUGHTON has hit the nail on the head. "Aspect" is exactly the word wanted. The aspect of a plane is the direction of its normal; and "parallel planes are defined as those which have the same aspect." Two aspects determine one direction, and two directions determine one aspect. Mr. Laughton deserves the thanks of geometers for suggesting so good a word.

Rugby, Oct. 23 J. M. WILSON

THE words "aspect" and "slope" have already a use in relation to the position of planes. They indicate two elements which *together* fix the position. Neither of them, taken alone, can indicate the position of a plane, unless a new and artificial meaning be assigned to one or other. Thus if I speak of the "aspect" of one of the faces of a roof as southerly, I have done something but not all that is necessary, towards describing the position of that face; if I add further that the "slope" is 30° I have definitely assigned the position. Again if I speak of the "slope" of Saturn's rings as 28° (the plane of reference being ecliptic), I have done something towards the description of their position; if I add further that their "aspect" is toward such and such a degree of the sign Gemini, I fully assign their position in space. And so on.

In the preceding sentences I have used the words "slope" and "aspect" as they are already understood. I apprehend that I have also used the word "position" as it is already understood, and that no other word could properly be used in the same sense in descriptive writing. I can see no reason why "position" should be dismissed from the position it has so long occupied, nor why "aspect" and "slope" should be regarded in a new and unfamiliar aspect.

It chances that I have long since had occasion to consider the question suggested last month by Mr. Wilson. In each of twelve books which I have written during the past six years, I have had repeated occasions to consider the slope and aspect, that is, the "position" of many important astronomical planes.

In a large proportion of the essays I have written, the same subject of plane position has had to be considered and described I am, therefore, somewhat seriously interested in opposing as well the disuse of the word "position," which no one can misunderstand, as the use of the words "aspect," "slope," "tilt," &c, in a sense not at present assigned (nor properly assignable) to them.

RICHD. A. PROCTOR

Sea-water Aquaria

I HAVE read with much gusto your article upon the Crystal Palace Aquarium. I am induced by it to put forward a caution with regard to the construction of rock-work in tanks.

Several weeks ago, casually looking over a heap of Bangor slaty rock, on the road bordering the Brighton Aquarium works, and being used for the rock-work of tanks, my attention was attracted by some bright green patches upon some of the stones, which appeared to me to be carbonate of copper, but was probably silicate. Looking further at one with a lens, I imagined that I could also distinguish particles of peacock ore. On attempting to purloin a specimen, I was very properly stopped from so criminal an act by the Cerberus in charge. I wrote to the chairman of the company, stating that, not having examined the stone, I might be only contributing a mare's nest to their zoological collection, but that if it contained much copper the fish would be in danger. I understand that upon receipt of my letter some rock was sent up to Dr. Percy, whose report, I am told, was to the effect that there was much sulphide of copper, and that the pretty green rock was therefore unfit for tank rock-work.

I think this will serve as a caution to the constructors of aquaria to examine all material which is to be in contact with water most carefully before using it. There are so many minerals which would be deleterious that I strongly advise an analysis and report in the case of every untried rock. The accident of my passing a heap of stones has saved the company, with which I am not in the least connected except as a fervent well-wisher, from a large expenditure and a serious scrape.

Allow me to ask those who are accustomed to the management of tanks, whether hydraulic pressure upon a small and strong one would be likely to assist in maintaining life in any of the deep-sea organisms, and whether it would be useful to make recesses for those loving darkness, with the axes opposite the plate glass side, so that a bull's-eye lantern could occasionally throw light upon their actions and mode of life?

Brighton, Oct. 21 MARSHALL HALL

ON HOMOPLASTIC AGREEMENTS IN PLANTS

AT the recent meeting of the British Association I pointed out in a short communication the difference that existed between mimicry in animals and what has been spoken of under that name amongst plants. The distinction was sufficiently obvious, and must have occurred to everyone who had given the matter any consideration, but my object was to try to raise a discussion upon the whole subject as exhibited in plants.

I fancy it is hardly sufficiently understood how commonly this agreement of facies occur in plants widely differing in other respects. I will give a few illustrations of it. Humboldt remarks ("Views of Nature," p. 351): "In all European colonies the inhabitants have been led by resemblances of physiognomy (*habitus, facies*) to apply the names of European forms to certain tropical plants, which bear wholly different flowers and fruits from the genera to which these designations originally referred. Everywhere in both hemispheres the northern settler has believed he could recognise alders, poplars, apple, and olive trees, being misled for the most part by the form of the leaves and the direction of the branches." Nor has the popular eye alone been deceived by these resemblances. Schleiden states ("The Plant," p. 255) that Australia has in common with Europe a very common plant, the daisy, yet Dr. Hooker has pointed out (Flora of Tasmania, pl. 47) that the plant intended by Schleiden is the very similar but distinct *Brachycoma decipiens* Hook. fil. Again, true flowering plants belonging to the very curious family *Podostemaceæ* have been figured as liverworts and other cryptogamic plants (Berkeley, Intr. to Crypt. Bot., p. 5). Many other instances of similar errors might be given.*

Since I read my paper, I have met with an essay by Schouw, in which he enumerates facts of the same kind. "There is still," he says ("Earth, Plants, and Man," p. 61), "another kind of repetition which I might call habitual *repetition*, or denominate *mimicry*, if this expression was not at variance with the subjection to law which exists throughout nature, but to comprehend which our powers are often insufficient." After various illustrations he proceeds:—"In the genus *Mutisia* we have the remarkable sight of a compositous flower, with the tendrils of a leguminous plant." (This by an accidental coincidence was one of the instances which I, myself, used at Edinburgh.) "In *Begonia fuchsioides* the leaves are similar to a *Fuchsia*, and very different from the other forms of leaf among the begonias, and the colour of the blossom likewise reminds us of the fuchsias. We have another most striking example in certain Brazilian plants, which although possessed of perfectly developed flowers and fruits, mimic, as it were, in their leaves and stems, groups of plants of much lower rank." (He is alluding to the *Podostemaceæ* mentioned above.) "*Lacis fucoides* resembles certain seaweeds so much, that it might be mistaken for one by a person who did not see the flowers. *Mniopsis scaturiginum* strikingly resembles a *Jungermannia*."

I suggested that when a plant put on the characteristic facies of a distinct natural family, it might conveniently be spoken of as a pseudomorph, having in view an obvious analogy in the case of minerals. I do not, however, now think on further consideration, that this term, although convenient, includes all the cases. In small natural families it is not always easy to recognise any general habit or facies at all, and in the case of plants belonging to different families where this is the case, but having a similar habit, it would be purely arbitrary to fix the pseudomorphism on any of them. Again *all* the individuals of distinct groups of plants might have a similar habit, and the same remark would apply. The difficulty is, however, got over by speaking of the plants in these cases as *isomorphic*.

My friend, Mr. E. R. Lankester, has pointed out to me that agreements of this kind may all come under what he has termed homoplasy (Ann. and Mag. of Natural History, July 1870). This is the explanation he gives of this expression:—

"When identical or nearly similar forces, or environments, act on two or more parts of an organism which are exactly or nearly alike, the resulting modifications of the various parts will be exactly or nearly alike. Further, if, instead of similar parts in the same organism, we suppose the same forces to act on parts in two organisms, which parts are exactly or nearly alike and sometimes homogenetic, the resulting correspondences called forth in the several parts in the two organisms will be nearly or exactly alike. I propose to call this kind of agreement *homoplasis* or *homoplasy*. The fore legs have a homoplastic agreement with the hind legs, the four extremities being, in their simplest form (*e.g. Proteus*, which must have had ancestors with quite rudimentary hind legs), very closely similar in structure and function. . . . Homoplasy includes all cases of close resemblance of form not traceable to homogeny."

The resemblances, therefore, above described between the vegetative organ of plants with no close generic relations, may be described as homoplastic. The difficulty

* Perhaps one of the most striking is the Natal cycad *Stangeria paradoxa* having been published and described by Kunze as a species of *Lomaria*, a genus of Ferns.

still, of course, remains to show *how* the homoplasy has been brought about. In some cases, as in the homoplastic forms of American Cactaceæ and South African Euphorbias, or in the stipular bud scales of many wholly unrelated deciduous trees, the nature of the similar external conditions may possibly be made out with some correctness. Again, Dr. Seemann has pointed out that by the rivers in Nicaragua and in Viti, the vegetation, although composed of very different plants, puts on the willow form ("Dottings by the Roadside," p. 46). A phenomenon true of two distant places accidentally contrasted, might be expected to obtain more generally; at any rate, among our indigenous riparian plants *Lythrum Salicaria* and the willow-herb are, as their names indicate, additional illustrations. The band of vegetation that fringes a stream is always densely crowded with individual plants, and it is easy to see that elongated and vertically disposed leaves would be most advantageous, exactly as they are to the gregarious plants of meadows and plains. The homoplastic agreement of riparian plants may be therefore a direct result of selective effort due to the position in which they grow.

In other cases the operation of similar external moulding influences is not so easy to trace. It might, perhaps, however, be imagined that plants would hereditarily retain the effects when the influences had ceased to operate, and no new ones had come into operation precisely adapted to obliterate the work of those that preceded them. Suppose, for example, that willows got their habit and foliage from ancestors that were exclusively riparian, then any descendant that happened to be able to tolerate situations with less abundant supplies of moisture, would not necessarily lose their characteristic foliage on that account. Such races might be expected to occur near rivers subject to periodic droughts, since under these conditions any others would be likely to perish. Under such circumstances we should have cause and effect no longer in contiguity; the riparian habit surviving the riparian situation.

I suggested at Edinburgh that possibly similar habits in plants might be bronght about by *different* causes. This was only a suggestion, and probably what has just been said is a truer account of the matter. At any rate the illustration I gave of my meaning has been quite misunderstood (as, for example, in the last number of the *Popular Science Review*). It is well known that there are a certain number of plants indigenous to the British Isles, which are found at a considerable height upon mountains and also upon the sea-shore, but not in the intervening space. In the latter situations they contain more sodium salts than in the former, and inasmuch as these salts are destructive to many plants, those that compose a strand flora must be able to tolerate them, and this of course is an advantage, because many of their competitors are poisoned off. Similarly plants of mountains must have a similar advantage over others in ability to tolerate mountain asperities of climate. Now, suppose a mountain submerged; its flora and certain portions of that of the strand come to coincide. Then if we suppose the mountain gradually to emerge, some of these plants will spread downwards under the uncovered surface, and travel over the whole of the interval that ultimately separates the mountain top and the strand. Why, then, do they not remain there? Simply, I believe, because they are elbowed out by other plants which, nevertheless, cannot tolerate the conditions of life either on the mountain or the shore, and leave these, therefore, as refuges which they are unable to invade. It is possible that the action of similar soil constituents might help to bring about homoplastic agreements in plants. The suggestion is not, however, one that occurred to me to make. My object was simply to show how two perfectly different causes might produce the same effect, namely, that of giving immunity from competition to a small group of plants. Except as an illustration of this point, the matter was quite irrelevant to the subject about which I was speaking. W. T. THISELTON DYER

ON THE DISCOVERY OF STEPHANURUS IN THE UNITED STATES AND IN AUSTRALIA

THE time has now arrived when a full statement of the facts relating to this interesting parasite. *Stephanurus dentatus*, should be made more generally known; for not only is the progress of helminthological science likely to be checked by delay in this matter, but, in the absence of definite information, the several merits of the original discoverer and describer of this entozoon are likely to be altogether ignored. I therefore record the facts and inferences in the order in which they have recently come under my notice.

On the 10th of January last, through the firm of Messrs. Groombridge. I received an undated communication from Prof. W. B. Fletcher, of Indianapolis, Indiana, U.S.A. In that letter Dr. Fletcher announces that he has "found a worm" infesting the hog, and he helps one to realise its abundance by adding that he obtained it "in nine out of ten hogs" which he examined. After recording some other important facts respecting the tissues and organs which were most infested by the parasite, Dr. Fletcher remarks that he cannot find any description of the worm in the work on Entozoa issued by the publishers above mentioned, nor in the writings of Von Siebold and Küchenmeister, and he therefore encloses specimens for my determination, requesting a reply.

As I have already stated in my first letter recorded in the *British Medical Journal* (for January 14, p. 50, where many other particulars are given which I need not here recapitulate) I was instantly struck with the "strongyloid character" of the fragmentary and shrivelled up specimens, and I may also add that it at once occurred to me that I had had some previous acquaintance with a scientific description of the worm. Proceeding, therefore, to turn over a series of helminthological memoirs, for many of which I stand indebted to the late veteran, Dr. K. M. Diesing, of Vienna, I soon had the good fortune to find the desired record. The memoir in question forms part of the "Annalen des Wiener Museums" for 1839, the full title being "Neue Gattungen von Binnenwürmern, nebst einen Nachtrage zur Monographie der Amphistomen."

As this work is probably little, if at all, known in the countries now necessarily most interested in the history of this entozoon, I cannot, perhaps, do better than transcribe Dr. Diesing's brief notice of the original discovery, together with his description of the external characters presented by the worm. After naming the parasite *Stephanurus*, on account of the coronet-like figure of the tail of the male, and giving a technical description of the species, he continues as follows:—"At Barra do Rio Negro, on the 24th of March, 1834, Natterer discovered this peculiar genus occurring singly or several together in capsules situated amongst the layers of fat, in a Chinese race of *Sus scrofa domestica*. Placed in water or in spirits of wine, they stretched themselves considerably, and almost all moved up and down."

"The males measure from ten to thirteen lines in length, the females from fifteen to eighteen lines, the former being scarcely a line in breadth at the middle of the body, whilst the latter are almost a line-and-a-half in thickness. The curved body thickens towards the tail, is transversely ringed, and when viewed with a penetrating lens, is seen to be furnished with integumentary pores. The oral aperture opens widely, and is almost circular; it is supplied with six marginal teeth, two of which, standing opposed to one another, are larger and stronger than the rest. The tail of the male, when evenly spread out, is surrounded by a crown of five lancet-shaped flaps; the combined flaps being connected together from base to apex by means of a delicate transparent membrane. The single spiculum situated at the extreme end of the tail, projects slightly forwards, being surrounded by three skittle-shaped bodies. The tail of the female is curved upon itself, rounded off, and drawn out at the extreme end into a straight, beak-shaped point, whilst to both sides of the stumpy caudal extremity of the body, short vesicular elevations are attached. The female generative opening occurs at the commencement of the second half of the body.

"Judging by its external characters this genus is most closely allied to Strongylus."

The above description is supplemented by a more lengthened account of the internal organisation of the worm; this part of the record displaying in an especial manner those powers of accurate observation which so fully characterised the great systematist in helminthology prior to the time when he was deprived of his eye-sight.

Having communicated to Prof. Fletcher my views respecting the true history and identification of *Stephanurus*, he was pleased to supply me with some further particulars. Thus, (after receiving my reply) in his second communication (dated from Indianapolis, February 22), he says: "I at once renewed my researches, and was rewarded by finding the little saw-like teeth, upon a six-sided jaw, and, if I mistake not, two larger teeth or hooks. I also removed the lungs, heart, and liver, entire, from several hogs (just killed by shooting in the head) and found the worm, as before stated, in the liver, in all the hepatic vessels, and also in the vena cava. In some cases I found the eggs in abundance in the pelvis of the kidney, and in the urine, even when I could discover no cysts or worms about them."

Dr. Fletcher then alludes to the circumstance that he had since his first letter to me placed himself in correspondence with Prof. Verrill, who, it appears, had previously examined the worm. Prof. Fletcher also obligingly enclosed Prof. Verrill's paper, extracted from the *American Journal of Science and Arts* of September 1870, and, in so far as I may be guided by its contents, it would now appear that the very first specimens which were obtained in the United States were the "five" examples sent by Dr. M. C. White, of New Haven, U.S., to Prof. Verrill, who adds:—"In the second instance, at Middleton, Conn., Dr. N. Cressy found large numbers of the worms in the fat about the kidneys of a young Suffolk pig, brought from New Jersey."

The title of Prof. Verrill's paper is, "Description of *Sclerostoma pinguicola*, a new species of entozoa from the hog."

At this point I pause to remark on some of the more practical questions connected with *Stephanurus*, for it must be quite obvious that so large a parasite, comparatively speaking, must, when present in great numbers, give rise to a great amount of disease, even if it should not ordinarily prove fatal. Dr. Fletcher, indeed, does not hesitate to write as follows:—"It is my opinion that this parasite is the cause, in some way, of the hog cholera, which has created such sad havoc within the past ten years, over the pork-producing parts of America. One farmer told me a few days ago that within a month his loss alone from this cause was over one hundred head; and sometimes, in one neighbourhood, in a few days time, thousands have perished, although this season is not a cholera year, as our farmers say. I advised one farmer to burn or bury the dead animals; but he informed me that he believed that fewer hogs die of the disease after eating the dead animals than those kept from them. Unfortunately, in this State there is no law guarding the spread of disease, neither is there any reward of reputation or gain for pursuing any investigation that would bring pork and beef packers into disrepute. I myself could not get a pig's kidney or beef's liver in our city market, because I made investigations in some Texas cattle (being cut up in our market) which damaged their sale a few years ago." In a third letter Dr. Fletcher tells me that greater facilities for examining the carcases of hogs had since been accorded him through the liberality of a Liverpool firm of pork packers, who had already killed 75,000 hogs during the summer season, *i.e.*, up to the date of the first week in July. In hot weather the slaughtering is conducted in ice-houses.

These practical observations by Dr. Fletcher appear to me to be of the highest importance, even though it should eventually turn out that there is no immediate connection between the occurrence of *Stephanurus* and the hog cholera epidemics. That this opinion rests upon substantial data seems probable from the circumstance that we have now not only received evidence of the occurrence of *Stephanurus* in Australia, but we are further apprised that the pigs which harbour it die of the disease superinduced by their presence. As I have already stated, in my second letter, published in the pages of the *British Medical Journal*, our earliest intelligence on this point rests upon the evidence furnished by a series of unnamed slides transmitted from Sydney to the President of the Royal Microscopical Society of London. Through the kindness of the Society's able Secretary, Mr. Slack, F.G.S., I was permitted to examine, identify, and name all the specimens, and it was then that I recognised *Stephanurus* amongst the number.

On the 4th inst. Dr. Morris's paper, which accompanied the specimens, was read to the Society. In that paper the author, like Prof. Verrill, expresses his belief that he has found a new entozoon, "its habitat being the fat surrounding the kidney of the pig." He speaks of it as occurring both in the "free and encysted state, the encysted being its final stage of existence," and, he adds, "its solid parts ultimately disappear, leaving a greyish brown fluid containing thousands of eggs." Those who desire further particulars in reference to the parasitism of pigs and sheep in Australia should consult Dr. Morris's paper, which will appear in the forthcoming November number of the *Monthly Microscopical Journal*. Dr. Morris speaks of the pigs as dying from some mysterious disease, and thinks "it is possible that this worm or its brood may be the cause." In some cases their death takes place quite suddenly, and this he supposes to be due to peritonitis set up by the swarming and migrations of the progeny. Be this as it may, it is interesting to notice the remarkable corsespondency of the conclusions arrived at by Dr. Fletcher and Dr. Morris independently. It will probably not be difficult to ascertain hereafter whether or not the maladies respectively termed "Hog Cholera" and "Mysterious Disease" are one and the same disorder; but whatever happens in this respect, it is now quite clear that this parasite, hitherto little regarded, and for many years past persistently overlooked, is extraordinarily prevalent in the United States, and, perhaps, equally so in Australia, it being further evident that its presence in the flesh of swine is capable of producing both disease and death. The statement of the worthy American farmer that the swallowing of infested flesh by a pig does not necessarily involve the pig-eating hog in a bad attack of a so-called "Cholera disease" requires to be further tested, and it also remains to be proven whether or not the *Stephanurus* be capable of passing through all its developmental changes from the egg to the adult form within the body of the bearer without having at some time or other gained access to the outer world. The comparatively large size of the ova, which I find to be about $\frac{1}{300}''$, or more than four times the size of that of Trichina, is not without significance; but as yet we are unacquainted with the larval stages of growth. If no intermediary bearers are necessary to its development, we ought not to have to wait long for a complete record of the life-history of *Stephanurus dentatus*.

T. S. COBBOLD

BALL ON MECHANICS*

THE object of this book is to "prove the elementary laws of mechanics by means of experiments"—a method the exact opposite of that generally adopted. According to the usual method, a few very general principles are assumed as derived from experimental data, a group of intermediate principles is then obtained deductively, by the aid of which the action of forces in particular cases can be analysed. The particular cases may be such as have an interest from their bearing on practical questions, but they are only examples of a general method applicable to innumerable other cases. There are therefore two distinct objects for which mechanical experiments may be made—viz, either to verify the fundamental principles, or to verify the deductions drawn in particular cases. Experiments of the former kind are absolutely essential to the existence of the science. Unless, for instance, the conditions of the action of the force of friction are determined by experiment, no deductions as to cases into which that force enters have any but a theoretical value. The same is true in all similar cases; such questions as, whether quantity of matter is proportional to weight, whether gravity at a given station is sensibly a constant force, whether the elasticity of solid bodies follows Hooke's law, and if so within what limits, can be answered by experiment only. Such questions, on the other hand, as the tension of a tie-rod under given circumstances, the relation between the weights which keep a given lever at rest,

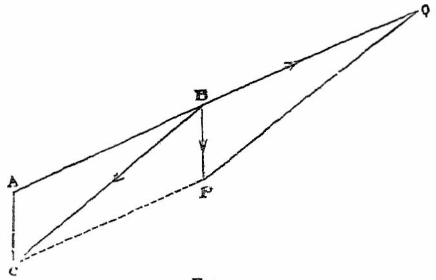


FIG. 1.

the relation between the power and the weight in a block and tackle, the form of the surface of a revolving liquid, admit of exact answers by deduction from the proper data, and, of course, the answers may be tested by experiment. Such experiments clearly have a different object from those of the former class. They have, indeed, this in common, that experiments of the latter kind also serve to verify fundamental principles, but they do so indirectly. It is, however, from the teacher's point of view that their value will be found greatest. In teaching the elementary parts of mechanics perhaps the greatest difficulty experienced is to make the learner feel that the diagrams drawn on the black board represent facts, that, for instance, the conclusion deduced from a triangle is really applicable to a crane. Put the experiment side by side with the deduction, and it will be seen that the experiment cannot fail to bring home to the mind of the learner that his reasoning relates to things and not merely to abstractions.

Let CB (Fig. 1) represent the jib or strut, and AB the tie-rod of a crane, the line AC being vertical. Let a weight P hang from A, and let it be required to determine the forces transmitted through the tie and the jib. P can be resolved into two forces acting along BC and AB produced, and an inspection of the figure will show that these forces bear to P the same ratio that the lines BC and AB bear to AC, and that the force along BC is a thrust, and that along AB a tension. This analysis is perfectly general.

We will now give Mr. Ball's experiment in illustration of the same question:—"A piece of pine BC, 3′ 6″ long and 1″ × 1″ in section (Fig. 2) is capable of turning round its support at the bottom B by means of a joint or hinge; it is held up by a tie AC 3′ long, which is attached to the support exactly above the joint. AB is 1′ long. From the point C a wire descends, having a hook at the end, on which a weight can be hung. The tie is attached to the spring balance, the index of which shows the strain. The spring balance is supported by a wire strainer, by turning the nut of which the length of the wire can be shortened or lengthened as occasion requires. This is necessary, because when different weights are suspended from the hook the spring is stretched more or less, and the screw is then employed to keep the entire length of the tie at 3′. The remainder of the tie consists of copper wire" (p. 29). Mr. Ball then goes on to notice that when a weight of 20lbs. is placed on the hook, the strain, as determined by the spring balance, is 60lbs., thus verifying the analysis of the case given above.

As an example of an experiment of the former class we will take the following,—it is the form in which Mr. Ball

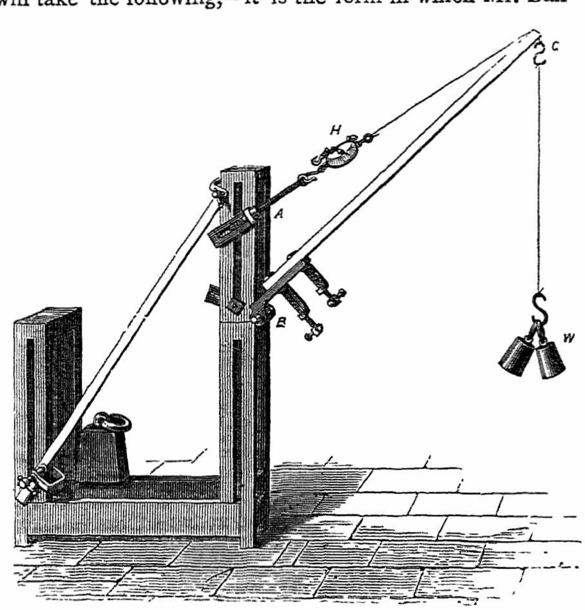


FIG. 2.

gives Galileo's experiment of dropping bodies from the top of the Tower of Pisa. The figure (Fig. 3) is so perfect that it scarcely requires explanation. So long as the current is in action, the horse-shoe G is magnetic, and a ball of iron F remains suspended from it. When the current is broken G is no longer magnetic and F falls. In this manner, by including the wire round both horse-shoes in the circuit, a ball of iron and one of wood, into which a flat-headed nail has been driven, can be kept suspended, and then by breaking the circuit they can be let fall at exactly the same instant, they are seen to reach the cushion at the same instant, and are thus shown to fall through equal spaces in the same time. Mr. Ball describes and discusses the experiment at some length, and shows how it proves that at a given station the attraction of gravitation on different bodies is proportional to their masses.

The above examples will give a better notion both of the contents and illustrations of the book than any long description. We may say, however, that the book contains a clear and correct exposition of the first principles of mechanics, and illustrates, by well-chosen experiments, all the points in the subject that can be fairly called elementary. The figures reproduce all the circumstances of the experiments with so much exactness that with

* *Experimental Mechanics: a Course of Lectures delivered at the Royal College of Science for Ireland.* By Robert Stawell Ball, M.A. With Illustrations. (London and New York: Macmillan and Co., 1871.)

moderate care the reader will understand the points illustrated nearly as well as if he saw the experiments themselves. In great part Mr. Ball has devised these experiments himself, and thus in the well-worked field of elementary mechanics he has introduced much that is original in treatment, and in some parts—particularly in his lecture on friction—there will be found something

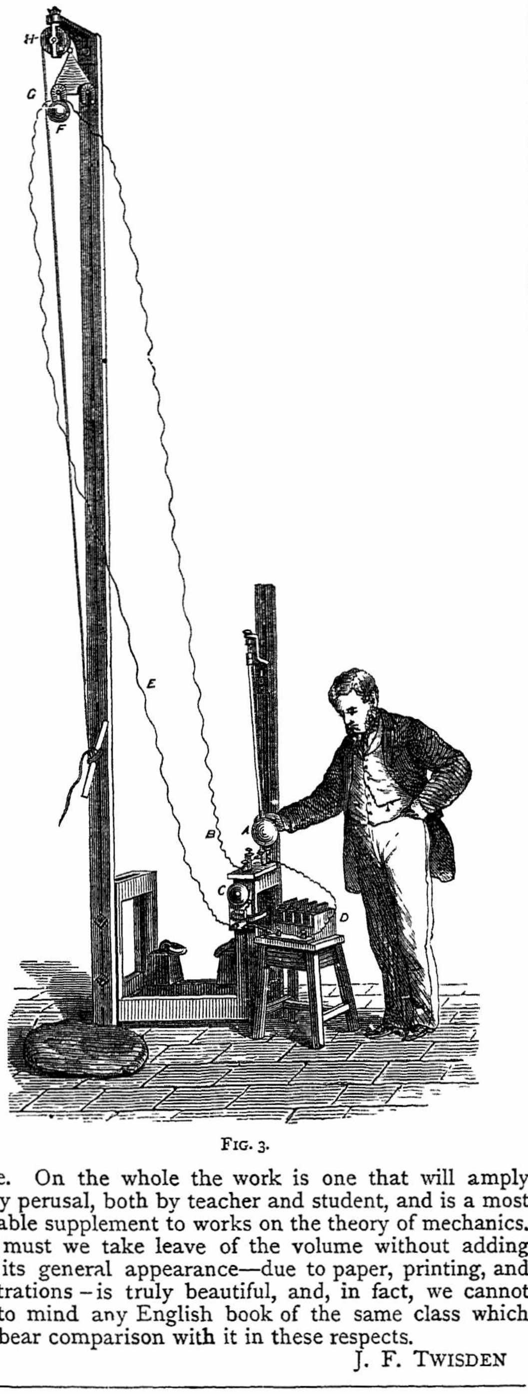


FIG. 3.

more. On the whole the work is one that will amply repay perusal, both by teacher and student, and is a most valuable supplement to works on the theory of mechanics. Nor must we take leave of the volume without adding that its general appearance—due to paper, printing, and illustrations – is truly beautiful, and, in fact, we cannot call to mind any English book of the same class which will bear comparison with it in these respects.

J. F. TWISDEN

ON THE BEST FORM OF COMPOUND PRISM FOR THE SPECTRUM MICROSCOPE

IN studying the spectra of coloured solutions and solid substances by means of the spectrum microscope, it is most important to employ prisms having a suitable amount of dispersion. It would be a very great mistake to suppose that the result is better with a very wide dispersion. This, of course, makes the spectrum larger, but very greatly impairs the definition of the absorption-bands. Everyone who has had experience with an ordinary microscope must be well aware that a particular magnifying power is best for each particular class of object or kind of structure, and that in some cases nearly all the important characters would be lost by employing too high a power; but at the same time too low a power would be equally disadvantageous in other respects. This analogy holds good in the case of the dispersion of prisms. The power ought to be regulated by the character of the absorption-bands. If they are dark, narrow, well-defined, and lie close together, as in the case of partially opaque crystalline blow-pipe beads of borax containing deposited crystals of oxide of lanthanum with oxide of didymium, a somewhat powerful dispersion is not only admissible, but quite necessary to separate some of the bands. If, however, they are broad and faint like those seen in the spectra of many of the colouring matters found in animals and plants, a powerful dispersion spreads them over such a wide space, and makes the shading off so gradual, that the eye can scarcely appreciate the extra amount of absorption; whereas, when a lower dispersive power is used, a well-marked absorption-band can easily be seen. This is more especially the case with impure mixtures. I have found that when it was requisite to examine a mixed, somewhat turbid, coloured solution to detect, if possible, the presence of some substance which, when alone, gave a spectrum with distinct absorption-bands, no trace could be recognised by means of a prism of high dispersive power; but it could be detected without any difficulty with a lower. In carrying on practical investigations it is far more important to be able to succeed in such a case than to exhibit on a large and more imposing scale the spectra of a few substances which give dark and well-defined bands. There can be no doubt that it is a great advantage to have a number of prisms of different dispersive power, so that in all cases the most suitable may be used; but at the same time some observers might not wish to have more than one, and thus it becomes important to decide what amount of dispersion is the best for the generality of objects—is sufficiently great to divide narrow, closely-placed bands, and yet not so great as to prevent our seeing broad and fainter. No magnifying power whatever is applied to the spectrum itself in the instrument now under consideration.

As described in some of my former papers,* the compound, direct-vision prisms first made for me by Mr. Browning were composed of two rectangular prisms of not very dense flint glass, and three of crown glass, one being rectangular, and the others of an angle of about 75°. This combination gives a dispersive power, which shows faint bands very well; but is not enough to divide the narrow and close bands seen in the spectra of a few substances. Mr. Browning then made prisms of similar construction, only that very dense flint glass was employed; This combination gives about double the former dispersion, which divides narrow and close bands admirably, but sometimes shows broad and fainter bands so very badly that they can scarcely be recognised. It thus appeared to me that, if only one compound prism be supplied with the instrument, the best dispersive power would be intermediate between these two extremes. At the same time much would depend on the particular purpose to which the instrument was applied, and also, to some extent, on the individual differences between different observers.

Mr. Browning has described † the plan that he proposes for the measurement of the position of absorption-bands by means of a bright line, seen by reflection from the surface of the prism, moved backwards and forwards

* *Popular Science Review*, vol. v., 1866, pp. 66—77; Brit. As. Report, 1865 (pt. 2), p. 11.

† *Monthly Microscopical Journal*, vol. iii. p. 68.

by a micrometric screw with a graduated head. My objection to the original construction was that the bright line was photographed on a small piece of glass, and the background was so far from being black as to much impair the spectra of substances that will not transmit a bright light. I suggested that in place of this glass plate a small piece of tin-foil should be used, having a very minute hole in it. This shows far brighter than the line in the photograph, and the back-ground is quite black; and thus the bright dot can easily be seen even when in the brightest part of the spectrum, and there is no extraneous light to impair the faintest absorption-bands. The only important objection to this method of measuring their position is, that a very slight movement in the apparatus, due to the loose fitting of moveable parts, alters the readings, and that the value of the measurements, as read off by the micrometer, depends on so many variable particulars, that nearly every instrument might have a different scale. The chief objection to my interference scales * is the difficulty of making all agree absolutely, but when accurately made they have not the above-named disadvantages. I therefore still adhere to that plan, but at the same time I have found the bright dot arrangement very useful, not only as an indicator in showing spectra to others, but also as a fixed point in comparing different spectra, or in counting the bands of the interference scale. Possibly without such help some observers might find this difficult, and would prefer in all cases to measure the position of bands by means of the graduations on the circular head of the micrometer, and therefore I was anxious to devise a prism that would have a dispersive power intermediate between the two extremes already mentioned, and at the same time have the upper face inclined at an angle of 45° to the axis, so that the bright dot micrometer might be employed conveniently. To accomplish this, Mr. Browning made for me a prism composed of two rectangulars of crown glass, one rectangular of very dense flint, and one of less dense, cut at such an angle as to give direct vision. This combination gives what I consider to be as good a medium dispersion as could be wished, and at the same time enables us to measure the position of the bands with the bright-dot micrometer as accurately as is requisite in nearly all practical applications. Subsequent trials have shown that the same advantages may be secured in a more satisfactory manner by replacing the less dense flint glass prism by two, one of flint and the other of crown, of such angles as give direct vision for the whole combination of five. The dispersion is very nearly the same as that of two prisms of ordinary flint glass of 60° angle.

I have been thus careful in explaining the advantages and disadvantages of various arrangements, because the successful use of the spectrum-microscope depends so much on such particulars, and because so many who have not had experience in the practical working of the instrument seem anxious to see a wide spectrum, and overlook the practical importance of being able to recognise obscure absorption-bands. My own experience of this question agrees with that of most of my friends who have worked with the instrument, and yet I am quite prepared to believe that a different amount of dispersion might better suit some observers, and to admit the truth of the German saying, "Eines schickt sich nicht für alle."

H. C. SORBY

* Proc. Roy. Soc., vol. xv. p. 434.

NOTES

RIPE in years and in honours, his work done and his fame world-wide, amid the regrets of all ranks of his countrymen, Sir Roderick Murchison has gone to his rest. It is nearly a year since he was seized with an illness which disabled him from further active work. Yet in the interval he has shown all his old interest in the affairs of which he has so long been the heart and soul, keeping up his intercourse with the world of science by reading, and with many of his associates by personal interviews at his own residence, and by correspondence. To the last his wonderful memory remained true, even to trifling details of place and date. Within the last few weeks, however, the disease made sad progress, and though he continued to enjoy frequent carriage exercise, his physical strength became less able to withstand any malign effects which the chills of autumn bring with them. On Thursday last he was seized with bronchitis, and gradually sank under the attack, till he died at half-past eight on Sunday evening, the 22nd inst. We shall offer next week a fuller reference to Sir Roderick's life-work and scientific influence. For the present, and ere the earth closes over all of him that is mortal, let us only say that in him Science has lost a hard-working and distinguished cultivator, as well as an influential patron, and that to a narrower circle of mourners his loss is also one of a kindly large-hearted friendship.

WE have to record the death, on Saturday last, at the age of seventy-nine, of Mr. Charles Babbage, the eminent mathematician and mechanician. The most important events of his life, as well as some of the eccentricities of his character, are familiar to the public through his autobiographical volume, "Passages in the Life of a Philosopher." Born in 1792, he entered Trinity College, Cambridge, in 1810, and was transferred to St. Peter's the following year. At his B.A. degree he did not take honours in mathematics, not having specially pursued that subject of study as a student, and was understood to have been disappointed at not being elected a fellow. In 1828 he was however elected Lucasian Professor of Mathematics at Cambridge, a position once held by Sir Isaac Newton. He published no less than eighty volumes, but his claim to public notice rested chiefly on his invention of the Difference Engine, on which he spent immense labour and a large sum of money. Notwithstanding his eccentricities and his failings, Mr. Babbage was a mathematician and an inventor of whom England may be justly proud.

THE English Government Eclipse Expedition sailed this morning for Ceylon in the *Mirzapore* from Southampton, Mr. Lockyer in charge, expecting to reach Point de Galle on Nov. 27. They hope to confer with the Indian observers as soon as possible, and plan a concerted campaign. The experience of the last Expedition necessitated that the whole of the instructions should be rewritten; and the Eclipse Committee of the British Association, consisting of the following gentlemen :—Sir William Thomson, L.L.D., F.R.S., President, Prof. J. C. Adams, D.C.L., F.R.S., G. B. Airy, F.R.S., Astronomer Royal, Prof. Clifton, F.R.S., Warren de la Rue, D.C.L., F.R.S., Dr. Frankland, F.R.S., Captain Douglas Galton, C.B., F.R.S., George Griffith, M.A., J. R. Hind, F.R.S., W. Lassell, F.R.S., President R.A.S., Lord Lindsay, J. Norman Lockyer, F.R.S., General Sir Edward Sabine, K.C.B., President R.S., General Strachey, F.R.S., W. Spottiswoode, LL.D., F.R.S., Colonel Strange, F.R.S., Prof. Stokes, D.C.L., F.R.S., and Dr. Thomas Thomson, F.R.S., have had very hard work to get the arrangements completed, in which they have been most zealously assisted by the Government, and by the Peninsular and Oriental Steam Boat Company. Lord Lindsay placed at the disposal of the Expedition the whole of his valuable instruments, and has sent a photographic observer at his own expense. Several members of the Expedition have voluntarily given up a month of their time before starting to perfect themselves in spectroscopic and other observations at the Royal College of Chemistry, a most commendable example to others in similar situations. We have now only to wish the Expedition a prosperous voyage, and better fortune with regard to weather than was experienced in Sicily last year.

WE have to announce the return of Mr. Gwyn Jeffreys from

North America. He examined all the principal collections of shells in the United States and Canada, and especially those made in the deep-sea explorations of the Gulf of Florida and Gulf of St. Lawrence. The former was in the charge of Dr. Stimpson at Chicago; and Mr. Jeffreys was entrusted with specimens (some of them unique) of all the species which appeared to him the same as certain undescribed species dredged by him in the depths of the East Atlantic during the *Porcupine* expeditions of 1869 and 1870. These specimens may be the only ones saved from the Museum of the Academy of Sciences at Chicago, which it is greatly feared was destroyed by the late deplorable conflagration. Several species of North American land and fresh-water shells will also be found to inhabit the eastern hemisphere, although bearing different names. Through the kindness of Prof. Baird, Mr. Jeffreys had an opportunity of dredging on the coast of New England in a Government steamer; and he everywhere received great hospitality and attention. He particularly acknowledges his obligation to Mr. Anthony, Prof. Agassiz, and Prof. Shaler, of Cambridge; the Hon. S. Powel, of Newport, R.I.; Prof. Baird, of Washington; Prof. J. C. Draper, of New York; Mr. Binney, of Burlington, N.J.; Dr. Isaac Lea, of Philadelphia; Dr. Stimpson and Mr. Blatchford, of Chicago; and to Principal Dawson and Sir W. E. Logan, of Montreal.

Les Mondes records the death of M. Henri Lecocq, Professor in the Faculty of Sciences at Clermont Ferrand, eminent both as a botanist and geologist. His life has been spent in encouraging and assisting the cultivation of the sciences to which he especially devoted himself; and by his will he has devoted his property to the same end. He leaves to the town where he resided the sum of 150,000 francs, of which 50,000 is bestowed on the botanic garden established by him, 50,000 to the maintenance of water-supply and fountains, and 50,000 to the establishment of covered markets. M. Lecocq leaves besides to the town all his collections of natural history, zoology, botany, geology, and mineralogy, as well as all the cabinets which contained them.

Mr. Alfred Henry Garrod, scholar in natural science of St. John's College, Cambridge, and formerly Demonstrator in Physiology to Prof. Humphry, has been appointed Prosector to the Zoological Society of London. There is probably no other post in the world which affords opportunities for the study and advancement of animal physiology and comparative anatomy equal to those enjoyed by the possessor of this office, owing to the extraordinary extent of the Society's vivarium in the Regent's Park. Mr. Garrod, we understand, will not enter upon his duties until the beginning of the new year.

Mr. Davidson, of King William's College, Isle of Man, has been elected a Scholar in Natural Science at Sidney Sussex College, Cambridge.

A scholarship is announced at Balliol College, Oxford, on the foundation of Miss H. Brakenbury, "for the encouragement of natural science," of the value of 70*l.* for three years. This is open to all candidates who have not exceeded eight terms from matriculation. The examination begins on Tuesday, November 21. Papers will be sent in (1) Mechanics and Physics, (2) Chemistry, (3) Physiology, but no candidate will be expected to take up more than two subjects at the most. There will also be a practical examination in the above subjects. Further information can be obtained from the tutors.

We understand that the next number of the *Contemporary Review* will contain an important article by Prof. Huxley in comment on some portions of Mr. Mivart's "Genesis of Species."

The following are among the Publishers' announcements of scientific works for the approaching season:—From Messrs. Longmans:—The Royal Institution, its Founder and its First Professors by Dr. Bence Jones, Hon. Sec.; Spectrum Analysis in its Application to Terrestrial Substances and Physical Constitution of the Heavenly Bodies, familiarly explained by Dr. H. Schellen, with Notes by William Huggins, LL.D, D.C.L, F.R.S, 1 vol. 8vo. with coloured plates and other illustrations; a Smaller Star Atlas, for the use of schools and junior students of Astronomy, by R. A. Proctor, B.A., F.R.A.S., in twelve circular coloured maps and two index maps, with an introduction showing how the stars may be recognised and their motions studied and understood; Popular Lectures on Scientific Subjects, by Prof. Helmholtz, translated by H. Debus; Elements of Materia Medica and Therapeutics, being an abridgement of the late Dr. Pereira's Materia Medica, and comprising all the medicines of the British Pharmacopœia, together with such others as are frequently ordered in prescriptions, and required for the use of medical practitioners, edited by Robert Bentley. From Mr. Murray:—The Principles of Geology, or the Modern Changes of the Earth and its Inhabitants considered as illustrative of Geology, by Sir Charles Lyell, Bart., F.R.S, 11th edition, thoroughly revised, illustrations, Vol. 1; The Metallurgy of Copper, Zinc, and Brass, including Descriptions of Fuel, Wood, Peat, Coal, Charcoal, Coke, Fire-Clays, by John Percy, F.R.S., new edition, revised, many illustrations. From Messrs. Macmillans:—A Treatise on the Origin, Nature, and Varieties of Wine, being a complete manual of Viticulture and Œnology, by J. L. W. Thudichum, M.D., and August Dupré, with numerous illustrations; the Ministry of Nature, by the Rev. Hugh Macmillan; a series of Science Primers, under the joint editorship of Profs. Huxley, Roscoe, and Balfour Stewart; the following will be ready about Christmas: Introduction, by Prof. Huxley; Chemistry, by Prof. Roscoe; Physical Science, by Prof. Balfour Stewart. From Messrs. Bell and Daldy:—Alpine Plants, containing more than one hundred coloured illustrations of the most striking and beautiful Alpine flowers, with descinetions by D. Wooster. From Messrs. Deighton, Bell, and Co:—The Desert of the Exodus, Journeys on Foot in the Wilderness of the Forty Years' Wanderings, by E. H. Palmer, M.A., Fellow of St. John's College, with maps and illustrations from photographs and drawings taken on the spot by the Sinai Survey Expedition, and C. F. Tyrwhitt Drake. From Mr. Goodwin:—A new and greatly-improved edition of What are the Stars? a treatise on Astronomy, by Mary Storey Lyle. From Messrs. Rivingtons:—Elementary Statics, by Hamblin Smith, 3rd edition, revised and corrected; Geometrical Conic Sections, by G. Richardson, M.A., Assistant-Master at Winchester College, and late Fellow of St. John's College, Cambridge; Analytical Geometry of Two Dimensions, by H. E. Oakley, M.A., late Fellow and Senior Mathematical Lecturer of Jesus College, Cambridge, H.M. Inspector of Schools. From Messrs. Cassells:—Elementary Astronomy, by Richard A. Proctor, B.A., F.R.A.S., with nearly fifty original illustrations; Elementary Geography, by Prof. D. T. Ansted, M.A., F.R.S., Examiner in Physical Geography in the Department of Science and Art, illustrated with original diagrams.

We are glad to learn that the Rev. E. Smith and Mr. Irving are busy with a new and complete flora of the neighbourhood of Nottingham, which we hope will ultimately include the whole of that county. The work is being done under the auspices of the Literary and Philosophical Society of Nottingham.

Dr. Petermann has written to several German papers to announce the success of a new German Arctic Expedition. According to a telegram received by him a few days ago, and since confirmed, Lieutenants Weyprecht and Payer have penetrated to 79° N. latitude, and have actually discovered the open Arctic Sea, which has been so long searched for. They employed a Norwegian sloop, and penetrated northwards between Spitzbergen and Nova Zembla, and they report an open sea from 42° to 60° E. longitude, and that but little ice was to be seen northward. By these results the anticipations of Dr. Petermann, who long ago recommended an expedition to the North of Spitzbergen, are fully borne out.

THE number of entries at the London Medical Schools is this year unusually large, University College taking the lead with the largest number of fresh entries. We understand that the means of instruction at this admirable school are further enlarged by supplying the only disadvantage at which it has hitherto laboured—a deficiency in the number of beds. In future the students at this institution are to have the privilege of attending the clinical instruction at Middlesex Hospital.

MR. W. R. S. RALSTON is to give the Ilchester Lectures at Oxford this term. They will take place on November 4, 11, and 18, and will be upon Russian Mythology and Folklore.

THE first Evening Lecture at the London Institution, Finsbury Circus, will take place on Thursday, November 2, at half-past seven, the subject being "Michael Faraday: the Story of his Life," by J. H. Gladstone, Ph. D., F.R.S.

THE Council of the Hackney Scientific Association will hold a Conversazione on November 7, at 7.30 P.M., at their Rooms, The Tabernacle, Old Street, N.E.

ON Saturday a meeting of the Senatus Academicus of the University of Edinburgh was held for the purpose of considering what steps should be taken in regard to the admission of the female medical students to the examinations. After a long discussion the Senatus adopted a resolution to the effect that no further difficulties were to be placed in the way of the ladies as regarded either matriculation or preliminary examination.

WE are glad to learn that at Marlborough College 205 boys are studying Science, and about three fourths of these have two lectures a week. Thus since the commencement of the half no form has had more than seven lectures on one subject. The following averages were obtained out of a maximum of 100 marks for each subject:—

Sixths and Upper Fifth—*Chemistry*	65·83
Upper Voluntary (from the three Fifths)—*Chemistry*	55·91
,, ,, ,, *Magnetism*	66·91
Upper Shell Form—*Chemistry*	64·20
Upper Fourth, A— ,,	56·28
Upper Fourth, B— ,,	56·29
Lower Voluntary (from three preceding)—*Magnetism*	61·85
Modern School: Upper Division—*Chemistry*	53·04
,, Middle Division— ,,	36·79
,, Lower Division— ,,	53·45
,, Upper Division—*Magnetism*	72·40
,, Middle Division— ,,	45·45

MR. HENRY WALKER states, in a letter to the *Daily News*, that interesting relics of the Glacial period are now to be seen at the Finchley Station, on the Highgate and Edgware Railway, on the branch line to Barnet, where the boulder clay is now being revealed in a section of nearly thirty-feet deep. The clay seems to have a maximum thickness of nine feet, and is rich in fossils drifted hither from the liassic, oolitic, and chalk formations of the north. Ammonites and gryphenas are found in great variety and abundance.

PROF. COPE has lately published in the Indianapolis *Journal* an account of a visit to the Wyandotte Cave, and of the animal life occurring within its limits. He reports this cave to be as well worthy the popular favour as the Mammoth Cave of Kentucky, since, although lacking the large bodies of water of the latter, it is fully equal and even superior to it in the number and beauty of its stalactites. The gypsum regions in the more remote parts of the cave are especially beautiful, this substance occurring in amorphous masses of great purity, or in the form of loose crystals resembling snow. Fourteen species of animals were found in this cave, consisting of a blind fish similar to, if not identical with, that of the Mammoth Cave, seven species of insects, two of spiders, one of centipedes, and three crustaceans. Several of these species, as might be imagined, are destitute of eyes, such organs being unnecessary to them in their subterranean abode.

THE discussion in the Indian papers about the Bis-cobra or Bhyscuppra has at length brought out a description. It appears that the name Cobra is misleading, for the animal is a saurian and has nothing to do with the snake, but its supposed poisonous qualities may have furnished the version of Cobra from Cuppra. It is a lizard of no very remarkable appearance; nor does it differ materially in outline from others of its class. Its length is from twelve to twenty inches. It has four feet and an elongated tapering head, in shape not unlike that of the common bloodsucker. It lives on trees, particularly the peepul, and on old tumbledown buildings. It is carnivorous, seeking its prey at night. On provocation it can change its hue from one shade of green to another, but it is not true that it can do more. It is often confounded with the burrowing lizard, which it much resembles, though there is a clear distinction. The latter is a vegetarian, having much longer claws, is different in gait, and cannot change its colour. The natives have a superstitious dread of the Bhyscuppra, but their fears have of late been proved to be unfounded. The creature has no poison in its mouth, nor even fangs. The writer says he has seen a goat bitten by it without unfavourable results, and has heard of other cases.

THE Cundurango is a tree found in Ecuador, the young stems and roots of which are claimed to be a specific cure for cancer and other diseases. A quantity of this was sent by the Government of that country to the State Department in Washington to be experimented upon by some physicians of that city, and the result of the inquiry having been satisfactory, a special expedition was sent out to obtain an increased supply. Much controversy has arisen, however, as to the real virtue of the plant, many physicians denouncing the whole movement as savouring of quackery and humbug. The precise botanical relationships and character of the plant have been until recently unknown; but we now learn from the *Andes*, of Guayaquil, of July 29, in a communication from Dr. Buyon, that it belongs to the order *Eupatoriaceæ*, and species *Mikania guaco* of Endlicher, and that its name of cundurango in the Quichua language means vine of the condor. It is the same plant that is called the guaco in Colombia. According to the tradition of the country, when the condor is bitten by a poisonous serpent it swallows the leaves of the guaco plant, and experiences no harm. In Colombia there are said to be three varieties of the guaco—green, purple, and white—the purple variety being intensely bitter, the white less so and more aromatic, while the green has more astringency. Dr. Bliss, of Washington, is understood to be the great champion of the cundurango, and to have accomplished several notable cures upon prominent personages, and considers it to be as reliable a specific in cancer and scrofula and other blood diseases as cinchona and its alkaloids have proved to be in zymotic diseases. It is quite certain that for many years this plant has been brought forward in tropical America as an invaluable cure for a variety of diseases. As the *Mikania guaco* is found abundantly in South America, it can readily be obtained without going into the interior of Ecuador, should it answer all the expectations of its partisans.

THE total fall of rain in Calcutta to the 31st July was 64·24 inches, the average for 17 years being 37·13 inches. This rain was accompanied by heavy floods and much damage to crops.

COAL is reported as having been found in the Nizam's dominions in the Rajpore and Kummun districts. Attention is now being directed to Beerbhoom, Chota, Nagpore, Rowah, and Bundulcund as a great mineral region.

THOUGHTS ON THE HIGHER EDUCATION OF WOMEN *

THERE are certain confusions of ideas as to the proper range and extent of the education of women, with other and vastly different questions as to the right of the softer sex to enter upon certain kinds of professional training. Let us endeavour to get rid of some of these misconceptions. In the first place, no one denies the right to an equality of the sexes in all the elementary education given in ordinary schools. This is admitted to be an essential preparation in the case of all persons of both sexes and of all grades of social position for the ordinary work of life. But when we leave the threshold of the common school, a divergence of opinion and practice at once manifests itself. Only a certain limited proportion either of men or women can go on to a higher education, and those who are thus selected are either those who by wealth and social position are enabled or obliged to do so, or those who intend to enter into professions which are believed to demand a larger amount of learning. The question of the higher education of women in any country depends very much on the relative numbers of these classes among men and women, and the views which may be generally held as to the importance of education for ordinary life, as contrasted with professional life. Now in Canada the number of young men who receive a higher education merely to fit them for occupying a high social position is very small. The greater number of the young men who pass through our colleges do so under the compulsion of a necessity to fit themselves for certain professions. On the other hand, with the exception of those young women who receive an education for the profession of teaching, the great majority of those who obtain what is regarded as higher culture, do so merely as a means of general improvement and to fit themselves better to take their proper place in society. Certain curious and important consequences flow from this. An education obtained for practical professional purposes is likely to partake of this character in its nature, and to run in the direction rather of hard utility than of ornament. An education obtained as a means of rendering its possessor agreeable is likely to be æsthetical in its character rather than practical or useful. An education pursued as a means of bread-winning is likely to be sought by the active and ambitious of very various social grades. An education which is thought merely to fit for a certain social position is likely to be sought almost exclusively by those who move in that position. An education intended for recognised practical uses, is likely to find public support, and at the utmost to bear a fair market price. An education supposed to have a merely conventional value as a branch of refined culture, is likely to be at a fancy price. Hence it happens that the young men who receive a higher education and by means of this attain to positions of respectability and eminence, are largely drawn from the humbler strata in society, while the young women of those social levels rarely aspire to similar advantages. On the other hand, while numbers of young men of wealthy families are sent into business with a merely commercial education at a very early age, their sisters are occupied with the pursuit of accomplishments of which their more practical brothers never dream. When to all this is added the frequency and rapidity in this country of changes in social standing, it is easy to see that an educational chaos must result, most amusing to any one who can philosophically contemplate it as an outsider, but most bewildering to all who have any practical concern with it ; and more especially, I should suppose, to careful and thoughtful mothers, whose minds are occupied with the connections which their daughters may form, and the positions which they may fill in society. The educational problem which these facts present admits, I believe, of but two general solutions. If we could involve women in the same necessities for independent exertion and professional work with men, I have no doubt that in the struggle for existence they would secure to themselves an equal, perhaps greater, share of the more solid kinds of the higher education. Some strong-minded women and chivalrous men in our day favour this solution, which has, it must be confessed, more show of reason in older countries where, from unhealthy social conditions, great numbers of unmarried women have to contend for their own subsistence. But it is opposed by all the healthier instincts of our humanity. A better solution would be to separate, in the case of both sexes professional from general education, and to secure a large amount of the former of a solid and practical character for both sexes, for its own sake, and because of its beneficial results in the promotion of our well-being considered as individuals, as well as in our family, social and professional relations. This solution also has its difficulties, and it can, I fear, never be fully worked out, until either a higher intellectual and moral tone be reached in society, or until nations visit with proper penalties the failure, on the part of those who have the means, to give to their children the highest attainable education, and with this also provide the means for educating all those who, in the lower schools, prove themselves to be possessed of eminent abilities. It may be long before such laws can be instituted, even in the more educated communities ; and in the meantime in aid of that higher appreciation of the benefits of education which may supply a better if necessarily less effectual stimulus, I desire to direct your attention to a few considerations which show that young women, viewed not as future lawyers, physicians, politicians, or even teachers, but as future wives and mothers, should enjoy a high and liberal culture, and which may help us to understand the nature and means of such culture. . . . . It is in the maternal relation that the importance of the education of woman appears most clearly. It requires no very extensive study of biography to learn that it is of less consequence to any one what sort of father he may have had than what sort of mother. It is indeed a popular impression that the children of clever fathers are likely to exhibit the opposite quality. This I do not believe, except in so far as it results from the fact that men in public positions or immersed in business are apt to neglect the oversight of their children. But it is a noteworthy fact that eminent qualities in men may almost always be traced to similar qualities in their mothers. Knowledge, it is true, is not hereditary, but training and culture and high mental qualities are so, and I believe that the transmission is chiefly through the mother's side. Further, it is often to the girls rather than to the boys, and it frequently happens that if a selection were to be made as to the members of a family most deserving of an elaborate and costly education, the young women would be chosen rather than the young men. But leaving this physiological view, let us look at the purely educational. Imagine an educated mother, training and moulding the powers of her children, giving to them in the years of infancy those gentle yet permanent tendencies which are of more account in the formation of character than any subsequent educational influences, selecting for them the best instructors, encouraging and aiding them in their difficulties, sympathising with them in their successes, able to take an intelligent interest in their progress in literature and science. How ennobling such an influence, how fruitful of good results, how certain to secure the warm and lasting gratitude of those who have received its benefits, when they look back in future life on the paths of wisdom along which they have been led. What a contrast to this is the position of an untaught mother—finding her few superficial accomplishments of no account in the work of life, unable wisely to guide the rapidly-developing mental life of her children, bringing them up to repeat her own failures and errors, or perhaps to despise her as ignorant of what they must learn. Truly the art and profession of a mother is the noblest and most far-reaching of all, and she who would worthily discharge its duties must be content with no mean preparation. It is perhaps worth while also to say here that these duties and responsibilities in the future are not to be measured altogether by those of the past. The young ladies of to-day will have greater demands made on their knowledge than those which were made on their predecessors.

But the question has still other aspects. A woman may be destined to dwell apart—to see the guides and friends of youth disappearing one by one, or entering on new relations that separate them from her, and with this isolation may come the hard necessity to earn bread. How many thus situated must sink into an unhappy and unloved dependence? How much better to be able to take some useful place in the world, and to gain an honourable subsistence ! But to do so, there must be a foundation of early culture, and this of a sound and serviceable kind. Or take another picture. Imagine a woman possessing abundance of this world's goods, and free from engrossing cares. If idle and ignorant, she must either retire into an unworthy insignificance, or must expose herself to be the derision of the shrewd and clever and the companion of fools. Perhaps, worse than this, she may be a mere leader in thoughtless gaiety, a snare and a trap to the unwary, a leader of unsuspicious youth into the ways of dissipation. On the other hand, she may aspire to be a wise steward of the goods bestowed on her, a centre of influence, aid, and counsel in every good work, a shelter and support to the

* Extracted from the Introductory Lecture to the First Session of the Classes of the Ladies' Educational Association of Montreal, October, 1871, by Principal Dawson, LL D., F.R.S.

falling and despairing, a helper and encourager of the useful and active; and she may be all this and more in a manner which no man, however able or gifted, can fully or effectually imitate. But to secure such fruits as these, she must have sown abundantly the good seed of mental and moral discipline in the sunny spring time of youth. Lastly, with reference to this branch of the subject, it may be maintained that liberal culture will fit a woman better even for the ordinary toils and responsibilities of household life. Even a domestic servant is of more value to her employer if sufficiently intelligent to understand the use and meaning of her work, to observe and reason about the best mode of arranging and managing it, to be thoughtful and careful with reference to the things committed to her charge. How much more does this apply to the head of the house, who, in the daily provisioning and clothing of her little household army, the care of their health, comfort, occupations, and amusements, the due and orderly subordination of the duties and interests of servants, children, and friends, and the arrangement of the thousand difficulties and interferences that occur in these relations, has surely much need of system, tact, information, and clearness of thought. We realise the demands of her position only when we consider that she has to deal with all interests from the commonest to the highest, with all classes of minds from the youngest and most untutored to the most cultivated; and that she may be required at a moment's notice to divert her thoughts from the gravest and most serious concerns to the most trifling details, or to emerge from the practical performance of the most commonplace duties into the atmosphere of refined and cultivated society. But it would be altogether unfair to omit the consideration of still another aspect of this matter. Woman has surely the right to be happy as well as useful, and should have fully opened to her that exalted pleasure which arises from the development of the mind, from the exploration of new regions of thought, and from an enlarged acquaintance with the works and ways of God. The man who has enjoyed the gratification of exercising his mental powers in the fields of scientific investigation or literary study—of gathering their flowers and gems, and of breathing their pure and bracing atmosphere, would surely not close the avenues to such high enjoyment against woman. The desire to do so would be an evidence of sheer pedantry or moral obliquity, of which any man should be ashamed. On the contrary, every educated man and woman should in this respect be an educational missonary, most desirous that others should enjoy these pleasures and privileges, both as a means of happiness and as a most effectual preventive of low and pernicious tastes and pursuits.

RECENT RESEARCHES ON FLIGHT*

OF late the perplexing problem of flight has received a greater amount of attention from physiologists and savants than has been bestowed upon it for years, and the result of their researches and experiences is in a fair way of becoming remarkable for its fruit-bearing character. Whilst abroad, such men as Borelli, Straus-Durckheim, Chabrier, Girard, and Marey, have severally given to the world the gist of their labours in this branch of science; at home, the Duke of Argyll and Dr. J. Bell Pettigrew have awakened our deep interest by their views on natural and artificial flight. To the latter is due the honour of giving birth to the celebrated "figure-of-8 wave theory," that is now attracting so much notice in our aeronautical schools.

As early as 1867, Dr. Pettigrew delivered, before the Royal Institution of Great Britain, a lecture, in which he propounded that novel theory, and in 1868 he published in the "Transactions" of the Linnean Society an elaborate memoir on "The Mechanical Appliances by which Flight is attained in the Animal Kingdom." The year after, Prof. J. E. Marey, in the "Revue des Cours Scientifiques," bore out Dr. Pettigrew's ideas, by the detail of his experiments with the sphygmograph, with which he succeeded in causing the wings of insects and birds to register their own movements. He says:—"But if the frequency of the movements of the wing vary, the form does not vary. It is invariably the same; it is always a double loop, a figure of 8. Whether this figure be more or less apparent, whether its branches be more or less equal, matters little: it exists, and an attentive examination will not fail to reveal it." An indefatigable worker, Dr. Pettigrew continued, without pausing, the task to which he had set himself—and that to him is indeed a labour of love; and in this year's "Transactions" of the Royal Society of Edinburgh, we have from his pen a complete monograph on "The Physiology of Wings," in which he treats with equal felicity of both natural and artificial flight. The mass of interesting fact brought to light by the author is too copious to allow of lengthened discussion, but from it we abstract the following items:—

"The wing is generally triangular in form. It is finely graduated, and tapers from the root towards the tip. It is likewise slightly twisted upon itself, and this remark holds true also of the primary or rowing feathers of the wing of the bird. The wing is convex above and concave below; this shape, and the fact that in flight the wing is carried obliquely forward like a kite, enabling it to penetrate the air with its dorsal surface during the up stroke, and to seize it with its ventral one alike during the down and up strokes. The wing is moveable in all its parts; it is also elastic. Its power of changing form enables it to be wielded intelligently, even to its extremity; its elasticity prevents shock, and contributes to its continued play. The wing of the insect is usually in one piece, that of the bat and bird always in several. The curtain of the wing is continuous in the bat, because of a delicate elastic membrane which extends between the fingers of the hand and along the arm; that of the bird is non-continuous, owing to the presence of feathers, which open and close like so many valves during the up and down strokes.

"The posterior margin of the wing of the insect, bat, and bird, is rotated downwards and forwards during extension, and upwards and backwards during flexion. The wing during its vibration descends further below the body than it rises above it. This is necessary for elevating purposes. The distal portion of the wing is twisted in a downward and forward direction at the end of the down stroke, whereas at the end of the up stroke it is twisted downwards and backwards. The wing during its vibrations twists and untwists, so that it acts as a reversing reciprocating screw. The wing is consequently a screw, structurally and functionally. The blur or impression produced on the eye by the rapidly oscillating wing is twisted upon itself, and resembles the blade of an ordinary screw-propeller. The twisted configuration of the wing and its screwing action are due to the presence of figure-of-8 looped curves on its anterior and posterior margins; the curves, when the wing is vibrating, reversing and reciprocating in such a manner as to make the wing change form in all its parts."

We may further point out that Dr. Pettigrew has not based his ideas on the structure of wings on mere theoretical considerations. Besides elaborate anatomical examination, he has entered with a true experimental spirit into a close study of the visible movements of most of the winged tribe. The very excellent diagramatic views with which his paper is elaborately illustrated convey at a glance much that it is difficult to express in words. In proof of this the reader need but compare those figures bearing on the wing movements of the butterfly, the dragon-fly, and the bird.

On these and similar deductions from the practical study of natural history, Dr. Pettigrew bases his elements of artificial flight.

J. MURIE

* Communicated by the Author from *Land and Water*.

INSTRUCTIONS FOR OBSERVERS, AT THE ENGLISH GOVERNMENT ECLIPSE EXPEDITION, 1871

SPECTROSCOPIC OBSERVATIONS

THE instruments used should, if possible, be of the following forms; and experience has shown that they should all be equatorially mounted and driven by clockwork (E of course excepted):—

Instrument A.—An analysing spectroscope showing the whole spectrum in one field, with reference spectra, or some means of rapid record, and with long slit and long collimator mounted at right angles to the axis of a reflecting telescope of large aperture and short focal length, with large finder, the slit of the spectroscope, of course, lying in the focus of the speculum. This combination enables us to obtain a small bright image of the corona, and by throwing this small image on the long slit, to observe the spectrum of the corona on both sides the dark moon—the long collimator permitting the slit to be as wide as possible, so that the maximum of light is admitted. The prism throwing the reference-spectrum into the collimator slides along a bar, so that the reference-spectrum may be made to occupy any part of the field, the height of this spectrum forming a standard of measurement.

Instrument B.—An integrating spectroscope, mounted equatorially, with clockwork or some equivalent arrangement, with long collimator, and object-glass of such aperture that an angle of about 3° is taken in. This, by means of a finder, should be directed to the sun's centre. It should be furnished with a reference-spectrum, or ready means of record.

Instrument C.—An analysing spectroscope of great dispersive power and automatic arrangement, attached to a clockwork-driven equatorial reflector or refractor, in the manner used for observations on the Janssen-Lockyer method.

Instrument D.—An analysing spectroscope of moderate or small dispersive power, attached to an equatorial in the same manner.

Instrument E.—A hand integrating spectroscope.

INSTRUCTIONS FOR USE OF INSTRUMENT A.—With this instrument it should be sought to determine, if possible:—

1. The spectrum of corona visible before and after totality.
2. The spectrum of any bright rays visible before or after totality.
3. The spectrum of lowest layer of chromosphere *just* preceding and following totality.
4. Whether there are any dark lines (attention to be directed to D, E, *b*, F only) in the spectrum of the corona during totality, at any distance from the sun; and, if so, at what distance?
5. The spectrum of any bright streamer seen during totality.
6. The existence and position of bright lines between D and 1474 (Kirchhoff) during totality.
7. Comparative heights of C, D^3, F, and 1474 (Kirchhoff), and lines, if any, between D and 1474 during totality.
8. The spectrum of the dark moon.

The observations should be conducted as follows:—

1. If reference-spectra are used, connect the bar carrying the spark-tube, by means of a piece of string, to the eye piece, so that the amount of light thrown by the small lens on to the slit, and parallel to it, may be controlled.
2. Carefully adjust the finder.
3. Have a slit of such width that on a very faint cloud, with the whole aperture of the reflector, the principal lines of the solar spectrum are alone visible (the three lines of *b* should appear as two).
4. Rotate the telescope-tube in order that the slit may lie along the line joining the points of contact at beginning and end of totality.
5. The observer at the finder should bring the streamer on to the slit, without rotating the telescope-tube.
6. If there are clouds near the sun, on no account move the telescope in right ascension, or meddle with the clock.

INSTRUCTIONS FOR USE OF INSTRUMENTS B AND E.—With these instruments it is possible to examine the changes which take place in the quality of the total amount of light proceeding from the circumsolar regions during the whole time of greatest obscuration. The observations may be made, say, from half an hour before totality to half an hour after; during totality, and if rapid changes are discovered before or after, the observations should be recorded every ten seconds or so, the times of commencement and end of totality being carefully noted, as it is important to connect the changes observed with the amount of chromosphere visible.

The observations should be conducted as follows:—

1. Adjust the driving-clock carefully to solar motion.
2. Adjust the slit so that most of the principal lines can be seen in the spectrum of a faint cloud.
3. Point the instrument to sun's centre three-quarters of an hour before totality, and connect the clock.
4. As totality approaches, observe which dark lines fade out and then brighten, noting the relative intensity of such bright lines.
5. *At the instant of totality* pay particular attention to the spectrum, in order to ascertain whether all lines are reversed, or only some.
6. During totality note every ten seconds all changes, especially of intensities, *e.g.*

1474 (Kirchhoff) as compared with	F
" " "	C
" " "	D^3
" " "	*b*
" " "	any lines between D & 1474
C as compared with	F

7. Note whether C entirely disappears.

Repeat the foregoing observations in reverse order till all changes cease.

INSTRUCTIONS FOR USE OF INSTRUMENTS C AND D.—It is important not only to compare observations made with instruments of large dispersion and those of smaller dispersive power, but to determine the obliterating effect of the atmospheric illumination, so as to render observations made during eclipses comparable with those made on the Janssen-Lockyer method.

The observations with these instruments should be conducted as follows:—

1. Before the eclipse commences sweep round the sun, and giving angles from the true north through the true east of the sun from 0° to 360°,* make a diagram of the chromosphere, its height being determined by the height of the C line; especially note all prominences of both kinds (that is, the diffused and eruptive ones), and the amount of motion indicated by changes in wave-length.
2. Find, near the point at which the sun will disappear, an average plane-topped region of the chromosphere where a little motion on either side does not brighten, or thicken, or lengthen the lines.
3. Observe the spectrum of this, and of the gradually narrowing underlying region of photosphere, and note the effect of the diminution of the photospheric light; such effect may probably be apparent before totality; note increased number of lines, their relative heights, and whether there is a diffused band over *b*; note also the width of F. Note also lines between D and 1474, and which lines disappear as the moon covers the lowest layers of the chromosphere. The spectrum should be swept from C to G before totality, and from G to C immediately totality has commenced.
4. During totality determine how far from the dark moon any spectrum is visible, and what that spectrum is. The brightest part of the *Outer* Corona should be chosen for this observation, the telescope being directed to it by means of the finder.
5. Observe the spectrum of a streamer, also, if there be time.
6. Just before the end of totality watch the chromosphere above the point at which the sun will reappear. Observe the phenomena in reverse order. See III.

PHOTOGRAPHIC OBSERVATIONS.—The instrument recommended to be employed during the eclipse of this year is a camera of about 4in. aperture and 30in. focal length, equatorially mounted, and driven by clockwork.

The pictures taken with such instruments should be exposed as follows, and negatives only should be taken:—

Where the totality is about 2 minutes.

Beginning.			Middle.			End.
5s	7s	10s	15s	10s	7s	5s

Where the totality is about 4 minutes.

Beginning.				Middle.				End.
5s	7s	10s	20s	15s	20s	10s	7s	5s

To insure a given number of pictures, it is desirable to have the same number of baths and plate-holders.

If this system be carried out we shall be able—

1. To use equal exposures for the examination of the Corona on either side the middle point of totality *in each series.*
2. To compare pictures of equal exposure taken at the same time with reference to the middle of the phenomenon *at all stations.*
3. To determine the effect of exposure.

TELESCOPIC AND NAKED-EYE OBSERVATIONS.†—*Before totality.*

1. Note how long the corona is visible before totality along the edge of the dark moon opposite the point at which the sun is about to disappear.
2. Sketch any rays visible before totality; give length, colour, and structure, as well as position.

At commencement of totality.

3. Sketch general outline and any rays (streamers) or rifts.
4. Note if there be a blaze of light or glare where the sun has just disappeared.

Middle of totality.

* Diagrams should be prepared showing the N. and E. points of sun as seen (1) with the naked eye, (2) in an inverting telescope, and (3) *on the slit plate of the spectroscope.*

† These observations should be made by observers *in pairs*, and they should not compare notes. If telescopes are thus used, 2 inches aperture and a power of 20 should be employed.

5. Sketch general outline, rays (steamers), and rifts.

Near end of totality.

6. Sketch general outline and any rays of streamers or rifts.

7. Note if there be a blaze of light or glare where the sun is about to reappear.

After totality.

8. Sketch any rays that may be visible; give length, colour, and structure, as well as position.

Questions to be answered in writing immediately totality is over.

a. Has there been any change? if so, specify what change.

b. Have especially the *dark rays* or rifts changed?

c. Describe what has been constant throughout, and define its structure.

d. State the colours you observed outside the red prominences.

e. Were the colours anywhere arranged *in layers* round the sun?

f. Were the colours anywhere arranged *radially*?

g. As the moon passed over the sun were the colours similar to those successively thrown over any one portion of the landscape?

h. State colours of rays and of spaces between them.

i. Did the dark rifts extend down to the moon, or did they stop short above the denser layers of the chromosphere?

k. Were the rays brightest near or far away from the moon?

l. What was the comparative brightness of the rays, chromosphere, and outer corona?

N.B.—Cards should be prepared, 8 inches square, with a circle 2 inches in diameter, filled in with some dark colour, in the centre. Round this circle the sketches should be made, the north point (or the vertex, as the case may be) being shown, and whether the sketches were made by means of an inverting telescope or with the naked eye.

SUGGESTIONS FOR TIMING THE PROGRESS OF THE ECLIPSE.—In Sicily, last year, the following method of recording the lapse of time during totality was found to prevent all excitement, and made the 80 seconds seem a very long time.

Determine the number of seconds of totality at the station—say 120.

Then, at the moment of totality, let one person attached to each party of observers, carefully observing the face of a chronometer or watch, say—

"You have now 120 seconds."

After 5 seconds,

"You have still 115 seconds."

After another 5 seconds,

"There are still 110 seconds remaining;"

and so on.

This may be done in a very steadying manner.

The times at which any of the phenomena occur must be noted by another observer. J. N. L.

HISTOLOGY

The Auditory Organ of Gasteropoda

DR. F. LEYDIG, of Tübingen, gives an interesting account of the Auditory Organ of Gasteropoda in the last part of Max Schultze's *Archiv für Mikroskopische Anatomie.* After a short historical introduction, in which the labours of previous observers are referred to, Prof. Leydig describes the form and divisions of the brain or cerebral ganglia in this class, and shows that these are fundamentally the same in *Limax, Arion, Vitrina, Helix, Clausilia, Carychium, Succinea, Physa, Planorbis, Ancylus.* This supraœsophageal or cerebral ganglion in these animals consists of two superior ganglionic lateral masses united by a commissure. The subœsophageal ganglion consists of an anterior portion, the ganglion pedale, and a posterior, the ganglion viscerale, which again are connected with the supraœsophageal ganglion by commissural bands. The ring thus formed is traversed by the œsophagus, the excretory ducts of the salivary glands, and the aorta. The anterior lobes of the cerebral ganglion give off the nerves of the tentacles and the optic nerves, and four other pairs. The auditory organ is *apparently* connected with the anterior division of the subœsophageal ganglion. It varies but little in size in different species, whatever may be their difference in magnitude. The organ is of spherical form, as seen from above, but flattened when seen in profile, where it is in contact with the ganglion. It is composed of a connective tissue capsule, made up of two layers—an outer looser investment, and an inner firmer tissue; between the two is a plexiform arrangement of muscular fibres and fasciculi. The inner capsule is lined by a layer of epithelium, which is thicker opposite the point of attachment of the nerve than elsewhere, and when perfectly fresh presents a very indistinct division into cells; of these there appear to be two varieties characterised by their nuclei; one form of nucleus being small, and lying near the attached surface of the cells, that is to say, externally; the other large and round, with a fusiform nucleus. Cilia appear to be always present, but are so extremely fine as to be occasionally scarcely visible. It is most distinct in *Ancylus fluviatilis*, and in this animal the trembling movement of the otoliths is most perceptible. He has seen appearances in *Helix hortensis* and *Clausilia similis*, which lead him to think that the large nucleated cells have bristles attached to them, instead of cilia like the smaller cells. The otoliths exhibit some, though insignificant, variations in size, form, and number. The majority approximate to an oval form, as in the *Helicinidæ*; they are more pointed in *Ancylus* and *Planorbis*. Smaller animals, as *Carychium minimum*, have very small otoliths. They are rounder in young than in older specimens of *Helix*, and at a later period they assume a cell-like appearance, the central part being clearer than the periphery, or a space forming in it which resembles a nucleolus; but he has no doubt, from his previous observations on the embryos of *Paludina vivipara*, that they crystallise out from the fluid of the auditory vesicle; being at first punctiform bodies, then become pointed at their extremities, and increasing by the deposition of successive laminæ on their surface. The idea suggested that they gain entrance from without is quite erroneous. His examinations of the real connections of the auditory nerve succeeded best in *Vitrina diaphana*, and these showed that the lateral commissures of the brain connecting the supra- and infra-œsophageal masses consist of the two commissures themselves, of a sympathetic nerve, of the auditory nerve or canal, and a blood vessel, all connected together by loose connective tissue. The auditory nerve, after leaving the capsule, first runs obliquely outwards to follow the curvature of the anterior division of the infra œsophageal ganglion, then suddenly bends upwards, and thus ultimately reaches, not the infra-, but the supra-œsophageal ganglion with which it is really in connection. Though holding the same relation to the ear that the optic nerve does to the eye, it differs from ordinary nerves in being hollow; hence its name of ear canal. The wall consists, like that of a nerve, of a homogeneous membrane, surrounded by looser connective tissue, and lined by epithelium. The interior is not filled with nerve fibrillæ. Prof. Leydig then notices the relations of this nerve to the passage leading from the ear towards the skin in *Cephalopoda*, in connection with which, however, no external opening has been found, though searched for, by Owsjannikow, Kowalewsky, and Boll.

SCIENTIFIC SERIALS

IN the *Quarterly Journal of Science* for October, three of the articles are continuations of papers which have appeared in previous numbers of the Journal. Mr. Mungo Ponton concludes his discussion of "Molecules, Ultimates, Atoms, and Waves." Lieut. S. P. Oliver gives another paper "On Modern British Ordnance and Ammunition," detailing the structure of some recently manufactured ordnanee; and from the editor we have "Some further Experiments of Psychic Force." After replying to adverse criticisms on his previous paper, Mr. Crookes details some fresh experiments which he considers to "confirm beyond doubt the conclusions at which he arrived in his former paper, namely the existence of a force associated in some measure not yet explained, with the human organisation, by which force increased weight is capable of being imparted to solid bodies without physical contact." The experiments detailed were all performed in the presence of Mr. D. D. Home, or of a lady in whom this force is stated to be remarkably developed; the accordion is no longer employed, while in the balance experiments the operator's hands, instead of lying on the board attached to the balance, are placed in a vessel of water laid on the board. Mr W. Mattieu Williams gives a useful abstract of the views advanced in his "Fuel of the Sun," for the benefit of those who have not time to read the larger work. The author of an anonymous paper "On the recent Gun-cotton Explosion" condemns the reaction against the use of gun-cotton, which has set in since the Stowmarket catastrophe, and attributes the explosion to culpable carelessness in the process of washing the free acid out of the cotton, and the extent of the disaster to the fact of the utterly needless stowage of large quantities of the manufactured article in the factory itself.

THE *Zeitschrift für Ethnologie* (1871, Heft iii.) begins with the second number of a series of papers by A. Ermann, entitled "Ethnographic Observations on the Coasts of Bering's Sea." The author passes in review the various articles of food and the vessels and methods employed for its preparation among the numerous tribes inhabiting the islands, coastlands, and interior of North-Western America; and he endeavours from his observations of this phase of domestic life to deduce conclusions in reference to the identity, or differences of origin, of these races. Herr Ermann draws attention to the fact that the Aleutians, like the people of Kamtschatka, subject some kind of fish to a process of fermentation before eating it, and that these, as well as all the neighbouring races, show a decided repugnance to the use of salted food, and ascribe to their abstinence from such a diet their superiority over the Russians both as regards length of vision and the continuance of unimpaired sight to old age. Heated stones thrown by means of wooden tongs into a wooden, or basket-work vessel, were everywhere found to be in frequent if not universal use as a substitute for our methods of boiling; and where vessels of a large size were required for preparing blubber, their wooden boats were used for the purpose, and the oil poured into bladders to be kept, not only to light their dwellings, but also to heat them by means of their bone lamps, known as *zirniki*. The Aleutians are the most advanced of all the tribes, and have amalgamated so thoroughly with the Russians, among whom they have lived, that it is difficult at first sight to detect their national characteristics from those which they have borrowed from their conquerors. In physiognomy they differ, however, very strikingly, and their dark, yellowish-brown skins and obliquely cut eyes remind one of the Mongolian type. The author treats of the sexual relations of the Aleutians, their early marriages, and the forms of polygamy and diandry practised among them; and describes their singular social houses, in which from 50 to 200 individuals live together in one house of considerable size (180 feet in length), sunk ten or fifteen feet below the surface of the ground. This paper, which is exhaustive as far as it goes, concludes with a notice of the boats, modes of navigation, and hunting, and of the weapons of these people, whose history has, in the present day, acquired special interest since the purchase of Russian America by the Americans. We have next a paper on the "Archæological Remains of Brandenburg," by the Prussian district judge, Ernst Friedel. It possesses scarcely more than a local interest, except in regard to the notice of the lost town in Blumenthal, the name and age of which are unknown, and whose history seems clouded in mystery. In 1689 the walls were still standing six feet above the ground, and the foundations of a church, of two large buildings conjectured to have been a castle, and of a townhall, could still be traced, with the well-defined positions of outer walls, gates, fosses, main and transverse streets, &c.; yet long before that time all knowledge of the place had been lost. When Prof. Beckman recorded its condition in 1751 (in his "History of the Margravate of Brandenburg"), a thick growth of trees had nearly obliterated the stone outlines of this lost town. Judge Friedel last visited the spot in 1870, at which time the walls had disappeared, but there remained traces of graves and of the foundations of Cyclopean walls, which, together with the presence of the so-called Semnonian stone, known in the district as the "Stone of the Marches," inclined him to the opinion that we have here the site of a prehistoric seat of worship, with its surrounding habitations. The stone, which lies at the foot of an oak, is about seven feet in length and six feet in width. The author is of opinion that the traditions and remains of the lost town of Blumenthal may refer to two widely separated periods; and that it may be a station of the ancient Semnones re-occupied in the 10th, 11th, and 12th centuries, or later; many German villages having become extinct in those troubled times, and even during the Hussite and other religious wars.

THE *K. Danske vid. Selsk Forh.* contains an interesting paper, incorporated in the *Z. f. Ethnologie*, by Prof. A. C. Oersted, on the *Silphium* of the ancients, which formed the staple commerce of the Roman colony of Cyrene, in North Africa, the present Barka. It was esteemed a great luxury by Greek and Roman epicures, who used its milky juice, mixed with meal, to give piquancy to their food, and employed it likewise medicinally. Under the rule of the Ptolemies the trade fell off, until at length, under the Emperor Nero, the consignment of one plant of the Silphium was deemed worthy of record. From a careful examination of the representations of this plant with its fruit on the coins of Cyrene, Prof. Oersted is led to infer that the much coveted Silphium was nearly allied to the *Narthex asafœtida*, found by Falconer in Northern Kaschmir, and since cultivated with success in the Botanical Gardens in Edinburgh, and he gives two plates in illustration of his opinion, one of which shows the Narthex reduced to the size of the plant delineated on the Cyrenian coin, the other being a *facsimile* of the coin itself. The resemblance between the two is most striking.

SOCIETIES AND ACADEMIES

PARIS

Academy of Sciences, October 16.—M. Chasles communicated some theorems concerning the determination of a series of groups of points on a geometrical curve.—M. P. A. Favre read a continuation of his thermic investigations upon voltaic energy, in which he described the results obtained under various conditions with batteries consisting of a plate of the alloy of palladium and hydrogen in dilute sulphuric acid and of a plate of platinum in solution of sulphate of copper. He tabulates his results, and also gives the results of experiments on the electrolysis of the acids employed.—M. Lecoq de Boisbaudran presented a memoir on some points of spectrum-analysis and on the constitution of induction-sparks.—M. F. M. Raoult presented a memoir giving the results of investigations of the calorific coefficients of the hydro-electric and thermo-electric currents, from which he concludes that the heat evolved by an electric current is independent of the nature of the battery employed, the calorific coefficient *Ke* being the same for all sources of voltaic electricity.—M. Delaunay noticed the reappearance of Tuttle's comet, which was discovered at Marseilles by M. Borelly on the night of the 12th–13th October. The reappearance of this comet at the time calculated is important as confirming its supposed identity with the second comet of 1790.—M. Chasles replied to the remarks made by M. Bertrand at the last meeting on the subject of the Arabian astronomer, Aboul Wéfa.—M. Berthelot communicated a further note on his researches upon the ammoniacal salts of the weak acids, relating chiefly to certain thermic phenomena observed when a solution of carbonate of ammonia is mixed with solutions of other alkaline carbonates.—A note by MM. C. Friedel and R. D. Silva on the action of chlorine upon various bodies of the series in C^3 and on the isomers of trichlorhydrine was read.—M. Marey communicated a note on the duration of the electric discharge in the torpedo, in continuation of a note presented by him to the last meeting.

PHILADELPHIA

Academy of Natural Sciences.—April 18.—Mr. Vaux, Vice-President, in the chair.—Prof. Leidy made the following remarks on some extinct turtles from Wyoming Territory. Several species of extinct turtles from the tertiary deposits of Wyoming differ from those previously described by me from the same formation. They are indicated by imperfect, though sufficiently characteristic, remains, sent to me by Dr. J. Van A. Carter, of Fort Bridger; and by others obtained during Prof. Hayden's exploring expedition the last year.—"Anosteira ornata." One of the turtles is founded upon a number of isolated plates and fragments of others of the carapace of about four different individuals, obtained from Church Buttes and Grizzly Buttes, Wyoming. The specimens are mainly marginal, including two pygal plates. The latter are remarkably thick at the fore part, where they are hollowed into a concavity directed forward, and bounded below by a projecting ledge. This concavity continues outward and forward upon the contiguous marginal plates as a groove, bounded by an inferior ledge, which would appear gradually to become narrower, and disappear at the third marginal plates in advance. The upper part of the pygal plate slopes on each side from a median acute ridge, or carina, which subsides at the posterior third. The marginal and pygal have all been conjoined with the costal plates by suture, and the former in addition by gomphosis, as in living emydes. The free surfaces of the plates are closely covered with radiant elevations. These centrally form rounded tubercles and peripherally more or less interrupted ridges with more or less interrupted branches. Apparently in younger plates the elevations form more continuous radiant and branching ridges, which would appear in older animals to have become more and more broken so as to form rounded tubercles. In some specimens the radiant ridged appearance is more conspicuous on the under surface of the marginal plates, while the rounded tuberculous condition is more obvious above. In two marginal plates, conspicuously tuberculated above, the lower surfaces are perfectly smooth. These probably pertain to a different species. None of the plates exhibit scute impressions, generally so evident in the emydes. Anosteira ornata was almost the size of the palm or middle hand. A pygal plate measures about eleven lines in length and breadth; and its height or thickness in front is seven lines. Another plate from a younger animal measures about seven lines long, eight broad, and four lines thick in front.—"Hybemys arenarius." The second turtle, almost as large as our common *Emys picta*, is founded on two specimens obtained by Prof. Hayden from a tertiary formation on Little Sandy Creek. They consist of a marginal plate and the portion of a costal plate. The bones are proportionately thicker than in our common emydes, but like them are smooth and deeply impressed by the scutes. The marginal plates appear to be the ninth of the series. From the groove of the costal scute impression it is directed quite as abruptly outwardly as in any recent emys. Its peculiarity, upon which I have founded the genus, is a striking character. The surfaces, separated by the groove of the marginal scute impressions, present each a half circular boss at the fore and aft borders of the bone. Thus from this specimen we may infer that the margin of the carapace was ornamented with a series of hemispherical bosses, each of which was situated in the position of and divided by the sutures of the marginal plates. The breadth of the specimen fore and aft and transversely is half an inch.

April 25.—"Morphology of Carpellary Scales in Larix, by Thomas Meehan. The facts which I have from time to time contributed, verbally or in papers, to the Academy, in regard to longitudinal series of axillary buds, and adnated and free leaves in coniferous plants, will, I believe explain something of the structure of the flowers of coniferæ, which, if not quite distinct from any view before taken, will at least have reached the conclusion by an original line of argument. I have shown that in the cases where there are longitudinal series of buds, one of the buds, and generally the upper supra-axillary one, is the largest. So far as this longitudinal series of buds is concerned, I find by extensive observation that there are very few of our American trees or shrubs which do not produce them under some circumstances, although they are more generally apparent in some than in other. In many cases they do not break quite through the cortical layer, but continue to grow from year to year, just as the wood grows, always remaining just under the outer bark. It is from these concealed but living buds that the flowers of the *Cercis*, or the spines of *Gleditschia*, will often appear from trunks many years old. In *Magnolia* and *Liriodendron* these concealed buds are easily detected by a thin shave of the outer bark with a sharp knife. In very vigorous shoots of the latter, a series of two—one supra-axillary—is not rarely found prominently above the bark. In many cases one of these buds, usually the lower, and really axillary one, never pushes into growth. In *Gymnocladus* neither upper nor lower would probably ever push, only for the fact that it matures no terminal bud, and thus the laterals have to renew the next season's growth. But for this, *Gymnocladus* would go up like a palm, or, more familiarly, as *Aralia spinosa*, does, without a single branch. Failing in the terminal, but two laterals push, giving the branches their dichotomous character. The two which push are always the upper ones in the series of 2, 3, or 4, which appear in this species. The purpose of this duplication of axillary buds will interest all who study this part of botany. I find that they are not for the duplication of parts, but are separately organised from one another. Thus in *Cratægus* and *Gleditschia*, the upper bud produces a spine, the lower is organised to grow as an axillary shoot the next season. But the best illustration of the distinctive organisation is in those cases where both upper and lower buds sometimes push the same season, as in *Itea*, *Lonicera*, *Caprifolium*, or *Halesia*. Here we find that one is organised for floral organs, and the other for axillary prolongation. The upper bud always has the same function, and the lower its own, in the same species. A flower being a modified branch, in which the bract is the leaf and the peduncle the axillary bud, it follows that the laws of axillary stem-production will be more or less reproduced in the inflorescence. What I have proposed to myself in this paper is simply to show that the scales in the male catkin of *Larix* are modified true leaves; while in the female they arise from buds of another organisation, being the morphologised secondary leaves, or phylloidal shoots, as I term them, of other coniferous genera.

BOOKS RECEIVED

ENGLISH.—A Systematic Handbook of Volumetric Analysis, 2nd edition: F. Sutton (Churchill).—Text-book of Geometry, Part 1: J. S. Aldis (Deighton and Bell).—Introductory Notes on Lying in Hospitals: F. Nightingale (Longmans).—Notes of a Naturalist in the Nile Valley and Malta: A. L. Adams (Edmonston and Douglas).—The Science of Arithmetic: Cornwell and Fitch (Simpkin and Marshall).—The School Arithmetic: Cornwell and Fitch (Simpkin and Marshall).—Partial Differential Equations; an Essay: S Earnshaw (Macmillan and Co.).—Thoughts on Life Science: E. Thring (Macmillan and Co.).

AMERICAN.—Earthquakes, Volcanoes, and Mountain Building: J. D. Whitney (Cambridge, University Press).

FOREIGN.—Physique Sociale, ou essai sur le développement des facultés de l'homme: A. Quetelet (Brussels, Muquardt).—Anthropométrie, ou mesure des différentes facultés de l'homme: A. Quetelet (Brussels, Muquardt).—Medizinische Jahrbücher: S. Stricker.

DIARY

MONDAY, OCTOBER 30.

LONDON INSTITUTION, at 4.—On Elementary Physiology (I.): Prof. Huxley, LL.D., F.R.S.

THURSDAY, NOVEMBER 2.

LONDON INSTITUTION, at 7.30.—On Michael Faraday; the Story of his Life: Dr. J. H. Gladstone, F.R.S.

CHEMICAL SOCIETY, at 8.—On Anthraplavic Acid: W. H. Perkin.

LINNEAN SOCIETY, at 8.—On the Origin of Insects: Sir John Lubbock, Bart., F.R.S.—Notes on the Natural History of the Flying Fish: Capt. Chimmo.—On a Chinese Gall, allied to the European Artichoke Gall: A. Müller, F.L.S.

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ERRATUM.—Page 498, second column, line 24, for "to Mr. Hincks" read "by Mr. Hincks."

NOTICE

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