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THURSDAY, OCTOBER 22, 1874

THE UNIVERSITIES COMMISSION REPORT*

II.

IT has of course been always well known that the endowments of Oxford and Cambridge have been by law restricted, till within the last few years, to members of the Established Church; but to the outside world it will probably be a surprise to learn from this Report how far-reaching have been the consequences of this restriction, and how deep is the ecclesiastical character which has been thus imprinted upon a large portion of the academical wealth which the nation imagines to be at its own free disposal. It must be premised that in this respect, as in so many others, Oxford furnishes far more matter for comment than Cambridge, so that the following illustrations will be mainly taken from the former University; and also that it is regularly in the most wealthy Colleges that ecclesiastical objects receive a disproportionate amount of pecuniary aid: two circumstances which point to the conclusion that it is superfluity of income which causes the interests of education and learning to be cast into comparative neglect.

The synoptical tables at the end of this volume state that the Oxford Colleges have in their gift or annexed to their Headships 436 benefices of the returned annual value of 187,000*l.* It is notorious that these returns are considerably below the gross amount actually received, but as they stand they represent a sum equal to more than two-thirds of the total amount which these same Colleges receive from their corporate endowments. The proportion at Cambridge is not quite so large. Some of the Colleges have exercised their statutory powers of selling their advowsons, but to no great extent, and it is yet a moot legal point whether the money produced from such sales can be diverted to purely secular objects. It is noticed, however, by the Commissioners, that in one or two cases such money has been carried to the ordinary account, and that in others it has been appropriated to purposes which otherwise must have been paid for out of the corporate revenue. The proper disposition of the wealth represented by these advowsons is clearly one of those questions which should not be left to the varying and self-interested action of the individual Colleges, but must be resolutely faced by Parliament, and if it be decided in the way which the progress of modern opinion seems most disposed to favour, there will result a very large increase on the total of 260,000*l.* a year mentioned last week as the clear sum available in the reconsideration of the endowments of Oxford. According to another heading in the synoptical tables the total sum of 8,600*l.* is expended upon the College chapels at Oxford, a total which will probably not be considered too large, when it is also stated that out of it are maintained the great choral services at Magdalen, New, and Christ Church, at an average of more than 2,000*l.* each. This sum, however, deserves quotation, if only out of contrast with the item which follows under the head of "Library," which amounts at Oxford to the bare pittance of 1,300*l.* Here also the amounts expended at Cambridge upon the ecclesiastical and secular establishments stand in a similar proportion. It is true that the libraries are awarded something besides from Trust funds and from fees on graduation, but the circumstance that their wants are so conspicuously put into the second place is most significant of the general tone of feeling prevalent at the Universities on these matters.

Another item in these tables is headed "Subscriptions and Pensions," amounting at Oxford to close upon 9,000*l.*, which may not perhaps seem an extravagant expenditure for the owners in fee of so much landed property; yet it will be viewed with much suspicion by those who know how feeble College meetings are in their resistance to the importunities of past members of their body seeking pecuniary help for all those objects which the Church of England takes upon itself to perform in rural parishes. The part of this subject, however, which is destined to attract the largest amount of public attention is that which has reference to the augmentation of College benefices out of corporate income, a process by which, as was before tolerably well known, the clerical fellows, forming as they do a majority in the governing bodies, provide comfortable pensions for their own declining years, and at the same time evince their interest in the general welfare of the Church. The extent, however, to which this process has been carried on is now revealed for the first time, though it is not quite apparent whether all has yet been disclosed, for in the course of their inquiries on this topic the Commissioners have not unnaturally been met with considerable reluctance, and in some cases apparently even with evasion. The synoptical tables for the Oxford Colleges give the amount thus annually devoted as just 9,000*l.*, which may be thought a fully sufficient charge for this item, being more than is set apart for College officers, for the management of estates, or for investment. This figure, however, it cannot be too widely known, is a totally delusive one, and probably does not represent one quarter of the amount which is really squandered in this way. This conclusion would be at once suspected by anyone who has an inkling of the facts, when he reads that Queen's is credited in this table with nothing at all, and Magdalen with only 17*l.* 10*s.* A more particular examination of the full returns made by the individual Colleges amply confirms these suspicions by proving, though in a roundabout way, that Queen's really pays away to incumbents 3,000*l.* a year, and Magdalen no less than 9,000*l.* To this it may be added that Christ Church, which in the tables is only credited with 2,000*l.*, does as a matter of fact spend just four times that amount; and that since 1835, and chiefly within the last few years, has given away 28,000*l.* for cognate ecclesiastical purposes. In connection with this subject, it may be mentioned that Magdalen possesses a certain benefaction called the Sheppard Fund, subject to no specific conditions, except that the proceeds are to be appropriated "to such uses as are likely to promote piety and learning in Magdalen or any other College." Out of a net 2,000*l.* a year received from this fund, 300*l.* is spent on management, &c., the ambiguous item of subscriptions runs away with 470*l.*, while 720*l.* is swallowed up in ecclesiastical objects, leaving a bare 540*l.* for Magdalen College and other schools. The accounts of the Hulme Trust connected with Brasenose teach the same lesson, for in that case no less than 4,000*l.* per annum out of a

* Continued from p. 476.

net revenue of 6,000*l.*, under the authority, it is true, of recent Acts of Parliament, is devoted to livings and churches; a considerable deviation, as the Commissioners observe, from the intention expressed in the will of the benefactor. The returns of the value of the Professorships are equally significant, for the five Divinity Chairs are each endowed with 1,500*l.* and a house, whereas the average of the remaining Professorships cannot be more than 500*l.* without a residence. It may here be incidentally mentioned that the collective income of the Oxford Professors from all sources amounts to 25,000*l.*, of which only 450*l.* comes from fees, and more than half of this latter sum from the fees of the four Science Professors.

Concerning the number of Fellowships confined to those who have taken or who have promised to take orders, this Report is entirely silent, on the same principle apparently as it omits to state what proportion of the College endowments is appropriated to the encouragement of Physical Science. For information on this latter topic, recourse may be had to the Report of another Royal Commission lately published, and the University Calendars yield some evidence on the former point. As to Oxford, it has been calculated that with the exception of Merton, where for the future all Fellowships, as well as the Headship, will be entirely open, nearly half the Fellowships are what is commonly called clerical, and all the remaining Headships are confined to clergymen. The proportion in the different Colleges is very irregular, but the reader will hardly be surprised to learn that, in accordance with what has been intimated above, at the four wealthiest Colleges the proportion is as high as two clerical fellows to one lay.

All these facts, and there are more of the same character, seem to point one way: that when the reconstruction of the Universities becomes a matter of public and not special interest, and when the uses to which their endowments are put shall be fundamentally reconsidered in the light of modern experience, one of the first questions which the nation will have to decide for itself will be whether so large a portion of academical property shall in the future be limited to purposes which certainly are not educational, and nowhere else than in England would ever be thought to be academical. That the Colleges themselves cannot be permitted to settle these great questions at their own sweet will is abundantly made clear by the facts recorded in this Report. It may be granted that the reformed statutes of a few of the Oxford Colleges, which are appended at the end of this volume, promise to abolish certain of the more prominent evils in their constitution, which evils indeed nowhere find any active defenders; but in none of these schemes is adequate importance attached to the duty of encouraging original research, the one part of its academical functions which Oxford neither performs nor regrets to have left unperformed. Moreover, the well-intentioned activity of some three or four of the less wealthy Colleges affords no guarantee that the greater institutions will not continue in their wasteful courses, and permit fresh vested interests to be acquired daily. Perhaps public opinion is not yet fully ripe, and perhaps those who have interested themselves in these subjects are not yet sufficiently unanimous; but for the future, at any rate, no excuses of this kind ought to be tolerated. The Commission on Scientific Instruction and the Advancement of Science has thrown into shape a scheme of reform which, though primarily adapted to the case of original research in the physical sciences, is capable of being extended to similar branches of genuine study, and to the outline of that scheme many prominent men, statesmen and others, have given in their adhesion. This Commission has now in its Report given us all the materials requisite for discovering where the necessary funds shall come from; and from henceforth it will be only due to laziness, or to individual perversity, if a definite scheme of University Re-organisation, conceived in the interests of unencumbered investigation and mature study, is not soon presented for the acceptance of the public.

SEDLEY TAYLOR'S "SOUND"

Sound and Music: a Non-mathematical Treatise. By Sedley Taylor, M.A. (London: Macmillan and Co.)

FINDING from the title-page and preface that this work, though non-mathematical, undertakes to give an account of the acoustical discoveries of Helmholtz, we acknowledge having felt some misgivings when we commenced the perusal of it. We will presently inform our readers whether we found our fears justified or not by the book itself; but we must first state why we felt them.

The recent reasonable and even necessary outcry for popular scientific education in this country has led to the publication of a perfect shoal of elementary treatises. Everyone who has a smattering of knowledge or who has access to a consulting library considers himself thereby fitted to write a treatise. For one such that is written by a man thoroughly competent as far as knowledge and experience can qualify him, we have half a dozen written by popular lecturers, or rather showmen, in whose eyes sensational experiments sensationally described form the really attractive portion of science! Besides these, we have a dozen others—some the work of those fluent writers who can master a new subject in a week, complete an octavo treatise on it by the end of the month, see it through the press, and proceed immediately to repeat the process on something newer still; the others, the original work of uninstructed but aspiring men, who have learnt too little to be aware either of what science is or of their own utter ignorance of it. This is no fancy sketch, but, as all competent to judge will allow, an exceedingly unpleasant reality. In some subjects, no doubt, competent men have the field (as yet) left almost to themselves. It is only now and then that an ignoramus ventures to produce a treatise on Hyperdeterminants, Vortex Motion, or Specific Inductive Capacity. Yet, if books on such subjects could command a host of eager *and ignorant* purchasers, there would soon be a supply from quarters hitherto undreamt of. But anyone and everyone can write on such simple matters as heat, light, electricity or (more to our present purpose) sound and music. "Bother Helmholtz, and Clerk-Maxwell, and Thomson," cries a public athirst for sensation, and whose palate is already dead to all but the most potent spices; "we want excitement, knowledge too if it comes painlessly, but excitement;" which (viz. the sensation and the excitement) are precisely what that same public will

not get from Mr. Taylor's work. Not once, in the whole course of his 219 pages, has he condescended to cater for the mere amusement of his reader. We hope, but almost against hope, that this will not interfere with the sale of his book.

The book, with the exception of a few slight blemishes, to some of which we will presently advert, is a very good one indeed: lucid, comprehensive, and accurate. Many of the more difficult ideas introduced are illustrated very happily by analogy; and, so far as the first half of the volume is concerned, there is nothing which should present a difficulty to any reader of average intelligence. It is necessarily otherwise with the second half, which treats mainly of music, for this is a subject which mere intelligence, however acute, will not enable a man to master. One may as well discourse of colours to the congenitally blind, as of music to a man devoid of "ear." It has often struck us as one of the most remarkable of phenomena in the physical world, that while we ourselves were only greatly annoyed by the discordant grinding of some street-organ miscreant, one friend beside us has been almost in a state of frenzy, while another, on the contrary, listened with the most stolid indifference. [We leave it to the psychologists to consider whether the mind itself may not, in certain individuals, have similar excess or defect in some particular quality, and if so, to explain by it the existence alike of sceptics and of fanatics.] Considering that this extraordinary difference is often found to exist between individuals nearly related, and in all other particulars closely resembling one another, it is not to be wondered at that even among those who possess in a special manner an ear for music, individuals should be found to differ widely from one another on many of the less important points. In such a case who is to decide? *Ceteris paribus*, we should be inclined to side with the mathematician, who has, as it were, an extra sense in addition to those possessed by his antagonist. Wherever, then, we find that Mr. Taylor's view is not exactly in accordance with that of Helmholtz (though the discrepancies, so far as we venture to think we understand them, are few, and, with one exception, of apparently small importance), we are inclined to take the side of Helmholtz. But, we repeat, this is not to be considered as a demerit of Mr. Taylor, for the main point of variance (if we be correct in supposing it to exist) seems to be an æsthetic one, upon which only a comparatively small number of persons (and these not only exceptionally gifted, but also highly trained) are competent to form an opinion. We outsiders may judge of the value of such opinions by comparing the verdicts of different art critics on the same picture; though in the case of sound, where the physical processes (in the external ear at least) are thoroughly known to the mathematician, he ought to have a decided advantage over those who have not his physical insight. The following passage (§ 75), seems particularly happy:—

"That *two sounds should produce absolute silence* seems, at first sight, as absurd as that two loaves should be equivalent to no bread. This is, however, only because we are accustomed to think of sound as something with an external objective existence; not as consisting merely in a state of motion of certain air-particles, and therefore liable, on the application of an opposite system of equal forces, to be absolutely annihilated."

There is, however, considerable objection to be taken to the word *forces*. Had Mr. Taylor said *motions*, or still better *disturbances*, the passage would have been not only clearer but more correct.

A closely-connected mistake occurs, in two different forms, in §§ 22, 50. In the former, the word *force* is used in place of *energy*; in the latter, *energy* is used where *force* is obviously the correct word. But here, though in all probability unconsciously, Mr. Taylor is only following the metaphysicians and other quasi-scientific men, who give what they call a "broad basis" to the meaning of a word by using it now in one sense and anon in quite a different one.

Another curious statement, occurring in § 8 and repeated in § 37, seems to show that Mr. Taylor's clock has a half-second pendulum, for he speaks of a *complete* oscillation (from side to side and back again) as taking place in one second!

The inherent defect of all non-mathematical treatment of a subject undoubtedly mathematical shows itself in the elaborateness of Mr. Taylor's explanation of wave-motion. We are quite sure that a very slight amount of the most elementary geometry, properly introduced, would have enabled him to condense the whole of this part of his work into one-third of its present bulk or even less, and this with a decided increase of simplicity and intelligibility to the ordinary reader.

We object entirely to the word *strictly* in the foot-note to § 5, for, instead of being *not strictly accurate*, the statement referred to is not even approximately accurate. In the same section there is an illustration of wave propagation by the alternate kneeling and standing of the individuals of a line of men, where the reader is likely to be much puzzled by the printing of "two, six, and nine," instead of "twenty, sixty, and ninety." This, however, may be called hypercriticism, so we proceed to point out that in § 23 there is a genuine blunder. Mr. Taylor says that in the diminution of loudness and dying away of the sound of a pianoforte wire once struck, "the effect produced is the same as if our harmonium had, while sounding out its note, been carried gradually further and further away from us," forgetting altogether what, indeed, we do not find in his book, the lowering of pitch which accompanies diminution of intensity when the source of sound moves away from the observer.

In § 54 the word *submission* (subdivision?) produces a curious effect, due probably to the printer.

We conclude by repeating that the work is a very good one, worthy of the subject; and that we are glad to see that (in default of an English translation of the "Tonempfindungen") the beautiful discoveries of Helmholtz have found in this country an able and congenial expositor. Had we thought less of the work we should not have been driven to criticism of mere isolated words or phrases which easily escape detection by an author himself. Yet, after all, we must conclude with an expression of amazement that a man who shows himself to have so thorough an appreciation of harmony as does Mr. Taylor, should tolerate for a moment in his pages a foreign word such as *timbre*, when we have an excellent and generally received English equivalent for it; or employ for a concord such a hideously inappropriate word as the English *clang*.

MAREY'S "ANIMAL MECHANISM"

Animal Mechanism. By E. J. Marey. "The International Scientific Series." (London: Henry S. King and Co., 1874.)

I.

ON more than one occasion during the last year or so, we have drawn attention to a small French physiological treatise by Prof. Marey, entitled "La Machine Animale." It is not only to a passage here and a passage there that we have had to refer, but to the thorough exposition of intricate problems of mechanical physiology, which have been worked out with a degree of ability rarely to be found in a single author. It is a translation of this work which forms the subject of the present review.

Prof. Marey divides his subject into three parts: the first devoted to general principles; the second to terrestrial locomotion; and the third to aërial locomotion. It is to the last two of these that we wish to draw attention both in this and the succeeding notice.

Terrestrial locomotion comprises that of bipeds and that of quadrupeds: man and the horse, exemplifying them respectively in their most complicated forms, serve as excellent examples. Human locomotion is a subject which admits of more scientific treatment than might at

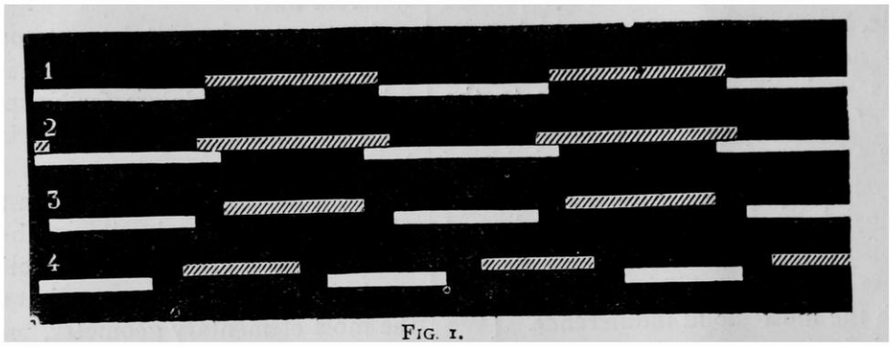


FIG. 1.

first sight be supposed. There is no better proof of this than the fact that until Prof. Marey quite recently disproved it, the theory of the brothers Weber was generally accepted, namely, that the non-supporting leg moves pendulum-like in walking.

Whilst, with the mind otherwise unoccupied, anyone sets to work to study the different movements of his legs in hopping, jumping, walking, and running, there are many points that he can make out without further assistance, such as the fact that in walking the feet are never both off the ground together, whilst in running the body is unsupported between each two steps. Our author and one of his pupils, M. G. Carlet, have, however, succeeded in putting down the results of their carefully conducted experiments in a form which allows of their being studied by others as well as by the subjects of the experiments themselves. By means of elastic air-bags with connecting tubes they have transferred the movements they discuss to paper, and have had these tracings copied as woodcuts.

After having proved that the intensity of the pressure of the foot upon the ground is not solely dependent on the weight of the body, it being greater at the end of the step than at its commencement on account of the muscular effort then added, Prof. Marey describes the vertical and horizontal movements of the body in walking, and shows that the former oscillations are twice as numerous as the latter. This can be verified by observation; at all events, the rise of the body can be seen to be as rapid as each step, whilst the slowness of "the waddle" is proverbial. Next, the greater pressure at the end of each step is proved, by a very ingenious con-

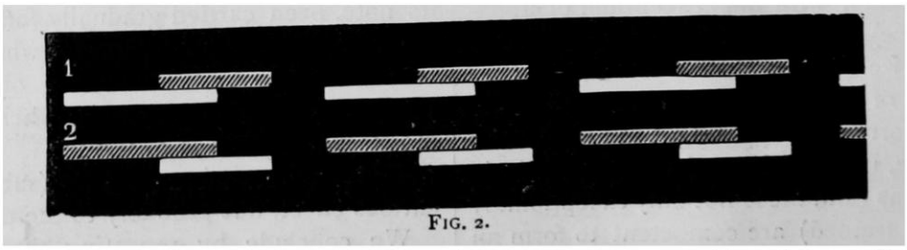


FIG. 2.

trivance, to increase the forward movement of the body during that time, and to be least at the moment when the foot reaches the ground.

In describing the rhythm of the different modes of progression adopted by man, the tracings obtained by the recording instrument are transcribed into a notation which is a modification of that employed in music. Two horizontal lines form the staff on which this simple music, consisting of only two notes, is written. A broad white line expresses by its length the duration of the pressure of the right foot; a similar shaded line does the same for the left; any interval between the two indicates the time during which the body is suspended above the ground. On this method the diagram in Fig. 1 will represent the formula of the rhythm of the walking pace (1), of ascending a staircase (2), of running (3), and of rapid running (4). From these it may be gathered that in walking the contact of one foot with the ground follows that of its fellow without any interval; that in climbing a hill or going upstairs there is this difference, namely, that the one foot does not leave the ground until its fellow has been in contact with it a perceptible time; that in running there is an interval at each step during which the body is quite off the ground; and fourthly, that in rapid running, though the duration of each step is shortened, that of the interval is lengthened.

Fig. 2 represents the gallop of children, (1) being what may be termed left gallop, and (2) right gallop, according to which foot is in front. This rhythm will be found instructive when we come to refer to the same in the horse.

The upper of the two portions of Fig. 3 represents a series of leaps with the feet together, whilst the lower is the notation of the hop on the right leg, in which, from fatigue, the duration of the time of contact with the ground increases; it will be observed that the time of suspension, nevertheless, does not vary. All these diagrams are so instructive in themselves that they need no further detailed explanation.

Fig. 4 will give an idea of the instrument employed in studying the complicated problem of quadrupedal action, in which it will be seen that the movements of each foot communicate, through elastic tubes, movements to the

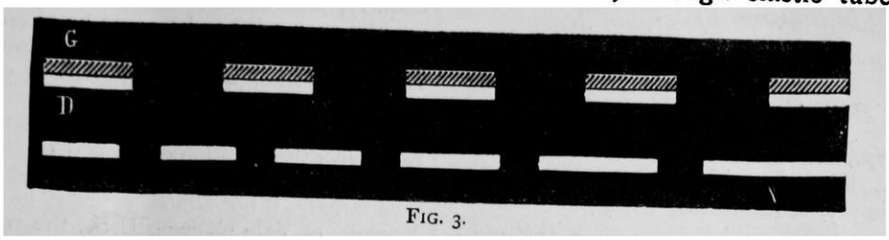


FIG. 3.

levers of the recording apparatus held in the hand of the rider. In interpreting the tracings thus obtained into the musical notation above employed to describe the different rhythms of human progression, the only thing necessary is to introduce a second pair of bars below that previously employed, to represent the hind feet. A diagram like Fig. 1 is the result. Before the introduction of this graphic method, the action of the horse, which used to be an endless subject of dispute, was made out from the imprint of the shoe-marks left in soft ground; this, however, varies for any given action with the rapidity of movement and the size of the animal which forms the subject of experiment.

As we explained not long ago (NATURE, vol. x. p. 39), according to the work before us, the action of the horse in walking, we need not discuss that step on the present occasion. It is by far the most complicated of the movements. The trot is much more simple, being a double instead of a quadruple action; the opposite fore and hind feet striking the ground simultaneously. There is also an "irregular trot," which is frequently met with, and depends on a lag in the action of the hind limbs.

"Several different paces, the common character of which is that irregular impacts return at regular intervals, are comprehended under the gallop." There is the gallop in *two*, *three*, and *four* times, so called according to the number of sounds heard in each completed pace Fig. 5 gives the notation of the gallop in three-time,

which is the most common; *A* indicating the time, and *B* indicating the number of feet which support the body at each instant of the step. From it the left hind-foot is

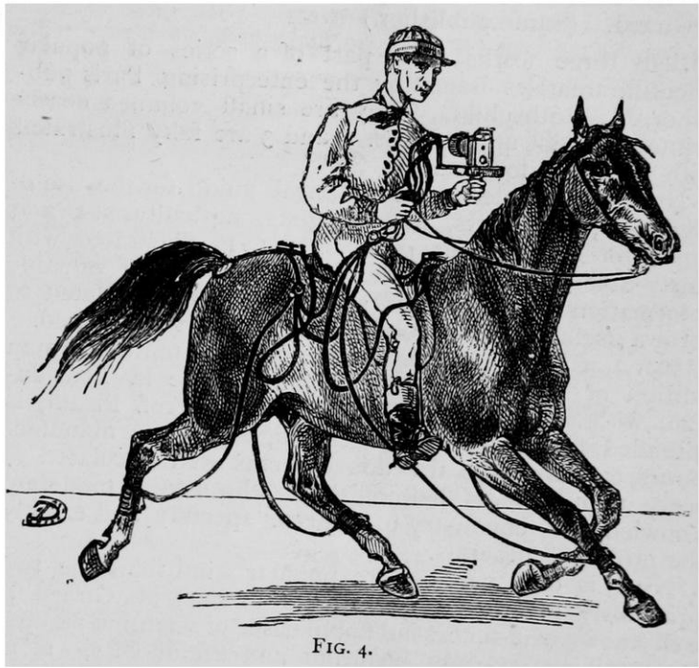


FIG. 4.

seen to reach the ground before any of the others, and to produce the first sound: the second is caused by the simultaneous impact of the right hind and left fore feet; and the third by the right fore-foot, which the animal always

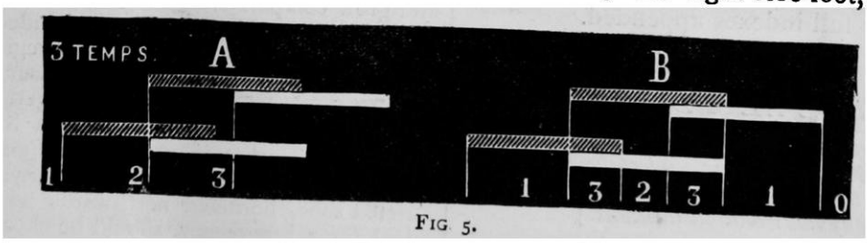


FIG. 5.

places forward to commence with. The similarity between this pace and that of children "playing at horses" can be readily seen by comparing this figure with Fig. 2. The gallop in four-time differs from that just described, in that the impacts of the hind legs are slightly delayed, which causes the two feet, which in three-time strike the ground simultaneously, to do so one after the other, the right hind one after the left fore, so that the single sound is duplicated.

The full gallop is so violent an action that the delicate instruments employed in analysing the previous movements have to be dispensed with, and a more substantial apparatus employed. The rider, instead of carrying it in his hand, has it tied, as a knapsack, on his back, and he sets the recording watchwork in motion with his teeth. Notwithstanding the difficulties of the experiment, very successful tracings have been obtained, which show that the full gallop is really a gallop in four-time, in which, although the fore-feet hit the ground with a fair interval, the hind feet hit it nearly simultaneously. The time of complete suspension is extremely short.

Besides the actual and relative durations of the different paces, Prof. Marey's instruments are so constructed as to record also the rise and fall of the body of the horse during each. This point is of particular interest, as it explains the varying degrees of comfort to the rider in

the trot, gallop, &c. The rise in the trot is sudden and simultaneous with the time the animal's feet are on the ground, and the fall with the time of suspension. In the gallop the same is the case, though the rises and falls are less sudden; they are, "therefore, less jarring to the rider, though they may, in fact, present a greater amplitude."

(*To be continued.*)

OUR BOOK SHELF

1.—*Les Roches; Descriptions de leurs Éléments: Methode de Détermination, etc.* Par Edouard Jannetaz, Docteur ès Sciences, etc. (Paris: J. Rothschild, 1874.)

2.—*Les Minéraux: Guide Pratique pour leur Détermination, etc.* Par F. de Kobell. Avant-propos et Additions, par F. Pisani, Professeur de Chimie et de Minéralogie. (Same publisher.)

3.—*Le Monde Microscopique des Eaux.* Par Jules Girard. (Same publisher.)

THESE three works form part of a series of popular scientific treatises issued by the enterprising Paris publisher, M. Rothschild. They are small volumes neatly printed and got up, and Nos. 1 and 3 are fully illustrated with well-executed cuts.

No. 1 is intended as a practical guide for the use of engineers, geologists, mineralogists, agriculturists, and pupils of Government schools. It is illustrated with thirty-nine woodcuts, contains a great deal of valuable information in small space, and seems well calculated to form a useful little handbook for the classes mentioned.

No. 2, which is a translation from the tenth German edition of Kobell's work by Count L. de la Tour-du-Pin, with a preface and additions by Prof. Pisani, is intended for the use of chemists, engineers, manufacturers, &c., and, like the above, seems well calculated to serve its purpose, of helping those who have a moderate knowledge of chemistry to analyse speedily and exactly the principal minerals.

No. 3 is of a much more popular kind than the two previously mentioned works; its author, M. Girard, is well known as a successful populariser of scientific results. It contains sixty-eight beautiful and useful cuts. It is intended as a handbook to those who wish to derive amusement and instruction from the use of the microscope, and takes up successively some of the principal points in the animal, vegetable (existing and fossil), and mineral kingdoms.

Nos. 1 and 2 have very full indexes appended.

LETTERS TO THE EDITOR

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

Periodicity of Auroras

ON my return to Newcastle-on-Tyne I take the opportunity of being able to recur to books of reference to reply to a question put by Mr. Procter, in NATURE (vol. x. p. 355), whether any complete catalogues of auroras have been constructed, and if they show indications of periodicity in its displays. Kæmtz's "Meteorology," in which almost every feature of the weather capable of being chronicled has been fully catalogued, probably contains a list more or less complete, up to its author's time, of all then known descriptions of auroras. If this be so, it has probably served for the groundwork upon which later and more complete catalogues have been compiled, extended, and completed in his own and other countries. Dr. Heis, the director of the Prussian Observatory at Münster, in Westphalia, is especially active in collecting information of the slightest appearances of aurora in any quarters of the globe, from whence published or private descriptions of them can be obtained. Every successive number of such works as Mr. G. J. Symons's *Monthly Meteorological Magazine* and the *Quarterly Journal of the Scottish Meteorological Society* contains, in a few pages of "meteorological notes" on the weather peculiarities of each month from their numerous observers, a list of scattered aurora-observations, which is probably as complete for the British Isles during the years in which these publications have been carried on, as the perfect or partial clearness of the sky over this country, and indeed over some adjacent continental stations, enables such a list to be made by observations. But this collection, invaluable as it is for our own immediate field of registry, is not assorted, nor suited, without extension by the help of similar collections made in surrounding foreign countries, to be regarded as a sufficiently extensive list of auroras for dealing generally with the question of their periodicity. The present state of progress of our knowledge, with regard to auroral frequency, we owe largely, if not almost entirely, to the researches of Prof. E. Loomis, of Yale College, U.S., the results of whose discussion of the collateral views and considerations involved in them will be found in numbers of the *American Journal of Science* for July 1860, Sept. 1870, and April 1873. In the first of these papers, a map of lines of equal auroral frequency for the northern hemisphere is presented, dividing the northern area of the globe into zones encircling the arctic regions. It appears, for example, from this map, that auroral displays are not very much more frequently visible in St. Petersburg than they are in London, and that even Boston and Edinburgh are as frequently visited by them as the great northern capital itself. An oval belt of

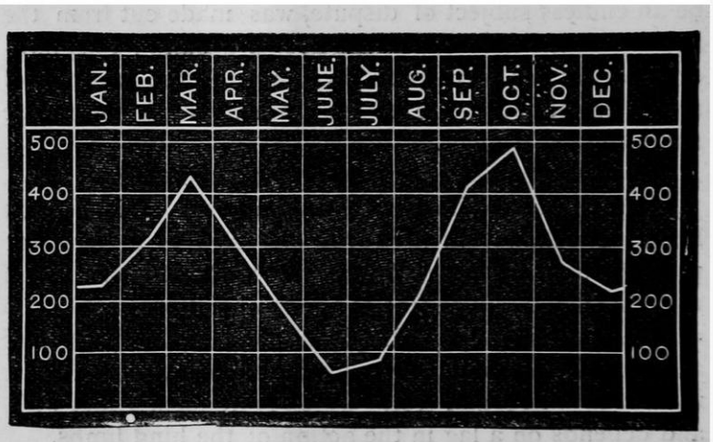


FIG. 1.—Number of auroras observed in each month of the year (Kæmtz).

greatest auroral frequency encloses together the north geographical and north magnetic poles, covering all the European, Asiatic, and American coast lines of the Arctic Ocean, and passing onwards from the latter across Hudson's Bay, the mouth of Baffin's Bay, and Iceland, back to the North Cape. For a short distance within this ample belt auroras continue to be tolerably frequent, and grow comparatively more scarce in Smith's Sound and the northern parts of Baffin's Bay, and indeed apparently in proportion as the geographical north polar regions are approached.* It is with the outer and not with the inner margin, however, of this ring-maximum of auroras that observers in ordinary latitudes are concerned, and it is pointed out in his most recent paper by Prof. Loomis, that in constructing general catalogues for deciding questions of auroral periodicity, a line, or at least a restricted zone, bordered northwards and southwards by lines of equal auroral frequency, should be chosen as the localities from which observations may be gathered. To place this line or belt in the zone itself of almost constant auroral activity, where auroras can only vary periodically in brightness rather than in

* It will be remembered that in Capt. Kane's description of a winter-detention of his vessel in Smith's Sound (the northernmost passage from Baffin's Bay, about eight and-a-half degrees from the north pole), it is related that the feeling of prolonged darkness at length became so oppressive that even the Esquimaux dogs were affected by it, and when excluded from the luxury whined piteously for light. A darkness so deep and enduring as this description suggests can scarcely have been broken, as it occurs in the more favoured belt twenty degrees south of this high latitude, at the mouth of Davis Strait, by the illumination of bright rays and flashing beams of constantly appearing fine auroras. The position occupied by Capt. Kane was not more than two or three degrees from the general centre of the region of fast-diminishing auroral frequency, embracing the whole Arctic Ocean, which is shown on Prof. Loomis's auroral map as merging insensibly on all sides into the broad or narrow belt of greatest auroral activity surrounding it. The latter seems to follow very nearly along its whole extent, with a corresponding strong depression and expansion of its width towards Hudson's Bay, the general direction of the arctic coast-line.

frequency, would be of no avail for enumerations; the zone selected must be one of occasional auroras, arising only from the southward spreading of the strongest disturbances of the ever-beaming and sometimes forth-sallying illuminations of the north.

It is also for such other obvious reasons, as that years of arctic exploration tend to appear in general catalogues as years of extraordinary auroral frequency, and that observations in Asia, Western America, and in the whole of the southern hemisphere have for the most part been made but recently or at very irregular intervals, that the use of general auroral catalogues in questions of periodicity calls for much selection and reduction of the miscellaneous mass of observations. A most extensive general auroral catalogue appears to have been published early last year, or at the end of the previous year,* by Prof. Lovering, of the United States, of which Prof. Loomis has employed the materials, and of which he acknowledges the completeness in terms of commendation. It extends from the year 500 B.C. to the year 1864, and includes with its supplements upwards of 12,000 cases of observed auroras. For the following years, from 1864 to the end of 1872, Prof. Loomis has continued the catalogue for a restricted area suited to the question of periodicity, partly from American sources, and partly (in Europe) from the periodical journal published by Dr. Heis, *Wochenschrift für Astronomie und Meteorologie*. The selected region of observation is limited on the north by an iso-auroral line skirting the northern boundary of the State of Massachusetts and crossing the Atlantic from near Boston to the north of Ireland, passing thence between England and Scotland, and through the northern part of Jutland, a little south of Stockholm, to a little north of St. Petersburg, where it continues its course in Russia as far as long. 40° E from Greenwich. The meridian of this longitude (nearly that of the eastern ends of the Black Sea and Red Sea) limits the area on the east. It is similarly limited westwards by the meridian of 80° W. from Greenwich, including Washington, and the eastern, but none of the western States of North America. A lengthy general catalogue for this region was extracted by Prof. Loomis from Lovering's list, including all the auroras recorded in it in the years between the beginning of the year 1776 and the end of the year 1872, with their month and dates. The whole of this long list, supplemented in great measure by his own inquiries, is given at full length at the end of the last paper (*sup. cit.*) by Prof. Loomis. The number of auroras in each year, or their annual frequency, is then obtained and laid down in a curve for the whole interval of ninety-six years of the observations. On the same plate is projected the mean daily range of magnetic declination, and the relative extent of black spots on the sun's disc for the same

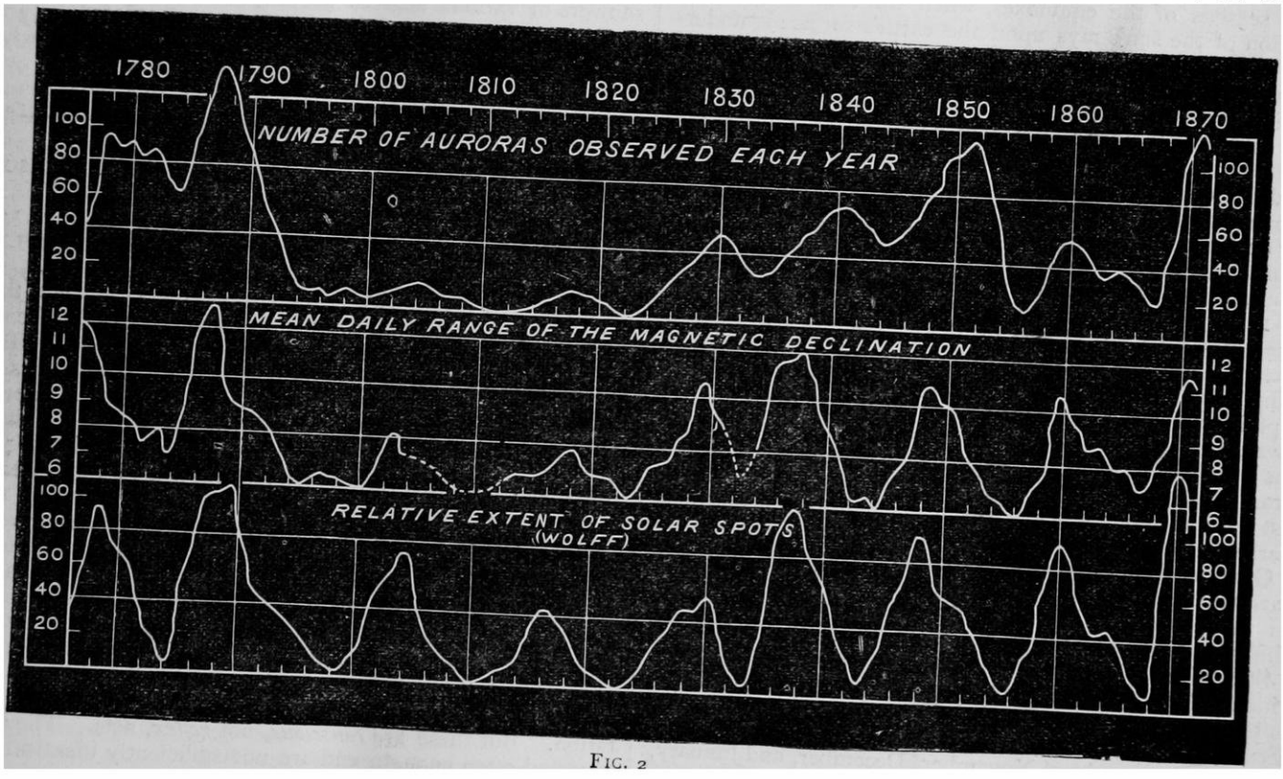


FIG. 2

series of years of observation; the latter from Wolff's numbers, and the former from the average of magnetic observations made at Prague from the year 1777 to the year 1871 inclusive. Very uncouth in appearance are all these curves: and the curve of annual auroral frequency is far the most shapeless in outline of them all; but the leading crests and troughs of the ruling eleven-year period of the sun-spot curve are conspicuously reproduced in each of the other two curves, so that it is difficult to say whether the auroral curve or the curve of magnetic declination is the stricter in its adherence to the times of maxima prescribed to it by the solar spots. In two cases, however, the auroral maximum took place some three years, and in another case about a year, too late (1840, 1851, 1871). The maximum of the magnetic disturbance curve also took place on one of these occasions (1838) a year later than the sun-spot maximum, while in the year 1787 both the auroral frequency and magnetic disturbance curves attained their maxima together between one and two years earlier than the sun-spot curve.

Prof. Loomis concludes that the times of auroral minimum and maximum frequency happen on an average from half a year to a year later than the same critical times of magnetic disturbance and of the sun's relative obscuration by black spots; that they are more nearly related to the same times for the magnetic daily range than for the sun-spot curve, and that the time of greatest auroral frequency lasts longer than that of the sun's obscuration by spots or of the magnetic needle's greatest daily disturbances. A period of very moderate activity in all the curves is embraced between the maxima of 1788 and 1830, which is particularly noticeable in the scarcity of auroras and in the smallness of the magnetic oscillations in that period. More than 4,000 auroras are included even in the limited selection from Prof. Lovering's catalogue used by Prof. Loomis to establish these results, and yet the interval of ninety-six years (during which the magnetic declination had been continuously observed) to which it is confined proves to be too short to determine certainly the long cycle of activity and repose that seems to govern the times of greatest auroral frequency for years together, in long recurring periods of between half a century and a century. In a previous paper (the second in the *American Journal of Science* above quoted), Prof. Loomis had arrived at all the conclusions of the paper just described from an auroral catalogue of his own construction, of observations in not very northerly latitudes of Europe and in the United States; extending, however, only to the year 1850, the closing year of the magnetical observations at Prague then accessible to him. A period of about sixty years, from the

* "Memoirs of the American Academy," vol. x.

maximum of the year 1790 to that of 1850, was thence concluded, perhaps too confidently, as the real length of this long cycle of auroral frequency.

On turning to Kæmtz's "Meteorology" (translation by C. V. Walker, 1848, p. 458), I find that the author, with his usual exhaustive completeness, has constructed a general list of auroras observed up to his time (about the year 1820), and has established from it certain laws of their periodicity. The list itself, although not given for brevity in the translation, is in all probability contained in the original, and it must embrace upwards of 3,000 cases of auroral occurrences, since a table of about that total sum showing the numbers recorded in each of the several months of the year is given as the most important scientific result of the compilation. The numbers seen in March, September, and October are about half as great again as those recorded in any of the adjacent months, and about twice as great as have been recorded in either of the two mid-winter months of December and January, when the length of the nights is yet most favourable for their registry. That the numbers of auroral displays noted in June and July are relatively very small is easily explained by the length of the twilight in those months in European latitudes, rendering many, that would be conspicuous exhibitions in darker nights, invisible.

The times of greatest annual activity of the auroræ are thus about the seasons of the equinoxes, when the seat of the most direct action of the sun's rays upon the earth's surface is undergoing its most rapid changes during the sun's yearly course; and when nearly the same parts of the earth's surface continue to be heated directly by the sun's rays at the seasons of the winter and summer solstices, there are times of comparative repose and tranquillity among the exhibitions of auroral outbreaks.

Regarding a secular period, Kæmtz's Catalogue appears to have shown nothing positive. "A period of this kind," he writes, "occurred between the years 1707 and 1790, attaining its maximum about the year 1752; since the year 1820 they have again continued to become more numerous." This maximum in the year 1752, and those shown on Prof. Loomis' auroral curve about the years 1780–90, 1850, and 1870–72, agree very ill with each other, or with the return of a constant cycle of long period connecting them together; the succession more nearly resembles that of periods of hot summers, or of cold winters, governed by fixed laws that have not yet been discovered in their returns and durations: and seems to point to causes influencing the production of auroras very similar to those which determine some of the obscurest features of our seasons. Thus, since the commencement of the earliest continuous temperature records at the Royal Observatory, Greenwich, in the year 1771, the commencement of winter or the arrival of a mean daily temperature of 40° has fluctuated between the months of November and December, apparently from different degrees of prevalence in those months of an annual tide of south-west wind then reaching a maximum in the British Isles. Assuming changes in the strength of this wind to be the cause of the observed fluctuations and of a gradually increasing retardation of winter and secular rise of mean temperature in the months of November, December, and January, noticed by Mr. Glaisher during the first half of the present century, the average course of this phenomenon, when submitted to examination, resembles very closely the general course of the curve of auroral frequency. There was a sensible retardation of the winter season from about the year 1775 to about the year 1790, followed by a marked acceleration from the latter year onwards through nearly the first quarter of the present century, indicating apparently a considerable abatement of south-west, anti-trade, or equatorial currents, on an average, for that lengthened period. The acting cause however returned, and its strength may be gathered from the fact that the mean temperature of the month of December at Greenwich during the twenty-five years from 1825 to 1850 was higher in eight years than that of the month of November, an anomaly which had only taken place thrice in the first quarter of the century. The last occurrences of the same kind, with which I am acquainted, happened in the years 1858, 1861, and 1862; but the strong retardations of winter, noticeable towards the year 1850, were then rapidly disappearing, and it is not improbable that in the further fluctuations that have since followed, a new correspondence between the secular rise of temperature of the months of November, December, and January at Greenwich, and the considerable maximum of auroral intensity reached during the years 1870–1873, may be found to bear out an analogy which is only hazarded here, in the absence of a better working hypothesis, as an apparently real and perhaps not altogether unnatural connection.

With regard to the relative proportion between eastward and westward movements of auroral rays, I know of no observations that have been made that can offer Mr. Procter any additional information. The possibility that auroral streamers may be uprushes of positive or negative electricity to a point of saturation in the highest regions of the atmosphere, followed by downrushes of the same electricity when the exciting cause in the interior or on the surface of the globe subsides, might be well proved by such observations. The existence of the motion shows that the auroral rays diverge sensibly from the earth's lines of magnetic force, probably in the endeavour (whether effectual or not is indifferent to the explanation) of the Aurora Borealis and Aurora Australis to combine and to neutralise each other (perhaps a rare occurrence) across the equator. The strength of the motion of the beams may be some measure of this tendency, and its absence a sign that the aurora is local and of comparatively little generality and extent. It may here be remarked that the annual periodicity of auroras differs entirely from that observed in the average frequency of sporadic shooting stars, which reaches a maximum in August and September, but has a well-marked minimum in March, resembling the single cold of winter and the single heat of summer produced three months earlier, in each year, by the tropical motion of the sun. A marked frequency of auroras on the dates of January 1–3, April 19–21, August 9–11, October 18–21, November 14 and 27, and December 10–12, when meteor-showers of various degrees of brightness are of almost annual occurrence, has not, as far as I am aware, been definitely traced and established; but the large auroral catalogues recently published by Prof. Loomis and Prof. Lovering will, it is evident, supply very valuable materials by which any such connection between auroras and periodical meteor-showers, if it exists, can be more thoroughly investigated and determined.

A. S. Herschel

Automatism of Animals

Your correspondent, Mr. Wetterhan, has, I think, misunderstood Prof. Huxley's argument; which is, not that the adjusted motions he refers to never were the result of conscious and voluntary motion, but that they are not so now. His letter has, however, induced me to call attention to what has always seemed to me a real difficulty. As I understand automatic or reflex actions, they are those which have been so constantly repeated and which are so essential to the well-being of the individual, that the various nerves implicated have become so perfectly co-ordinated that the appropriate stimulus sets the whole machinery in motion without any conscious or voluntary action on the part of the individual. Thus we can quite understand how a paralysed limb would be drawn up when the sole of the foot is tickled or the toe pricked. If, however, any such irritation continues to be felt in the normal state, a man would stoop down and remove the irritating substance with his hand, or would place his foot upon the opposite knee, and, stooping down, endeavour to *see* the object which caused the irritation. But these are *conscious*, not *reflex*, acts. They are not repeated often enough, and are not sufficiently identical in form, to become automatic; and we are not told that a wholly paralysed human body does actually go through these various motions, as it certainly would do if not paralysed.

Now, in the case of the frog I can quite understand the jumping, swallowing, swimming, and even the balancing; for all these are actions so essential to the animal's existence, and so often repeated during life, as to have become automatic. So, also, I can understand the drawing up of the foot to remove an irritation on the side of the body, for with the short-necked frog this too is an essential, and must have been an oft-repeated action. But we are further told that "if you hold down the limb so that the frog cannot use it, he will, by and by, take the limb of the other side and turn it across the body, and use it for the same rubbing process." Now, this seems to me not to be explicable by automatic or reflex action, because it cannot have been an action frequently if ever performed during the life of every frog. It is true that from the co-ordination of the movements of the opposite limbs, we might expect, if the irritation were continued, and the leg on the same side kept for some time in motion, that the other leg would begin to move *in the same way*. But what causes it to move in a quite different and unusual way, *across* the body to the opposite side; and this, as related, at once and without first trying its own side? The most usual motion of both legs is directly up and down, each on its own side. What is it that causes one of these legs, when it

begins to move, not to move in the usual way (that which *is* automatic during life), but in an unusual manner, which must have been very rarely, if at all, used during life, and when used must have been purely conscious and voluntary? I think I cannot be mistaken in considering this to require some explanation. It may be that the frog is constantly, during life, crossing one foot over to rub the opposite side of the body; but we cannot accept this as an explanation unless it has been observed to be a fact. What puzzles me is, that Prof. Huxley, Dr. Carpenter, and Mr. Darwin, all refer to this case as an example of reflex action, and none of them see any difficulty in it, or seem to think that it requires any more explanation than the remaining quite intelligible cases. As others may, like myself, feel the difficulty I have endeavoured to point out, I hope some of your physiological correspondents will enlighten us if they can.

ALFRED R. WALLACE

Supernumerary Rainbow

IN Mr. Backhouse's letter (NATURE, vol. x. p. 437) he remarks that the supernumerary rainbow is commonly seen only in the upper part of the arch. Dr. Thomas Young, in his Bakerian Lecture ("Works," vol. i. p. 185, or Phil. Trans. 1804), after explaining the supernumerary bow by interferences, quotes a paper in vol. xxxii. of the Phil. Trans., in which Dr. Langwith describes his observation of a supernumerary bow on August 21, 1722; then remarks: "I have never observed these inner orders of colours in the lower parts of the rainbow. I have taken notice of this so often that I can hardly look upon it as accidental; and if it should prove true in general, it will bring the disquisition into a narrow compass; for it will show that this effect depends upon some property which the drops retain whilst they are in the upper part of the air, but lose as they come lower and are more mixed with one another." But I am not aware that anyone has ever remarked an appearance which struck me on seeing a few days ago a very complete primary and secondary bow with a portion of two supernumerary bows within the primary and about the highest part of the arch. To my eye the supernumerary bows were *not concentric* with the primary. My son agreed with me as to this appearance when I pointed it out to him; yet I thought it was probably an illusion till the following explanation occurred to me.

The rain-drops may be presumed to be smaller high in the air, and to increase as they descend.

Now, the smaller drops produce wider interference fringes than the larger drops do. Hence the supernumerary bow is widest and therefore farthest from the primary at the top of the arch, and gets narrower and nearer to the primary as it descends the arch on each side, and "in the lower parts" ultimately fines away to nothing. According to this theory the supernumerary bow is not always concentric with the primary, nor indeed circular.

It should be observed that another reason for the interference bow being seen most frequently at the highest part of the bow is that the small drops high in the air are probably more uniform in size than the larger drops lower down.

Oct. 8

JOSEPH BLACKBURN

Colour in Flowers not due to Insects

THE doctrine that the conspicuous colours of flowers are entirely due to the necessity for cross-fertilisation by the agency of insects seems to be taking the world by storm. It is supported by Mr. Darwin and Sir John Lubbock. It could scarcely be put forward on better authority. Yet there are several facts with which it does not harmonise. For instance—

1. *Cultivation* increases the size and colour of flowers quite independently of the existence or non-existence of insects.

2. *Double flowers* in which the doubling arises from metamorphosis of stamens or pistils are more showy than the single forms, yet insects can be of little use to them, since they are either partially or entirely barren. The double-blossomed cherry is brilliantly conspicuous, but it bears no fruit.

3. Such *abortive flowers* as the cultivated Guelder Rose and Hydrangea depend for their beauty upon the destruction of the reproductive organs. If their increased splendour is meant only as a lure to insects, it is surely an absurd failure.

4. The *autumn colours* of leaves and fruits can serve no such purpose, yet these are often as bright and conspicuous as the flowers of summer.

5. *Fungi* and *lichens* exhibit brilliant colours, which can have nothing to do with insect-fertilisation.

Do not these facts indicate that though insects may be attracted by conspicuous colours, and may have some influence in the maintenance of coloured species, there is yet a deeper and more permanent cause for the colour itself?

Leicester, Oct. 11.

F. T. MOTT

Habits of Squirrels

WOULD you permit me to ask of your readers a question or two upon the habits of squirrels? I have had one in my possession, from the age of three weeks, for more than two years. I have noticed that whenever it cleans itself, after licking, it *sneezes* violently three or four times into its forepaws, then rubs them thus damped over its fur. It seems to have the power of sneezing at volition.

Now, is this habit of sneezing, for the purpose of cleaning itself, a habit peculiar to squirrels; or is it shared by other animals?

I notice also that frequently when it is going thoroughly to clean itself it jerks its forepaws over its ears, bringing them back over its eyes, and always causing a milky liquid to suffuse the eyes. This liquid swims over the eye, and then is absorbed. I have thought that it may use this secretion also for the purpose of moisture. The animal is in perfect health and splendid condition.

A squirrel I had three years ago also had this habit, though in a slighter degree.

D. T.

THE NEW VINE-DISEASE IN THE SOUTH-EAST OF FRANCE

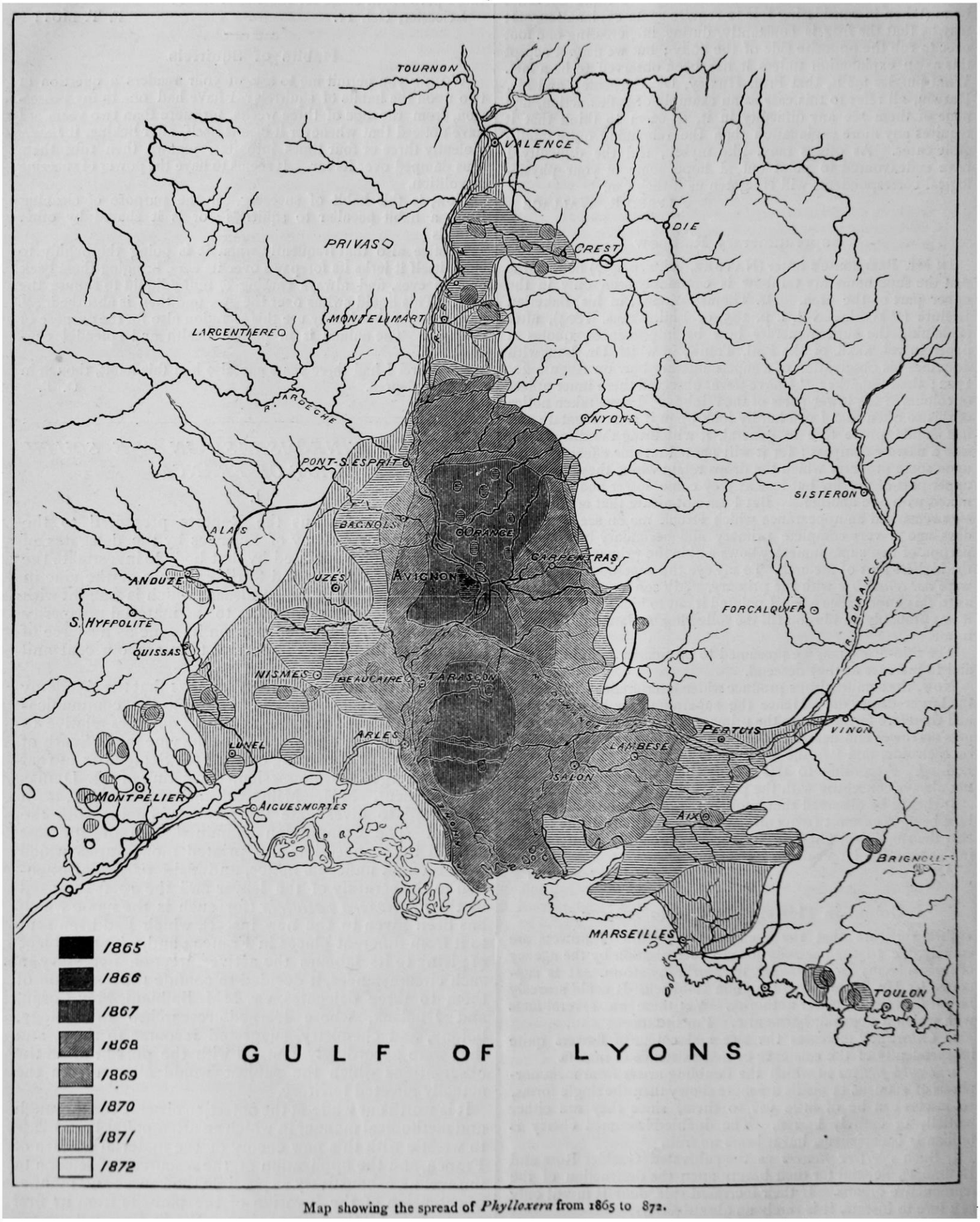
I.

WE have before us the Reports presented to the French Academy of Sciences by the delegates of the Commission appointed by that body to investigate the phenomena of the new and terrible disease of the vine in the south-east of France—a disease which is fraught with the most serious consequences to the material prosperity of that country, which depends on its wine as a source of national wealth not less important than are our coal and iron to us.

It was in the autumn of the year 1871 that the Academy of Sciences directed special attention to the communications which poured in upon it from all quarters relative to the ravages of the new parasite of the vine in the South of France; and at the sitting on the 25th September in that year, it charged a Commission, consisting of M. Dumas as president, MM. Milne-Edwards, Duchartre, and Blanchard, to investigate the means of coping with the disease. The Commission examined with the greatest care all the manuscripts and printed monographs which were brought under its notice, and paid particular attention to the scrutiny of the leaves and the roots attacked by the *Phylloxera vastatrix* (for such is the name which has been given to the new insect), which had been sent to it from different places in France; and, with the object of giving to its labours the active direction necessary in such circumstances, it decided to confide the execution of them to three delegates, viz. MM. Balbiani, Max Cornu, and Duclaux, whose learned researches in zoology, botany, and chemistry, suggested recourse to them, and they were accordingly charged with the pursuit of all the observations which the subject would allow of, on the actually affected territory.

It is worth our while, at the outset, to observe the thorough and methodical manner in which an attempt has been made to wrestle with this new enemy of the material welfare of France, and the application of the resources of science to unravel as exhaustively as possible the causes and manner of extension of the invasion of the parasite from its first appearance till the present time. We in England are too apt in similar crises to neglect the practical employment of scientific means, to depend on private and individual exertions for the investigation and treatment of the different causes which threaten the national wealth or

prosperity; and though in the long run perhaps we come out of the difficulty in a manner not altogether unsatisfactory, still such result can only be obtained at the xpense of interests to which speedy action and promp methodical treatment are the only means of preservation. But in France and in most of the continental countries of



Map showing the spread of *Phylloxera* from 1865 to 872.

Europe, the State, or at least important corporate bodies, come quickly to the aid of science, which, thus subsidised and encouraged, can penetrate far deeper and can have a freer play for its researches. As a result, in the present case we have the studies of men of science on this subject of altogether national importance, studies which, if we mistake not, should go far to direct the efforts of the nation into the right course of treatment for the extirpa-

tion of this alarming scourge, which has destroyed the produce of so many of the fairest vineyards of the south-east of France.

It is a matter of no difficulty to master the history of the new disease produced by the *Phylloxera*, and to trace its growth from the earliest beginnings. The first definite signs of the invasion of the parasite were observed in the year 1865, at a spot (plainly marked in the maps annexed to the report of M. Duclaux, and now copied for our readers) on the plateau of Pujaut, near Roquemaure, in the neighbourhood of Avignon, and in the department of the Gard, on the west bank of the river Rhône. Though in this year it attracted but little attention, in 1866 it descended rapidly from the plateau to the outskirts of the village of Roquemaure, and also appeared in several spots in the departments of Vaucluse and the Bouches du Rhône, both lying on the east side of the river-valley. It was the owner of a vineyard in this latter department, a M. Delorme, of Arles, who was the first to recognise the disease, while still in the birth, as a new disease, and to have the presentiment of the disasters which would follow in its train. At a later period a commission of the Society of Agriculture of the Hérault visited by request the vine-yards around Saint-Rémy, and a member of that commission, M. Planchon, discovered that the cause of the vine-disease was an insect "destined to be the subject of so much discussion, and to become the source of so much misery." It was he who afterwards gave the parasite the name which it has since borne everywhere—*Phylloxera vastatrix*.

Before proceeding to describe the ravages of the insect and the manner in which it ultimately causes the death of the vine, it will be well to show the progressive extension of the disease itself over the country adjacent to the Rhône valley and lying inland to the north of the Gulf of Lyons. M. Duclaux has shown us, in his series of maps annexed to his report, the progress of the disease between the years 1865 and 1872, and marks it as gradually extending from the little spot first attacked in the neighbourhood of Avignon till in the last of those years it included the whole country between Valence on the north and Marseilles on the south, while westwards and eastwards it extended to Montpellier and Aix respectively, thus covering, roughly speaking, nearly four departments, viz., the Gard, the Drome, Vaucluse, and Bouches du Rhône. We are told in the memoir of M. Louis Faucon, also presented to the Academy of Sciences, and embracing a later period than that of M. Duclaux, that the disease extended to an alarming degree in the year 1873, at the same or a greater progressive rate, and had established itself in that year in no less than twelve departments of South-east France, having spread into the Ardèche, the Basses-Alpes, Var, Isère, Hérault, and even reaching so far as the Gironde and the two Charentes.

We may gain a more precise idea than can be afforded by a mere observation of the geographical extension of the disease, of the disastrous nature of the ravages of the *Phylloxera*, by the examination of some of the statistics of the grape-crop in successive years in some of the departments attacked. Thus, in the department of Vaucluse, where the disease showed itself in 1866, there were in 1869, according to the results obtained by the departmental commission instituted at Avignon to observe on the new vine-disease, 6,000 hectares absolutely dead or dying, and a much larger number already attacked, which have since succumbed to the parasite. Out of the 30,000 hectares of vineyard comprised in this department, 25,000, or five-sixths of the total area, have been destroyed. In the Gard, where the vine flourishes better than in the above-mentioned department, the ravages of the disease are yet most terrible, for in 1871, in the arrondissement of Uzès, but one-half of the average crop was produced, and in the arrondissement of Nismes, a tenth part of the crop was destroyed. These proportions, moreover, have increased since that year.

If we examine the mischief done in the less extended areas of the communes, we shall obtain a still clearer idea of the rapid spread of the disease :—

COMMUNE OF GRAVESON.

1865-66-67	mean crop	10,000	hectolitres
1868	"	5,500	"
1869	"	2,200	"
1870	"	400	"
1871	"	250	"
1872	"	100	"
1873	"	50	"

In the commune of Maillanne the crop in 1868 was only 40 per cent. of the average of the three preceding years, while in 1869 it was only 10 per cent. In the commune of Eyragues the crop in 1868 was about 33 per cent. of the average of the three preceding years, and in 1869 there was a further falling off of about 10 per cent. In 1870 the crop in the three above-named communes was almost entirely destroyed. From instances such as these, fairly selected from many others equally tragic in their stern figures, we may form some idea of the magnitude of the disaster. Indeed, it is difficult to see, so rapid is the extension of the disease, how, unless some potent and effective remedy can be soon applied, any vine-bearing district in France can escape the visitation of the *Phylloxera*.

Though there can be no doubt that the *Phylloxera* is the cause of the new vine-disease, this conviction was by no means arrived at at once, nor without considerable doubts being thrown upon it by those whose better judgment was obscured by the confusion of concomitant phenomena such as drought, cold, and impoverishment of the soil with the real source of malady of which they were the companions. Others, even now, hold that the *Phylloxera* is the effect and not the cause of the disease; this idea M. Faucon dissipates satisfactorily in his treatise by the following reasoning :—A vine is watched which is in a perfect state of health and vigour; not a single parasite is discovered in the ramifications of its roots. A day comes when the destructive insect invades it—it resists for some time; the *Phylloxera* lays its eggs, multiplies its numbers, and with them its attacks. The stem of the vine begins to show signs of the disease, and if the roots are laid bare, they may be observed to have deteriorated in some degree from their normal state. The multiplication of the insect continues, and assumes such proportions as to form yellow spots of no small size, the result of the close collection of a large number of the insects, whose puncturings are so numerous and so incessant that the roots can no longer perform their proper function, the nutrition of the plant, which, in consequence, falls into a most evident state of sickliness, lingers on for some time, and eventually dies. The *Phylloxera* takes its first food where it can get it with the least difficulty. After it has exhausted the surface rootlets, tender and succulent as they are, it attacks others deeper down; then it spreads over the hardier roots, till at last the prodigious increase of its family causes it to overrun the whole radical system of the plant, and even the part of the stock of the vine which is underground. It abandons the exhausted plant when it is of no more use to it, and its instinct turns its steps towards a new vine, where it can find fresh food. The work of destruction in a vine, especially if it be vigorous and the soil nutritious, is not completed in a few days. A year may pass without the vine exhibiting any marked sign of sickness. The store of vigour which it contains in itself, added to that which it imbibes for some time after it is attacked in the soil, will permit it during one or even two seasons to perform the double functions of nourishing both itself and the parasite which eventually destroys it. M.

Faucon's observations, confirmed by those of all the other persons who have made positive investigations for themselves, have established that—

1. The number of insects on a plant is in direct and constant accordance with the state of the roots.

2. According as the state of the roots is healthier, is the number of insects greater.

3. The number diminishes in proportion to the exhaustion and consequent death of the roots.

4. On an absolutely dead plant it is impossible to discover a single insect. Surely, therefore, the *Phylloxera* is the cause, and the only cause, of the vine-disease, since its appearance invariably precedes the rotting of the roots, and never follows on their decay

We postpone till next week the description of the *Phylloxera* itself and the manner in which it attacks and ultimately kills the vine, together with the mention of the various means which have been proposed for the extirpation of the disease.

(*To be continued.*)

PHYSICS AT THE UNIVERSITY OF LONDON*

AT the present time, when the bulk of the educated population of many countries may be divided into the three classes of *Evaminandi*, *Examinati*, and *Examinatores*, a large part of any discussion of what is called the higher education must inevitably be devoted to the question of examinations. Usually, if the matter is discussed from the point of view of those whose business it is to teach, the result is the condemnation of examinations in general as unfavourable to all thorough study; and, from whatever quarter the discussion proceeds, it seems to be taken for granted that the functions of the teacher and those of the examiner are naturally opposed to each other. And indeed no one who has given any attention to the question can doubt but that such an opposition really does exist in very many cases. Originally employed by teachers themselves to consolidate and test the results of their instruction, examinations were at first a natural part of the educational system; but of late years they have rapidly developed into an independent species, which has separated off from the parent organism and now too often tyrannises over it. As of other developments, so of this, we are bound to believe that it is an adaptation to co-existing conditions, and therefore fulfils some useful purposes; but, from the teacher's point of view, as soon as examinations become detached from instruction, and come to be the end of learning instead of a means of teaching, the evils they produce are much more apparent than these benefits. When they have no worse result, they are apt to be viewed by students as affording them an authoritative standard, independent of the judgment of their professors, by which to decide what subjects of study and what parts of these subjects are of sufficient importance to be worthy of their attention. It is therefore not to be wondered at that such examinations should be looked upon by teachers with dislike, as being hindrances and not helps to their work, or that we should hear frequent protests against their excessive multiplication.

While, however, I in general heartily sympathise with such protests, and feel strongly that the difficulty of honest and thorough teaching in my own subject is greatly increased by the regulations for those examinations which, in fairness to the students attending my lectures, I am bound not to lose sight of, it does not seem to me that the remedy for the evils complained of is to be looked for in the abolition of the present examination system. This system is no doubt defective in many ways, and we may perhaps hope that some day it will be replaced by one more accordant with sound educational principles; for the present, however, it exists, and must be recognised as one of the conditions under which our work has to be done. Practical wisdom therefore teaches that instead of trying to get rid of it, we should strive as far as possible to improve it, to lessen its faults, and to develop whatever good it may be susceptible of.

It is admitted on all hands that examinations carried on in direct connection with teaching are of great educational value, of so much value indeed that no careful teacher ever thinks of doing without them. What, therefore, in the interests of sound education, we ought to strive for, in relation to those examinations which are not connected with any system of instruction, is that they should be made, as nearly as possible, what they would be if they did form part of such a system. It is perhaps too much to expect that this should be taken as the leading principle in the case of examinations such as those, now so common in connection with various branches of the public service, which exist for the primary object, not of promoting education, but of preventing dolts and dunces from being supported at the public expense; but, besides these, there are many examinations nowadays, which, though unconnected with teaching, are professedly intended for the advancement of education. Among such examinations, those of the University of London are on many accounts the most important, and the intimate relation between them and much of our work in this College seems to me to be a sufficient reason for considering how far the influence which, through this relation, they exert upon our teaching, is beneficial or otherwise.

If any further justification be needed for discussing the educational tendency of the examinations of the University of London, beyond the general one arising from the paramount importance of the improvement of education, it may be found in the history of the University. It is doubtless known to many of my audience that the University of London was constituted, in most essential respects as it now exists, by a Royal Charter dated December 5, 1837, in order, "for the advancement of religion and morality, and the promotion of useful knowledge, to hold forth to all classes and denominations of [her Majesty's] faithful subjects, without any distinction whatsoever, an encouragement for pursuing a regular and liberal course of education." The form which this encouragement was to take was that of "ascertaining, by means of examination, the persons who have acquired proficiency in Literature, Science, and Art, by the pursuit of such course of education, and of rewarding them by Academical Degrees, as evidence of their respective attainments, and marks of honour proportioned thereto;" and it was directed that all persons should be admitted as candidates for degrees in Arts and Laws, who should produce certificates of having completed the course of instruction prescribed by the University either in *this* College or in King's College, London, or in any other such institution as might be authorised by the Crown to issue such certificates. But in 1858, the Senate of the University obtained a new charter by which they were empowered to admit candidates to the examinations for degrees in Arts, Laws, Science, and Music without requiring them to have previously pursued any prescribed course of study, or to have attended any particular place of instruction; and since that time no other qualification has been demanded of graduates of the University of London (with the exception of those who have taken degrees in Medicine) than the ability to pass the appointed examinations. I do not now propose to discuss the question whether the passing of an examination only affords as good ground for conferring academical distinction as the passing of the same examination combined with studentship at some recognised college or other educational institution; my object at present is

* Introductory Lecture delivered at the opening of the Session of the Faculties of Arts and Laws and of Science, in University College, London, on Monday, Oct. 5, 1874, by C. Carey Foster, F.R.S., Professor of Physics.

simply to draw attention to the fact that the University of London, created in order to encourage the pursuit of "a regular and liberal course of education," no longer requires candidates for degrees in Arts or in Science to pass through any collegiate course, but considers that she sufficiently fulfils her mission by devising and carrying out into practice a system of examinations. It appears to me that this fact justifies all who are interested in the progress of sound education in demanding that these examinations should be so arranged as to encourage to the utmost possible extent thorough study and conscientious teaching.

The present Regulations of the University do not in all cases seem to me to fulfil this condition as completely as they might do, and I therefore think that I may suitably make use of this opportunity for trying to point out their defects as definitely as I can, and for attempting, if possible, to suggest improvements. I need hardly say, however, that whatever criticisms or suggestions I may venture to make will refer almost exclusively to the Regulations affecting that branch of science, namely Physics, with which I am specially connected. I believe, nevertheless, that the general principles which it is of greatest importance to keep in view in framing an examination in any department of knowledge are very nearly the same, and therefore I venture to hope that if the reflections which my experience of the London University examinations, both as an Examiner and as a Teacher, has suggested to me, are of any value in relation to my own subject, they may not be quite worthless in relation to others.

In order to apply to the case of Physics the general principle that examinations and direct teaching ought to be only different ways of attaining the same object, it is needful to consider first of all what reasons there may be for including the study of Physics in "a regular and liberal course of education," and what ought therefore to be the aim of teacher and examiner alike. With regard to this point, it will probably be admitted that the educational value of the study of Physics depends upon the mental discipline which it ensures, and not upon the individual facts, or even on the general laws, with which it stores the memory. It follows from the nature of the phenomena with which this science deals, that, to a much greater extent than has hitherto been the case with the phenomena of any other branch of science, the exact conditions of their occurrence have been ascertained, and the relations which they bear to one another have been expressed by definite numerical laws. In consequence of the precision which it is hence possible to give not only to statements respecting individual physical phenomena, but also to statements involving general laws, the reasoning by which the conclusions of Physics are established assumes a stricter character than can be attained in any other branch of natural science. It may be confidently asserted that, for training the mind in habits of accurate thinking, no other study can be compared with that of Physics if properly pursued; for, while it affords abundant practice in deductive reasoning of mathematical strictness, it obliges us to give no less attention to the converse process of inferring general laws from particular concrete phenomena and the direct impressions which they make on our senses. It is this combination of deductive with inductive reasoning which constitutes the special value of the study of Physics for the purposes of mental discipline. It is quite true that the deductive processes of Physics are borrowed from Mathematics, and that it shares the inductive method with all the other branches of natural science; but the greater definiteness of physical phenomena, as compared with those of other sciences, not only, as I have already said, leads to a greater definiteness in our general conclusions respecting them, but, as a further consequence, makes it easier to test the truth or falsehood of their conclusions by comparing the results deductively derived from them with the results of new experiments or observations. It may even, indeed, be thought that the comparative definiteness and precision of the problems with which the science of Physics is concerned render the study of it less serviceable, as a preparation for dealing with the complex questions which arise in the common experience of life, than the study of sciences in which the uncertainty and indefiniteness of the data leave a greater scope for the exercise of a judicious tact in the estimation of probabilities; but to maintain such an opinion would be very much like saying that in order to become familiar with the laws of chemical action and the nature of chemical combination, we ought to study the transformations of albumen and chlorophyll rather than the properties of such things as potassium, oxygen, or sulphuric acid. It is of course because physical phenomena are simpler and more accessible to investigation than those of Chemistry or Biology, that greater progress has been made in the study of them, and that the explanations that have been reached are of a higher degree of certainty and generality; but it is precisely the relatively advanced stage which has been reached by it that gives to the study of Physics its high value as an element in general education, and is the reason why it furnishes us with fuller and more instructive examples of scientific reasoning than other sciences.

The nature of the intellectual benefits that have been pointed out as resulting from this study, suggests at once the conditions that must be fulfilled in order to obtain them. If in studying Physics we really undergo, as I have said, a process of training to think correctly, this can only be through the exercise of our minds in following the demonstrably correct trains of thought whereby the general conclusions of Physics have been derived from the observed facts, and through our becoming so familiar with them that, consciously or unconsciously, we take them for our models, whatever may be the subjects to which we require to direct our minds. It follows from this that these benefits do not depend upon the direct results of experiment or observation with which the study makes us acquainted, nor upon the general laws of nature which it reveals to us, but upon the reasoning processes whereby facts and laws are connected together and both are made part of the living body of science. And from this again we see that the kind of teaching and study to be aimed at is that which enables us to trace these processes step by step and to understand their validity; while the kind to be anxiously avoided is that which stores the memory with detached pieces of information, either in the form of facts whose mutual relations are not perceived, or in the form of theoretical conclusions hung up between heaven and earth, and supported neither by revelation from above nor by demonstration from below. This latter, however, is the kind of teaching so much in demand and so frequently offered, which is known by the name of "cramming."

By way of guarding against misconception, it may be well to point out—what, however, is exceedingly obvious—that there can be no reasoning about Physics until the facts of Physics are known, and therefore that the teaching of these facts must always occupy an important place as the indispensable groundwork of all that is to follow. But still it must be remembered that, so long as we are considering the study of Physics merely as a part of general education, the facts of the science are of importance only in relation to the reasoning that is based upon them. Taken by itself, one bit of information is of about as little use in developing the mental powers as any other; it does us about as much good to be told that "heat is a mode of motion" as that "the Government of England is a limited monarchy," and to know the difference between a thermometer and a barometer enlarges the mind to about the same extent as to know how to distinguish a pitchfork from a Dutch hoe.

We may now return to consider the effect of the examinations of the University of London upon the teaching of Physics. These examinations, as we have seen, exist for the express purpose of encouraging the pursuit of "a regular and liberal course of education," or, as it may be otherwise expressed, in order to encourage good teaching and to discourage bad; and in the foregoing remarks I have tried to show as definitely as I can what meaning is to be attached to the words "good" and "bad" in relation to the teaching of Physics. The obvious conclusion, applicable to the particular point to which I now wish to ask your attention, is that examinations are to be regarded as *good* if they induce candidates to *think* about the mutual relations of individual facts and their connection with general principles; while examinations are *bad* in proportion as they lead to the loading of the memory with unconnected scraps of knowledge.

There are two ways in which the examinations of the University of London tend to affect the quality of teaching for good or for evil: first, by the general Regulations drawn up by the Senate in reference to the various examinations, including the list of subjects to be taken up and the specifications of the requirements in each subject; and secondly, the questions set by the Examiners, which form as it were a detailed commentary, authorised by the Senate, on the meaning of their own Regulations. For various reasons, the lowest examinations, or those which come earliest in the University scheme, produce the greatest effect on methods of teaching and learning; for one thing, they affect the greatest number of candidates, and they come at a part of the candidates' career when they are most dependent on external authority or advice as to the course of their studies.

THE BIBLIOGRAPHY OF SCIENCE

THERE can be no surer indication of the universal spread of science during the last few years than the large and annually increasing number of works relating to its various branches that are advertised for publication during each successive season. The considerable element which science now forms in education, in the arts and manufactures, in commerce and agriculture, and in the social economy of life, renders the knowledge of at least its rudiments absolutely necessary in almost every sphere of existence. The particulars given below will show that publishers are fully alive to the importance and value of good works in this department of literature.

Although even now we have a large quantity of educational books of varying degrees of mediocrity and excellence in almost all the commoner branches of science, and the number of works is ever increasing, yet the advance made by science makes it imperative that fresh manuals and class-books and new editions should be continually published, in order that students and workers should be enabled to keep pace with its rapid strides. The works we notice beneath range from the smallest general primer to the most elaborated and matured works in particular and specific branches of science; and among them will be found books by men of the highest reputation in their special provinces. We have endeavoured to notice every work of importance which is to be published during the next few months; but our list is necessarily incomplete; we shall, however, in future numbers note any deficiencies, omissions, or fresh announcements.

In ASTRONOMY we observe the following books:—*The Moon*, and the Condition and Configuration of its Surface, by Edmund Neison, Fellow of the Royal Astronomical Society, &c., illustrated by maps and plates. (Longmans.) *A Primer of Astronomy*, by J. Norman Lockyer, F.R.S., with illustrations. (Macmillan.)—A new edition of *Navigation and Nautical Astronomy*, in theory and practice, by Prof. J. R. Young. (Lockwood.)—*The Transits of Venus*, a Popular Account of Past and Coming Transits, from the first observed by Horrocks, A.D. 1639, to the Transit of A.D. 2112, by Richard Anthony Proctor, B.A. Cantab., Hon. Fell. King's Coll. Lond., with twenty plates and numerous woodcut illustrations. (Longmans.)

In CHEMISTRY we are promised a new edition of *Dr. Normandy's Commercial Handbook of Chemical Analysis*, enlarged and almost re-written by Dr. H. M. Noad, Ph.D., F.R.S. &c., with numerous illustrations. (Lockwood).—A second edition of *Plattner's Manual of Qualitative and Quantitative Analysis with the Blowpipe*, from the last German edition, revised and enlarged by Prof. Th. Richter, of the Royal Saxon Mining Academy, translated by Prof. H. B. Cornwall, Assistant in the Columbia School of Mines, New York; this work is illustrated with eighty-seven woodcuts and one lithographic plate. (Sampson Low.)—*Industrial Chemistry*, a Manual for Manufacturers and for use in Colleges or Technical Schools, being a translation by Dr. J. D. Barry, of Professors Stohmann and Engler's German edition of Payen's "Précis de Chimie Industrielle;" edited throughout and supplemented with chapters on the Chemistry of the Metals, by B. H. Paul, Ph.D., with very numerous plates and woodcuts. (Longmans.)—A third enlarged edition of *A Systematic Handbook of Volumetric Analysis*, or the Quantitative Estimation of Chemical Substances by Measure, applied to Liquids, Solids, and Gases, with numerous engravings, by Francis Sutton, F.C.S., Norwich. (Churchill.)—*The Chemical Effects of Light and Photography, in their Application to Art, Science, and Industry*, by Dr. Hermann Vogel. (King and Co.)—A new edition, revised and enlarged, of *Practical Metallurgy*, by John Percy, M.D., F.R.S., Lecturer on Metallurgy at the Government School of Mines. Vol. I., Part 1. Introduction; Fuel, wood, peat, coal, charcoal, coke, refractory materials, fire-clays, &c. Vol. I., Part 2. Copper, zinc, brass. (John Murray.)

In PHYSICS and MECHANICS, Messrs. Longmans will publish the three following books:—*The Elements of Physics*, by Neil Arnott, M.D., F.R.S., the seventh edition, revised from the author's notes and other sources, and edited by Alexander Bain, LL.D., Professor of Logic in the University of Aberdeen, and by Alfred Swaine Taylor, M.D., F.R.S., Professor of Medical Jurisprudence, Guy's Hospital.—*Introduction to Experimental Physics, Theoretical and Practical*, including directions for constructing physical apparatus and for making experiments, by Adolf F. Weinhold, Professor in the Royal Technical School at Chemnitz, translated and edited (with the author's sanction) by Benjamin Loewy, F.R.A.S, with a preface by G. C. Foster, F.R.S., Professor of Physics in University College, London, with numerous wood engravings.—*Lessons in Elementary Mechanics*, introductory to the Study of Physical Science, by Philip Magnus, B.Sc., B.A. This book is adapted to the requirements of the London Matriculation, Preliminary, Scientific, First M.B., and other Examinations.

Messrs. Charles Griffin will issue *A Mechanical Text-Book*, a Practical and Simple Introduction to the Study of Mechanics, by William John Macquorn Rankine, C.E., LL.D., F.R.SS., &c., late Regius Professor of Civil Engineering in the University of Glasgow; and Edward Fisher Bamber, C.E.

In BIOLOGY we have a large number of new books and new editions, of which the following are the most noteworthy:—*The History of Creation*, by Prof. Ernst Haeckel, the translation revised by E. Ray Lankester, M.A. (King and Co.)—*Elements of Human Physiology*, by Dr. L. Hermann, Professor of Physiology in the University of Zurich, translated and edited from the sixth (yet unpublished) German edition, at the author's request, by Arthur Gamgee, M.D., F.R.S., Brackenbury

Professor of Practical Physiology and Histology in the Owens College, Manchester. (Smith, Elder, and Co.)—*Outlines of Animal Physiology*, with engravings on wood, by W. H. Allchin, M.B., M.R.C.P., Assistant Physician to the Westminster Hospital and Lecturer on Practical Physiology, Histology, and Pathology in its Medical School. (Churchill.)—*Notes of Demonstrations on Physiological Chemistry*, by S. W. Moore, F.C.S., Joint Demonstrator of Practical Physiology at St. George's Medical School. (Smith, Elder, and Co.) This work is nearly ready for publication.—The same publishers announce *The Pathological Anatomy of the Nervous Centres*, by Edward Long Fox, M.D., F.R.C.P., Physician to the Bristol Royal Infirmary, with illustrations; and a *Text-Book of Pathological Anatomy*, by John Wyllie, M.D., F.R.C.P.E., Lecturer on General Pathology at the School of Medicine, Surgeons' Hall, Edinburgh, &c.

We are glad to see that Messrs. Churchill have in the press a fifth and revised edition of Holden's well-known work on *Human Osteology*, comprising a Description of the Bones, with Delineations of the Attachments of the Muscles, &c.—The three following new works also belong to the same publishers :—*Frey's Manual of the Histology and Histo-Chemistry of Man*, a Treatise on the Elements of Structure and Composition of the Human Body, for the use of Practitioners and Students, largely illustrated with engravings on wood, translated by Arthur E. J. Barker, I.R.C.S.I., and revised by the author.—*The Student's Guide to Human Osteology*, with numerous lithographic plates, by William Warwick Wagstaffe, F.R.C.S., Assistant Surgeon and Lecturer on Anatomy at St. Thomas's Hospital.—*The Student's Guide to Practical Histology, Histo-Chemistry, and Embryology*, with engravings on wood; by H. A. Reeves, F.R.C.S. Edin., Assistant Surgeon and Demonstrator of Anatomy at the London Hospital.

The only other book we notice in this branch of science is a new edition of *Demonstrations of Anatomy*, being a Guide to the Knowledge of the Human Body by Dissection, by George Viner Ellis, Professor of Anatomy in University College, London, with 248 engravings on wood. The number of illustrations has been largely added to in this edition, and many of the new woodcuts are reduced copies of the plates in the author's work, "Illustrations of Dissections." (Smith, Elder, and Co.)

In GEOGRAPHY and TRAVELS, probably the works most looked for are *The Last Journals of Dr. Livingstone, in Eastern Africa, from 1865 to his Death*, continued by a narrative of his last moments and sufferings, taken down from the mouth of his faithful servants Chuma and Susi, edited by Rev. Horace Waller, F.R.G.S., Rector of Twywell, Northampton, with a map prepared on the spot by the author, and illustrations from his sketches. (Murray); and Sir Samuel Baker's new book, which is entitled *Ismailia*, a Narrative of the Expedition to Central Africa for the Suppression of the Slave Trade, organised by Ismail, Khedive of Egypt, with maps, portraits, and upwards of fifty full-page illustrations by Zwecker and Durand (Macmillan.)

Messrs. Sampson Low, as usual, are to the fore in books of travels. We give the titles and some particulars of seven of them :—*Turkistan*, Notes of a Journey in the Russian Provinces of Central Asia and the Khanates of Bokhara and Kokand, by Eugene Schuyler, Secretary of American Legation, St. Petersburg. This book will be profusely illustrated.—*The Straits of Malacca, Indo-China, and China*, or Ten Years' Travels, Adventures, and Residence Abroad, with upwards of sixty woodcuts from the author's own photographs and sketches, by J. Thompson, F.R.G.S., author of "Illustrations of China and its People." This work contains a narrative of the writer's personal experience and adventures in the Straits of Malacca, Siam, Cambodia, Cochin-china, and China, illustrated with over sixty wood engravings from the author's sketches and photographs. A long residence in the Straits of Malacca enabled the author to visit some of the native states, and to give an account of our important colonial possessions in that quarter of the globe, as also of his personal intercourse with the native Malay rulers, and his estimate of the value of the Chinaman and of Chinese labour in a tropical region.—*The Second North German Polar Expedition in the years* 1869—70, of the ships *Germania* and *Hansa*, under command of Capt. Koldeway, edited and condensed by H. W. Bates, Esq., of the Royal Geographical Society, and translated by Louis Mercier, M.A. (Oxon.) The narrative portion of this important work will be full of interest and adventure in the ice-fields; and, in addition to much matter of great scientific value, will give a graphic account of the hardships and sufferings of the crew of the *Hansa* after the crushing of that ship in the ice.—*Warburton's Journey across Australia*, an account of the Exploring Expedition sent out by Messrs. Elder and Hughes, under the command of Colonel Egerton Warburton, giving a full account of his perilous journey from the centre to Roebourne, Western Australia, with illustrations and a map, edited, with an Introductory Chapter, by H. W. Bates, Esq., of the Royal Geographical Society.—*Captain Tyson's Arctic Adventures;* Arctic Experiences, containing Captain George E. Tyson's Wonderful Drift on the Ice-Floe, a history of the *Polaris* Expedition, the cruise of the *Tigress*, and Rescue of the *Polaris* Survivors, to which is added a General Arctic Chronology, edited by E. Vale Blake, with a map and numerous illustrations.—*The Marvellous Country*, or Three Years in Arizona and New Mexico, by Samuel W. Cozzens, illustrated.—*The Earth as Modified by Human Action*, by George P. Marsh, being a new edition of "Man and Nature."

Mr. Murray announces *Six Months among the Palm Groves, Coral Reefs, and Volcanoes of the Sandwich Islands*, by Isabella Bird, author of "The Englishwoman in America," with illustrations.

Messrs. Trübner have nearly ready *A Peep at Mexico*, Narrative of a Journey across the Republic from the Pacific to the Gulf, in December 1873, and January 1874, by J. L. Geiger, F.R.G.S, with four maps and forty-five original photographs.

In MEDICINE, &c., the announcements are very numerous; we give the more important. Messrs. Longmans have in the press *A Dictionary of Medicine*, edited by Richard Quain, M.D., F.R.S., assisted by numerous eminent writers.

Messrs. Charles Griffin will publish very shortly *Outlines of the Science and Practice of Medicine*, a Handbook for Students, by William Aitken, M.D., F.R.S.

From Messrs. Churchill we receive notice of the following forthcoming books among a long list of others, viz. :—*Air, Water, and Sewage*, a Manual of Analysis for Medical Officers of Health, &c., by Francis Sutton, F.G.S., and William Thorp, B.Sc., F.C.S.—*A Handy-Book of Forensic Medicine and Toxicology*, with numerous wood engravings, by W. Bathurst Woodman, M.D. St. And., Assistant Physician and Lecturer on Physiology at the London Hospital, &c., and C. Meymott Tidy, M.A., M.B., Medical Officer of Health and Food Analyst for Islington.—*Experimental Investigation of the Action of Medicines*, a Handbook of Practical Pharmacology, with engravings, by T. Lauder Brunton, M.D., D.Sc., Lecturer on Materia Medica in the Medical College of St. Bartholomew's Hospital.—*The Diseases of Tropical Climates and their Treatment*, with Hints for the Preservation of Health in the Tropics, by J. A. B. Horton, M.D. Edin., F.R.G.S., Staff-Assistant-Surgeon of the Army Medical Department.—*The Face, Mouth, and Throat*, the Surgical Treatment of their Diseases, Injuries, and Deformities, with engravings on wood, by Francis Mason, F.R.C.S., Senior Assistant Sur-

geon and Lecturer on Anatomy at St. Thomas's Hospital.—*The Student's Guide to the Diseases of the Eye*, with engravings, by Henry Power, M.B., F.R.C.S., Senior Ophthalmic Surgeon to St. Bartholomew's Hospital.—*Report on the Issue of a Spirit Ration during the March to Coomassie*, by E. A. Parkes, M.D., F.R.S., Member of the General Medical Council.—*The Student's Guide to the Practice of Midwifery*, with engravings, by D. Lloyd Roberts, M.D., Vice-President of the Obstetrical Society of London, Physician to St. Mary's Hospital, Manchester.—*Clinical Studies of Disease in Children*, by Eustace Smith, M.D., F.R.C.P., Physician to the King of the Belgians, Physician to the East London Hospital for Children.

Messrs. Charles Griffin have nearly ready *A Dictionary of Hygiene and Public Health* (with illustrations), comprising Sanitary Chemistry, Engineering, and Legislation, the Dietetic Value of Foods, and the Detection of Adulterations, based on the "Dictionnaire d'Hygiène Publique" of Prof. Ambroise Tardieu, by Alexander Wynter Blyth, M.R.C.S., L.S.A., A.R.C., Medical Officer of Health, and Analyst to the County of Devon.

Messrs. Smith, Elder, and Co. also promise us a work *On the Curative Effects of Baths and Waters*, being a Handbook to the Spas of Europe, by Dr. J. Braun, with a Sketch on the Balneotherapeutic and Climatic Treatment of Pulmonary Consumption, by Dr. L. Rohden, an abridged translation from the third German edition, with Notes, by Hermann Weber, M.D., F.R.C.P., London Physician to the German Hospital.

The following BOTANICAL BOOKS are advertised as coming out this season:—*Medicinal Plants*, by Robert Bentley, F.L.S., Professor of Botany in King's College, London, and Henry Trimen, M.B., F.L.S., of the British Museum, and Lecturer on Botany at St. Mary's Hospital Medical School. This work will include full botanical descriptions and an account of the properties and uses of the principal plants employed in medicine, especial attention being paid to those which are officinal in the British and United States Pharmacopœias. The plants which supply food and substances required by the sick and convalescent will be also included. Each species will be illustrated by a coloured plate drawn from nature. This will be published in monthly parts, and Part I. will be ready very soon (Churchill.)—*Pharmacographia*, a History of the Principal Drugs of Vegetable Origin found in Commerce in Great Britain and British India, by F. A. Flückiger and D. Hanbury, F.R.S. (Macmillan.)—*The Primæval World of Switzerland*, by Prof. Oswald Heer, of the University of Zurich, translated by W. S. Dallas, F.L.S., and edited by James Heywood, M.A., F.R.S., with numerous illustrations. (Longmans.)

In the Sciences of GEOLOGY and MINERALOGY, &c., we are promised *Geology, for Students and General Readers*, embodying the most Recent Theories and Discoveries, by A. H. Green, M.A., Professor of Geology and Mining in the Yorkshire College of Science. Part I. The Elements of Physical Geology, with upwards of 100 illustrations by the author. Part II. The Elements of Stratigraphical Geology, with upwards of 100 illustrations by the author. (Daldy, Isbister, & Co.) The same publishers also have *Geological Climate and Time*, a Theory of Secular Changes of the Earth's Climate, by James Croll, of H.M. Geological Survey; *A Treatise on Mining*, by Lottner and Serlo, of the Berlin Academy of Mining, translated from the German by Prof. Le Neve Foster and Mr. Galloway, with 268 illustrations and diagrams; and *The Creation*, or Dynamical System of the Earth's Formation, in accordance with the Mosaic Record and the latest Discoveries of Science, by Archibald T. Ritchie.—*The Origin of Creation*, or the Science of Matter and Force, a New System of Natural Philosophy, by Thomas Roderick Fraser, M.D., and Andrew Dewar. (Longmans.)—*The Dawn of Life upon the Earth*, by J. W. Dawson, LL.D., F.R.S., F.G.S., Principal and Vice-Chancellor of McGill University, Montreal, with illustrations. (Hodder and Stoughton.)

Finally, among MISCELLANEOUS BOOKS the following will probably interest the majority of our readers:—A new edition is nearly ready of *The Origin of Civilisation and the Primitive Condition of Man*, Mental and Social Condition of Savages, by Sir John Lubbock, Bart., M.P., F.R.S. (Longmans.)—*Outlines of Cosmic Philosophy, based on the Doctrine of Evolution, with Criticisms on the Positive Philosophy*, by John Fiske, M.A., LL.B., formerly Lecturer on Philosophy at Harvard University. (Macmillan.)—*On the Sensations of Tone*, as a Physiological Basis for the Theory of Music, by Prof. H. Helmholtz, translated (with the author's sanction) from the third German edition by Alexander J. Ellis, F.R.S., F.S.A. (Longmans.)—*Out of Doors*, a selection of original articles on Practical Natural History, by the Rev. J. G. Wood, M.A., F.L.S., author of "Homes without Hands," &c., with six illustrations, from original designs engraved on wood by G. Pearson. (Longmans.)—*Insects Abroad*, being a popular account of foreign insects, their structure, habits, and transformations, by the Rev. J. G. Wood, M.A., F.L.S., illustrated with 600 figures by E. A. Smith and J. B. Zwecker. (Longmans.)—*The Aërial World*, by Dr. George Hartwig. (Longmans.)—*Memoir of Sir Roderick Murchison*, including extracts from his journals and letters, with notices of his scientific contemporaries, and a sketch of the rise and progress, for half a century, of Palæozoic Geology in Britain, by Archibald Geikie, LL.D., F.R.S., Murchison Professor of Geology and Mineralogy in the University of Edinburgh, and Director of the Geological Survey of Scotland. (Murray.)—*The Physics and Philosophy of the Senses*, or the Mental and the Physical in their Mutual Relations, by R. S. Wyld, F.R.S.E., illustrated. (King and Co.)—*The Elements of the Psychology of Cognition*, by Robert Jardine, B.D., D.Sc., Principal of the General Assembly College, Calcutta. (Macmillan.)—*On Parasites in the Animal Kingdom*, by M. Van Beneden. (King and Co.)—*The Doctrine of Descent and Darwinism*, by Prof. Oscar Schmidt. (King and Co.)—*Optics*, by Prof. Lommel, profusely illustrated. (King and Co.)—*Fungi*, their Nature, Influences, and Uses, by the Rev. M. J. Berkeley and Dr. M. Cooke, profusely illustrated. (King and Co.)—*Scientific London*, an account of the History and present scope of the principal Scientific Societies and Institutions of London, by Bernard H. Becker. (King and Co.)

THE NEW REPTILE-HOUSE IN THE JARDIN DES PLANTES

THE new house for Reptiles and Batrachians in the Jardin des Plantes at Paris was opened to the public last week. It contains four divisions: two larger central, and two smaller end compartments, all connected by folding doors. The front larger compartment is fitted up in the middle with large shallow tanks for the Crocodilia, of which there are five examples of *Crocodilus vulgaris*, *C. frontatus*, *Alligator mississippiensis*, and two species of *Jacare*. In front is a row of glass cages for Snakes—Boas, Pythons, and various Colubrines. The second larger compartment is devoted chiefly to Batrachians, and contains various Salamanders (*Triton*, &c.), and a large number of Axolotls (*Siredon*). In one tank are the two celebrated specimens of this most abnormal of creatures which have got rid of their external gills and converted themselves into the Salamandroid form, *Amblystoma*. In one of the end compartments are the venomous snakes; in the other, Lacertilia of various kinds.

The cages for the Snakes are fitted up with moss, earth,

and stones, which are certainly prettier and more natural than the gravel and blankets used for the same purpose in our Zoological Gardens. But the difficulty seems to be that the animals conceal themselves and are not easily extracted from their hiding-places, whereas a blanket is readily unfolded when the occasion requires, and is more easily kept clean and tidy.

There can be no question of the great improvement of this house as compared with its predecessor, nor of its superiority to the Reptile-house in our Zoological Society's Gardens, so far as concerns space and arrangement. But as regards the extent of the collection, we believe the London Society still holds its own.

NOTES

SEVENTY-FIVE cases of specimens taken by the *Challenger* expedition have been received at the Admiralty from Prof. Wyville Thomson.

THE vessel bearing the French Transit Expedition, under charge of M. Janssen, was caught in the typhoon which swept over Hong Kong on Sept. 23; although the ship appears to have suffered, the *personnel* and apparatus are happily safe. We may state that M. Janssen's wife accompanies him.

FROM the list of the lectures to be delivered during the present term at Oxford, on subjects connected with Natural Science, the want of organisation among the teachers of its different branches is but too apparent. The four biological courses—by Prof. Rolleston (1), Mr. Lankester at Exeter College (2), Mr. Barclay Thompson at Christ Church (3), and Mr. Chapman at Magdalen (4)—are to be on (1) The Comparative Anatomy of Vertebrata, (2) The Structure and Genealogy of Vertebrata, (3) Ichthyic Anatomy, (4) The Anatomy of Vertebrata; so that no provision is made for those who are studying Human Anatomy, nor the Invertebrata. Histology fares hardly any better, for its rapid progress during the last few years has quite overthrown the practical microscopy of ten years ago. The Professor of Experimental Philosophy and Dr. Lee's Reader in Physics are also both to lecture on Electricity.

SIGNOR L. M. D'ALBERTIS, the Italian naturalist, who recently ascended the Arfak Mountains in New Guinea and made so many important discoveries, is now at Genoa preparing for a fresh expedition into the same country, and will leave Europe in about a month's time. On this occasion the traveller will endeavour to penetrate into the southern part of that *terra incognita*, that is into the district adjacent to Torres Straits, where mountain-ranges of considerable altitude are known to exist. Should he succeed in his arduous enterprise, there can be no doubt that he will reap an abundant harvest, as the zoology of this part of New Guinea is absolutely unexplored.

SIGNOR D'ALBERTIS' former companion, the distinguished botanist, Dr. Beccari, is still in the East. His last letters, dated at Macassar in August last, announce his recent return there from an excursion into the south-eastern districts of Celebes. We believe that Dr. Beccari also is preparing for a fresh expedition to New Guinea.

UNDER the sanction of the trustees of the British Museum, the course of twelve lectures on Geology, which the liberal endowment of Dr. Swiney makes *free to the public*, will this year be delivered by Dr. Carpenter, at the Birkbeck Literary and Scientific Institution, Southampton Buildings, Chancery Lane, on Saturday evenings, at half-past seven o'clock, commencing Saturday next. We understand that the main purpose of the course will be to elucidate the past history of the earth by the study of the changes at present in progress; and that the course will include an account of the lecturer's own researches in the deep sea. It will be illustrated by an extensive series of photographs and paintings, exhibited by the oxy-hydrogen lantern.

THE South African correspondent who sent us the Natural History Notes which appeared in NATURE, vol. x. p. 486, is Mr. J. P. Mansell Weale.

IT has been decided to publish, as a yearly volume, a Record of Works on Geology, Mineralogy, and Palæontology, British and Foreign. The first volume will be printed by the middle of 1875, and will contain short abstracts or notices of papers, books, maps, &c., published during the year 1874. It is estimated that this volume will contain from 200 to 300 pages, and that its price will be 10*s.* 6*d.* The gentlemen named below have volunteered to assist in the work, which has already been begun. Those marked * have taken charge of various sections (as sub-editors), and the last has undertaken the post of general editor :—* W. Carruthers, F.R.S. (British Museum); C. E. De Rance, F.G.S. (Geological Survey); R. Etheridge, jun., F.G.S. (Geological Survey of Scotland); D. Forbes, F.R.S.; Prof. Geikie, F.R.S. (director of the Geological Survey of Scotland); * Prof. A. H. Green, F.G.S.; Prof. T R. Jones, F.R.S.; A. J. Jukes-Browne, F.G.S. (Geological Survey); * G. A. Lebour, F.G.S.; * L. C. Miall (Leeds Museum); E. T. Newton, F.G.S. (Jermyn Street Museum); Dr. H. A. Nicholson, F.G.S.; * F. W. Rudler, F.G.S. (Jermyn Street Museum); E. B. Tawney, F.G.S. (Bristol Museum); * W. Topley, F.G.S. (Geological Survey); Henry Woodward, F.R.S. (British Museum); H. B. Woodward, F.G.S. (Geological Survey); W. Whitaker, F.G.S. (Geological Survey). The work will be greatly helped if Provincial Societies and Field Clubs will forward copies of their publications to the editor. It is hoped, from the low price, that the number of subscribers will be enough to cover the expenses of printing; but should this not be the case, a number of eminent scientific gentlemen have kindly consented to act as guarantors. Names of intending subscribers, and of societies and institutions that will purchase the Record for 1874, will be gladly received by the editor.

MR. WILLIAM DITTMAR, F.R.S.E., Lecturer on Chemistry at Owens College, Manchester, has been appointed Professor of Chemistry at Anderson's University, Glasgow, in the place of Dr. Thorpe, who has been elected Professor of Chemistry at the Yorkshire College of Science.

DR. WILLIAM STIRLING has been appointed assistant to Dr. Rutherford, the newly elected Professor of Physiology in the University of Edinburgh.

DR. JAMES APJOHN has resigned his appointment of Professor of Chemistry in the Medical School of Trinity College, Dublin.

MR. BRYCE M. WRIGHT, the well-known collector of fossils, who for some time past had been far from well, died last week.

A NEW wing has been quite recently added to King's College, London, by means of which considerable improvements have been made in the Physiological Laboratory and the Dissecting Room.

TWO scholarships in Science, of the value of 100*l.* each, have this year been awarded at St. Bartholomew's Hospital; one to Mr. Coates, of Balliol College, Oxford, the other to Mr. Saunders, of Downing College, Cambridge, these gentlemen having been coupled as of equal merit for the first place in the competition.

THE following gentlemen have been elected to the vacant Natural Science Postmasterships in Merton College :—Mr. J. Larden, of Rugby School, and Mr. A. Macdonell, of Aberdeen University. The Delegates of Unattached Students of Oxford University give notice that the Master and Court

of Assistants of the Clothworkers' Company have offered three exhibitions of 50*l.* a year each, tenable for three years, for the encouragement of the study of natural science; the first examination to be held at the beginning of the Hilary Term 1875, at which time one exhibition will be awarded. Gentlemen who shall have matriculated in the present term, or who have not yet matriculated, are eligible for this exhibition.

THE following sonnet on the late Dr. Jeffries Wyman appears in the New York *Nation*, with the initials "J. R. L.":—

"The wisest man could ask no more of Fate
Than to be simple, modest, manly, true,
Safe from the Many, honoured by the Few;
Nothing to court in World, or Church, or State,
But inwardly in secret to be great;
To feel mysterious Nature ever new,
To touch, if not to grasp, her endless clew,
And learn by each discovery how to wait;
To widen knowledge and escape the praise;
Wisely to teach, because more wise to learn;
To toil for Science, not to draw men's gaze,
But for her lore of self-denial stern;
That such a man could spring from our decays
Fans the soul's nobler faith until it burn."

A TELEGRAM from Berlin states that Major von Mechow will shortly start by sailing vessel from Rotterdam to succeed Dr. Lohde, who is in ill health, in the military command of the scientific expedition which left Europe in June 1873, under the leadership of Dr. Gussfeldt, for the exploration of Central Africa. The Berlin African Society will also send out a second expedition under the leadership of Captain von Homeyer, which will leave at the end of December. It will first proceed to Canandge, on the frontier of Angola, and will endeavour to reach the capital of Muata-Jamvo.

THE Austro-Hungarian explorers of the North Pole are preparing a popular edition of their adventures, as well as a scientific narrative.

WE learn from *Iron* that a scheme has been recently devised for supplying London with an inflammable mixture of gases to replace coal. The new gas, termed "pyrogen," consists of a mixture of nitrogen and carbonic oxide, three-fourths by weight consisting of the latter gas. The temperature of combustion of the mixture is stated to be 2,700° C.; and for heating purposes the flame of the burning gas is to be allowed to raise some good radiating substance to incandescence in an ordinary grate. It is justly pointed out that with our present arrangements three-fifths of the available heat of coal are wasted, but, on the other hand, it must not be forgotten that on the proposed plan the force evolved in the oxidation of the carbon (in whatever form it is made use of) to carbonic oxide is likewise wasted. We should prefer, on the whole, to see some feasible plan for utilising the waste heat of coal, as the highly poisonous nature of carbonic oxide would, in the absence of all other objections, be a serious obstacle to its introduction into our dwelling-houses.

AT an influential meeting held at Manchester on Monday, to take measures to secure some permanent memorial of the late Sir William Fairbairn, it was resolved to raise funds for the purpose by public subscription, and "that the permanent memorial of Sir William Fairbairn be in the form of a statue of such a character and to be placed in such a position as may be hereafter determined, and also for a scholarship or some other suitable endowment in connection with the Owens College." It was understood that the scholarship or endowment should have special reference to the teaching of engineering or pure mechanics.

MR. JOHN HORNE of the Botanic Garden, Mauritius, who is now on a botanical expedition in the Seychelles, writing to Dr Hooker, says that he has visited the islands of Silhouette, Praslin, and Félicité, searching them from the sea-shore to the tops of the highest hills, in Silhouette up to 2,200 ft., at which elevation Pitcher-plants abound, hanging in immense clusters over every stone, bush, and tree. Flowers of these Nepenthes were obtained, and arrangements made for procuring a good supply of plants. When these materials come to hand it will be seen whether the Nepenthes of Silhouette is different from the *N. wardii* which grows in Mahè. The tops of these mountains where the Pitchers grow have a perpetual moisture hanging over them, being almost constantly enveloped by mist and rain.

WE have received an excellent little Italian work—price only two francs, notwithstanding its many illustrations. It is entitled "Parasiti Interni degli Animali Domestici," and is a translation of the well-known little English work on the subject, by Dr. Spencer Cobbold, F.R.S. The Italians are very anxious to make themselves acquainted with English scientific works, and this translation by Dr. Tommasi, as well as the admirable translation of Huxley's "Vertebrate Anatomy" by Prof. Giglioli, show their earnestness.

THE fifth volume of the "Annali del Museo Civico di Storia Naturale" of Genoa, just issued, is occupied with an excellent memoir on the Ornithology of Borneo, prepared by Count Tommaso Salvadori, of Turin. The memoir is based on the collections made in Sarawak in 1865 and subsequent years, by the Marquis Giacamo Doria and Dr. Odoardo Beccari, which contained about 800 specimens. All previous authorities on the birds of Borneo have been consulted, and the result is a complete *résumé* of all that is yet known upon the ornithology of this most interesting country, which will be highly acceptable to naturalists.

AT two o'clock P.M. on the 18th inst. a severe shock of earthquake was felt at Malta. There was a heaving motion, accompanied by an explosive noise resembling the bursting of a shell. Eight slight shocks followed later. Several buildings are injured, but no casualties are reported.

A TELEGRAM, dated Bombay, Oct. 17, states that a cyclone in Bengal has caused a total interruption of telegraphic communication with Calcutta. Fifty miles of the line are reported to have been blown down, and a passenger train has been thrown off the rails. No further details of the damage done have yet been received.

THE Council of the Labour Representation League have drawn up a Report founded upon the resolutions adopted by the members at a meeting held some weeks since touching the endowed schools in their relation to technical education. The Report, which deals very fully with the question, and which will shortly be published *in extenso*, recommends a scheme of technical training under four heads, viz.—1. In our elementary board schools. 2. The secondary industrial schools. 3. The higher endowed schools, such as Eton, Harrow, &c. 4. The Science and Art Department at South Kensington. The scheme will be submitted to a general meeting of workmen and others interested in the question, for discussion and approval. The Council of the League express themselves very sanguine as to the beneficial results that would follow the adoption of the scheme. In connection with the subject of technical education we may state that the opening meeting of the members of the Artisans' Institute was held on the 14th inst., in the premises of the institution, Castle Street, St. Martin's Lane. The meeting was addressed by the Rev. H. Solly, Mr. Samuel Morley, M.P., Dr. Carpenter, and others, and the promoters are sanguine of its success in educating and elevating skilled workmen.

ON Monday evening a public meeting was held in the hall of Clanricarde College, Pembridge Square, Bayswater, Dr. J. H. Gladstone, F.R.S., presiding, to establish a popular society in

West London for the advancement of natural history and physical science. There was a very good attendance, chiefly of members of the various London field clubs. A number of ladies have been received as members, and working men are represented on the committee.

ACCORDING to the *Belgique Horticole*, Dr. Candèzi has invented a small photographic apparatus, which he calls a "scenograph," which consists simply of a stick and of a camera the size of an opera glass. To photograph a plant or other object, it is sufficient to place it in the focus of the scenograph for a minute or two. The negatives, it appears, can be purchased ready prepared.

THE opening of the School of Horticulture at Versailles, which was to have taken place on Oct. 1, is postponed till Dec. 1.

DR. A. CORLIEU states, in *La France Médicale* for Sept. 30, that he had occasion to search the registers of the parish of Saint Antoine, preserved in the National Library. It was in the cemetery of the Innocents, in that parish, that the dead bodies from the Hôtel-Dieu were interred; and Dr. Corlieu has ascertained that during the first six months of 1694 the deaths in the hospital amounted to 11,696. In 1873, during the same space of time, the mortality amounted to 770 for 925 beds.

THE additions to the Zoological Society's Gardens during the past week include a Chacma Baboon (*Cynocephalus porcarius*) from South Africa, presented by Mr. J. D. Lloyd; a Ducorps' Cockatoo (*Cacatua ducorpsi*) from the Solomon Islands, presented by Mr. F. J. Dean; two Lions (*Felis leo*) from South Africa; a Malbrouck Monkey (*Cercophithecus cynosurus*) from West Africa; a Sun Bittern (*Eurypyga helias*) from South America, deposited; two European Rollers (*Coracias garrula*), European; a Naked-throated Bell-bird (*Chasmorhynchus nudicollis*) from Bahia; a solitary Tinamou (*Tinamus solitarius*) from Rio de Janeiro, purchased.

SCIENTIFIC SERIALS

THE *Quarterly Journal of Microscopic Science* for this month commences with two articles which are of special interest to embryologists, and therefore to biologists generally. The former of these is by Mr. F. M. Balfour, entitled "A Preliminary Account of the Development of the Elasmobranch Fishes;" it occupies about forty pages, and is fully illustrated. The investigations were conducted at the Zoological Station at Naples, which illustrates the value of that institution, and the justifiableness of Dr. Dohrn's enthusiasm. The earliest stages of development are those most minutely described. The points of greatest interest made out are the following:—(1) The epiblast of the blastoderm in that part which corresponds to the caudal extremity of the future embryo, folds round inwards and becomes continuous with the deeper layers; which leads the author to conclude that, as the hypoblastic origin of the alimentary canal is connected with the presence of a food-yolk, and in origin its those animals which develop an "anus of Rusconi" is not so, the former is but an adaptation. (2) The notochord is shown to be developed from the hypoblast, the mesoblast forming a mass on each side of it. This may depend upon the mesoblast, whose lateral columns just referred to, are "split off, so to speak, from the hypoblast," also developing a median independent sheet; or it may be, which unbiassed observation undoubtedly supports, that the notochord is a true hypoblastic structure. The former of these views, as the author remarks, "proves too much," since it is clear that by the same method of reasoning we could prove the mesoblastic origin of any organ derived from the hypoblast and budded off into the mesoblast. If Mr. Balfour's fundamental fact is verified, it will much modify the argument as to the homology of organs as based upon their embryonic origin. (3) The medullary groove is quite flattened out in the cephalic region at the time that the canal is fully formed in the caudal. This paper is well worthy of careful study.—Mr. Ray Lankester writes on the development of the pond snail (*Lymnæus stagnalis*), and on the early stages of other mollusca. He begins by describing the shell-gland, which is situated below the developing shell; he shows its presence in Lamellibranchs, Gasteropods, Pteropods, also in the Brachiopoda and *Loxosoma*. From this the question is asked whether it in any way corresponds to the pen of the Dibranchiate Cephalopoda and the internal shell of *Limax*. Reasons are given in favour of the plug, which is always found to occupy the shell-gland, being developed into the latter; but with regard to the former, the author, from originally holding the opinion that it has a similar origin, now thinks differently for the following reasons:—The pen of *Loligo* must correspond to the guard of the Belemnite, in which the phragmacone is aborted. This guard is only a sheath to the phragmacone, which again corresponds to the whole shell of *Spirula*. The shell of *Spirula* must have been preceded by the shell-gland, therefore the plug of the latter cannot have been the direct origin of the *Loligo* pen. The latter part of the paper discusses the development of the pond-snail in detail.—Mr. E. A. Schäfer describes an ingenious and much-improved microscope warm-stage, in which a mercury valve regulates the gas supply to a small circulating boiler. He remarks that much of the cooling is produced by the proximity of the objective, and suggests that this may be warmed by coiling a tube round it. It has always occurred to us to ask whether the heating of objectives does not injure, for the time being, their optical powers; as they are constructed so as to be achromatic, &c., at the average temperature of the air, and very slight differences must produce material changes in the distance between the lenses and their shape.

Bulletins de la Société d'Anthropologie de Paris, fascicule v. tome 8, 1874.—M. Topinard concludes his paper on the anthropology of Algiers, by drawing attention to the five periods which characterise the anthropological history of the colony, and which are those of the brown-skinned Kabyles; the light-skinned Kabyles; the Numidians, to whom we must refer the greater number of the Berber inscriptions hitherto found; the Romans, Arabs, and Turks; and lastly, the Aryans. M. Topinard is of opinion that in the fair and dark skinned Berbers we have a kindred race with our oldest West-European races, and that therefore, with due regard to locality, we have evidence that European colonies could be made, like those tribes, to flourish in various parts of Algiers. In the meanwhile, however, as General Faidherbe has remarked, it becomes a question of political as well as ethnological importance to investigate and, if possible, arrest the causes which are diminishing the numbers of the native population, whose existence is the more important from their being the best able to bear the climate and cultivate the soil. M. Topinard considers that the mortality among the native races is not to be referred with any special prominence to diseases introduced by Europeans, but is due very much more to a natural scrofulous diathesis antecedent among them, to any imported constitutional taint, while famine, war, and many other causes depending upon political conditions are probably the most important agents in the process.—M. de Mortillet has recalled the attention of the Society to M. l'Abbé Bourgeois' assumed evidence of the existence of man at the base of the Miocene or mean Tertiary, while he presented to them one of the latest of the Abbé's finds of flint implements from the Miocene beds at Thenay, and which in its longitudinal lines showed unmistakable traces of cutting. The speaker pointed out that since the foundation of the calcareous beds at Beauce, and the deposit of the flints at Thenay, the mammalian fauna has been renewed at least three times, while the differences between the extinct and living fauna are sufficient to justify the acceptance of the supervention of specific genera. The question of the existence of man in the mean Tertiary period rests, however, for the present, open, and must await further discoveries of a less questionable nature before it can obtain an unassailable solution.—M. Onimus, in a paper on language, has considered at length the importance of reflex action generally on all phenomena of the nervous system and on the intellectual functions, illustrating his point by reference to the changes in the faculty of speech which give rise to aphasia, and considering the manner in which the latter lesion is modified by the previous and normal mental condition of the patient. This number also contains a suggestive paper, by Madame C. Royer, on the mathematical laws of reversion through atavism; notes by M. Bataillard on the Gipsies of Algiers; and a report of the hairy dog-man of Kostroma, in whom an abnormal development of the hair of the head and the down on the face and neck, combined with considerable prognathism, has similated the characters of the canine head.

THE *Bulletin de la Société d'Acclimatation de Paris* for July devotes a considerable portion of its space to the description of an ostrich farm at the Cape of Good Hope. This industry is largely extending in that colony, and yields excellent results.—M. Maumenet gives a valuable contribution in the shape of a paper on the various plants acclimatised by him at Nîmes, in the province of the Gard. Bamboos, Eucalyptus, palms, and several new and useful Chinese plants and vegetables, are among his successful attempts at acclimatisation.—M. Martinet gives details of the mode of cultivating the *Erythroxylon coca* in Peru, a vegetable which the French are desirous of introducing into Algeria and French Guiana.—M. Collenot suggests, as a means of staying the ravages of the Phylloxera, that instead of introducing American vines, the wild vines abundant in many parts of France should be carefully cultivated; they produce, in a wild state, excellent fruit, and as they are very hardy, he thinks that they would withstand the attacks of this pest.—A Japanese tree, the Sophora (*Styphnolobium japonicum*), is recommended for cultivation as rivalling the Eucalyptus in many respects. The wood is very hard, and a tree planted in France thirty-five years ago is now 21 ft. in circumference. It resists cold and drought with equal facility.—The silkworm is being acclimatised in the Baltic provinces, and some species of this caterpillar seem able to withstand the cold with ease.

SOCIETIES AND ACADEMIES

LONDON

Royal Microscopical Society, Oct. 7.—Charles Brooke, F.R.S., president, in the chair.—A paper, by Mr. Alfred Sanders, entitled "Supplementary Remarks on the Appendicularia," was read to the meeting by the secretary, in which the author corrected several observations made in the course of a previous paper, and gave an exhaustive description of a species which he believed to be different from any hitherto described, although he refrained at present from naming it as new.—A paper by Mr. Kitton, of Norwich, was also read by the secretary, upon some new species of diatoms found in deposits sent from New Zealand by Mr. H. R. Webb and by Capt. Perry from Colon.—Mr. Slack made some observations on silica films prepared from a solution containing four parts glycerine to one part water, and pointed out the difficulty of obtaining clear definition of the forms presented when high-power objectives of large angle were employed, whereas those with small angular aperture gave good results.—Mr. Stewart drew the attention of the Fellows to a remarkable living organism exhibited in the room by Mr. J Badcock, of the nature of which very considerable doubt was entertained, the prevailing opinion being that it was either an entozoon or the larval form of some unrecognised animal.

LEEDS

Naturalists' Field Club and Scientific Association, Oct. 13.—Mr. Edwd. Thompson, vice-president, in the chair.—A lecture was delivered by Mr. Samuel Jefferson, F.C.S., upon "Volcanic Phenomena." After giving the more familiar facts with regard to the shape and formation of volcanic cones, the nature of the ejected materials, the periods and frequency of eruptions, and the distribution of volcanic energy, and after an exposition of the chief hypotheses which have been framed with regard to the internal condition of our earth, Mr. Jefferson pointed out a coincidence which had not to his knowledge been previously noticed, that the equatorial diameter between the two centres of intensity of volcanic energy, Java and Quito, is shorter by two miles than that drawn at right angles through Africa. Mr. Jefferson explained his views at some length.

PHILADELPHIA

Academy of Natural Sciences, June 2.—Dr. Ruschenberger, president, in the chair.—"Poisonous character of the flowers of *Wistaria sinensis*."—Mr. Meehan remarked that there was a popular belief that the flowers of the *Wistaria sinensis* were destructive to bees. He had himself seen hundreds of dead bees under large flowering plants. He was struck with the fact this season that none were dead under similar circumstances. The flowers were continually visited by the honey bee and others, without, so far as he could see, any fatal results following. It was clear, therefore, that whatever might be the cause of the death of these insects under some circumstances, it could not be from the honey alone.—"Growth of the *Cuicus arvensis*, Hoff." In regard to the rapidity with which plants sometimes grew, Mr. Thomas Meehan observed that, though it was well known that the Canada thistle spread surprisingly, there had been no figures giving its exact growth placed on record. From experiments he found that it spread at an average rate of about three-fourths of an inch of growth per day, equal to maize or other rapid-growing vegetation above ground.

June 16.—Dr. Ruschenberger, president, in the chair.—Prof. Leidy made remarks on the revivification of *Rotifer vulgaris*, showing that when the animals are actually dried they are incapable of being revivified.—Prof. Cope mentioned the capture of a young *Balæna eisarctica*, of forty-eight feet in length, in the Raritan River, near South Amboy. He was informed that the whale was entirely black, and the dorsal line without irregularities.—Prof. Cope explained the distinctive features of the genus Symborodon, one of the gigantic horned mammalia of Colorado, as compared with Titanotherium, exhibiting typical specimens of the latter from the Academy's museum, showing four inferior incisor teeth, while the lower jaw of Symborodon does not possess any.

PARIS

Academy of Sciences, Oct. 12.—M. Bertrand in the chair.—The following papers were read:—The enunciation of the principle of the theory of *timbre* is due to Monge, by M. H. Resal.—Letter from M. Langley, director of the Alleghany Observatory, United States, on cyclonic movements, by M. Faye. This paper was an extension of the author's theory of sun-spots. The laws of fluids in rotatory motion round a vertical axis are shown to apply to these phenomena.—M. Daubrée made some remarks in connection with the foregoing paper concerning the indications of circular motion traced in the diluvian deposits of the neighbourhood of Paris.—Critical observations on the employment of the tincture or powder of guiacum for testing the purity of "*kirschenwasser*," by M. Boussingault.—M. C. Sédillot communicated a surgical paper on the subject of preventive trepanning.—Presence of the genus Lepisosteus among the fossils of the Paris basin, by M. P. Gervais.—External linear extraction, simple and combined, of cataract; a surgical memoir, by M. R. Castorani.—Proportion of real to sulphated ashes in the products of the sugar industry, by M. Ch. Violette.—Communications relating to the destruction of Phylloxera were received from MM. Maurice Girard, Mouillefert, Balbiani, &c., upon which remarks were offered by M. Dumas.—New experiments with alkaline sulphocarbonates for the destruction of Phylloxera; method of employing them, by M. Mouillefert.—Researches on the action of coal-tar in the treatment of phylloxerised vines, by M. Balbiani.—On the employment of electro-diapasons of variable periods as tonometers and electric contact breakers, by M. E. Mercadier.—Attempted theory of the formation of the secondary facets of crystals, by M. Lecoq de Boisbaudran.—Microscopic study and proximate analysis of a pumice from Vesuvius, by M. F. Fouqué. Under the microscope this stone was seen to be composed of a multitude of crystals of amphigene united by an amorphous vitreous substance; of crystals of hornblende, pyroxene, peridote, oxide of iron, felspath, and brown mica irregularly distributed through the mass. An analysis of the amphigenetic crystals proved this mineral to be rich in sodium and calcium; the amphigene from the tufa of Somma is generally potassic.

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