THURSDAY, JUNE 22, 1871

STATE MEDICINE

AMONG the duties which the State owes to Science, none are of more practical and vital importance, and none are more urgent, than those which concern the care exercised, or that should be exercised, over the public health by properly appointed State Medical Officers. The essays of Dr. H. W. Ramsay have so fully explained the term "State Medicine" that we do not feel it necessary here to do more than allude to the subject in very general terms. It will readily be acknowledged that some sort of a medical polity is a necessity for a State; but while in this country certain laws and regulations exist for the improvement of the public health, still there has been but little or no effort made to establish these laws on a scientific basis.

In the recently issued Second Report of the Royal Sanitary Commission, the true relations of the State towards the public in these matters are thus admirably enforced:—"Every person should be entitled to such reasonable public protection in respect of his health as he is in respect of his liberty and his property. For instance, he should no more be liable to have the water of his well poisoned by the neglect of his neighbour, than to be robbed with impunity. And he should be under this protection, as far as it is reasonably attainable, everywhere and at all times. The first principle, therefore, of sanitary administration is, that no member of the community shall wilfully or for profit damage another man's supply of the three absolute essentials of life, food, water, and air; and therefore that it is the duty of the State to secure, as far as possible, that these essentials shall be supplied in sufficient quantity and the greatest attainable purity in all circumstances in which these objects cannot be attained by individual care and resources. In this point of view it may appear a question whether the State should allow that any man, even by prescription, shall be held to have acquired the right to pollute, for his own advantage, another man's food, water, or air, or in any manner poison him. At any rate care should be taken that no one shall acquire such right in future."

The second requirement is laid down with equal clearness, viz.:—"Universality, through constant supervision by public health officers in every part of the country. The efficiency of the agents in sanitary administration is as important as their ubiquity. They must be well instructed and capable, without the pedantry or officiousness of sciolists. Ignorance, pretentiousness, or overmeddling on the part of the agents, would bring into disrepute any sanitary system. In a free country disrepute would bring about failure. Fitness in the agents is the third requisite in sanitary legislation."

When, however, the Commission comes to apply these principles to the existing state of things, the only practical suggestion offered is that the supervision of the public health be entrusted to the Poor Law Medical Officers, of whom there are in England alone about 4,000. The Commissioners have evidently a suspicion that this suggestion will not be favourably received by the country. And we have no hesitation in saying that it is miserably inadequate. When we look at the value of the examinations to which alone medical students are compelled to submit themselves before they obtain a license to practise, or when we look (must we say it?) at the life of the average medical student attached to any of our great hospitals, no two conclusions are possible on this subject. It is notorious that, as a rule, it is not the most competent of the London students who ultimately arrive at the position of general practitioner in a country village; and the Poor Law authorities, however discriminative their choice, can only select from the material to their hand. To effect the objects arrived at by the Sanitary Commission, a far more highly educated class of men is required.

That medical men should be educated in a knowledge of State medicine will probably not be denied, and that the State for its own good should encourage such knowledge will probably also be granted; but it is not easy to persuade a State to adopt even approved of principles, if these principles require a wholly new machinery for the effectual carrying of them into practice. The Universities are, however, engaged in the work of education, and upon them, we think, devolves the duty not only of keeping up the standard of education, but of endeavouring to push this standard ever a little advance of the day.

The training necessary for the medical profession is very different from that required to qualify one to be an authority on State medicine; it most certainly assists in this qualification, but a man might be a most excellent surgeon or a most skilled physician, and yet not be able to pronounce an opinion on many of those subjects on which his advice would be required by the State.

In a medical school belonging to a college which holds out considerable rewards to those students who distinguish themselves as classical or science scholars, there is always a probability that some of the students in medicine will have also been distinguished students in arts. Experience has proved that this is the case in Trinity College, Dublin; and experience has proved the incalculable advantage of a high training in art-subjects to the future medical man. What better combination of knowledge, indeed, could there be to form a model officer of State medicine than that of a thorough knowledge of science (using the term as it is generally understood at the Universities) and of an equally thorough knowledge of medicine? We are glad, therefore, to find that, acting on the suggestion of Dr. Stokes, their Regius professor of physics, the University of Dublin has determined to hold a yearly examination for a diploma on State medicine, the first of which was held on the 12th inst. This examination was open to all doctors of medicine of the Universities of Oxford, Cambridge, and Dublin.

The course is a long but a highly interesting one. It resolves itself into the following among other subjects:—1. Law: The legislation relative to sanitary measures, to the conduct and duties of medical men, to vaccination, inoculation, lunatic asylums, &c. 2. Engineering: This chiefly in connection with the construction of hospitals, barracks, troop ships, prisons, and the sewerage and waterworks of cities. 3. Vital and Sanitary Statistics, including the science of statistics as applied to man, and the practical application of statistics to medicine. 4. Meteorology, including a knowledge of climates, &c. In addition the

candidates will be examined in Pathology, *i.e.*, the laws of epidemics, of contagion and infection, influence of hereditary disposition, &c.; in Chemistry, under the heads of—1, air; 2, water; 3, gaseous poisons: 4, principal deodorising and disinfecting agents; and in Medical Jurisprudence under the divisions of Hygiene and Forensic Medicine. This course has been evidently selected with great care, and appears well calculated to test the qualifications of the candidates. The medical men who successfully pass it and obtain the diploma, ought certainly to be able to assist in establishing on a scientific basis the laws relating to the public health.

One very serious omission we observe in the list of subjects to be examined in, and it is one we would have least expected, viz., the Microscope and Spectroscope. It is perfectly astonishing to find the number of well-educated men in the medical profession who are unable to understand the ordinary manipulation of an ordinary microscope, or of a spectroscope in connection with the microscope. The medical men who pass this examination will, we believe, take rank at once as medical experts—but fancy one qualified to act as a medical expert and yet not knowing how to manage an achromatic condenser!

At present this movement of the Dublin University can but be regarded as an experiment, but it is an experiment in the right direction, and one that has been, and we hope for years will be, conducted under the watchful eye of a most able physician, who thoroughly understands the subject of medical education, and who, throughout his whole life, has laboured to elevate the profession that he adorns.

*PRIMITIVE CULTURE**

II.

THE chapters on mythology, which naturally follow those on language, form an admirable summary of the history of myth from its vigorous infancy in the earlier ages of human thought through the various stages of growth and maturity onwards to second childhood, death by ossification of the heart, and final post-mortem existence through millenniums of disembowelled mummydom. Myth, in fact, is as ubiquitous, as multiform, as language. Nay, it is perhaps more ubiquitous, more multiform. The spaniel, who fawns on his master or flies at a beggar, who bays at the moon or cowers from the thunder, has evidently framed to himself some simple dog-theory in connection with certain phenomena, which is closely analogous to, if it be not absolutely identical with, a rudimentary myth. It is, indeed, probably not too much to say that wherever a phenomenon is stated or explained, whether with or without the intervention of language, there exists a myth, though a higher knowledge than that which creates the myth is always requisite in order to recognise its mythic character. The Ptolemaic system of astronomy, for instance, has been long ago conclusively demonstrated to be a myth, although a myth belonging to an advanced stage of culture, and a thousand and a thousand others are everywhere around us only waiting for the extension of knowledge to effect the metamorphosis requisite for their recognition. It is evident that if this theory of myth be even approximately correct, the statement or explanation of any phenomenon in language is in effect merely the creation of another phenomenon out of which myth may be evolved *ad infinitum*; in short, that myth is essentially the outcome of the complex action, reaction, interaction, and counteraction of human thought on the one hand, and the sensible phenomena of the universe, including those of language, on the other. The sensible phenomena of the universe may thus not inaptly be regarded from the standpoint of Democritus or Lucretius as continually throwing off films or likenesses of themselves, which films or likenesses, once seized and appropriated by language, become additional phenomena, with a vitality, so to speak, and reproductive power of their own. On the other hand, if, in accordance with the spirit of Scandinavian philosophy, we regard philosophy itself, art, poetry, science, morality, and religion—all the products of human thought—as a single living organism, we may then consider myth as the former substance of the organism, the physical atoms which have been gradually eliminated and replaced in the process of growth and development. Or, not to complicate matters by the introduction of evolution,—civilised knowledge, as a whole, may be likened to an old canoe, of which no plank nor nail is the same as when she started on her first voyage, and myth to the old timbers and metal which once formed a part of her, but have now been some lost, some metamorphosed into wholly different shapes, some utilised again in the construction of other vessels. We can thus understand how every department of thought has absorbed and assimilated more or less of myth,—how myth has absorbed and assimilated more or less of every product of the human intellect. It is, in fact, the non-appreciation of the true place of myth in human knowledge, which has led so many earlier students of mythology astray. One school looked on all mythology as crystallised poetry; another as indurated chronicle; a third as frozen philosophy; a fourth as petrified religion, and so forth;—each school doing something towards really making mythology what it believed mythology to be, and all, as a net result, extracting from one of the most vitally-interesting investigations a mere *caput mortuum* of doubly-distilled platitude, and quintessential commonplace. So long as "mythology" meant simply an acquaintance from without with the Greek and Roman Pantheon, such a result was, perhaps, inevitable. Unfortunately the doctrines of these schools are not even yet by any means universally recognised as being themselves mythic; and many of them are still to be found reproduced in contemporary works of no inconsiderable learning, to supply future students with illustrations of Mr. Tylor's theory of survival. It must be admitted, too, that even the late brilliant achievements of more scientific inquirers still leave a vast field untouched for classification and comparison. Nor is this task an easy one. A myth is always the statement or explanation of a phenomenon, and myths may thus be classified according to the phenomena to which they refer; but first of all "to catch your myth," and then to determine the phenomenon to which it refers, are feats, for the most part, beyond the skill of ordinary students. An amusing instance of these difficulties is afforded by Mr. Tylor himself. "No legend," he observes, "no allegory, no nursery rhyme, is safe from the her-

* "Primitive Culture: Researches into the Development of Mythology, Philosophy, Religion, Art, and Custom" By Edward B. Tylor, author of "Researches into Early History of Mankind," &c. Two vols. 8vo. (London: Murray, 1871.)

meneutics of a thorough-going mythologic theorist. Should he, for instance, demand as his property the nursery 'Song of Sixpence,' his claim would be easily established: obviously the four-and-twenty blackbirds are the four-and-twenty hours, and the pie that holds them is the underlying earth, covered with the over-arching sky; how true a touch of nature it is that when the pie is opened—that is, when day breaks, the birds begin to sing; the King is the Sun, and his counting out his money is pouring out the sunshine, the golden shower of Danae; the Queen is the Moon, and her transparent honey the moonlight; the Maid is the 'rosy-fingered' Dawn, who rises before the Sun, her master, and hangs out the clouds, his clothes, across the sky; the particular blackbird, who so tragically ends the tale by snipping off her nose, is the hour of sunrise. The time-honoured rhyme really wants but one thing to prove it a Sun-myth, that one thing being a proof by some argument more valid than analogy." This is exquisitely ingenious; but what if the rhyme should turn out to be, after all, only a quite genuine nursery riddle, of the type which Mr. Tylor has so admirably illustrated elsewhere? An archetypal clock, presented as a *haute nouveauté* to some Edward III. or Richard II. would satisfy all the conditions of the enigma. The large circular face would represent the pie;—the four-and-twenty hours duly figured thereon, in accordance with the liberal notions of archaic horology, would correspond to the four-and-twenty blackbirds; the striking, possibly with chimes, to the song of the birds; the king in his counting-house, counting out his money, would felicitously symbolise the hour-hand counting out the time, which is money, in majestic solitude, unaccompanied as yet by any fussy revolutionary minute-hand; the queen in the pantry, eating bread and honey, would typify the stealthy activity of the fine wheel-teeth of steel and brass; the maid in the garden, hanging out the clothes, would appropriately allegorise the wooden drum on which the weights were suspended by lines, at a distance from the works; while the magpie, which seems a preferable heading to "black-bird" who snaps off the maid's nose, would probably be none other than the ingenious mechanist who wound up the instrument, and, having done so, removed the key from the nozzle of the drum. Whatever may be thought of this interpretation, it seems exceedingly probable that the rhyme is really a riddle, and, indeed, many other unintelligible jingles are most likely referable to the same category. One of them, if a riddle, does also unquestionably enunciate a sun-myth. In the immortal Jack and Jill who went up a hill to fetch a pail of water, we may clearly recognise the sun and moon under an enigmatic, not to say riddleiculous exterior, and after satisfying ourselves as to their identity, we may further admire the curious felicity with which the difference of sex between Hêlios and Selênê—etymologically identical with the difference between *leôs*, a lion, and *leaina*, a lioness—is indicated in the English ditty. To return, however, from the precincts of the nursery, Prof. Max Müller, with a natural bias in the direction of his own brilliant researches, seems to ascribe the origin of myth somewhat too exclusively to the influence of language, just as in his interpretation of myth he appears to pay a rather too marked attention to the Dawn-Goddess to do full justice to the claims of other less seductive divinities. The Professor himself, however, will probably be among the first to recognise the value of Mr. Tylor's distinction between material and verbal myth, and to acquiesce in the classification which considers the former as primary, the latter as secondary in the order of evolution.

In his account of eclipse-myths, Mr. Tylor quotes sundry remarks of Mr. Samuel Davies eighty years ago with regard to the struggle between ecclesiastical authority and science in India. "The learned Pundits," says Mr. Davies, "reject the ridiculous belief of the common Brahmuns, that eclipses are occasioned by the intervention of the monster Rahoo, with many other particulars equally unscientific and absurd. But as this belief is founded on explicit and positive declarations contained in the 'Vedus' and 'Pooranus,' the divine authority of whose writings no devout Hindoo can dispute, the astronomers have some of them cautiously explained such passages in those writings as disagree with the principles of their own science; and where reconciliation was impossible, have apologised as well as they could for propositions necessarily established in the practice of it by observing that certain things, as stated in other Shastrus, might have been so formerly and may be so still, but for astronomical purposes astronomical rules must be followed." It is, perhaps, not a mere accidental coincidence that in 1760, a few years before this was written, the following "Declaratio" appeared at the end of the third volume of the Jesuit edition of Newton's works, published at Geneva:—"Newtonus in hoc tertio libro telluris motæ hypothesem assumit. Autoris propositiones aliter explicari non poterant, nisi eâdem quoque factâ hypothesi. Hinc alienam coacti sumus gerere personam. Cœterum latis a summis pontificibus contra telluris motum decretis, nos obsequi profitemur." Fortunately for Mr. Tylor and his fellow-workers, the difficulties which beset the scientific inquirer from this source have probably almost reached their minimum in England. Ecclesiastic thunder itself has lapsed into mere survival, and roars, if it roars at all, only after the fashion of Snug the Joiner's lion.

The remainder of the work, occupying part of the first and the whole of the second volume, is devoted to a discussion of "Animism," in other words, of the philosophy of religion in relation to early and barbaric civilisation. The subject is one of almost equal interest, importance, and difficulty, and Mr. Tylor's treatment of it is eminently original and masterly. Tracing the origin of a belief in spiritual beings to the result of primæval thought on the problems presented by the difference between the dead and the living body, by sleep and waking, trance, disease, and death, he follows the course of its development upwards into the existing religions of the most civilised races. Showing how the doctrine which teaches a possible continued existence after death of the souls of individual creatures really supplied a theory adequate to explain the phenomena to the barbaric intellect, he calls attention to the process by which this belief in a ghost-soul became expanded into a belief in other spirits, who were held to control the events of the material world, and hence became the objects of worship and propitiation, until Animism reached its full development in a system inculcating a belief in controlling deities and subordinate spirits, in souls separable from bodies and a future state of existence,

morality being incorporated into religion only in the later stages of culture. One of the most striking points in the whole work is Mr. Tylor's identification of the theory of "images" generally ascribed to Democritus with the savage theory of object-souls. Democritus explained the fact of perception by declaring that things are always throwing off images of themselves, which images, assimilating to themselves the surrounding air, enter a recipient soul and are thus perceived. This theory, Mr. Tylor adduces evidence to prove, is merely an application to the phenomena of thought of one of the most characteristic doctrines of savagery, the doctrine that every object, inanimate as well as animate, possesses a soul of its own. "Nor is the correspondence," says Mr. Tylor, "a mere coincidence, for at this point of junction between classic religion and classic philosophy the traces of historic continuity may be still discerned. To say that Democritus was an ancient Greek is to say that from his childhood he had looked on at the funeral ceremonies of his country, beholding the funeral sacrifices of garments and jewels and money and food and drink, rites which his mother and his nurse could tell him were performed in order that the phantasmal images of these objects might pass into the possession of forms shadowy like themselves, the souls of dead men. Thus Democritus, seeking a solution of his great problem of the nature of thought, found it by simply decanting into his metaphysics a surviving doctrine of primitive savage animism." No more pregnant identification of philosophic tenets with those of earlier religion has been achieved since Comte traced back to fetishism the conception of a soul of the universe as held by certain pantheistic schools.

In describing the nature of the soul as understood by the lower races—well indicated by the way in J. Amos Comenius's "Orbis Sensualium Pictus," where he figures *anima hominis* as a dotted outline of a man—Mr. Tylor calls special attention to the spirit-voice, which is conceived as a murmur, chirp, or whistle—as it were the ghost of a voice. Among the Algonquins souls chirp like crickets; among the New Zealanders, Polynesians, and Zulus, they squeak or whistle. Nicolaus Remigius, whose "Dæmonolatreia" is one of the ghastliest volumes in the ghastly literature of witchcraft, cites Hermolaus Barbarus as having heard the voice *sub-sibilantis dæmonis*, and, after giving other instances, adduces the authority of Psellus to prove that the devils generally speak very low and confusedly in order not to be caught fibbing. The idea of ghosts whistling is still far from extinct in England. In Leicestershire and elsewhere it is reckoned "very bad" to hear "the Seven Whistlers," though strict inquiry about them only elicits the suggestive fact that "the develin"—or common martin—"is one on 'em."

In his account of the doctrine of transmigration of souls, Mr. Tylor forbears to touch on one circumstance, which probably exercised some considerable influence on its development. When two systems of mythology, both originally derived from the same source, came into close contact after long separation, both the difference and the similarity between them could hardly escape attention. If the names of certain deities common to the two systems had been changed while their history and attributes had remained substantially unaltered, the theory of transmigration would, in some cases, satisfactorily account for the phenomenon. In fact, mythologically, the doctrine of transmigration is simply true. Mythology is just now demanding of history the extradition of William Tell, on the plea that his ghost is one which has transmigrated from her domain; and the scientific detective who falls in with Robin Hood or King Arthur will hardly fail to recognise in the one the transmigrated soul of Phœbus Apollo, in the other, the wandering spirit of the Bear-ward in Böotes, returned from his long sojourn in the northern sky.

Tempting, however, as are the inquiries suggested in this profusely suggestive work, the reviewer's limit has already been transgressed. We have not yet, we cannot have for years, or for ages, anything approaching to a complete science of history or exhaustive philosophy of religion, but the scientific student of Primitive Culture will at least admit that in these volumes the foundation of both has been "well and truly laid."

BOOK SHELF

Dr. Dobell's Reports on the Progress of Practical Medicine in different Parts of the World. Vol. ii. (1871, Longmans.)

IN these reports Dr. Dobell aims at obtaining from the natives of different countries concise statements of the advances made in medicine and the allied branches of knowledge, which have appeared in foreign journals, or in a more permanent form. He has obtained more or less full and detailed reports from America, Australia, California, China, France, Germany, Iceland, India, Italy, Java, Newfoundland, New Zealand, Portugal, Prince Edward's Island, Shetland Isles, Turkey, and the United Kingdom. The idea is a good one. The flood of periodical literature is so great that it is most difficult to keep up with the weekly journals of this country alone, and it becomes almost hopeless to do so with those of France and Germany. Such reports as those before us materially lighten labour, and the only objection to them is that a man who is working at any given subject cannot rely upon their being complete. The report on French progress by Prof. Villemin is a good one. That on German advances, by Dr. Alhaus is much too short. It might, with great advantage, have been extended at the expense of the excerpts from English writers. Everyone has access to the leading English journals, and, moreover, this part of the work is already well done by Braithwaite and Ranking, but comparatively few have access to Virchow's Archiv, the Deutsch Klinik, and the Wiener Medizinische Zeitung. Many of the English abstracts might have been condensed. We miss a Russian report. Yet both Russian naturalists and Russian physicians have journals of their own. On the whole the book is a useful one, and we can recommend it to our readers as containing a considerable mass of information which they will not elsewhere easily find.

Geometrische Seh-Proben zur Bestimmung der Sehschärfe bei Functions-prüfungen des Auges. Von Dr. Boettcher. (Berlin, 1870. London: Williams and Norgate).

THIS little book, with its test objects, is intended as a substitute for Snellen's test types to be used by those who are unable to read, and has been drawn up by Dr. Boettcher, with especial reference to the testing of the vision of recruits. Besides the ordinary types, it contains a number of figures of squares and rectangles, variously disposed in regard to one another at different distances, and it need scarcely be added of various sizes. The very smallest require good vision to enumerate their number and disposition at the ordinary distance of eight inches, whilst the largest should be seen at two hundred feet. They afford

a good means of determining the existence of Hypermetropia, Myopia, Astigmatism, and other affections of the retina of the eye, and seem to us to be well adapted for the purpose for which they are intended. H. P.

LETTERS TO THE EDITOR

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

Thickness of the Earth's Crust—Mr. Hopkins and M. Delaunay

In your numbers for March 16 and 23, 1871 (pp. 400, 420) you give brief notices of the proceedings of the Academy of Sciences in Paris on the 6th and 13th of that month, from which it appears that Mr. Hopkins's method of determining whether the crust of the earth is thick or thin has been again under discussion there. In the latter of these notices M. Delaunay observes that he had been anticipated in his objections by Mr. Hennessy.

It so happens that Mr. Hopkins sent to me in Calcutta in 1858 a copy of Mr. Hennessy's paper (which was published in the *Philosophical Transactions* of 1851) with his remarks in writing in the margin; and I think it will be interesting to your readers if I give Mr. Hopkins's opinion of the paper.

Mr. Hennessy remarks (p. 546) that Mr. Hopkins's "result was founded on the hypothesis of the non-existence of friction and pressure from molecular causes at the surface of contact of the shell and nucleus." On which Mr. Hopkins writes:—"This is not correct. My hypothesis is the absence of friction between the fluid particles themselves."

Again, Mr. Hennessy considers, as a result of his calculation, "that we are entitled to assume that the motion of rotation of both shell and nucleus takes place nearly as if the mass were entirely solid." On which Mr. Hopkins observes: "Nothing could justify the assumption of a mechanical impossibility." And he traces this erroneous conclusion to the fact that Mr. Hennessy has made two assumptions in the course of his calculations which vitiate it throughout, viz., (1) that the axes of instantaneous rotation of the shell and nucleus would coincide (which is implied in the last formula in par. 2. p. 514), "which," wrote Mr. Hopkins, "they certainly would not," and (2) that "the shell (or crust) is rigid" (p. 519, 525) so as to resist, without change of form, the internal pressure which arises from the inner surface, that is, the surface of the nucleus, ceasing to be a surface of equilibrium, which Mr. Hopkins very reasonably considers to be quite inadmissible, and that accordingly the results deduced from these assumptions are "valueless."

2. I will take this opportunity of reverting to my letter to you of April 10, 1871. I there point out that what Mr. Hopkins did consists of two parts—(1) his conception of the idea that as the crust is not solidly connected with the fluid nucleus the amount of precession must depend in some measure upon the thickness of the crust; and (2) his *calculation* of the amount of precession this idea would lead to, so that by comparison with observation the thickness might be approximately found. In this way he discovered that if the crust and nucleus were homogeneous, and of the same density (which they are far from being), the inner and outer surfaces of the crust being similar and similarly situated spheroids, the internal pressure of the fluid would act so as to leave terms in the precession depending on the thickness of the crust, only of the second order of small quantities; whereas, in the case of the earth where the mass is heterogeneous, the mean density being double of the superficial density, the thickness is involved in terms of the first order in the expression for the precession, and by a comparison with observation leads to Mr. Hopkins's result, viz., that the thickness is very great, something like 800 or 1,000 miles at least.

Calcutta, May 24 JOHN H. PRATT

The Duties of Local Societies

It is undoubtedly the work proper to local natural history societies to study well the productions of their own immediate neighbourhood, to catalogue all the fossils, plants, and animals, and to note any peculiarities regarding them. In the settlement of the great questions still under discussion, much will depend upon their faithfully performing this duty. All naturalists will cordially endorse whatever has been said in regarding such societies from this point of view, and will agree in declaring that it is far better they should be occupied in such labour than in the discussion of theories and abstruse general questions, which are better left to larger and more influential bodies. It is their office to collect facts upon which individual minds may generalise. This of course applies to such bodies in their collective capacity, and not to the members as individuals; it is very probable that such individuals may make use of the facts collected by the society.

But it should also be remembered that local societies have another duty to perform, and one, too, of hardly secondary importance, and that is the inculcation of the love of natural history in other minds. Indeed, it will often be found that for a time at least this must take precedence of the work already mentioned. It is well known to all who have taken any active part in field clubs and the like, that the real work devolves upon two or three members, sometimes fewer still, and it is totally beyond the power of these two or three to work up the whole natural history of the district by themselves; they may have the will and the ability, but neither the time nor the means. We have known societies numbering above a hundred members where this was the case; the great majority could not be called working members at all; they joined for various reasons, some merely because it was rather "the thing" to do in the town or village; the greater number probably because they were interested in seeing specimens, hearing pleasantly-written papers at meetings, highly delighted at microscopical conversations, &c., &c., but did not care about working in the subjects for themselves. It is very evident that in such cases the first and foremost aim should be to induce as many as possible to become students of nature, at least to enable them to make intelligent notes of what they observe. Hence we find that the reports of provincial societies occasionally appear with little addition to what is already known, very little local information in them, and though this is to be greatly regretted (and in reality is so by the editors), it should not be regarded, as it often is, merely as matter of reproach by others more advanced. Local magazines and reports are issued mainly for the perusal of the members and others living in the locality, and such persons naturally wish to see the best of the papers that have been read; and the matters that interest them most are not always new discoveries, wherever they may be made.

But besides the ordinary method of reading papers at meetings principally, if not solely, attended by members, there are others to be followed by way of inducing outsiders to join the society. One is that of "Penny Rambles," which has been very successful in some localities. These should be conducted by some one not only well versed in natural history, but gifted with the not common ability to impart his knowledge in an attractive and popular way. There should be a change of conductors as often as possible, but care ought to be taken always to secure good ones, as one disappointment lasts a long time; this implies that some competent person or committee should have the control over the arrangements. Sometimes it will be found that one man makes himself so well understood, and consequently so attractive, that he is preferred to others, and here the *vox populi*, within due limits, should have weight. As for subjects, no naturalist will ever be at a loss: the geology of the neighbourhood, some quarry, sand pit, or sea beach; the botany, some of the rarities and their peculiarities; entomology also, and an occasional chat about some interesting antiquity in the vicinity. No abstruse theories should be taken up, they may be intensely interesting to the real naturalist, but are in a general way unknown, and if known, unappreciated by the multitude.

The science lectures, lately so admirably carried out at Manchester, and already referred to in these pages, will occur at once to every one; they might well be taken up in all large towns. But could not Museum Lectures also be started? The duty of every local society to establish a museum has been ably argued by another pen—a museum not for its own sake merely, but with this secondary idea before them, the good of the town or village in which they may be located; one in which the labouring man shall find displayed specimens of the wealth of his own neighbourhood, as well as typical forms from far off lands. Prof. Huxley has well said in one of his "Lay Sermons" that there is a general impression among people that every event of importance happened a long time ago; it is equally true that they fancy any natural object worth looking at must be sought for a long way off; it is our duty to eradicate both impressions. If some plan could be adopted of giving penny lectures in the Museum, it would

greatly add to the interest excited; it would assist people to understand what they see, and tend to the destruction of that languid curiosity so painfully evident in the faces of sightseers. The contents of one case would serve for one or two lectures, and those who listened would necessarily carry away a few new ideas.

We have been viewing the question solely from its popular side, being convinced that it is of great importance; other plans may occur to the reader, and may be well worthy of ventilation.

HENRY ULLYETT

Colour

SINCE the publication in NATURE of my paper on "Colour," I have received several inquiries for references on the subject. These I should have given at the time, only that I wrote away from books; perhaps on the principle of "better late than never," the publication in NATURE of the following selection may save trouble to some interested in the matter.

Helmholtz: "Ueber die Theorie der zusammengesetzten Farben;" "Poggendorff's Annalen," lxxxvii. p. 45; "Philos. Magazine," (4) iv. p. 519.

Maxwell: "Experiments on Colour perceived by the Eye, with Remarks on Colour Blindness;" "Edinburgh Transactions," xxi. p. 275.

Maxwell: "On the Theory of Compound Colours, and the Relations of the Colours of the Spectrum;" "Phil. Trans.," 1860.

Maxwell: "Account of Experiments on the Perception of Colour;" "Phil. Mag." (4), xiv. p. 40.

Müller: "Zur Theorie der Farben;" "Pogg. Ann" vol. 139, p. 411.

These are the principal original memoirs. Of books on colour there are very few that can be trusted. Benson's "Principles of the Science of Colour" is recommended by Prof. Maxwell. There is also a tolerably complete exposition of the subject in Helmholtz's "Physiologische Optik," of which excellent work a French translation has, I believe, been published.

Have any of the readers of NATURE tried a double image prism for exhibiting the mixtures of two colours? By the aid of a Nicol the proportions of the components may be varied at pleasure, and the combination is, in my experience, more effective than the plate of glass referred to in the books. However, on account of the texture of the coloured papers or wafers, the mixture is not so perfect as that obtained by rotation.

J. W. STRUTT

A Hint to the Longsighted

A SMALL optical expedient which has been of service to me may be new to some of your readers, and useful, on occasion, to those among them whose sight is as long as my own. The focal length of the convex lens I require for my right eye in reading is twelve inches, and I find that by holding a lens of 30-inch focus about a foot from this eye I am enabled to see distant objects not only with singular distinctness, but also perceptibly magnified. I can read moderate-sized print at the distance of twelve feet, and make out the details of a church tower half a mile off nearly as well as with a small opera glass magnifying two and a half times. The greater the distance of the lens from the eye the greater is the magnifying power; but beyond a certain point (depending on the focus of the lens and the distance of the object) the gain is more than neutralised by the loss of distinctness with eyes that deviate but slightly from the normal standard, the lens employed must be so weak that the gain is inappreciable.

I presume that a lens thus held at a distance from the eye, like the German "Stöpfel Linse" described by Sir John Herschel, "realises the notion of Descartes as to the mode of action of a telescope, which he regarded as an enlargement or prolongation of the eye. For the natural cornea we substitute an artificial one, which is more remote from the retina, and so forms there a larger image."

W. T. RADFORD

Lignite and Selenite

WILL you kindly allow me to inquire whether any of your readers can inform me if there exists any connection between lignite and selenite when found together, and, if so, in what way the lignite assists in the formation of the crystals of calcium sulphate.

I have recently found selenite in three or four different places, and in each case associated with lignite, viz., in the Bracklesham Beds near Stubbington, in the Woolwich Beds at Dulwich, and in ochrey clay near Lewisham Chalk Pits.

June 19 AN AMATEUR

Arctic Auroras

IN answer to your inquiry, I send you the following information on a Northern Light observed at Kooltook, S.W. end of the Baikal Lake, by Dr. Dyhoffsky. It is taken from a source doubtless not at your disposition (Bulletin of the Siberian section of the Geographical Society, 1871, No. 2):—

"On October 24 (1870) evening a northern light was observed at Kooltook. It began at 9 P.M. with a red light, which appeared more and more distinctly from behind the mountains that border the landscape on the north. It was a little towards the east from the magnetic meridian. This light now increased in the form of a column, now diminished, and at times seemed to vanish entirely. After nearly an hour of such waverings, the light gradually began to increase and get broader; at midnight it reached its utmost intensity and development.

"Its least limits on the horizon were included between N. 59° E. and N. 45° W. Six columns were distinctly visible at midnight, reaching half the distance between the horizon and the zenith, the middle column was the brightest and highest, but at the same time the narrowest, and bordered with reddish-yellow. The other columns were less brilliant but far broader. When the middle column decreased, the western one began to increase, though it never reached the intensity of the middle column. The other columns also increased and diminished by turns; then the phenomenon gradually fainted away, and at three o'clock there remained but a ruddy light, which now, as at the beginning, was brighter towards the east of the meridian."

The same aurora was observed at different localities of Europe.

P. KROPOTKINE

Catherine Channel, Petersburg, May $\frac{13}{25}$, 1871

Day Auroras in the Arctic Regions

I CAN now answer Dr. Burder's question regarding the appearance of the Aurora Borealis in the Arctic Regions. The other evening (last Thursday) I had a conversation with a distinguished magnetician and Arctic explorer, and he informed me that he has often seen the Aurora in *broad daylight* in those regions, the colour invariably being crimson. This, I hope, will once for all settle the apparently vexed question (*pace* Dr. Burder) of "alleged" daylight Auroras. Not to repeat the entire "crusher" of Dr. Burder's, I think many will now discard as "unworthy of serious criticism" his cirrus-cloudy arguments. He must pardon me for being so unceremonious, and remember his own interesting way of confuting—or, better, his attempt.

JOHN JEREMIAH

SCIENCE IN PLAIN ENGLISH

I.

IN tracing the development of public opinion, no period is more instructive than the last three hundred years; and at present the review is particularly important, for we seem to be in a position analogous to the state of Europe just before the Revival of Classical Learning. We are evidently on the eve of great changes in principle, and one vital question is to consider the value of classical culture as compared with the study of science.

The distinctive work of the thirty years (1820-1850) was to "diffuse useful knowledge" among the middle classes. Beside the establishment of mechanics' institutions throughout the country, the London University was founded in 1828; and the British Association for the Advancement of Science held its first annual meeting at York on September 27, 1831, under the presidency of Earl Fitzwilliam.

Another agency has been brought into action, more especially directed to the practical arts, and bringing into friendly competition the various nations of Europe. The International Exhibition of 1851 had a remarkable in-

fluence upon the application of science and art to trade and manufactures, calling forth a memorial from the leading manufacturing and commercial towns as to the importance of establishments for instructing workmen in the principles of science and art, on which their respective industries depend. It was stated that unless this was speedily done the country would run serious risk of losing that position which hitherto had been its strength and pride.

This foreboding was confirmed by the Exhibition at Paris in 1867, which showed an advance made by Continental nations even in some departments in which England had been considered supreme. The conclusion was received with surprise in some quarters, and vexation throughout the country.

There was no doubt that remarkably rapid progress in manufactures had been made by some of the Continental nations; and this rapid improvement was attributed, in a great measure, to the scientific training of proprietors and managers in France, Belgium, Germany, Switzerland; and to the elementary instruction which is universal amongst the working population of Switzerland and Germany. The facilities for acquiring a knowledge of theoretical and applied science are incomparably greater on the Continent than in this country; and that knowledge is based on an advanced state of secondary education.

Hence, a great effort has been made to obtain similar advantages of education for this country, in order that we may retain the position which we now hold. There can be no doubt that scientific training has become a question no longer admitting of delay; and a demand has arisen for Technical Education, by which we are to understand scientific and artistic education, with a view to improvement in industry.

To promote this object, several educational reforms have been suggested; and first of all, that in the universities and grammar schools instruction in science and art should be placed on the same favourable footing as other studies. Only one-third of the boys in the great public schools go to our universities; and therefore, two-thirds pass directly from the schools to enter upon the various pursuits of life. Now there are two methods of education. One gives a youth direct preparation for his future pursuits; the other trains the mind by processes which are not directly adapted for any worldly career, but which are supposed to strengthen the intellectual faculties.

The latter object is pursued in classical education, which is defended upon the ground that, though it does not provide special instruction for the useful purposes of the world, it still furnishes general culture. No one can deny that classical education supplies excellent training in certain directions; but there is a growing conviction that, for the practical purposes of life, the classics have been tried and found wanting; that, while they serve for ornament and for delight, they are not "good for life."

But even with a view to culture, we should not overlook the importance of Science in mental training. Science, properly taught, is one of the best means of educating the highest faculties of the human mind. By proper teaching, however, we must understand, not merely instruction in the facts of science, but discipline in the methods of science. Mere head-knowledge may do a man very little good; it is the habit of mind, the training in method, that determines the character of the man. Hence, the minds of the young should be imbued with scientific principles and trained in scientific methods.

A twofold advantage is asserted by scientific advocates: that as science has now reached so high a stage, it may be used as a means of the best mental cultivation; while, at the same time, it communicates a kind of knowledge which may be made practically useful in every walk of life.

A movement has already been made in some quarters, but sparingly, not to say grudgingly. Some schools have admitted science on about equal terms with dancing, that is to say, they give one or two hours a week to it. Or they may even admit it on equal terms with French; but it is generally made quite subordinate; and while classics are rewarded with high honours, science receives few distinctions. At Harrow the teaching of physical science has been introduced, but has not yet been made part of the regular curriculum; boys are not obliged to learn physical science, though they may get prizes for it. The most difficult point in this part of the subject is where to find suitable masters for the teaching of science. This, no doubt, must be a work of time; but if the demand springs up, the supply will follow.

But beside the demand for a reform in the institutions already existing, there is a general conviction that scientific and technical schools are required in all the great centres of industry; that such schools ought to be established; that we must have "Technical Education." In many districts those who desire to send their own sons or the sons of their better workmen for instruction in science, are unable to carry out their views because no suitable schools exist in their neighbourhood. There are numerous grammar schools in different parts of the country, but many of them were founded in the two centuries which followed the Revival of Classical Learning. Consequently, they are generally under the influence of classical traditions; and a comparatively small proportion of the boys are learning the physical or natural sciences.

The fact is that technical schools cannot be permanently supported unless we diffuse a taste for science and art. If we create the taste, the technical schools will be well filled. We must introduce the elements of science and art into the primary schools, and we shall soon change the secondary education of the working men.

It too often appears that, from the utterly defective education of the people, they do not know what is good for them, and have not the slightest conception of the methods that should be taken to improve their present ignorant and imperfect condition. In some instances so deplorable is the state of elementary education that it is found impossible to give the working classes the instruction which they desire to receive in the sciences connected with their work. They are not able to read with sufficient facility to master the books put before them; they cannot write well enough to take notes of the lectures which they hear; nor are they sufficiently familiar with arithmetic to make the necessary calculations. Hence it results that one of the first difficulties in promoting technical instruction is the want of fundamental training as the basis of scientific knowledge.

The learned will have to revise the method of teaching. There is a well-founded suspicion that the course commonly pursued has been wrong in principle. The teachers proceeded from generalities, constructed very pretty systems, and dealt largely in refinements. Many people now believe, on the contrary, that we ought to begin with individual instances, then lead the pupil to construct a broad outline, and gradually to fill up the picture as his knowledge advances.

Or take another illustration. If a man works his way up the mountain side he meets with many difficulties, but at length, when he reaches the top, he enjoys a fine prospect all around. Now, if that man wishes to guide others up the mountain, it is not sufficient for him to harangue from the top, or to dilate upon the fine prospect which he enjoys. He must come down again to the valley; he must take others by the hand, and lead them by the way which he took himself, or very nearly by the same way.

Until recently elementary treatises on science were written *from the top of the mountain*. The authors, enjoying an expanded prospect, were disposed to take general views; and to discuss principles which, however interesting to themselves, had little or no interest for

the pupil. There was a want of sympathy with the learner. For example, the writers on Geography began with the globe, and expounded the elements of Spherical Trigonometry and Astronomy, talking of *meridians*, *parallels*, the *tropics*, the *equator*, and the *ecliptic*. At present the best teachers of geography *to young children* begin with the place where the pupil lives and dwells; thence they proceed to the surrounding districts, to neighbouring countries, and end with the Globe.

Bacon says that "wherever it is possible knowledge should be *insinuated* into the mind of another in the manner in which it was first discovered." If this principle were fairly carried out it would work great changes in our methods of teaching.

WILLIAM RUSHTON

Queen's College, Cork

MOSS LOCHS

AS these lochs are seldom visited save by sportsmen of either the rod or the gun, it will be necessary for me to give a short description of them. These lochs are generally situated high up, near the tops of the hills, the hills being wholly or in part covered with heather and moss. They are of small size, varying from about a mile to a hundred yards in length; the water is of a dark porter colour. They look as if an immense hole had been dug in the peat, and the hole then filled with water; the banks, which are wholly or in part composed of peat, rising almost perpendicularly out of the water, and at some places extending downwards for many feet under it; at other places going only to a depth of a foot or two, and then extending for some feet in a nearly horizontal direction, when they again dip abruptly to a considerable depth. These abrupt precipices of peat, as seen under the water, are often formed in curious, fantastic shapes, and look more like rock than soft peat; and when seen by the sunshine—broken by the passing waves– through the dusky water, with the surroundings of bleak, bare hill, total silence, save the plaintive cry of some bird passing overhead, and no life, save the lizard and the snake—the whole presents a scene, the weird effect of which on the imagination is seldom if ever exceeded by anything else in nature.

What strikes the observer of these lochs is, that not only are the banks made of peat, but the sides and bottom are wholly or in part made of the same material; and there seems to be no difference between the peat at the bottom of the loch and that on the banks. It looks exactly like as if the peat had begun to be formed at the bottom of the loch, and had gradually extended upwards till it had risen above the water. Yet it could not have done so, because, although water-lilies and some grasses are seen growing under a depth of a foot or two of water, yet all vegetation ceases at a depth of a very few feet. How then came the sides and bottom of these lochs to be formed of peat? There are no signs of any convulsions of nature after the peat had been formed to account for it. If produced by any upheaving of the earth stopping the exit of the water, the upheaving must have been very violent, because many of these lochs are deep and yet of but small size. How, then, came the peat in the position in which we now find it? An examination of the outlet will at once explain the difficulty. The stream which leaves the loch winds its way through mossy ground, the bottom of its channel being covered with water plants. These water plants, as they grow from year to year, are gradually filling up the channel, and so adding to the depth of the loch. It is now easy to understand how peat is found at such depths in these lochs. We will suppose the loch to begin from marshy ground or from a small loch. The channel of the outlet—being covered with water plants—gradually gets filled up, so increasing the depth of the water in the lake, while vegetable life is busy adding peat to the banks. And thus marshy ground or a shallow loch with shelving beach is converted into a deep moss loch with perpendicular sides. The rising of the channel of the outlet and of the sides does not always take place at the same relative rate. In one loch recently visited the peat bank was about eight feet above the water, whilst in another where there was a vigorous growth of water plants in the outlet, the water was within a few inches of being over its banks. That water plants are capable of producing this result will be doubted by none who have seen them fairly establish themselves in a pond, how soon they over-run, and, if left alone, fill it up.

Moss lochs stand in marked contrast to other lochs. In other lochs the water, as it passes from them, has worn their channels, and is year by year wearing them further, so lowering the water in them; whilst in moss lochs the channels are year by year being filled up, so gradually raising the water in them. It may be objected that the water plants in the outlet would be uprooted by the water from the loch during floods; but such is not the case, because in most cases, when the water leaves the loch, it passes through a nearly level channel, so that it never gets up speed sufficient to damage its bed. And besides, these lochs being situated near the tops of the hills, they drain but a small extent of country. In no case visited had any of the lochs a stream of any size running into it, and the amount of water which passed from them was in every case small.

As there are few rules without exceptions, it is possible that the rule that the outlets from moss lochs are covered with water plants may not hold good in every case; it is quite possible that the outlet from a moss loch might be over a rocky channel. If such should happen to be found, it does not necessarily prove that it was not formed in the way shown. The plants might continue to fill up the outlet till the water was raised to such a height that it found a passage over a new channel at a part of the hill where there was no moss and nothing but bare rock. We would thus have a moss loch grown in the way shown, but which had ceased to grow.

JOHN AITKEN

WRITERS ON SCIENCE

AT the recent dinner of the Royal Literary Fund, Sir Henry Anderson proposed the toast of "Writers on Science." We make the following extracts from the reply by Dr. Richardson from the report of the Society:—

"Who are the writers on science? Are they as well known as other great writers? They are not. They are less fortunate, and, therefore, the more worthy of the exceptional honour you would bestow on them. Excuse me a moment or two while I indicate the peculiarities of the position of the writer on science. He is a man communicating to the word that which is, by comparison, new to the world. The poet can cast back for his models to a time when the Greeks had not so much as the figment of an alphabet. The theologian may go back for his lesson to the earliest manifestations of the life of intellect on the planet. The historian finds subject and matter ready for his hand from the oldest and remotest, as well as the newest, writings and traditions of races and peoples. The story-teller is embarrassed with the richness of the past, and troubled by the greed of his admirers for more of his work. These all, indeed, are but the continuing interpreters of things, events, thoughts, which every man who claims to read claims also to understand. The writer on science has none of these advantages; he is but newly born into an old world of thought, and is not simply telling of new wonders, but is often himself learning at the same time as he is instructing an audience unlearned in his knowledge. Thus he comes slowly into the recognised

brotherhood of men of letters; at the best he speaks to but a small audience, amuses rarely, excites sometimes without intention hopes that are delusive, and requires always, in order that he may be fairly understood, a degree of patience it is vain to expect from the multitude. To these difficulties others are added belonging to the work he accomplishes. The most original writers on science are destroyed constantly by the magnitude and overpowering character of the work they have written, and by the practical results that spring from the work. In other literature the book produced lives as the book, and the learner from it, age after age, must go back to the fountain head to drink and drink; in science literature the book sinks into the fact it proclaims, and the fact remains the exclusive master of the field. A striking example of this flashes across my mind at the present moment. Every reading man and woman knows that in the reign of Queen Elizabeth the book of Shakespeare's plays had its origin, and nearly everyone who has read the book (and who has not?) remembers the curious saying in it, 'I'll put a girdle round the world in forty minutes.' But how many are there who have read another great book of that same reign, entitled 'De Magnete;' or are aware that at the time when Shakespeare was writing his now-familiar phrases, the author of the book on the Magnet, the Queen's physician, one William Gilbert, when his daily toils of waiting upon the sick were over, was working with his smith in the laboratory at his furnace, needle, and compass, was writing up for the first time the word 'Electricity,' and was actually forging the beginnings of the very instruments that now, in less than forty seconds, put the girdle round the globe? Again, writers on science are lost sometimes in the blaze of their own success. They raise wonder by what they do, and fall beneath it. All knowledge newly born is miracle, but by-and-by, as the knowledge becomes familiar, the miracle ceases. In this way advances in science become part of our lives, while the men who write them down cease to us. When the Leyden jar was first described, Europe was mentally as well as physically convulsed with the thing; now a Leyden jar is a common object—we all know it; but how few know of Mr. Cuneus, who first described this instrument of science? The whole civilised world is cognisant in this day that communication from one part of the world to the other, by telegraph, is almost child's play; but how many have seen or heard of Mr. Cavallo's original Essay on Electricity as a means of communicating intelligence to places distant from each other? There is nothing more commonplace, in our day, than to know that a living human being can be placed in gentle sleep, and, while in blissful oblivion, can have performed on him what were once the tortures of the surgeon's art; but how few have heard or seen Sir Humphry Davy's paper announcing to mankind this grand beneficence! These are some of the difficulties of writers on science; and yet there is another I must name, be it ever so lightly. I refer to the desperate struggles of the man of science who has nothing but science to carry him on in life. None but such as are placed as I am, practising as physicians in the metropolis of the world, and admitted at the same time, as men of science, into some knowledge of the subject upon which I now speak, can form a conception of the almost hopelessness of the position of the pure scholar of science. On this I say no more. I would awaken but not weary your sympathy . . . . much of the difficulty these writers have had to bear I recognise with admiration, as their truest glory; and I see that hope for better worldly prospects is near. A profession of science is no doubt organising. The world is at last asking men of science to employ themselves in teaching the world; and the teachers, bending to the labour, are, in their turn, willing to suspect that they are but as children, or at best youths, in the race after knowledge. This is most hopeful; and it is hopeful also to find that men who claim to be conservators of a knowledge that was matured when science was unborn, are listening now to our scholars with an attentive ear, and are beginning to accept that the Lord of Nature, whether he reveal himself to the ancient law-giver in the burning bush that was not consumed, or to the modern astronomer in the burning glory of the omnipotent sun, is one and the same Lord. Thus there is hope, I may say certainty, in the future for the literature of science; for its poetry, its parables, its facts, nay, even for its religion."

FEARFUL EARTHQUAKE IN CHINA

THE American Minister in China, General Lowe, has just forwarded to the Secretary of State at Washington the following account of the fearful earthquake which occurred in the Bathang, in the province of Szchuen, on the 11th of April, which he has had translated from the report of the Chinese Governor General of the province in which it occurred:—"Bathang lies on a very elevated spot beyond the province about 200 miles west of Li-Tang, and about thirty post stations from the district town of Ta-tsien, on the high road to Thibet. About eleven o'clock on the morning of the 11th of April, the earth at Bathang trembled so violently that the government offices, temples, granaries, stone houses, storehouses, and fortifications, with all the common dwellings and the temple of Ting-lin, were at once overthrown and ruined; the only exception was the hall in the temple grounds, called Ta-Chao, which stood unharmed in its isolation. A few of the troops and people escaped, but most of the inmates were crushed and killed under the falling timber and stone. Flames also suddenly burst out in four places, which strong winds drove about until the heavens were darkened with the smoke, and their roaring was mingled with the lamentations of the distressed people. On the 16th the flames were beaten down, but the rumbling noises were still heard under ground like distant thunder, as the earth rocked and rolled like a ship in a storm. The multiplied miseries of the afflicted inhabitants were increased by a thousand fears, but in about ten days matters began to grow quiet, and the motion of the earth to cease. The grain collector at Bathang says that for several days before the earthquake the water had overflowed the dykes, but after that the earth cracked in many places, and black, fœtid water spurted out in a furious manner. If one poked the earth the spurting instantly followed, just as is the case with the salt wells and fire wells in the eastern part of the province; and this explains how it happened that fire followed the earthquake in Bathang. As nearly as can be ascertained there were destroyed two large temples, the offices of the collector of grain tax, the local magistrates' offices, the Ting-lin temple, and nearly 700 fathoms of wall around it, and 351 rooms in all inside; six smaller temples, numbering 221 rooms, besides 1849 rooms and houses of the common people. The number of people killed by the crash, including the soldiers, was 2,298, among whom were the local magistrate and his second in office. The earthquake extended from Bathang eastward to Pang-Chahemuth, westward to Nan-Tun, on the south to Lintsah-shih, and on the north to the salt wells to Atimtoz, a circuit of over 400 miles. It occurred simultaneously over the whole of this region. In some places steep hills split and sunk into deep chasms, in others mounds on level plains became precipitous cliffs, and the roads and highways were rendered impassable by obstructions. The people were beggared and scattered like autumn leaves, and this calamity to the people of Bathang and the vicinity was really one of the most distressing and destructive that has ever occurred in China."

ON THE STRUCTURE OF THE EEL'S SKULL

THE skull of the Eel is much less specialised than that of most other Osseous (*Teleostean*) fishes. I was made aware of this many years since whilst preparing skeletons of the common kind (*Anguilla acutirostris*), and of the conger (*Muræna conger*). Afterwards, when Prof. Huxley's "Croonian Lectures" (Proc. Roy. Soc.) came into my hands, the importance of the aberrant structures of this type of skull was shown to me; and since that time I have been on the watch for further opportunities for dissecting and working out both this type, and also that of the Amphibia, which it serves to illustrate. In a few weeks' time I shall be able to make myself understood with regard to those morphological changes which take place in the vertebrate skull as it passes from a low Ichthyic into the higher Amphibian type. This will be done by the illustration and description of the frog's skull in the forthcoming part of the "Philosophical Transactions," an abstract of which paper has already appeared in these columns. At present the nomenclature of the parts of the cranium and face of the fish is in a state of painful confusion. I shall not, however, trouble the student with confusing references, but continue to use those terms which he will find in my other morphological papers. I may, however, remark that these differ in some instances from those used by Professor Huxley, for instance, his "squamosal" is my "pterotic" (see "Elem. Comp. Anat.," p. 188). This is a bone called "mastoid" by Cuvier, and this term was adopted by Prof. Owen. These anatomists came much nearer the truth than my friend; but the bone only represents *part* of the human "mastoid"—its antero-superior region. Again, the terms for the palato-pterygoid arcade are very confusing; Cuvier's "internal pterygoid," also called ento-pterygoid by Owen and Huxley, does not correspond to the internal pterygoid plate of man and the mammalia generally, but to a third piece, which I call meso-pterygoid, and which occurs in a young pig's and in a young fox's skull in my collection; I have also found it in the palate of all sorts of birds, except the fowls and Struthionidæ. The true representative of the human internal pterygoid is, in fishes, called "transverse" by Cuvier; most correctly the "pterygoid" by Owen; confusingly the "ecto-pterygoid" by Huxley. I drop the frequently misapplied terms, "ecto-" and "ento-pterygoid," altogether, and call the true "transverse bone" of the reptile—never seen in fishes—the "transpalatine." Most of the other terms used by me agree with those used by Prof. Huxley in his "Elements."

There is, however, in the hyoid arch one segment which requires its name,—that given to it by Prof. Owen—to be changed; I refer to that lump of cartilage which becomes segmented off from the lower part of the hyoid cornu by a joint cavity, and which has two ossifiic centres. This has been called the "basi-hyal;" but it is merely a distal and not a basal bone, the key-stone being the "glosso-hyal," which passes into the basi-branchial bar. I would call it the "hypo-hyal," as it is the manifest "serial homologue" of the "hypo-branchials." All these things I hope soon to make plain in a paper now in hand, on the "Structure and Development of the Salmon's Skull." My materials at hand, from which I have studied the eel's skull, are the adult conger's skull, that of a small *Muræna* (? species), and the heads of large and small common eels. The smallest of these are the gift of Mr. F. Buckland; they measure 2 inches 8 lines in length. The cranium of the eel is long, triangular, and depressed, the nasal region being very pinched and narrow, whilst the occipital is expanded, and sends out over-hanging outgrowths, — backwardly projecting crests, which are continuous in the conger, but distinct spurs in the eel.

These crests in the eel are formed by the super-occipital at the mid-line; then a pair from the epiotics; and below, and external to these a bilobate pair, belonging largely to the pterotics, but also to the ex-occipitals.

The flat top of the skull, up to the exit of the fifth nerve, is square, the top of the cranium then narrows suddenly to half the breadth of the square part.

On each side, there is, in the broad part of the skull, a large overhanging eave, below which is the double recess which forms the glenoid cavities for the hyo-mandibular. If the large parietals which meet at the mid-line were removed, we should see the "great upper fontanelle," bounded behind by the perfected occipital arch, and laterally by the cranial and auditory elements. Indeed, the term cranio-auditory elements would be a correct term for several of these bones, the auditory capsule coalescing very early with the rising crests of the investing mass, and the subsequent ossifications enclosing both the sense-capsule and the membranous cranium. Behind, the expanded occipital region is largely indebted to the "epiotics," and "pterotics," two pairs of which bones are really primarily related to the cartilaginous auditory sac. There is no opisthotic, and the large "pro-otic" is surmounted by a part of the posterior sphenoid, which is to be found in the bird, but not in the reptile or mammal. I allude to the post-frontal, a great outstanding projection from the "ala magna," a crested, fore-turned, supero-lateral element of the primordial skull. In front of the "foramen ovale," the "ali sphenoids" wall-in the skull; they are unusually large for an osseous fish; they rest upon an inverted "saddle" of bone, with a free fore-edge. This is the fish's basi-sphenoid, and corresponds to the pre-pituitary part of the human basi-sphenoid, and to its anterior clinoid region. In high-skulled fishes this bone is Y-shaped, the descent of its long crus showing that the "meso-cephalic flexure" of the embryo is never wholly recovered from in these fishes; and its slender size showing that the connective band which brought the investing mass into union with the "trabeculæ cranii," was a feeble strip of cartilage. Behind the saddled-shaped basi-sphenoid of the eel is the open pituitary space, which, as in birds, is merely closed below by the ossification of sub-mucous fibrous tissue, in the form of the para-sphenoid. The large basi-occipital, which encloses all the retiring notochord that belongs to the skull, helps to form an elegant tri-radiate synchondrosis in the floor of the skull; for all that part of the "investing mass" from which the notochord had retired, is invested, not by a basi-sphenoidal ossification, but by the huge "pro-otics" which meet at the mid-line, behind the open pituitary space. The structures of the skull that have morphological continuity with the vertebral column cease behind the optic nerves, and even the parts surrounding the pituitary body are of a secondary or connective character, bringing the true cranial structures into fusion with parts derived from the first or pre-stomal facial arch, the trabeculæ cranii. Now there comes in a most important condition of the skull of the eel; for the anterior sphenoidal region has no cartilaginous walls whatever; the roof is formed by the narrow frontals (frontal in the conger); the side walls are membranous, and the floor is that sub-mucous bone the para-sphenoid. In young eels, 5 in. long, the trabeculæ may be traced to their union with the "investing mass" in the pre-pituitary region; but there they unite with each other, and in the anterior sphenoidal region, instead of turning upwards to form a skull floor, they grow downwards, investing the convex upper face of the para-sphenoid (see Fig. B). Over the optic region the *pterotics* overlap, in the conger they nearly reach as far as the hinder end of the bony ethmoid; and here the frontal sends out a few post-orbital snags, and sends downwards on each side a thick post-orbital process, which articulates with the ali-sphenoid. At this part the narrow skull bends downwards in a Roman-nosed manner. The solid nasal region in front is of equal length with the long membranous interorbital space; these are separated by the large, thick,

ear-shaped unossified pre-frontals, or lateral ethmoids. The median ethmoid is ossified entirely by the thick, bony bar, which commences as a knife-shaped vertical plate, or parostosis; here in the eel as in the Amphibia, the distinction between parostosis and endostosis at times breaks down. The long tooth-bearing vomer splits the parasphenoid with its long style, as far back as the pituitary space; it coalesces with the ethmoid when the eel is five or six inches in length. Where the bony ethmoid and vomer unite there is a groove; along this the olfactory crus runs, protected outside by the grooved, soft, lateral, ethmoidal wing, which arose as an outgrowth of the trabecular bar; the "cornua" of the trabeculæ (Fig. C) persist as filiform prolongations, continuous with the lateral ethmoids behind, and end in blunt points near the fore part of the ethmo-vomerine bony mass. In the conger, but not in the eel, the vomer sends out a wing on each side for the lateral ethmoids to rest upon. The parasphenoid is very deeply split at both ends, both for the vomer and the basi-occipital; it has large wings in the basi-temporal region, which underlie, in a squamose manner, the lower edge of the prootics. These latter bones divide the foramen ovale; behind and below the posterior opening there is a small passage evidently the distinct foramen for the "portio dura." The vomer and parasphenoid are azygous splints applied to the under surface of the coalesced and metamorphosed trabecular bars.

When the membranous cranium dips downwards in front (mesocephalic flexure) then the trabeculæ are not only parallel with the base of the first cerebral vesicle, but also nearly so with their immediate successors, the mandibular bars; whilst thus contiguous they form a *secondary connection*, which, of course, lengthens as the trabeculæ ascend with the cranial sac, and thus enlarge the mouth cavity. This bar is well chondrified in fishes

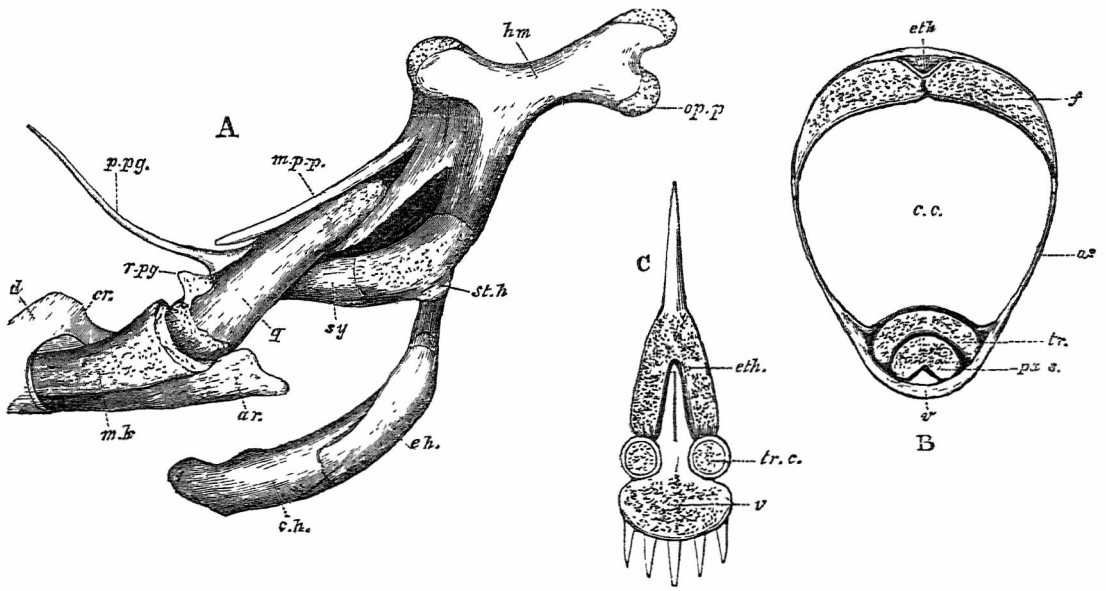

FIG. A.—INNER VIEW OF MANDIBULAR AND HYOID ARCHES OF A YOUNG EEL, 2⅝ inches long: *r.pg.* rudiment of cartilaginous pterygoid; *p.pg.* pterygo-palatine; *q.* quadratum; *ar.* articulare; *d.* dentary; *cr.* coronoid; *mk.* Meckel's cartilage; *hm.* hyo mandibular; *sy.* symplectic; *st.h.* stylo-hyal; *e.h.* epi-hyal; *c.h.* cerato-hyal; *op.p.* opercular process; *mp.p.* metapterygoid process.

FIG. B.—SECTION OF ANTERIOR SPHENOIDAL REGION IN A YOUNG EEL, 5 inches long: *eth.* ethnoid; *f.* frontal; *o.s* orbito-sphenoidal region; *tr.* trabeculæ: *pa.s.* parasphenoid; *v.* vomer; *c. c.* cranial cavity.

FIG. C.—SECTION THROUGH THE NASAL REGION OF THE SKULL OF A YOUNG EEL, 5 inches long: *eth.* ethnoid; *v.* vomer; *tr. c.* trabecular cornu.

All the figures are magnified about 25 diameters.

generally, and in the tailless Amphibia. In the tailed Amphibia it is abortively developed, and no solid hyaline cartilage is found in this part in Sauropsida and Mammals. (See "On Skull of Fowl," Phil. Trans., 1869, pl. 81, figs. 1, 3, 6, 10, and 11, p. 767.)

The eel also has no solid cartilage in this bar, save a slight rudiment behind, as in the "Urodela" (Fig. A), and the three ectostal plates that invest the large cartilaginous bar in most osseous fishes—the palatine, meso-pterygoid, and pterygoid—are represented by a needle-like, solid style of bone, pointed in front, and pedate behind where it attaches itself to the inside of the front edge of the quadrate. In old eels this style becomes a flattened bar, articulating by a squamose suture with the quadrate, and loosely attached to the lateral ethmoid and the maxillary in front. This bone is the counterpart of the single plate in the Lepidosiren's mouth (see Huxley's Elem., Figs. 84 and 85, D, pp. 208, 209); but the pterygo-palatine of that fish is applied to a thick cartilaginous connective that fills in the whole sub-ocular region. As in the Lepidosiren and the Amphibia, tailed and tailless, the eel has only one ossification on the pier of the mandibular arch, and the generalised nature of the fish is shown in the partial coalescence which takes place between this and the succeeding (hyoid) pier. In the Lepidosiren, as in the Chimæra, the coalescence is entire between all but the free segmented rays of the first and second post-stomal arches; in the Urodelæ we have a similar state of things, but in the Anoura coalescence only takes place in the lower half of the pier. In all these it is cartilaginous confluence, but in the eel it is merely the anchylosis of the bony symlectic (Fig. A, *sy.*, *q.*) with the quadrate. Although there is no metapterygoid perched upon the quadrate, yet that element sends upwards a meta-pterygoid process which runs between and within two large denticulations of the hyo-mandibular. This latter bone (*hm.*) is very massive, and being most strongly united both by synchondrosis and deeply serrated suture to the quadrate, the suspensorium of the eel is exceedingly strong, quite as strong as, and more elastic than,

the quadrate of the Sauropsida. It forms an acute angle with the basi-cranial line, as in most other fishes, but in *Muræna helena* (see Huxley, Croon. Lect., p. 34, and Osteol. Catal. Mus. Coll. Surg., vol. i., p. 14), the suspensorium is very frog-like, forming an obtuse angle. The well-developed heads of the hyo-mandibular fit into proper glenoid cavities, the foremost of which is made in the post-frontal and pro-otic, and the hinder pit is in the pterotic. The knob for the opercular is very large in the adult, and in eels five or six inches long the only sign of the separateness of the symplectic is the transverse cartilaginous tract which connects it with the hyo-mandibular; but in my youngest specimen it can be seen separate, with its own ectosteal sheath (Fig. A, *sy.*); it is very short, and the cartilaginous interspace above is very large. From the middle of that synchondrosis there arises a small semi-segmented bud of cartilage, the "stylo-hyal" (*st. h.*); this becomes ligamentous in the adult; in other Teleostei it forms a rather small cylinder, completely segmented off, and it acquires a bony sheath. The rest of the descending hyoid cornu is a thickish arcuate rod of cartilage ossified by two ectosteal sheaths, the "epi"- and "cerato-hyals." In Teleostei generally, the distal end is cut off by a joint cavity, and ossifies from two more ossicles, forming the "hypo-hyal" segment; this structure is not attained in the less specialised eel. The arch is finished by a long and stout glosso-hyal. Even the free bar of the first post-stomal arch—the mandible—has its peculiarities, for, contrary to rule, it has no angular splint—and the "coronoid," so seldom present in Teleostei, and so constant in Sauropsida, is well developed in the eel; it is very small in old individuals of the cod-fish. The dentary alone is dentigerous, and is very large and strong, with a large coronoid process; the "articulare" is short and massive. In the upper part of the face the specialised subcutaneous bones (*parastoses*) are very instructive; several belong to the lateral-line series, but, modified and broken up into two rows in the head, they form tubular mucous bones; these are the nasals and "sub"- and "pre-orbitals." Another facial series, which may run obliquely from the snout to the hinge of the lower jaw, has only two on each side,—the pre-maxillary and maxillary. Here we have, contrary to rule, the short pre-maxillary edentulous and the maxillary bearing teeth. The specialised bones of the back-face and throat are worth mention; the pre-opercular is oblong, twisted, strongly convexo-concave, and burrowed by mucous glands. The opercular fits by a deep cup to the knob on the hyo-mandibular; like the feebler sub-opercular, it is strongly falcate; the latter fits by a sliding joint to the pedate upper end of the wedge-shaped large inter-opercular. The long, thick-based, slender-pointed "branchiostegals" are eleven in number on each side in the common eel; the basal bone of this wondrously specialised series of dermal bones is the so-called "uro-hyal;" it is knife-shaped behind, and in front terminates in a massive head, facetted for the cerato-hyals. I call this bone the "basi-branchiostegal;" for the "uro-hyal" of the bird is the remnant of the basi-branchial bar. The student can easily obtain both the gigantic conger and the larger specimens of the common eel, and, having become familiar with the parts of the skull and face of such an ordinary teleostean as the cod, and of the larger amphibian types, both tailed and tailless, he will then be able to gain a much clearer idea of the fundamental harmony existing between such diverse types, if this intermediate eel-type be once well understood.

The development of the skull in the culminating amphibian, the frog, has yielded me already such satisfactory results that I am somewhat restless to know the early conditions of that of the fish: then whole groups of low vertebrate types will begin to be seen in harmonious relation.

W. K. PARKER

NOTES

THE following is a list of the Presidents of Sections nominated by the Council of the British Association for the approaching meeting at Edinburgh:—Section A, Prof. P. G. Tait, of Edinburgh; Section B, Dr. Andrews, of Belfast; Section C, Prof. Geikie; Section D, Prof. Allen Thomson; Section E, Alex. Keith Johnston, sen.; Section F, Lord Neaves; Section G, Prof. Fleeming Jenkin. The Evening Discourses will be delivered by Prof. Abel and Mr. E. B. Tylor.

IT is stated that the labours of the Royal Commission on Coal, appointed a few years ago by Sir George Grey, are on the point of completion, and the result is the demonstration of the fact that, assuming a certain annual increase in the rate of consumption, sufficient economically gettable coal exists in Great Britain and Ireland to last from 800 to 1,000 years. We shall be very glad to see such an important fact demonstrated.

WE have to record the death of Mr. George Grote, Vice-Chancellor of the University of London, whose serious illness we mentioned a fortnight since. He died on Sunday last, after a long illness, in his seventy-seventh year. We can ill afford to lose men who have so long and so ably thrown their influence and their abilities into the cause of the higher education of all classes of the community.

WE regret to announce that Mr. Numa Edward Hartog, Senior Wrangler of the University of Cambridge in 1869, died on Monday last of smallpox. Mr. Hartog was still, in common with other Nonconformists, excluded from the substantial reward of his exertions; but in the present Session he gave important evidence before the Lords' Committee on University Tests, and it is due perhaps to the sympathy which his exclusion excited that the Lords proposed a measure which would have admitted him to a Trinity Fellowship. Before, however, he could take advantage of the passing of the University Tests Bill the man who was expected to be the first to reap its fruits had passed away.

AT the recent examination for the newly-established Diploma in State Medicine given by the University of Dublin, the first place was taken by Mr. J. W. Moore, ex-scholar Trinity College, Dublin; the second by Dr. A. W. Foot, Junior Physician to the Meath Hospital and County of Dublin Infirmary; the third by Mr. Yeo, who obtained the Junior Medical Exhibition in 1864, and the Senior Medical Exhibition in 1866; and the fourth by Mr. Todhunter, a gentleman already well known in certain circles for his literary abilities.

THE new museum and library at Clifton College were inaugurated on Saturday last by a *conversazione*. There was a good collection of objects of interest contributed by gentlemen of the neighbourhood; some music, and a speech from the Rev. Principal of the College, interested the large company, and Prof. Church delivered an address on "Colour."

THE new buildings of St. Thomas's Hospital on the southern Thames Embankment, opposite the Houses of Parliament, were opened yesterday by the Queen in person.

THE Victoria Institute concluded its fifth session on Monday. Its members are now 305 in number, seventy having joined since February; the papers for the coming session include two on subjects connected with the vegetable kingdom.

THE managers of the London Institution, in accordance with the recommendation of the annual meeting of proprietors, have resolved to afford opportunities during the ensuing season for the reading and discussion of papers on subjects of special interest in science, literature, commerce, and the arts, provided they receive such offers as will insure a succession of suitable communications. It is believed that this proposed extension of the use of the Lecture Theatre in Finsbury Circus will produce a series of attractive meetings similar in character to those of the Society of

Arts, but representing more directly the business and thought of the City. The managers do not intend to restrict the reading and discussion of papers to the proprietors of the Institution, or to limit the range of subjects otherwise than by the provisions of the charter, which precludes politics and theology.

ON Saturday last, the 17th, the Rugby School Natural History Society made an excursion through Charnwood Forest. Mr. Hambly, the manager of the Mount Sorrel granite works, conducted them over his workshops and quarries; and Mr. Ellis showed them his slate pits at Swithland. They also visited Woodhouse Eaves, the Beacon, the Monastery, and Bardon Hill. The geologists, botanists, and entomologists were alike well content with the results of a very pleasant day's excursion. The party numbered forty-one.

SIR JOHN PAKINGTON, as President of the Institution of Naval Architects, has addressed a letter to the President of the Board of Trade, in which, among other suggestions, he proposes as an additional clause in the "Prevention of Accidents Act" that in future adjusters of compasses shall be duly certified by the Board of Trade, after examination, as properly qualified.

WE are requested to state that the value of the Natural Science scholarship at Magdalen College, Oxford, will be 95*l.*, and not 80*l.* as stated last week, and that the name of the successful competitor for the Johnson Memorial Prize Essay is John G. Gamble, not James S. Gamble.

DR. MURCHISON, F.R.S., has been this week recommended by the Grand Committee for election by the Governors as Physician to St. Thomas's Hospital, Mr. Croft for election as Surgeon, Dr. John Harley and Dr. Frank Payne as Assistant Physicians, and Mr. Francis Mason and Mr. Henry Arnott as Assistant Surgeons.

DR. HOOKER reports that the upper valleys of the Atlas range are very steep and picturesque, and are thickly inhabited by a fine race of people called Shelloos. The first positive indication of ancient ice action met with was a stupendous moraine at about 6,000 feet—a perfectly unmistakeable one, but, curiously enough, with no traces above or below it, no *roches moutonnées*, no striated or grooved surfaces, and no perched blocks, except on the moraine itself. The height of the peaks of the axis is very uniform for a considerable distance, and they have very steep faces; there are no glaciers nor perpetual snow, properly so called; but snow lies all the year in steep gullies of the north face, stretching downwards for probably 5,000 feet from the summit. The vegetation is chiefly Spanish.

THE following works on Science are amongst the publishers' announcements for the next few weeks:—From Messrs. Longman—Dr. Ueberweg's "System of Logic and History of Logical Doctrines," translated by Thos. M. Lindsay; "Cooper's Dictionary of Practical Surgery and Encyclopædia of Surgical Science," new edition by S. A. Lane; in Gleig's School Series: "Animal Physiology," by Dr. E. D. Mapother; "Physical Geography," by W. Hughes. From Mr. Murray—"Rambles among the Alps, 1860—1869," by E. Whymper. From Griffith and Farran—"The Theory and Practice of the Metric System of Weights and Measures," by Prof. Leone Levi, F.S.A.; "A Compendious Grammar and Philological Handbook of the English Language," by J. Stuart Colquhoun, M.A., barrister-at-law. From W. and R. Chambers—"Class Book of Science and Literature; Zoology from do.; Botany from do.; Geology from do."; "Standard Animal Physiology," Part I. for Standard IV.; "Standard Geography," Part I. for Standard IV.; "Standard Physical Geography," for Standards IV., V., VI.; "Mackay's Arithmetical Exercises," for Standard Work, Parts I., II., III., IV.; Part V., embracing Metric System; "Standard Algebra;" "Explicit Euclid," Books I. and II. From S. Low, Son, and Co.—a complete treatise on the "Distillation and Preparation of Alcoholic Liquors," translated from the French of M. Duplais, by Dr. M. McKennie; a treatise on "The Manufacture of Vinegar," by Prof. H. Dussance. From Cassell, Petter, and Galpin—"Selected Obstetrical and Gynæcological Works of Sir J. Y. Simpson," edited by Dr. J. Watt Black; "Model Drawing," by Ellis A. Davidson, being the new volume of Cassell's Technical Manuals, with numerous illustrations and drawing copies; the "Technical History of Commerce," by Dr. Yeats, LL.D.; the "Natural History of Commerce" (second edition), by Dr. Yeats, LL.D.

WE reprint the following sentence from the recently published address of the President of the Tyneside Naturalists' Field Club, commending it to the notice of similar institutions throughout the country now that the season for excursions is commencing:—"We have no law excluding ladies from our club, but yet we have no lady members. Ladies, however, sometimes attend our meetings, and it would, I think, be an advantage to the club (may I hint also that it might be an advantage to the ladies?) if more of them came, and oftener. It is of infinite importance that mothers should be able to impart to their children an intelligent interest in Nature. They cannot do this unless they first possess that interest themselves, and in what way can it be more pleasantly developed and refreshed than by meetings such as ours? It may perhaps be objected that the length and occasionally the rugged character of our walks prove an obstacle to the presence of the weaker sex; but my impression is that this is not the case to any very serious extent, and in many of our excursions ladies have proved themseves quite equal to walks as long and as arduous as are at all desirable for our purposes. I would therefore recommend—not any new rule, which is needless—but simply that we should persuade our lady friends to join the club as members, and not as only casual visitors."

WE have received the prospectus of a proposed American *Archæological Review and Historical Register*, devoted to Archæology, Anthropology, and History, to be devoted to the rapidly increased interest displayed in these subjects in America, and designed not to meet the wants of men of science only, but of all interested in the Origin and Antiquity of Man. Its contents will include original contributions, the reports of learned societies in America and abroad, and a department of "Notes and Queries." The *Review* is intended to be published either monthly or quarterly in New York, and will be edited by Dr. Wills de Hass.

WE learn from the *American Naturalist* that Messrs. J. A. Allen and Richard Bliss, jun., of the Museum of Comparative Zoology at Cambridge, Mass., with Mr. C. W. Bennett, of Holyoke, Mass., started late in April on a six months' collecting trip to the Plains and the Rocky Mountains. The primary object of the expedition is to collect the larger mammals of the West.

THE Ohio Legislature has appropriated 21,000 dols. for continuing the survey of that State, and 18,000 dols. for publication of the results. This survey is under the direction of Prof. Newberry himself; and his corps, which has been employed for some time, will be increased by Prof. J. T. Hodge, Prof. J. H. Stevenson, and others, for the purpose of more speedily finishing the work.

MANY scientific societies have been desirous of taking advantage of the International Exhibition and of the Albert Hall to hold meetings in connection with the Exhibition, and to bestow attention on scientific visitors. The small theatres have, however, been occupied by specimens exhibited, and the Albert Hall is considered too large.

A BRILLIANT meteor of unusual form was seen at Panama on the morning of May 1 at half-past two. It was due south and

about 30° above the horizon. It was of the form of a darting flame, parallel to the earth's surface from east to west. The head was of dazzling whiteness, the middle bright yellow, and the tail violet. It ended in a train of brilliant sparks of about 2° in length, and was visible about two minutes. The whole sky was of a rosy colour, and particularly in the east. The same tinge was visible in the evening at half-past seven.

A SCIENTIFIC sanitary question has arisen in India. On the ground of necessity, public offices have been supplied with anti-thermic arrangements; but the economical fit, still strong, has led to a government decree that it cannot afford such provision, and that kuskus windows and their essentials must be provided at the expense of the officials. This will afford an additional pressure on the agitation for transferring the public departments to the English towns, sanitaria, or tea plantations in the hills.

IT is stated that Assurance Companies in India have declined to accept the lives of the officers of the Geological Department there on account of the exposure to which they are subjected.

A UNITED Service Institution for India has been formed, and it is gratifying to observe that it is to be established at Simla in the Himalayas, in a healthy district instead of an unhealthy place.

THE severe earthquake of the 25th of February in Chile has called attention to the views of Mr. Darwin and Prof. Rudolph Falb of Prague. Mr. Darwin was in Chile in the great earthquake of February 20, 1835. It is observed that the recent earthquake began at the same time, 11.30 A.M. Mr. Darwin considered that the space from under which the volcanic matter was erupted in Chile was 720 miles in one line and 400 in another, and that the existence was indicated by a subterranean table of lava of the area of the Black Sea. Prof. Falb maintained that the influence of the moon is the chief cause of earthquakes, and in a letter to NATURE of the 14th of April, 1870, he explained and defended his doctrine, and referred to the earthquakes of Manilla, the volcano of Puraco in Columbia, and convulsions in Peru. His prophecies of a great earthquake in Peru, which occasioned so much alarm, were not realised. The Manilla earthquake, he says, took place two hours and a half after the culmination of the moon. It is affirmed that the late earthquake in Chile had no relation to the culmination of the moon. It is to be noted that the great earthquake in Honolulu in the Hawaian Islands took place on the night of February 19, six days before that of Chile.

AN earthquake was felt at Rawul Pindee and Murree, in the Himalayas, in April.

THE Russian Government are believed to be organising an expedition to New Guinea for the purposes of scientific research and exploration. It is, however, believed in Australia that this is only an indirect method of obtaining a foothold in that country, and it is proposed that the Government of Victoria should send an expedition to New Guinea, in order to obtain by treaty certain portions of territory for purposes of settlement. Should this design be carried into effect, it is to be hoped that every facility will be given to Naturalists to accompany the expedition into this large and comparatively unknown country.

THE *Friend of India* states that from the report on the general state of the weather in the North-West Provinces and Oudh during March, it appears that the direction of the wind, as in the preceding two months, was for nearly the whole month from the north-west in the N.W. portion of the provinces, and west elsewhere. During the first half of the month a tendency to change to the east was occasionally perceptible, and this was especially the case during the time of the barometric depression from the 13th to the 20th. The month as a whole was much drier than usual.

MR. BENTHAM'S ANNIVERSARY ADDRESS TO THE LINNEAN SOCIETY

(*Continued from page* 114)

IN geographical biology Denmark proper is of no great importance except as a connecting link, on the one hand, between the Scandinavian peninsula and Central Europe, and, on the other, as the separating barrier between the Baltic and the North Seas. Low and flat, without any great variety in its physical features, it is unfavourable for the production or maintenance of endemic organisms, and forms an inseparable portion of the region of Central Europe. But the Arctic possessions included in the kingdom, Greenland, Iceland, and the Faroe Islands, are of great interest; and Denmark itself is remarkable for the number of eminent naturalists, zoologists as well as botanists, produced by so small a state. Its reputation in this respect, established by the great names mentioned in my review of Transactions in my Address of 1865, is being well kept up by Bergh, Krabbe, Lütken, Mörch, Reinhardt, Schiödte, Steenstrup, and others in zoology; whilst Lange, Œrsted, and Warming are among the few who now devote themselves more or less to systematic botany. Their general zoological collection, when I last visited it, many years since, was not extensive, although rich in northern animals, and very well arranged under the direction of Steenstrup, and the insects in the Storm Gade Museum were very numerous; whilst at the University was deposited the typical collection of Fabricius. The Herbarium at the Botanic Garden, valuable for the types of Vahl and other early botanists, has been in modern times enriched by the extensive Mexican collection of Liebmann, the Brazilian ones of Lund and others; whilst Œrsted's Central-American and Warming's Brazilian plants are also at Copenhagen, but whether public or private property I know not. The botanical and zoological gardens are of no great importance, but the biological publications are kept up with some spirit, especially the Transactions of the Royal Society of Science, Schiödte's continuation of Kröyer's "Tidsskrift," and the "Videnskabelige Meddelelser" of the Natural History Society; and some of the authors have adopted a practice strongly recommended to those who write in languages not understood by the great mass of modern naturalists, that of giving short *résumés* of their papers in French. On the most important contributions to systematic zoology since those mentioned in my address of 1868, I have received the following memoranda:—Prof. Reinhardt, in publishing in the Transactions of the Royal Danish Academy (1869) nine posthumous plates, executed under the direction of the late Prof. Eschricht, illustrating the structure of various cetacea, has accompanied them with short explanations. Prof. Reinhardt has further published, in the "Videnskabelige Meddelelser" for 1870, a list of the birds inhabiting the Campos district of central Brazil; notes on the distribution, habits, and synonymy are copiously added; and the introductory remarks on the geographical distribution, &c., are very suggestive, and ought to be translated for the benefit of the friends of ornithology in England and elsewhere. The same "Videnskabelige Meddelelser" contains an essay by Dr. Lütken on the limits and classification of ganoid fishes, chiefly from a palæontological point of view, accompanied by a synopsis of the present condition, in systematical and geological respects, of that important branch of palæichthyology. In Mollusca, Dr. Bergh has published, in Kröyer's "Tidsskrift" for 1869, one of his elaborate, anatomical, and systematic monographs of the tribe Phillideæ, with many plates, of which a detailed notice is given in the "Zoological Record," vol. vi. p. 559. In insects, Prof. Schiödte, in the same journal for 1869, has given an elaborate essay containing new facts and views on the morphology and system of the Rhynchota, analysed in the "Zoological Record," vol. vi. p. 475. To Dr. Krabbe we owe the description of 123 species of tapeworms found in birds, an elaborate monograph accompanied by ten plates, and printed in the Transactions of the Royal Danish Society for 1869, with a French *résumé*. (Noticed in "Zoological Record," vol. vi. p. 633.) In Echinoderms, Dr. Lütken's valuable essays on various genera and species of Ophiuridæ, recent and fossil, with a Latin synopsis of Ophiuridæ and Euryalidæ, and a general French *résumé*, forming the third part of his "Additamenta ad Historiam Ophiuridarum," in the Transactions of the Royal Danish Society for 1869, have been analysed in the "Zoological Record," vol. vi. pp. 369, 462, &c. No

contribution to systematic botany of much importance has appeared in Denmark since those mentioned in my Address of 1868.

There exists no general Danish Fauna; but I have a rather long list of detached works and essays from which the Danish inhabitants of the different classes of animals may be collected. Of these the most recent are Collin's Batrachia, in Kröyer's "Tidsskrift" for 1870, and Mörch's marine Mollusca, publishing in the "Videnskabelige Meddelelser" for the present year.

With regard to Iceland, the only works mentioned are Steenstrup's terrestrial mammals, or rather mammal, of Iceland, in the "Videnskabelige Meddelelser" for 1867; and Mörch's Mollusca in the same journal for 1868. C. Müller's account of the birds of Iceland and the Faroe islands dates from 1862, and Lütken's of the Echinoderms from 1857, and I find no mention of any special account of the insects of the island; whilst in botany, C. C. Babington has given us, in the eleventh volume of our Linnean journal, an excellent revision of its flora, the phænogamic portion of which may now be considered as having been very fairly investigated; and E. Rostrup, in the fourth volume of the Tidsskrift of the Botanical Society of Copenhagen, has enumerated the plants of the Faroe Islands.

The Scandinavian peninsula is, on several accounts, of great interest to the biologist. It includes a lofty and extensive mountain-tract, with a climate less severe than that of most parts of the northern belt at similar latitudes, and the uniformity of the geological formation is broken by the limestone districts of Scania. It thus forms a great centre of preservation for organic races between the wide-spread tracts of desolation to the east and the ocean on the west, and has therefore been treated as a centre of creation, whence a Scandinavian flora and fauna has spread in various directions. As the home of Linnæus it may also be considered as classical ground for systematic biology, the pursuit of which is now being carried on with spirit, as evidenced by such names as Holmgren, Kinberg, Liljeborg, Malm, Malmgren, G. O. Sars, Stal, Torell, and others in zoology; and Agardh, Andersson, Areschoug, Fries, Hartmann, and others in botany. Two of the academies to whose publications Linnæus contributed, those of Upsala and Stockholm, continue to issue their Transactions and Proceedings; and to these are now added the memoirs published by the University of Lund. They lost Linnæus's own collections, and the Zoological Museum at Upsala, when I saw it many years since, was poor, that of Stockholm better, and in excellent order. In the herbaria, Thunberg's and Afzelius's collections are deposited at Upsala, and Swartz's at Stockholm, where the herbarium of the Academy of Sciences has been of late years considerably increased under the care of Dr. Andersson.

The Scandinavian Fauna and Flora have been generally well investigated. The numerous Floras published of late years show considerable attention on the part of the general public. I observe that Hartmann's Handbook is at its tenth edition; Andersson has published 500 woodcut figures of the commoner plants, taken chiefly from Fitch's illustrations of my British Handbook; and my lists contain many papers on Swedish Cryptogams. The relation of the Scandinavian vegetation to that of other countries has also been specially treated of by Zetterstedt, who compared it with that of the Pyrenees, and by Areschoug, Andersson, Ch. Martins, and others, as alluded to in more detail in my Address of 1869. Many works have succeeded each other on the Vertebrate Fauna since the days of Linnæus; amongst which those of Liljeborg as to Vertebrata in general and of Sundeyall as to Birds are still in progress. The Crustacea, Mollusca, and lower animals have been the subjects of numerous papers, the marine and freshwater faunas having been more especially investigated by the late M. Sars and by G. O. Sars; and Th. Thorell, in the Upsala Transactions, has given an elaborate review of the European genera of spiders, evidently a work of great care, preceded by apposite remarks on their generic classification, and a general comparison of the Arachnoid faunæ of Scandinavia and Britain, all in the English language although published in Sweden. This work, however, does not extend to species, beyond naming a type (by which I trust is meant an example, not the type) of each genus; nor is the geographical range of the several genera given. There appears to be no general work on Scandinavian insects.

The fauna and flora of Spitzbergen have specially occupied Swedish naturalists. To the accounts of the Vertebrata by Malmgren, and of the Lichens by T. M. Fries, have now been added, in recent parts of the Transactions or Proceedings of the Royal Swedish Academy, the Insects by Holmgren, the Mollusca by Mörch, the Phænogamic Flora by T. M. Fries, and the Algæ by Agardh.

An excellent and elaborate monograph of a small but widely spread genus of Plants, entitled "Prodromus Monographiæ Georum," by N. J. Scheutz, has appeared in the last part of the Transactions of the Academy of Upsala. Several interesting features in the geographical distribution of some of the species are pointed out, amongst which one of the most curious is the almost perfect identity of the *G. coccineum* from the Levant and the *G. chilense* from South Chile, the differences being such only as would scarcely have been set down as more than varieties had both come from the same country. The whole memoir is in the Latin language; the specific diagnoses are rather long, but the observations under each section and species point out the connection with and chief differences from the nearest allies.

The whole of the botanical literature published in or relating to Sweden has been regularly recorded in annual catalogues, inserted by T. O. B. N. Krok in the "Botaniske Notiser" of Stockholm.

The chief interest in the biology of Russia consists in its comparative uniformity over an enormous expanse of territory. Extending over more than 130 degrees from East to West, and above 20 degrees from South to North, without the interposition of any great geological break in mountain,* or ocean, all changes in flora or fauna, in the length and breadth of this vast area are gradual; whilst the mountains which bound it to the south and to the east, and the glacial characters of the northern shores, offer to the Russian naturalist several more or less distinct biological types, such as the Caucasian, the Central Asiatic, the Mantchurian, and the Arctic, all blending into the great Europeo-Asiatic type, and the three first-named, at least apparently, constituting great centres of preservation. By the careful discrimination of the various races which give to each of these types its distinctive character, the study of their mutual relations, of the areas which each one occupies without modification, of the complicated manner in which these several areas are interwoven, of the gradual changes which distance may produce, of the cessation of one race and the substitution of another without apparent physical cause, the Russian, even without travelling out of his own country, can contribute, more than any other observer, valuable materials for the general history of races. In botany I have on former occasions referred to Ledebour's "Flora Rossica" as the most extensive complete flora of a country which we possess, and to the numerous papers by which it has been supplemented. Several of these are still in progress, chiefly in the bulletin of the Society of Naturalists of Moscow, and I have notes of local floras and lists from various minor publications. The last received volume of the Memoirs of the Academy of Petersburgh include the botanical portion of Schmidt's travels in the Amur-land and Sachalin, in which the geographical relations of the flora are very fully treated of; and the first part of a very elaborate "Flora Caucasi" by the late F. J. Ruprecht, which may be more properly designated Commentaries on the Caucasian Plants than a flora in the ordinary sense of the word. It is an enumeration of species, with frequent observations on affinities, and a very detailed exposition of stations in the Caucasus, but without any reference to the distribution beyond that region; above 300 large 4to pages only include the Polypetalæ preceding Leguminosæ, and the lamented death of the author will probably prevent the completion of the work. N. Kaufmann, Professor of Botany at the University of Moscow, an active botanist of great promise, whose death last winter is much deplored by his colleagues, had published a Flora of Moscow in the Russian language, which had met with much success. In the zoology of Russia the most important recent work is Middendorff's "Thierwelt Sibiriens," analysed in the "Zoological Record," vi. p. 1, which, with the previously published descriptive portion and the botany of the journey by Trautvetter, Ruprecht, and others, forms a valuable exposition of the biology of N.E. Siberia, a cold and inhospitable tract of country, where organisms, animal as well as vegetable, are perhaps poorer in species and poorer in individuals than in any other region of equal extent not covered with eternal snows. Middendorff's observations on this poverty of the

* The celebrated chain of the Oural, which separates Asia from Europe is, in the greater part of its length, too low, and the ascent too gradual to have much influence on the vegetation. The so-called ridge between Perm and Ekaterinburg is, according to Ermann, not 1600 feet above the level of the sea, and rises from land which, for a breadth of above 120 miles, is only 700 feet lower.

fauna of Siberia, its uniformity and conformity to the European fauna, on the meaning to be given to the species, on their variability and on the multiplicity of false ones published, on the complexity of their respective geographical areas, on their extinction and replacement by others, &c., are deserving of the careful study of all naturalists. L. v. Schrenck's Mollusca of the Amur land or Mantchuria (reviewed in the "Zoological Record," iv. p. 504) is equally to be recommended for the manner in which the specific relations, the variability, affinities, and geographical distribution of Mantchurian Mollusca are treated. The publications of the first meeting of the Association of Russian Naturalists include a review of the Crustacea of the Black Sea by V. Czerniavski, an account of the Annulata Chætopoda of the Bay of Sebastopol by N. Bobretzki, and a paper on the zoology of the Lake of Onega and its neighbourhood by K. Kesslar, including a review of the fishes. Crustacea, and Annulata of the Lake of Onega, and of the Mollusca collected in and about the Lakes Onega and Ladoga, and a list of the butterflies of the Government of Olonetz. The historical and scientific memoirs published by the University of Kazan, of which several volumes have recently reached us, include a systematic enumeration and description of the birds of Orenburg (329 species), with detailed notes of their habits, &c., by the late Prof. E. A. Eversmann, edited after his death by M. N. Bogdanoff, forming an 8vo volume of 600 pages in the Russian language.

There is not in Russia at the present moment sufficient encouragement on the part of the public to induce the publication of independent biological works beyond a few popular handbooks; but the Imperial Academy of Petersburg has, on the other hand, been exceedingly liberal in the assistance it affords, and active in its issue of Transactions with excellent illustrations, as well as of its bulletin of proceedings. The volumes recently received include J. F. Brandt's "Symbolæ Sirenologicæ" and researches on the genus *Hyrax* (reviewed in "Zoological Record," v. p. 3, and vi. p. 5), A. Strauch's Synopsis of Viperidæ, with full details of their geographical distribution, E Metschnikoff's studies on the development of Echinoderms and Nemertines, and N. Miklucho-Maclay's Memoir on Sponges of the N. Pacific and Arctic Oceans, with remarks on their extreme variability inducing the multiplication of false species. In botany, Bunge's Monograph of the Old-World species of *Astragalus* is the result of many years labour and careful investigation. The eight sub-genera and 104 sections into which this extensive genus is divided appear to be very satisfactory; but the species (971) are probably very much too numerous, and we miss that comparison with American forms which, considering the very numerous cases of identity or close affinity, is essential for the due appreciation of the N. Asiatic species. Bunge has also published a monograph of the *Heliotropia* of the Mediterraneo-Oriental region in the Bulletin of the Society of Naturalists of Moscow, which continues its annual volumes. The parts recently received continue several of the botanical enumerations already noticed, together with various smaller entomological papers.

(*To be Continued*)

GEOLOGY

On the Supposed Legs of the Trilobite, Asaphus platycephalus*

AT the request of Mr. E. Billings, of Montreal, I have recently examined the specimen of *Asaphus platycephalus* belonging to the Canadian Geological Museum, which has been supposed to show remains of legs. Mr. Billing, while he has suspected the organs to be legs so far as to publish on the subject,† has done so with reserve, saying, in his paper, "that the first and all-important point to be decided, is whether or not the forms exhibited on its under side were truly what they appeared to be, locomotive organs." On account of his doubts, the specimen was submitted by him during the past year to the Geological Society of London; and for the same reason, notwithstanding the corroboration there received, he offered to place the specimen in my hands for examination and report.

Besides giving the specimen an examination myself, I have submitted it also to Mr. A. E. Verrill, Prof. of Zoology in Yale College, who is well versed in the Invertebrates, and to Mr. S. I. Smith, assistant in the same department, and excellent in crustaceology and entomology. We have separately and together considered the character of the specimen, and while we have reached the same conclusion, we are to be regarded as independent judges. Our opinion has been submitted to Mr. Billings, and by his request it is here published.

The conclusion to which we have come is that the organs are not legs, but the semi-calcified arches in the membrane of the ventral surface to which the foliaceous appendages or legs were attached. Just such arches exist in the ventral surface of the abdomen of the Macrura, and to them the abdominal appendages are articulated.

This conclusion is sustained by the observation that in one part of the venter three consecutive parallel arches are distinctly connected by the intervening outer membrane of the venter, showing that the arches were plainly *in the membrane*, as only a calcified portion of it, and were not members moving free above it. This being the fact, it seems to set at rest the question as to the legs. We would add, however, that there is good reason for believing the supposed legs to have been such arches in their continuing of nearly uniform width almost or quite to the lateral margin of the animal: and in the additional fact, that although curving forward in their course toward the margin, the successive arches are about equidistant or parallel, a regularity of position not to be looked for in free-moving legs. The curve in these arches, although it implies a forward ventral extension on either side of the leg-bearing segments of the body, does not appear to afford any good reason for doubting the above conclusion. It is probable that the two prominences on each arch nearest the median line of the body, which are rather marked, were points of muscular attachment for the foliaceous appendage it supported.

With the exception of these arches, the under surface of the venter must have been delicately membranous, like that of the abdomen of a lobster or other macruran. Unless the under surface were in the main fleshy, trilobites could not have rolled into a ball.

JAMES D. DANA

* From the American *Journal of Science and Arts*, Vol. I, May, 1871.

† Q. J. Geol. Soc., No 104, p. 479, 1870, with a plate giving a full-sized view of the under surface of the trilobite, a species that was over four inches in length.

SCIENTIFIC SERIALS

Annales de Chemie et de Physique. The whole of the last part of the "Annales" is occupied by M. Berthelot's *Méthode universelle pour réduire et saturer d'hydrogène les composés organiques*, which is a *résumé* of the elaborate and exhaustive researches on the action of hydriodic acid on organic substances in which he has been engaged for the last three or four years. Most of the results have been already published from time to time in the *Bulletin de la Société Chimique de Paris*, and this classical research is now completed by the publication of the details of the methods of analysis and the thermochemical considerations involved. The author has found that any organic compound can be transformed into a saturated hydro-carbon, having, in general, the same number of atoms of carbon as the original substance, by heating it for a sufficient length of time to a temperature of 275°C., with a large excess of an aqueous solution of hydriodic acid of the specific gravity of 2·0. The proportion of the acid is varied according to the nature of the substance submitted to its action, twenty or thirty parts being sufficient to reduce an alcohol of the fatty series, whilst a member of the aromatic series and such substances as bitumen, wood charcoal, and coal, require, at least, one hundred times their weight; the large excess of acid serving the purpose of dissolving the iodine set free during the reaction, thus preventing its destructive action on the organic compound, and also in allowing the quantity of hydriodic acid necessary for the reduction of the substance, to be withdrawn from the solution without reducing its strength so far that the reaction ceases. One of the most remarkable results exhibited in the application of this method is that of the direct transformation of benzene into the saturated hydrocarbon, hexylene hydride, $C_6H_6 + 8HI = C_6H_{14} + 8I$, affording, as it does, an instance of a direct passage from the aromatic to the fatty series. When other members of the phenyl series are treated with hydriodic acid, the ultimate product is the same; but there is an intermediate step in the reaction, resulting in the formation of benzene, which, by the continued action of the acid, is transformed into the corresponding saturated hydrocarbon. The fifth and last part of the paper is

of great interest from a theoretical point of view, since it comprises the results of the author's experiments on bitumen, wood charcoal, and coal. The former of these substances, under the influence of hydriodic acid, yields hexylene hydride, the saturated hydrocarbon corresponding to benzene, from which it may be inferred that bitumen is a derivative of benzene, produced by condensation and loss of hydrogen. Charcoal and coal, when treated according to M. Berthelot's method, are transformed into a mixture of various saturated hydrocarbons, identical with those found in petroleum oil. In fact *the coal is changed into petroleum oil.*

THE most important paper in the first three numbers of vol. xiii. of the *Atti della Societa Italiana di Scienze Naturali* (April and November 1870, and January 1871), is a continuation of Prof. Delpino's article on "Dichogamy in the Vegetable Kingdom." In this paper the author passes in review the various modes in which the impregnation of plants is effected, with especial reference to the provisions for the impregnation of one plant by the fecundating organs of another.—M. A. Curò publishes a note on parthenogenesis among the Lepidoptera.—M. F. Sordelli contributes a note on the anatomy of the genus *Acme*, and on some of the hard parts of *Cœcilianella acicula*, illustrated with a plate; and further an anatomy of *Limax Doriæ*, Bourg., also illustrated, and including a tabular arrangement of the species of the genus *Limax*, for the elucidation of the characters of two new species, which the author describes under the names of *L. punctulatus* and *L. Bettonii*.—The Secretary of the Society, Dr. C. Marinoni, notices some remains of *Ursus spelæus* from the Cave of Adelsberg.—M. G. Bellucci gives an account of some evidences of prehistoric man in the territory of Terni.—M. L. Ricca communicates some observations on dichogamy in plants made by him upon the Alps of Val Camonica in 1870; and also a systematic catalogue of the vascular plants growing spontaneously in the olive-zone of the valleys of Diana, Marina, and Cervo, with indications of the special conditions of growth, times of flowering of each species, and occasional remarks upon their characters.—At p. 130 is the description of a supposed hybrid *Orchis, O. coriophoro-laxiflora.*—From M. C. Bellotti we have some observations on the disease of flaccidity, which destroys so many silkworms (*morts-flats*) in France and Italy; and from Dr. Taramelli a memoir, illustrated with an elaborate coloured plate, on the ancient glaciers of the Drave, Save, and Isonzo.

SOCIETIES AND ACADEMIES

LONDON

Geological Society, June 7.—Mr. Joseph Prestwich, F.R.S., president, in the chair. Messrs. Henry Collinson and Thomas Milnes Favell were elected Fellows, and Dr. J. J. Kaup, of Darmstadt, was elected a foreign member of the society. The following communications were read:—1. "On the persistence of *Caryophyllia cylindracea* Reuss, a Cretaceous Coral, in the Coral-fauna of the Deep Sea." By Prof. P. Martin Duncan, F.R.S. The author first referred to the synonyms and geological distribution of *Caryophyllia cylindracea*, Reuss, which has hitherto been regarded as peculiar to the White Chalk, and as necessarily an extinct form, inasmuch as it belonged to a group possessing only four cycles of septa in six systems, one of the systems being generally incomplete. The distribution of the *Caryophylliæ* of this group in the Gault and the Upper Chalk, the Miocene, and the Pliocene, was noticed, and also that of the species with the incomplete cycle. The falsity of this generalisation was shown to be proved by the results of deep-sea dredging off the Havannah, under Count Pourtales, and off the Iberian peninsula under Dr. Carpenter and Mr. Gwyn Jeffreys. The former dredged up *Caryophyllia formosa* with four complete cycles, and the latter obtained, from depths between 690 and 1090 fathoms, a group of forms with four complete and incomplete cycles. This group had a Cretaceous facies; one of the forms could not be differentiated from *Caryophyllia cylindracea*, Reuss; and as a species of the genus *Bathycyathus* was found at the same time, this facies was rendered more striking. The representation of the extinct genera *Trochosmilia, Parasmilia, Synhelia, and Diblasus*, by the recent *Amphiheliæ, Paracyathi*, and *Caryophylliæ* was noticed, and it was considered that as the Cretaceous forms throve under the same external conditions, some of them only being persistent, there must be some law which determines the life-duration of species like that which restricts the years of the individual. It was shown that deep-sea conditions must have prevailed within the limits of the diffusion of the ova of coral polyps somewhere on the Atlantic area ever since the Cretaceous period. Mr. Gwyn Jeffreys remembered that at the spot where the coral in question was dredged up the sea-bottom was extremely uneven, varying as much as fifty fathoms within a quarter of a mile. It was also not more than forty miles from land. The species of mollusca dredged up were extremely remarkable, and many were totally different from what he had previously seen. They were, however, living or recent; none of them were Eocene or Miocene, much less Cretaceous, like *Terebratula caput-serpentis*. He quoted from Mr. Davidson other instances of the persistence of forms, especially of the genus *Lingula* from the Silurian formation. The persistence of this species of coral, as well as that of Foraminifera, from the Cretaceous to the present time, was therefore not unique, and other cases of survival from even earlier times might eventually be recognised. Dr. Carpenter, after commenting on the reductions that extended knowledge enabled naturalists to make in the number of presumed species, could not accept the mere identification of species as of the highest importance in connecting the Cretaceous fauna with that of our own day. The identity of genera was, in his opinion, of far more importance. He instanced *Echinothuria* and *Rhizocrinus* as preserving types identically the same as those of a remote period, and as illustrating the continuity of the deep-sea fauna from Cretaceous times. The chemical and organic constitution of the deep-sea bottom of the present day was also singularly analogous to that of the Chalk sea. The low temperature at the bottom of the deep sea, even in equatorial regions, was now becoming universally recognised, and this temperature must have had an important bearing on the animal life at the sea-bottom. Prof. Ramsay thought that there was some misapprehension abroad as to the views held by geologists as to continuity of conditions. They had, however, always insisted on there having been an average amount of sea and land during all time; and the fact of sea having occupied what is now the middle of the Atlantic since Cretaceous time would create no surprise among them. If, however, the bed of the Atlantic were raised, though probably many Cretaceous genera, and even species, might be found, there would on the whole be a very marked difference between these Atlantic beds and those of the Chalk. Mr. Seeley had already, in 1862, put forward views which had now been fully borne out by recent investigation. His conviction was that, from the genera having persisted for so long a time, the genera found in any formation afforded no safe guide as to its age, unless there were evidence of their having since those formations become extinct. Mr. Etheridge maintained that the species in different formations were sufficiently distinct, though the genera might be the same. Recent dredgings had not brought to light any of the characteristic molluscan forms of the Cretaceous time; and it would be of great importance to compare the results of future operations with the old Cretaceous deep-sea fauna. Prof. Rupert Jones, with reference to the supposed sudden extinction of chambered Cephalopods, remarked that Cretaceous forms had already been discovered in Tertiary beds in North America, and also that cold currents could not have destroyed them, seeing that icebergs came down to the latitude of Croydon in the Chalk sea.—2. "Note on an *Ichthyosaurus* (*I. enthekiodon*) from Kimmeridge Bay, Dorset." By J. W. Hulke, F.R.S. In this paper the author described the skeleton of an *Ichthyosaurus* from Kimmeridge Bay, agreeing in the characters of the teeth with the form for which he formerly proposed the establishment of the genus *Enthekiodon*. The specimen includes the skull, a large portion of the vertebral column, numerous ribs, the bones of the breast-girdle, and some limb-bones. The first forty-five vertebral centra have a double costal tubercle. The coracoids have an unusual form, being more elongated in the axial than in the transverse direction, and this elongation is chiefly in advance of the glenoid cavity. The articular end of the scapula is very broad. The paddles are excessively reduced in size, the anterior being larger than the posterior, as evidenced by the comparative size of the proximal bones. The species, which the author proposed to name *I. enthekiodon*, most nearly resembles the Liassic *I. tenuirostris*. The length of the preserved portion of the skeleton is about 10ft., the femur measures only 2in., and the humerus 2·7in.—3. "Note on a Fragment of a Teleosaurian Snout from Kimmeridge Bay, Dorset." By J. W. Hulke, F.R.S. In this

paper the author described a fragment of the snout of a Teleosaurian obtained by Mr. J. C. Mansel, F.G.S., from Kimmeridge Bay, and which is believed to furnish the first indication of the occurrence of Telosaurians at Kimmeridge. The specimen consists of about 17in of a long and slender snout, tapering slightly towards the apex, where the præmaxillæ expand suddenly and widely. The nostril is terminal and directed obliquely forwards; the præmaxillæ ascend 2·5in. above the nostril, and terminate in an acute point; and each præmaxilla contains five alveoli. The lateral margins of the snout are slightly crenated by the alveoli of the teeth, of which the three front ones are smaller than the rest; most of the teeth have fallen out, but a few are broken off, leaving the base in the sockets. Mr. Seeley thought it likely that Mr. Hulke would eventually be led to re-establish his genus *Enthekiodon*. He remarked on the peculiar characters presented by the specimen, and referred especially to the coracoids, which were unlike those of *Ichthyosaurus*, but presented a close resemblance to those of *Plesiosaurus*. He considered that there were indications of its having been connected with a cartilaginous sternum. The scapula furnished an important character in its widening, which formed a distinct acromion process. Mr. Seeley remarked that double-headed ribs occur only in animals with a four-chambered heart; and that, considering this and other characters, there was no reason for placing *Ichthyosaurus* lower than among the highest Saurians. He considered that the Teleosaurian snout differed from all known types. Dr. Macdonald believed that what is called the coracoid has nothing to do with the shoulder-girdle, and thought it might be a part of the palate. Mr. Mansel stated, in answer to the President, that the fossils were obtained from about the middle of the Kimmeridge Clay. Mr. Etheridge suggested that it would be desirable to ascertain whether the horizon of the *Ichthyosaurus* described was the same as that of the specimens from Ely. Mr. Gwyn Jeffreys inquired as to the food and habits of the *Ichthyosaurus*. Mr. Hulke, in reply, stated that, from the presence of a stain and of numerous small scales, under the ribs, the food of the *Ichthyosaurus* probably consisted of Squids, and small fishes. He showed that the so-called coracoid was clearly a part of the shoulder-girdle.

Geologists' Association, June 2. — Rev. T. Wiltshire, president, in the chair. A paper on "Flint" was read by Mr. Hawkins Johnson, F.G.S. After stating the reasons which had induced him to pay special attention to the subject of the formation of flint, the author described the characters and mode of occurrence of nodular and tabular flint and chert. The various combinations into which silicon enters were then recapitulated, and a description of sponges introduced a statement of the theory contended for in this paper to account for the formation of chalk flints. This theory is simply that *silicon* replaced the *carbon* of the sarcode of the sponges of the Cretaceous seas. Flints are therefore merely silicified sponges. The empty shells of echinoderms were frequently used by sponges which in many cases outgrew and surrounded the shells, and these sponges afterwards becoming silicified we find the tests of echinoderms either wholly or partly embedded in chalk flints. Prof. Tennant dwelt upon the opinions of Dr. Bowerbank, and pointed out in opposition to the views of that authority that agates could not have derived their origin from sponges, since they were found in volcanic rocks. Mr. Deane, who had been associated with Dr. Mantell in his researches with respect to the origin of flints, stated that, contrary to the general belief that fossils were not found in any flints except those from the Upper Chalk, organisms had been discovered in flints from the Lower or Grey Chalk. Dr. Bedwell, who had paid great attention to this subject for a long time, denied Dr. Bowerbank's assertion that a central layer of chalk is not present in horizontal as it is in vertical tabular flint, and he could not admit the possibility of vertical walls of flint, sometimes of great height, being produced by the silicification of sponges which grew on each side of a fissure in the bed of the chalk sea, as had been contended for by Dr. Bowerbank and Mr. Johnson. Prof. Morris, after complimenting the author on the value of the paper and the knowledge of the subject which he had displayed, referred to the investigations into the origin of flint by the observers of the last century, and gave a very interesting *résumé* of the principal facts connected with the occurrence of flint in the stratified rocks. The Professor contended for the segregation of the silica of the chalk around nuclei, in opposition to the theory advocated by Mr. Johnson, which was first propounded by Dr. Brown of Edinburgh. The amount of diffused silica in the Upper Chalk is much less than in the Lower Chalk, in which flints are rare. The tests of echinoderms are never silicified, nor are phosphatic animal substances, such as bone. He believed that the sponges of the old seas, from what we know of the sponge-gravel and the Upper Greensand, were chiefly silicious, and not ceratose; and that they were extremely abundant is shown by the fact that in the Haldon Hill Green-and masses of chert occur eight feet thick, which are quite full of the spiculæ of sponges. Mr. Johnson briefly replied, but was scarcely prepared then to combat the observations of Professor Morris. Very fine collections of flints showing peculiarities were exhibited by Messrs. Johnson, Bedwell, Evans, Leighton, Deane, and Meyer.

Mathematical Society, June 8.—Mr. W. Spottiswoode, F.R.S., president, in the chair. Messrs. W. Chadwick, M.A., and J. Griffiths, M.A., were elected members of the society.—Prof. Cayley, V.P., stated results he had arrived at in his investigation of Plücker's models of certain oceanic surfaces. He had been able to identify eight out of the fourteen models in the Society's possession (presented by Dr. Hirst.)—W. Samuel Roberts, M.A., gave an account of his paper "On the Motion of a Plane under certain Conditions."—Prof. Henrici, V.P., exhibited cardboard models of two ellipsoids, of a hyperboloid of one sheet, and of an elliptic paraboloid, also stereograms of the models of surfaces exhibited at former meetings of the society.

Entomological Society, June 5.—Mr. J. W. Dunning, F.L.S., vice-president, in the chair.—The Secretary read a letter from the Rev. L. Jenyns, of Bath, with reference to the reported showers of insects or other organisms at Bath, noticed at the last meeting. Mr. Jenyns had examined some of these organisms, and found they were *Infusoria*, probably *Vibrio undula* of Müller, many of them being congregated into spherical masses enveloped in a gelatinous substance. They fell during a heavy shower of rain.—Mr. Butler exhibited specimens of *Lepidoptera*, upon which he and Mr. Meldola had experimented with a view to ascertain the action of dyes. Many species had been subjected to aniline dyes, and all kinds of colours produced. Mr. Butler also found that when the insects were immersed in a solution of soda for the purpose of causing the dyes to be more readily taken, the colouring matter of the scales was completely discharged and collected at the bottom of the solution. Mr. Bicknell had subjected *Gonopteryx rhamni* to the action of cyanide of potassium, acting upon a suggestion made last meeting, and the yellow colour was changed to orange-red.—Mr. W. C. Boyd exhibited an example of *Ramia cratægata*, captured near London, the apical portion of one wing of which was changed to brown.—Mr. Müller exhibited the bell-shaped nest of *Aglena brunnea*, a spider; also galls of an undescribed species of *Phytophus* on *Betula*.—Mr. F. Smith exhibited three rare British species of *Hymenoptera*, captured by Mr. Dale in Dorsetshire, consisting of *Myrmecomorphus rufescens* (*Proctotrupidæ*), *Ichneumon glaucopterus*, and *Osmia pilicornis*.—Mr. Holdsworth, of Shanghai, communicated notes on the method practised by the Chinese in cultivating the silk-producing *Bombyx Pernyi*.—Mr. Butler read "Descriptions of Five New Species of Diurnal *Lepidoptera* from Shanghai."—Mr. Baly communicated "Descriptions of a new genus, and of some recently-discovered species of *Phytophaga*."—Mr. Kirby communicated "Synonymic Notes on *Lepidoptera*."

Statistical Society, June 20.—Mr. Hyde Clarke read a paper "On the Transmissibility of Intellectual Qualities in England." As one kind of test of intellectual exertion, he took the statistics of the writers of books in the Biographia; of 2,000 authors, 750 were born in country districts, and 1,250 in town districts. Examining the towns and the distribution in them, 333 were allotted to London, 73 to Edinburgh, and 53 to Dublin. The largest numbers in the tables beyond these were found in cathedral and collegiate cities. The deductions he drew were that intellectual activity is distributed unequally, but that it is more among the town or more highly educated population than among the rural populations. He pointed out that the larger the concentrated educated population, the larger is the intellectual development, and he referred to the like examples of Greece, Rome, and modern Europe, where the same law is to be traced. The great modern centres of industry in England occupy a low relative position in the list, and are scarcely to be noticed, but they are now beginning to contribute. He affirmed that the literary class was produced from the educated class, and not from the illiterate classes. While no educational effort will produce men of great genius, he inferred that literary attainments are in

relation to literary culture or the culture of the educated classes, and that by extending education to other classes of the population, the intellectual capacity of the community will be extended and propagated within certain limits.

Manchester

Literary and Philosophical Society, April 4.—"Notes on drift of the eastern parts of the counties of Chester and Lancaster." By E. W. Binney, F.R.S., F.G.S., president. Having in a previous paper given a short description of the higher drift found in these counties, the author now proceeds to consider the thick surface covering of the general drift, which nearly hides from our view the underlying strata, except where they are exposed in river courses or in canal or railway cuttings. This generally reaches to an elevation of about 700 feet above the sea, and does not alter much in its appearance, whether it is seen at Blackpool, Ormskirk, or Liverpool, or at Burnley, Rochdale, Glossop, or Macclesfield, except being usually more divided as it is found inland, and approaches the sides of the Pennine chain. It consists of beds of till, clay, sand, and gravel. It has been treated on by various authors, a list of whose works are given.

Annual Meeting, April 18.—Mr. E. W. Binney, F.R.S., F.G.S., president, in the chair. The report of the Council was read by one of the secretaries. The Council have the satisfaction to report that the past year has been one of steady progress for the Society. The following gentlemen were elected officers of the Society and members of the Council for the ensuing year:—President: Mr. Edward William Binney, F.R.S., F.G.S. Vice-presidents: Mr. James Prescott Joule, D.C.L., F.R.S., F.C.S., Mr. Edward Schunck, F.R.S., F.C.S., Mr. Robert Angus Smith, F.R.S., F.C.S., Rev. William Gaskell. Secretaries: Mr. Henry Enfield Roscoe, F.R.S., F.C.S., Mr. Joseph Baxendale, F.R.A.S. Treasurer: Mr. Thomas Carrick. Librarian: Mr. Charles Bailey. Other Members of the Council: Mr. Peter Spence, F.C.S., Mr. William Leeson Dickinson, Mr. Henry Wilde, Mr. Robert Dukinfield Darbishire, F.G.S., Prof. Osborne Reynolds, and Mr. William Boyd Dawkins, F.R.S. Dr. Joule, F.R.S., drew attention to the remarkable atmospheric phenomenon which had been seen by several persons in Derbyshire and elsewhere, on the evening of Good Friday, April 7, and stated that he had witnessed a similar appearance near Glasgow on the day before it was observed in this neighbourhood. The perpendicular ray extended upwards from the sun to an altitude of 30°, and was very clearly defined. It was observed from half an hour before, until after the sun had set. The phenomenon was also witnessed, at the same time, by Prof. J. Thomson, who was sailing on the Firth of Clyde.

Cambridge

Philosophical Society, May 15.— "On Dr. Wiener's model of a cubic surface with twenty-seven real lines," Prof. Cayley, F.R.S.—"On the tides in a rotating globe covered by a Sea of depth constant at all points in the same latitude, attracted by a moon always in the plane of the equator; considered with reference to the tidal retardation of the earth's angular motion about its axis," Mr. Röhrs. "On the motion of imperfect fluid in a hollow sphere, rotating about its centre under the action of impressed external periodic forces, considered with reference to the phenomena of precession and nutation," Mr. Röhrs.

May 29.—"On an illustration of the empirical theory of vision," Mr. Coutts Trotter. "On a table of the logarithms of the first 250 Bernoullis Numbers," Mr. Glaisher.

New York

Lyceum of Natural History, Oct. 24, 1870.—"The Geological Position of the Remains of Elephant and Mastodon in North America," by Dr. J. S. Newberry. The genera *Elephas* and *Mastodon* existed on the globe during the Miocene Tertiary Epoch and were represented by various species from that time to the advent of man. The question is, when the two species *Elephas primigenius* and *Mastodon giganteus* are first met with in ascending the geological scale. In Europe it is claimed that remains of these species are found in the true Boulder Drift, and in California in the Pliocene Tertiary deposits. Whether either of these statements is strictly true remains to be decided by future investigations. In central and eastern North America the remains of elephant and mastodon are found abundantly in peat bogs and other superficial and recent deposits, also in some strata of unconsolidated material which are considered as belonging to the drift, although there has been much difference of opinion whether these beds form part of the true undisturbed drift, or whether they consist of re-arranged drift-materials or what is called "Modified Drift. The facts now offered seem to prove conclusively that the remains of elephant and mastodon are found in the true and unchanged drift, but only in the more recent of the drift deposits. The presence of these great mammals must therefore be considered as one of the incidents in the history of the drift, but as incidents belonging only to the last chapters in this long and somewhat eventful history. In order that the advent of the elephant and mastodon may be properly placed in the sequence of phenomena embraced in the Drift period, it will be necessary to make a brief review of these phenomena so far as they are known to us. The geological periods immediately antecedent to the Drift are the Cretaceous, which was a period of marked continental submergence, when the ocean covered most of the western half of the continent and reached several hundred feet higher than now over the basis of the eastern highlands; and the Tertiary with its three subdivisions Eocene, Miocene, and Pliocene. The Eocene was a period of continental progressive emergence—land area gradually expanding, climate subtropical. In the Miocene and Pliocene epochs the topography was in a general way what it is now, but in detail the surface was considerably more diversified, especially by the presence of great fresh-water lakes which occupied much of the surface on both sides of the Rocky Mountains. At this time there was probably a land connection between the northern part of North America and Europe on the one hand and Asia on the other. The climates of Alaska and Greenland were then as mild as that of Virginia now; the flora was luxuriant and varied, and was common to Europe, Iceland, Spitzbergen, Greenland, our continent, and North-eastern Asia; palms grew farther north than the Canadian line. The fauna was much richer than now, including elephant, rhinoceros, and many other animals not now living in either of the Americas, and indeed as large a number of the great mammals as are now found in Africa. The superficial boulders and gravels of the Drift are clearly the result of iceberg action. It is proved by the undisturbed condition of the clays below, that they must have been *floated* to their present resting places, just as boulders, sand, and gravel are floated from Greenland to the banks of Newfoundland, and there spread broadcast over the sea bottom. In the Drift deposits above the blue clay, remains of Elephant and Mastodon have been repeatedly found, still more frequently in the Peat-bogs of the present surface, and the much-discussed question has been, whether these mammalian remains were deposited with the upper layers of the Drift or were buried in them by subsequent shifting, as in the valleys of streams. The facts to which attention is now specially directed would seem to decide that question. It has long been known that in many parts of the valley of the Mississippi, wells penetrating twenty, thirty, or more feet, the superficial accumulations of *drifted* materials—clays and sands, with gravels and boulders brought from the far north—encounter sticks, logs, stumps, and sometimes a distinct carbonaceous soil. Combining facts of this character, of which records have been accumulating from year to year, with those brought to light by recent investigations directed specifically to this object, it is proved that over a great area at the West a sheet of buried timber, a vegetable soil, beds of peat covered with sphagnous moss, erect stumps, and in some cases standing trees, form a distinct line of demarcation between the older and newer drift deposits. In or above the horizon of this ancient soil have been found numerous animal remains: *Elephas*, *Mastodon*, *Castoroides* (the great extinct beaver) and some others.

Paris

Academy of Sciences, June 5.—M. Faye in the chair. M. Delaunay gave some supplementary information relative to the attempts made by the Communists to set fire to the National Observatory. The director of the establishment says that M. Yvon Villarceau was somewhat incorrect in the description of the damage done to the instruments belonging to the geodesic service, of which he is the chief and superintendent. The National Observatory, which was built more than two centuries ago under the reign of Louis XIV., is a very strong building, with thick walls, and the garden itself is at an elevation of 10ft. from the level of the surrounding land. The extent of the garden is about half an acre. The Communist forces had garrisoned it, and it was only when obliged to retreat that they tried to burn it down, which attempt was defeated only by the personal exertions of the staff, their families, and well-disposed persons in the vicinity.

The spherical copper caps of the equatorials were perforated by many holes from Versaillists' rifles, and the equatorials themselves were slightly hurt. But altogether the damage done is nothing in comparison with the harm which was contemplated.—Dr. Guyot sent a paper on Dynamite, and the means of protecting storehouses from spontaneous explosion. Dynamite is known to be a mixture of sand and nitro-glycerine. When it is wrapped in a cartridge, made as usual with paper, the capillary attraction works on the nitro-glycerine, which is slowly separated from the sand, and impregnates the protecting matter. In this new form nitro-glycerine is almost as explosive as in its ordinary liquid state, which may very easily be proved.—M. Elie de Beaumont read a circular noticing that the next session for the British Association will be held this summer at Edinburgh. The learned perpetual secretary expects that many members will try to attend it, so that French science may have a fair representation, which is seldom the case on these occasions.

June 12.—M. Delaunay in the chair. The greater part of the members, who were obliged to escape from Paris, have resumed their seats. M. Leverrier was congratulated on having resumed his professorial duties at the Sorbonne, where he has opened this very morning his regular course of lectures on Mathematical Astronomy, Almost every scientific editor of the Parisian papers has returned also to his seat.—M. Serret presented a memoir on the principle of least action, economy of mechanical work by natural forces acting from certain centres by attraction. Euler and Lagrange had confined their exertions to show that the first differential was always zero. This was not sufficient, as such a differential may belong to a maximum if the second differential becomes negative, which was left to be demonstrated by Euler and Lagrange. The work was very difficult indeed.—M. Becquerel read a very long paper on atmospheric electricity. It was worked by himself as well as by his son, as the first part of a theory which can be reviewed only when completed. M. Becquerel, advocating the opinions started by Pelletier, thinks that the electricity of the upper regions is positive, and he says, moreover, that it comes from the sun, which is a focus of positive force. The electrical connection from the sun to our upper atmosphere is maintained through celestial space, which is not an absolute vacuum, but is filled with gases at a low pressure. The electricity of the earth is negative, and every thunder clap is a discharge between the earth and the upper regions through the air.—M. W. de Fonvielle sent a note reviewing the organisation of the Postal Telegraphic service in England, and showing that the French Government is wrong in maintaining two different administrations. The case of the French Government is very bad, as the two administrations were amalgamated during the war by the Tours delegation, under M. Steenackers, and ultimately separated. M. Buys Ballot, the celebrated director of the Utrecht Meteorological Observatory, asked from the Portuguese Government the establishment of a Meteorological station, or rather system, in the Azores Archipelago. This will result in the issuing of regular reports when the south-western gales are on their way to visit the British Islands and Western Europe. M. Delaunay, who read over the note at full length in the name of M. Buys Ballot, strongly advocated the proposition of his learned colleague. It is greatly to be hoped that the Portuguese Government will yield very shortly to the suggestion.

Academy of Inscriptions and Belles Letters, June 9.—The first sitting for a long period, as almost every member had been a refugee outside Paris, except a few officials. M. Haureau, director of the National Printing Office, explained that nothing was disturbed at this establishment. The Oriental Department is in excellent working order. The manuscripts of several members, which are kept there as well as valuable documents, are safe, owing to the mild rule of M. Debock, a working compositor, who was appointed a delegate by the Commune, and who protected also the National Archives, which are located in an adjoining building.—M. Alfred Maury, who had been left as Director of Archives by the Commune, had much trouble in protecting it against Communist fury, even with an order signed by Debock. M. Maury was praised for the energy exhibited and the courage shown in remaining at his post, running the risk of being taken as a hostage. He was much assisted in his work of protection by the gate-keeper, who severally turned out small parties of incendiaries coming with petroleum to execute their infamous orders. M. Leon Renier said that the stock of Borghesi works printed by the Academy, has perished at the same time as the Louvre Library. But the Borghesi manuscripts are safe. The 7th volume had not been distributed, and it will be necessary to print it again at the expense of the Academy, which had a limited credit for the whole edition. M. Leopold Delisle said that the manuscripts of the National Library, which had been concealed in the Archives, are safe. A few shelves had been slightly attacked by damp, but the real damage amounts to very little. There are seven nominations required in order to fill up the vacancies; death has removed four members, two ordinary members and one foreign associate. The Academy has adopted a proposition of M. Renan to fill up the vacancies gradually. On the 16th the Academy will appoint a commission for reporting upon the respective merits of candidates as foreign associate members. On the 23rd the Academy will examine the titles of the candidates for filling the seats of MM. Villemain and Alexander, whom the Academy lost before the Prussian siege. On the 30th the Academy will appoint a committee for reporting upon the candidates to two honorary memberships; but the nomination for the last two ordinary memberships will be postponed till next winter.

BOOKS RECEIVED

ENGLISH.—Scrambles among the Alps, 1860-1869: E. Whymper (Murray).—The Antiseptic System: Dr. A. Sansom (H. Gillman).—Introductory Text-book of Meteorology: Dr. A. Buchan (Blackwood and Sons).—Manual of Modern Geography: Rev. A. Mackay, 2nd edition (Blackwood and Sons).

FOREIGN.—(Through Williams and Norgate)—Die Grundzüge des graphischen Rechnens u. der graphischen Statik: K. von Ott.—Der Seidenspinner des Maulbeerbaumes: F. Haberlandt.

PAMPHLETS RECEIVED

ENGLISH.—Chemical Phenomena of the Blast Furnace, Pt. II.: J. Lowthian Bell.—Annual Address by the President of the Royal Geographical Society.—Practical and Experimental Philosophy, Pt. II: R. Willis.—Report of the Winchester College Natural History Society.—Vaccination viewed politically: F. W. Newman.—An Essay on Unsolved Ethical Questions: D. Rowland.—Transactions of the Northumberland and Durham Natural History Society.—On Barometric Differences and Fluctuations: J. K. Laughton.—Thirty-eighth Annual Report of the Royal Cornwall Polytechnic Society.—A Catalogue of Hardy Perennials, &c.: W. Robinson.—British Statesman and Churchman, No. 10.—Will the Earth become a Sun-Spot?: R. Holmes.

AMERICAN AND COLONIAL.—Australasian Medical Gazette, No. 37.—Catalogue of the Iowa University, 1870-71.—Lectures delivered at the Industrial and Technological Museum, Melbourne, during the Spring Session of 1870.—Population: its Law of Increase: N. Allen.—The Physiological Laws of Human Increase: N. Allen.

FOREIGN.—Ueber einige Trematoden und Nemathelminther: R. von W. Sakow.—Ofversigt af konigl., V. Akademie, Forhandlingen.—Die Geographische Verbreitung der See-gräser.

DIARY

FRIDAY, JUNE 23.

QUEKETT MICROSCOPICAL CLUB, at 8.

MONDAY, JUNE 26.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.

WEDNESDAY, JUNE 28.

SOCIETY OF ARTS, at 8.—Anniversary Meeting.

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