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THURSDAY, NOVEMBER 13, 1873

ON THE MEDICAL CURRICULUM

IN a recent number of this journal (NATURE, Oct. 2, 1873) we made some remarks on medical studies, which were intended more for students themselves than in any way to bear on the principles of medical education. To the latter subject special attention has just been directed by Prof. Huxley, who, as Lord Rector of the University of Aberdeen, has drawn up a series of propositions for the consideration of the Court at the next meeting in February or March, on which occasion he will deliver his inaugural address.

The following are the motions that the Lord Rector will propose :—

"I. That, in view of the amount and diversity of the knowledge which must be acquired by the student who aspires to become a properly qualified graduate in medicine; of the need recognised by all earnest teachers and students for the devotion of much time to practical discipline in the sciences of chemistry, anatomy, physiology, therapeutics, and pathology, which constitute the foundation of all rational medical practice; and of the relatively short period over which the medical curriculum extends—it is desirable to relieve that curriculum of everything which does not directly tend to prepare the student for the discharge of those highly responsible duties, his fitness for the performance of which is certified to the public by the diploma granted by the University.

"II. That it would be of great service to the student of medicine to have obtained, in the course of his preliminary education, a practical acquaintance with the methods and leading facts of the sciences comprehended by botany and natural history in the medical curriculum; but that, as the medical curriculum is at present arranged, the attendance of lectures upon, and the passing of examinations in, these subjects occupy time and energy which he has no right to withdraw from work which tends more directly to his proficiency in medicine.

"III. That it is desirable to revoke or alter ordinance No. 16, in so far as it requires a candidate for a degree in medicine to pass an examination in botany and zoology as part of the professional examination; and to provide, in lieu thereof, that the examination on these subjects shall, as far as possible, take place before the candidate has entered upon his medical curriculum.

"IV. That it is desirable to revoke or alter said ordinance No. 16, in so far as it requires candidates for the degree of doctor of medicine to have passed an examination in Greek, and that, in lieu thereof, either German or French be made a compulsory subject of examination for said degree, Greek remaining as one of the optional subjects."

In considering these points a review of the method by which the present position of the medical curriculum has been arrived at, will throw considerable light on the steps which ought to be taken for its improvement, and will show how subjects which have but an indirect bearing, or none at all, on medicine proper have been gradually made to form an element of the course of study, without any question having been asked as to whether their introduction does not bring its concomitant disadvantages.

The influence of Materia Medica seems to have been great in bringing about the present state of affairs. When Dr. Anthony Todd Thomson and Dr. Pereira, in their enthusiasm for their favourite subject, extended its limits so as to include a full account of the source and history of every one of the articles which were mentioned in the Pharmacopœia, and went so far as to give a full description of *Gallus bankiva*, together with all the steps in the development of its egg, simply because *Ovi vitellus* is an antidote against poisoning by corrosive sublimate, and is employed in the preparation of Mistura Spiritus Vini Gallici (egg flip), it is evident that as the sciences of zoology and botany became more profound, Materia Medica as a subject would proportionately expand. At last a time came when separate lectures had to be given on the above-mentioned kindred subjects, in order that those on Materia Medica might be more easily comprehended by the student; and, as might be expected, these independent lectures on zoology and botany, as those on chemistry had done before, became so complete in themselves, as to reduce the subject which had given rise to their introduction, to a simple formulary for the chemist, with references to the sources of the necessary scientific information. The introduction, however, of zoology and botany as separate independent elements of the curriculum, brought into the medical education a large mass of matter, which is very valuable no doubt in itself, but to the student entirely irrelevant; and as in the short pupilage of three or four years there is a much larger amount that ought to be learned than can be properly acquired in the time, it becomes a matter worth serious consideration, whether subjects which are not indispensable to a thorough training should be still taught and be required by the examining bodies. The question therefore resolves itself into the determination of whether the loss of time necessary for obtaining a superficial knowledge of a couple of sciences, is counteracted by the advantages of those sciences as a mental training and a basis for higher work? In an Introductory Lecture delivered some time ago at University College, Prof. Huxley throws the weight of his opinion in the scale against retaining the subjects which must be to him most dear, in the medical curriculum; and most will agree with him, notwithstanding the many difficulties in the way of an improved programme.

With regard to Prof. Huxley's fourth proposition, in which it is considered desirable to omit Greek from the preliminary examination, and substitute German or French in its place, the interest will not be so great to most, as that relating to the scientific qualifications that are necessary. The same conservative spirit which has prevented any reduction in the overloaded Biological portion of the curriculum, has, without question of any kind being asked, never even hinted at any change in the long-established and well-tried school-course, in which the at one time practically valuable and indispensable Greek and Latin are still retained, though of less importance at the present day. How many of our scientific men find that nothing deters them in every step of their work, more than a want of knowledge of the German language, now that the scientific activity of that country is so considerable and so rapidly increasing. There must be a change with the times, even in primary education, and we hardly think that in his introductory address to the King's College Medical Society on the 23rd of last month, Prof. Curnow put the case fairly when he disapproved of the substitution of German for Greek, because the one could be

mastered by a few months' residence in a neighbouring country, whilst the other had done more to develop true culture than almost all other writings since. It is not proposed simply to substitute German or French for Greek, the advantages to be derived from which are now fully absorbed into the spirit of the nation, but, by the change, to leave a sufficient time, in addition to the education in modern languages, for the study of the Natural Sciences during the school-boy period. That the dead languages form an excellent mental training no one doubts, but that Physics and Chemistry do the same is daily becoming more certain; and the time is not far hence when the facts and methods of Physiology and Comparative Anatomy will be so well known and assorted, that they may be placed in the same category.

*THE SOUTHERN UPLANDS OF SCOTLAND**

THE range of hills, which in Scotland extends from the German Ocean to the Irish Sea, having a N.E. and S.W. direction, has been aptly designated the Southern Uplands. This range is nearly parallel in its course to that of the Highlands proper. It exhibits hills, some of which attain to an elevation approaching nearly 3,000 feet; but its physical features, although marked in many localities with scenes of great beauty, are devoid of the stern and rugged grandeur which characterises the more northerly mountains of Scotland. The hills of this range usually consist of rounded and grass-covered undulations, or long tracts of plateaux. They have been specially named the "pastoral district of Scotland," and their scenes have furnished subjects for many a pastoral song, and many a border ballad.

The Southern Uplands of Scotland are cut deeply into by some of the streams which flow into the Solway Firth, the Esk, the Annan, the Nith, the Urr, and the Dee being the most important of them. They are drained on the southward side by the Cree and the Luce; on the northward side they are the sources of the Ayr; and the Tweed and its tributaries drain a large portion of their north-east area.

In the early period of Scotch geology, the days of Playfair and Hutton, the Southern Uplands were regarded as affording no traces of the evidence of life in the rocks which compose them; and these rocks were referred to the "primary" group. It was not until the discovery of fossils in a limestone which occurs at Wrea in Peeblesshire, in their higher portion, by Sir James Hall, that the rocks which formed these hills were assigned to the "transition" age. The terms "primary" and "transition" have now ceased to be applicable to the nomenclature of geology; and the discovery by Prof. James Nicol in 1840, in the flaggy beds of Greiston in Peeblesshire, of graptolites, indicated the Silurian age of the strata here. Since the discovery of Nicol, several geologists have added greatly to our knowledge of the rocks which compose the Southern Uplands. Other bands of graptolites have been found richer in fossil contents than those first discovered; and these, along with a few other forms of organic remains, have still further confirmed the Silurian age of the great mass of strata which make up the hilly country in the South of Scotland.

The result of the observations made on the rocks of the Southern Uplands up to the period when they came under the notice of the Geological Survey of Scotland led to the conclusion that the lowest strata exhibited were referable to the Llandeilo age. That these Llandeilo rocks were succeeded by deposits containing fossils, as in the case of the Wrea limestone, indicating the horizon of the Bala or Caradoc rocks, was also known—and certain rocks which occur near the north-western margin of the area in the neighbourhood of Girvan in Ayrshire, have been referred by Sir Roderick Murchison to a still higher position in the Silurian series.

The labours of the Geological Survey of Scotland have not only confirmed these conclusions, but have added greatly to our knowledge of the nature of the Silurian rocks of the South of Scotland. They have also furnished subdivisions of these rocks, and a more ample account of their arrangement and fossil contents.

Every geologist familiar with the lower portions of the Silurian rocks of the Southern Uplands, the Llandeilo strata, had experienced great difficulty in recognising horizons, in this series, such as would enable him to divide these rocks into distinct portions. It is true that bands of anthracitic shale abounding in graptolites were, as regards their petrological nature, very distinct from the rocks in which they were intercalated. The great mass, however, of the Llandeilo beds of the Southern Uplands consist of rocks known in old petrological nomenclature as "greywackes"—a name which is still retained for want of a better—and as these rocks differed only in coarseness, and sometimes in colour, this circumstance rendered the division of the South of Scotland Silurian rocks into separate groups extremely difficult. And when it is added to this that contortions have greatly folded and denudations have largely planed off the edges of these rocks, the difficulty of making out distinct horizons among the Llandeilo strata of the South of Scotland becomes very apparent. It is only by a careful, continuous, and long series of observations recorded in maps large enough to show all the contortions, the ins and outs of the strata, that these rocks could be brought into subdivisions enabling them to be recognised. Such have been the work of the officers of the Geological Survey of Scotland; and now we have in the explanatory notes to some of the sheets which have been published, the results of their work recorded, and the subdivision of these Llandeilo rocks indicated.

The explanation to Sheet 15, published in 1871, which includes, among other matters, a description of the Llandeilo rocks occurring in that portion of the Southern Uplands occupied by the north-west part of Dumfriesshire, the south-west portion of Lanarkshire, and the south-east portion of Ayrshire, contains the results of the labours of the Survey among these rocks. There do not appear, in any portion of the South of Scotland Silurian strata, any rocks which appertain to an age older than the Llandeilo; and these Llandeilo rocks are referable only to the Upper Llandeilo series, the Lower Llandeilo or Shelve rocks of Murchison, the Arenig rocks or Skiddaw slates of Sedgwick, being unknown in the district. This Upper Llandeilo series exhibits itself in the

* Memoirs of the Geological Survey of Scotland, Sheets 1, 2, 3 and 15, &c. Explanations of, 1871, 1872, 1873.

form of an anticlinal axis near the southern border of the Silurian area. This axis can be well seen in Roxburghshire and Dumfriesshire, having a north-east and south-west direction. It has also been recognised by the officers of the Geological Survey in Wigtonshire; and the rocks which it exhibits, which are the lowest in the Southern Uplands, have been designated by Prof. Geikie the "Ardwell group." This group is made up of "hard, well-bedded greywackes and grits, with bands of hard shale or slate. These rocks have a prevailing reddish or brownish hue, especially on weathered surfaces."

As seen in Dumfriesshire and Roxburghshire these low rocks have the same aspect and nature. They have afforded, both in Wigtonshire and Dumfriesshire, markings which have considerable resemblance to the fossil described by McCoy as *Protovirgularia*, and in Roxburghshire they have yielded crustacean tracks, but no other traces of organic remains have been obtained from them.

Above the Ardwell group the officers of the Geological Survey recognise a mass of strata to which they have given the name of the "Lower or Moffat Shale group." This group is composed of "flaggy greywacke and grey shales," which are distinguished by the occurrence in them of several bands of black carbonaceous shales. These strata are well developed in the neighbourhood of Moffat, Dumfriesshire, from whence they derive their name. The black carbonaceous shales are very persistent, having been traced by the officers of the Survey from near Melrose to the western shores of Wigtonshire, "a distance of more than 100 miles." Three bands of carbonaceous shales can frequently be made out, but occasionally they come together so as to form one thick band. These bands are very prolific in graptolites. They have, from their carbonaceous aspect, induced many persons, under the guidance of "practical miners," to expend large sums of money in search after coal, and some of the spots where they have been worked are known under the name of "coal heughs."

Although the Moffat group is well developed through the greater portion of the Southern Uplands, it is on the coast of Wigtonshire that the best sections of the series can be seen. Here they are recognised resting on the Ardwell group, having at their base "grey and reddish shales, and clays, with calcareous bands and nodules, and enclosed bands of black shale, the lowest members being hard and flaggy." The second member of the Moffat group, as seen on the Wigtonshire coast, consists of black shales with intercalated clays, like the fire-clays of the coal-measures. Calcareous nodules and lenticular bands are also associated with the black shales, the whole being so intensely plicated as to render an attempt to determine their thickness extremely difficult. Upon the black shales well-bedded greywacke and grits occur with occasional shaly partings. These are succeeded by black shales so much jumbled and jointed, that their thickness cannot be made out. The next sequence consists of grey flagstones, flaggy sandstones, and grits, in beds of varying thickness up to 3 or 4 ft., with abundant partings of grey shale. To these succeed a thick band of finely laminated grey shale, 3 or 4 ft. Black shales, bands 12 to 18 ft. in thickness, occur next, and the highest members of the group consist of fissile shales.

The Moffat group, as represented in Wigtonshire, has a thickness of about 1,000 ft., of which more than half consists of flaggy greywacke beds. The underlying series, the Ardwell group, probably attains to a much greater thickness.

The third member of the Upper Llandeilo rocks of the Southern Uplands of Scotland, like the second, derives its name from Dumfriesshire. It is well exhibited in the hill called Queensberry, and has been designated the Queensberry grit group. The characters of this third member, as they are seen in Wigtonshire, "consist of greywacke and grits in massive courses, with occasional bands of grey and greenish shales." Massiveness and regularity of bedding and jointing are the characters of this group. The sandstones are often coarse; and sometimes even coarse conglomerates appear, in which some of the embedded fragments are sometimes from 2 ft. to 3 ft. in diameter, a feature which distinguishes the Queensberry group from all the other members of the Upper Llandeilo rocks of the South of Scotland. Fossils appear to be absent from this group, no trace of them having been met with in the three parallel bands which traverse Wigtonshire.

In the Dumfriesshire portion of the Upper Llandeilo area of the South of Scotland, there have been recognised, above the Queensberry grit group, black shales with graptolites, the thickness of which have not yet been ascertained. To these black shales the name of Hartfell group has been given. As the typical area where these rocks occur is in the higher part of the Annandale district, the sheets of which have not yet been published, we have at present no account of this group from the Geological Survey.

The Hartfell group is succeeded by the Daer group, which is made up of hard blue and purplish greywacke, and grey shales. It derives its name from a stream flowing from the north side of Queensberry into the Clyde. Its strata are greatly folded, and no reliable estimate can be formed of the thickness of the Daer group.

The Hartfell shales of the Daer group seem to thin out towards the south-west. They have not been distinctly recognised in Wigtonshire, where the Dalveen group, which in Dumfriesshire succeeds the Daer group, is seen resting conformably upon the Queensberry grits.

In Dumfriesshire the Dalveen group consists of fine blue and grey greywacke, and shales having no features distinguishing them from other members of the upper Llandeilo rocks. Their estimated thickness is about 2,900 ft. They are well exposed in Dalveen Pass, Dumfriesshire, whence their name, and in Dinabid Linn they are seen passing under a coarse pebbly rock, "Haggis Rock."

In Wigtonshire the lower part of the Dalveen group is seen overlying the Queensberry rocks south of Corsewell Lighthouse. Here its lower portion is remarkably shaly, but thick masses of greywacke also occur. Among the shaley beds are some bands worked at Cairn Ryan for slates. These slates have long been known as affording graptolites; and another thin band of black shale also containing the same fossils appears in this group in Wigtonshire.

In Dumfriesshire above the Dalveen group a series of

coarse and fine grits and greywacke, having red and green bands of flinty mudstone, conglomerate, and occasional breccia associated with them, occur—a persistent band of conglomerate containing quartz-rock pebbles, Lydian stone, and jasper characterise this group. The conglomerate, being locally known as "Haggis Rock," has furnished the name to the series, which is about 1,800 feet thick. The Haggis group in Dumfriesshire is seen striking across the river Afton, also, along the N.W. flanks of the Lowther hills, and elsewhere in this county. More to the north it can be recognised along the north-western margin of the Silurian area in Crawfordjohn, Lanarkshire. The Haggis rock is not persistent in its character. To the N.E. this conglomerate becomes much finer in grain, and passes "into a gritty greywacke." This group has hitherto yielded no fossils. In Wigtonshire the Haggis rock cannot be distinguished as a distinct series; its characteristic conglomerate being, as already seen, of local occurrence, it does not appear to manifest itself in the Silurians in the S.W. of Scotland.

(*To be continued.*)

LOCAL SCIENTIFIC SOCIETIES

IN very many ways has the general advance of intelligence, elevation of taste, and spread of education been shown during the present century, and more especially during the last thirty years; one of these ways is undoubtedly the increasingly rapid spread of Local Scientific Societies. What we mean by a "Local Scientific Society," as distinguished from the large Societies of London, is an association of individuals in a particular locality for the common study of one or more branches of science, by the reading of original papers, and what is perhaps of more importance, the actual investigation of the natural history—geology, zoology, botany, meteorology—and archæology of its district. Of the societies established within the last thirty years, nearly all are marked by these characteristics; such at all events is their professed object, and we are glad to say that, to judge from the special reports which we have received, and the numerous printed "Proceedings" of greater or less pretensions which are sent us from time to time, a very large proportion creditably carry out their programme.

In a number of the principal towns of England and Scotland associations exist, dating, some of them, from the end of last century, known as "Literary and Philosophical Societies," or by some similar title. These are generally comparatively wealthy, possessed of good buildings containing a library, museum, reading-rooms, lecture-hall, &c., with a large body of members belonging to the middle and upper classes. These, however, so far as their original objects are concerned, with one or two exceptions, scarcely come under the category of Local Scientific Societies, in the sense of the definition given above, though many of them, stimulated by the growing taste for Science, have recently added to their usual courses of lectures on literary subjects, others on subjects connected with Science, and have even organised classes for the study, under competent lecturers or teachers, of one or more branches of Science. In some instances, moreover, a few of the members of these respectable old associations have united to form societies of a kind which entitle them to be regarded as Local Scientific Societies, and even Field-Clubs. Still, all these older societies, as they existed previous to 1830, differed in many essential respects from the Local Societies and Field-Clubs which began to spring up about that time; even the well-known Literary and Philosophical Society of Manchester, quite on a par with some of the best London Societies, and which has produced original work of the highest value, has been all along confined to the learned and professional men of the city and neighbourhood, who have made use of the meetings of the Society for the purpose of making known the results of their independent scientific investigations.

So far as can be ascertained, the society just mentioned is the oldest provincial society which can be considered as in any way scientific, having been established in 1784, for the purpose of diffusing "literary and scientific intelligence, and of promoting the literary and scientific inquiries of learned men in the town and neighbourhood." "The results of its labours," Sir Walter Elliott says, in his valuable address to the Edinburgh Botanical Society, in 1870, on this subject, "were published in 'Memoirs,' the first volume of which appeared in 1785, at which time James Massey was president, and Thomas Barnes, D.D., and Thomas Henry, F.R.S., were Secretaries. Five volumes had appeared up to 1802. In 1805 a second series commenced under the Rev. John Walker, President, and John Hall and John Dalton, Secretaries, which had extended to five volumes more in 1860. A third series was commenced in 1862, and has reached volume xiii. The second series is enriched with many papers by Dalton, including the first development of the atomic theory." In 1858 a microscopical and natural history section was established; the latter, however, we regret to say, is since defunct.

The next society of this class in order of time was instituted at Perth in 1781, as the Perth Literary and Antiquarian Society; we need not say that, so far as eminence is concerned, it was never to be compared with the Manchester Society. It has never done scientific work of any value, though it possesses a handsome building, with a museum, devoted mostly to antiquities, but having a fine natural history collection as well, and a good library. Like many other societies of a similar kind, its building serves as a kind of meeting-place or club, where those members who have nothing to do can meet and have a gossip, and read the papers. This society has published only one volume of "Transactions" (in 1827), but so far as we know, they have now no transactions to record. A few years ago, as will be seen from our list in Vol. viii. p. 521, a Natural Science Society was established in the county, with Perth as its headquarters, which gives promise of being one of the best working Local Scientific Societies in the kingdom.

In 1801 a society of a similar kind was established in the sister kingdom, the Literary Society of Belfast, which has never done anything to call for note here. Previous to this, however, in 1793, the Newcastle-on-Tyne Literary and Philosophical Society was established, which, although it has published only one volume of memoirs, and is little more than the owner of an excellent public library, does good work by providing educational courses of lectures for in-

struction in mathematics, chemistry, and other branches of science as well as literature.

Up to 1830, about twenty other societies, more or less "Philosophical," which term seems then to have been thought a more dignified term than "Scientific," were instituted within the three kingdoms, including the Ashmolean Society of Oxford, and the Cambridge Philosophical Society. Of these, no less than six were in Yorkshire alone, a county, as we shall see, which continues to hold the foremost place, so far as number of scientific societies is concerned; the West Riding bristles with little Field Clubs. Among the best of the societies referred to is the Liverpool Literary and Philosophical Society, which, especially since its amalgamation in 1844 with the Natural Science Society, has done some excellent work, as can be seen from its voluminous "Proceedings," which contain papers that would do credit to any society. The Glasgow Philosophical Society is also one of high standing; and the Royal Geological Society of Cornwall, founded in 1814, which has done some good work in connection with the geology of the district. The Royal Institution of Cornwall is also one of the most creditable of these old societies, having been formed in 1818, for the advancement of knowledge of natural history, natural philosophy and antiquities, especially in their connection with Cornwall. Besides its valuable antiquarian work, it has published "The Cornish Fauna," a compendium of the natural history of the county.

The one of these older societies which in its object and work corresponds most nearly to our definition, is the Northumberland, Durham, and Newcastle Natural History Society, instituted at Newcastle-on-Tyne in 1829. Among its original members were Sir John and Sir Walter Trevelyan, and the late Albany Hancock, and both before and since its junction with the Tyneside Naturalists' Field Club, it has done much work of a kind similar to that which the recently established Field Clubs aim to do, having between 1831 and 1838 published two volumes containing valuable lists of the flora and fauna of Northumberland and Durham. This society, though somewhat crippled for want of funds, is still in a flourishing condition, and continues, in conjunction with the Tyneside Club, to publish in their Transactions, under the title of "Natural History Transactions of Northumberland and Durham," excellent lists of the fauna and flora, existing and fossil, of the district which it has adopted as its field for work. It possesses some splendid collections which the Newcastle College of Physical Science is generously allowed to use for purposes of study.

Had we space, others of these societies founded previous to 1830, as well as some of a more ambitious kind than the simple Field-Club, instituted since that time, could be named, which stimulated either by the example of the field-clubs, or more probably by the general advance of culture and the growing impressiveness of Science, have done much to foster a love for Science in their respective neighbourhoods and to investigate the natural history of their several districts. A large proportion of societies of this class are found in the south-west of England, in Devonshire and Cornwall: such are the Cornwall Polytechnic Society, the Devonshire and Cornwall Natural History Society, the Devonshire Association—a peripatetic Society founded in 1862 after the model of the British Association—the Royal Institution of South Wales (Swansea), and the Isle of Wight Philosophical and Literary Society. Others also we might mention at the other end of England, for an examination of our list shows that the activity of the country in this respect has been developed to the greatest extent in the north and south.

These societies, though differing in some essential respects from the simple Field-Club, yet in their own way do good and serviceable work by the establishment of museums, the encouragement of local exhibitions, the occasional publication of papers illustrative of the natural history and archæology of the district, and recently, what we deem of considerable importance, the institution of courses of lectures by eminent men of science, and the establishment of classes for the working and other classes who are engaged during the day. We would urge all of this class of association to bestir themselves to the performance of more thorough and more extended work in these directions, thereby not only doing a benefit to the members themselves, as well as to the cause of Science, but elevating the district in which they are located, and thus helping the country onward in the general march of improvement. By means especially of continuous series of lectures by eminent men of science and by well-organised systems of classes, the good that might be done by these institutions would, we believe, be inestimable; and now that the Science and Art Department offers such splendid facilities for the establishment of classes and museums in connection with any institution that chooses to take advantage of them, no local society of any pretensions need any longer be without the material of a comprehensive and high-class education for its members and those in its neighbourhood who are willing to be improved; only a lazy unwillingness to keep up with the rapid progress of the time can deprive a neighbourhood of these advantages. The Royal Cornwall Polytechnic Society, the first "Polytechnic" in the United Kingdom, is an example of what can be done in one way, by the establishment of lectures and classes, and by the institution of medals and money prizes for successful attempts to apply Science to industry. But a model which all literary and philosophic societies, *et hoc genus omne*, would do well to imitate, though they would find it difficult to rival, is the Birmingham and Midland Institute, an institute of which its originators may well be proud, and for the establishment of which they deserve the gratitude of the busy and important district in the midst of which it is planted. It scarcely comes within the scope of our subject, and we only mention it to show to the class of societies with which we are at present dealing, what they might hope to achieve if they only had the will and the generosity to bestir themselves and take the necessary steps. There is no reason why in every county town or other suitable place institutions of this kind should not be established, forming active centres of intellectual culture, and to which the smaller scientific societies of the surrounding districts might be affiliated without losing their independence and with very valuable results. We hope ere long to see this accomplished; and who are better fitted to take the initiative in the matter than those societies which pretend to represent the culture of the districts from which their members are drawn?

(*To be continued.*)

THORPE'S "QUANTITATIVE ANALYSIS"

Quantitative Chemical Analysis. By T. E. Thorpe, Ph.D., F.R.S.E., Professor of Chemistry, Andersonian University, Glasgow. (Longmans.)

WE welcome with pleasure a work which in the present state of our literature on Quantitative Chemical Analysis, may well be looked upon as a boon to the advanced chemical student. Fresenius's Quantitative Analysis has been so generally accepted by chemists as the standard book in this branch of Science, that we greatly regretted the unwarrantable liberties taken by the English editor in the late edition of our trusty author's work. The publishers, who did not, in justice to the accomplished author, recall that edition, may yet learn that the chemical public, at all events, know how to appreciate a good work on Quantitative Analysis. We confess to a feeling of relief, speaking as a teacher of chemical analysis, as we perused Mr. Thorpe's book; for although we have to differ from the author on some minor matters, we believe that this new work will speedily be found in the hands of every chemical student.

Our author has evidently felt what others have experienced before him, that Fresenius's Quantitative Analysis became with every new edition more and more unwieldy (we are speaking of the German editions), and that, at the commencement at least, a simpler guide to quantitative analysis might with advantage be placed in the hands of the student. As methods of analysis—especially volumetric methods—multiplied year after year, the teacher and the student looked to the master for some indications which methods should, under given circumstances, be adopted in preference to others. Mr. Thorpe has evidently been bent upon supplying this want. In the treatment of his subject he has followed the example set by Woehler in his "Practische Uebungen in der Chemischen Analyse," rather than that of Fresenius. It appears to us, however, that he has somewhat fallen into the other extreme, for, in the place of a series of carefully elaborated methods for the determination of each base and acid, he has contented himself with giving a few examples only of individual determinations, and has preferred to teach quantitative separations almost exclusively by describing, in language both terse and concise, a number of complex quantitative analyses, such as are likely to occur in practice. There is much to be said for this plan of teaching analysis, so to speak, *en bloc*. It involves, however, much repetition, or, at the very best, reference from one example to another, and leaves the student in considerable uncertainty whenever he has to break new ground. The aim of all quantitative teaching should be to enable the analyst to adopt or devise for himself correct methods of separation. The foundation for quantitative methods should, in fact, be laid by careful and accurate qualitative work. A good workable method may often be preferable to a more elaborate although more strictly accurate method.

In the endeavour to write as compactly as possible, the author has frequently over-estimated the mental powers and the chemical knowledge, say of second years' students, for whose use the work is apparently written, and has thus sacrificed clearness for briefness. We refer, for instance, to the methods given for the separation of iron, manganese, &c. in Spiegeleisen, condensed as it appears, from Fresenius, where the ammonium carbonate method occurs, but where it would be difficult for a student, without the teacher's assistance, to trace the chemical changes. There is too much of the *how* to do a thing, and too little of the *why* to do it throughout the work, to make it as useful to the beginner as it would otherwise be. Although the several methods for the separation of manganese from iron, &c., are to be found in different parts of the book, there are scarcely sufficient hints, why and under what circumstances and conditions the one method is to be used in preference of the other. The same applies to various other methods of separation. Well known and familiar chemical methods, again, are abandoned, occasionally, for new methods of at least questionable utility. We may mention, among such, the use of hydrochloric acid, as the starting-point in alkalimetry.

The same remark applies to the apparatus described and illustrated. The woodcut on p. 142 *ex. gr.*, illustrative of the method for taking the specific gravity of ammonia, looks startlingly elaborate. Much credit is due, however, to the author and his coadjutor, Mr. Dugald Clerk, for the care bestowed upon the preparation of the woodcuts. We consider them, for the most part, well selected and well executed. There is that pleasing evidence to the chemical eye, that the illustrations have originated in the laboratory, and that they depict apparatus which can be practically used, and are not merely put in to please and catch the eye. In fact, when we compare some high-priced books of the class, which it would not be difficult to enumerate, with the elegantly got-up and cheap volume of Mr. Thorpe, we can only congratulate him on the book he has produced.

If we may be allowed to tender advice, we should say:—Condense the part on the operations of weighing; enlarge the number of examples of simple gravimetric analysis, so as to include the more important acids and bases; draw a line between determinations usually required in analyses for practical or commercial purposes, and the more elaborate complete analysis of the same bodies; and last, but not least, explain more fully, why and when one method answers better than another—if only in compassion for the weaker analyst.

We cordially recommend the book, and hope to see these suggestions adopted in the next edition, for which in all likelihood we shall not have to wait long.

LETTERS TO THE EDITOR

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

The Management of the British Museum

I BEG to protest against the remarks upon the management of the British Museum contained in your article of November 6. The general question whether a public institution of the sort is best governed by a public official or by a body of Trustees, may very likely admit of much discussion, but the decision should not be prejudiced by totally ignoring the noble work which has been and is being done by the Museum. No scientific man surely can be ignorant that the British Museum exists not so much for the momentary amusement of gaping crowds of country people, who do not understand a single object on which they gaze, as for the promotion of scientific discovery, and the advancement of literary and historical inquiry. We are told about the indifference of the Museum Trustees to the best interests of science, but we are not reminded frequently enough that it is

almost impossible to carry out any scientific or literary inquiry in a complete manner, without resorting to the great national museum. There are doubtless many things which the Trustees have not done, but is it a slight matter that they have given us, on the whole, by far the most extensive and complete body of collections anywhere brought together in the world? The library and reading-room alone are enough to do honour to their management, and it is almost impossible to fathom the degree in which this library assists every kind of inquiry. When we are least aware, we are often enjoying the fruits of investigation in that library; the late Prof. Boole, for instance, spent the last few months of his life in the Museum, pursuing an exhaustive inquiry into previous writings on the subject of Differential Equations.

As regards the other collections, I presume that no one will call in question their enormous extent; and the fact that they are not adequately lodged and displayed as yet, is due to their very vastness, and to the fact that Government would not, until lately, afford the money for the new buildings. As regards the real interests of original inquiry, too, comparatively little harm is done by the want of room for exhibition, since *bonâ fide* scientific students can always obtain access to the collections.

I am far from denying that the officials who have conducted the South Kensington Museum have, by an enormous expenditure of public money, collected together a great quantity of beautiful objects of art, and have thus not only afforded opportunities for art study, but have made this museum a very agreeable and fashionable lounge. But I must protest against the notion, apparently countenanced in NATURE, that the scientific value and work of a national museum is to be measured by the number of millions of persons who saunter through the galleries. No doubt the utility of a museum in affording popular instruction and elevated amusement to large masses of people is very considerable, but this popular work is altogether of a different order from the strictly scientific object of collecting together all the products of intellect and of Nature. It is an unavoidable misfortune of the best and highest work in science that it is quite unobtrusive. The public is struck by the thousands who crowd the decorated galleries of South Kensington. There is nothing to attract public attention in the two or three hundred bookworms patiently plodding through the books in the Museum library, or the few students turning over the drawers of the zoological, botanical, mineralogical, numismatic, and other collections. But in NATURE, which has so powerfully advocated the necessity of promoting original research in this country, I should expect, more than anywhere else, to find a due appreciation of the noble work which is being carried out by the British Museum trustees, and by the staff of eminent scientific and literary men who are employed under their direction in promoting almost every branch of literature and science. We have heard many complaints of the apathy displayed by Government in the promotion of science. The existence of the British Museum is the best answer to that complaint. As regards those branches of science which demand the use of large collections, it may be regarded as the great national laboratory; and if scientific men do not make adequate use of it, that is their fault and not that of the trustees.

W. STANLEY JEVONS

[Our opinion of the immense importance to research of the collections of the British Museum is quite in accordance with the above letter of our esteemed correspondent, and if he will read the article again he will see nothing in it to indicate any difference of opinion. Indeed we regard the positions of the scientific men in the British Museum as positions of endowed research, and positions, moreover, which have amply justified it, miserable as the amount is in many cases. Our objection is to the existence of trustees not represented by a Minister, and to the action of the trustees, who have not expanded the area of the utility of the collections, and who have cared so little for the men of science working under them and the collections themselves that the former are underpaid and the latter are much less useful than they might be. Mr. Jevons concedes the whole point when he refers to the money so properly spent at South Kensington; for had the British Museum been under the same Minister, money would have been spent there too. The money must be spent unless we are to sink to the level of—well, let us say Morocco; and it is to prevent this that the proposed transfer has been suggested.—ED.]

On the Equilibrium of Temperature of a Gaseous Column subject to Gravity

IN NATURE, vol. viii. p. 486, Mr. Guthrie asks the question, "Is thre no possibility of testing the nature of thermal equilibrium of a column of still air?" I think to this question an answer may be given, which, though indirect and imperfect, will perhaps decide the controversy on the above subject.

If gravity causes in the temperature of a gaseous column the difference, which Mr. Guthrie thinks it does, that difference must be in proportion to the height of the column, and in inverse proportion to the specific heat of the gas. Hence it follows that, if two equal columns of different gases, both under the same thermal influence, are joined at their lower parts by a thermo-electric pile, the side of this pile, which is surrounded by the gas with the highest specific heat, must be constantly cooler than the other side. The result of my experiments respecting this, is the confirmation of Mr. Guthrie's opinion. The description of these experiments, and a theoretical treatise on the subject, have been in the hands of Prof. Poggendorff since the beginning of last June, and will be published in an early number of his *Annalen*.

I hope that my experiments will induce others to try them in the same or in another manner, in order to bring the question concerning the influence of gravity on the thermal equilibrium to a final decision. Should it prove in favour of Mr. Guthrie's theory, as I believe it will, this theory, represented till now only by a very small minority, although it was broached twenty years ago by Waterston,* will give rise to results† which may perhaps clear up many of our ideas about Kosmos.

The argument which Prof. Clerk-Maxwell has brought against Mr. Guthrie in NATURE, vol. viii. p. 85, does not appear to me to be generally correct. He says:—In a given horizontal stratum of a gaseous column subject to gravity, a greater number of molecules come from below than from above to strike those in the stratum, because the density of the gas is greater below than above. Certainly the number of molecules, which enter into such a stratum during a certain time, depends upon the density of the gas, but besides this, it depends upon the probability of entering into it, which exists for each molecule. Now, this probability is not only dependent upon the distance of a molecule from the stratum, upon its velocity, its direction and its encounters with other molecules, but also upon the very fact of its being above or below the stratum.

Gravity continually tends to diminish the distance between any horizontal stratum and each molecule which is above the stratum, and continually tends to increase the distance between the stratum and each molecule which is below. Hence it follows that the probability of entering into the stratum will be greater for a molecule which is above than for one below, if, in the case of both, all other circumstances are equal. For example, consider two molecules, which in a given moment move with the same velocity and in the same direction on the two sides of the stratum; if this direction is horizontal like the stratum, and if in the given moment the distances of the molecules from the stratum are both very small, in the next moment the molecule above the stratum will have entered into it, while that one below will have removed from it.

In the case of the density being greater below the stratum than above, more molecules would enter it from below, if gravity did not exist. But under the influence of gravity, the effects of the difference in density can be balanced by those of the above-mentioned difference in the probability, which exists for each molecule of entering into the stratum during a certain time. I even consider this last difference to be the dynamical cause of the difference in density.

Westend, near Berlin, Oct. 20

G. HANSEMANN

Periodicity of Rainfall

As far as my own figures are concerned, the reply to Mr. Meldrum's question is very easily afforded. I agree with him that it is undesirable to use averages deduced from groups of stations variable both in the number and locality of their components. The observations which I quoted were those of a single station, Halton, St. Philip, Barbadoes.

With respect to the general question, I regret being unable to share Mr. Meldrum's evident enthusiasm, and that a very different opinion has been published in the *Zeitschrift*, by Dr. Jelinek, one of the most eminent meteorologists of the present day. It may be convenient to some readers to be informed that an abstract of Dr. Jelinek's article is given in "British Rainfall, 1872," together with a general *résumé* of the state of the question up to the date of its publication.

Camden Square, Nov. 1

G. J. SYMONS

* In "On Dynamical Sequences of Kosmos."

† I have expounded some of these results in an abstract mechanical form in "Die Atome und ihre Bewegungen" (Cöln Lengfeld'sche Buchhandlung, 1871).

THE COMMON FROG*

IV.

HAVING now passed in review the greatest differences presented by the nearest allies of our common frog (the members namely of its own order), certain facts of interest present themselves respecting the geographical distribution of the group. These facts are interesting, because they point not only to the exceptional nature of the faunas of South America and of Australia, but also to a certain zoological affinity between those two regions of the earth, distinct as they are from one another. Thus, as has been mentioned, it is only in Australia and South America that the typical genus *Rana* is absolutely wanting. One genus of Tree-frogs, *Pelodryas*, is confined to Australia, but is closely resembled by another genus, *Phyllomedusa*, which is restricted to South America, and differs from the former only by the absence of a web between

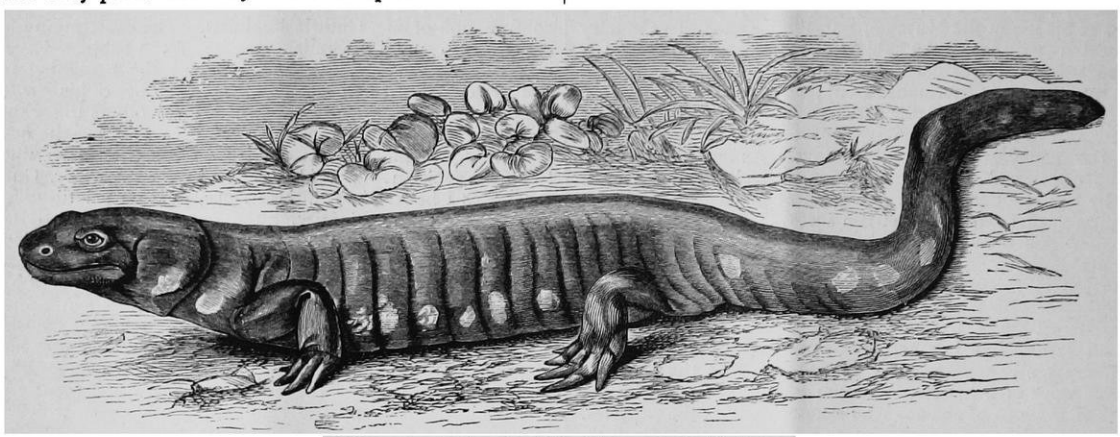

FIG. 16.—An American Eft of the genus *Amblystoma*.

the toes. It should be recollected that the primary subdivisions of a zoological order are termed *families*. One whole family, called *Cystignathidæ*, is (with the exception of two species) confined to Australia and America.

The typical Tree-frogs (*Hyla*) abound in South America and are also found in Australia, but not in India or in Africa south of the Sahara. On the other hand another genus of Tree-frogs (*Polypedates*), is found in India, Japan, and Madagascar, but not in either Australia or America.

The typical Toads (*Bufo*) have, however, their headquarters in South America, yet are wanting in Australia,

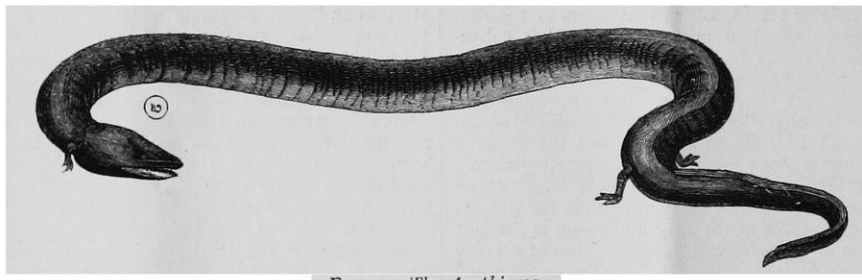

FIG. 17.—The *Amphiuma*.

though they are found everywhere else where the order exists at all.

The earth's surface, considered as to its population of the frog and toad order, may be divided into three great regions. The first of these is composed of Europe, Northern Asia (with Japan and Chusan), North America, and Africa north of the Sahara. The second region consists of Africa south of the Sahara, Madagascar, India, and the Indian Archipelago. The third region is made up of South America and Australia, and the resemblance between these two parts of the earth's surface as to their frogs and toads is paralleled by that as to their

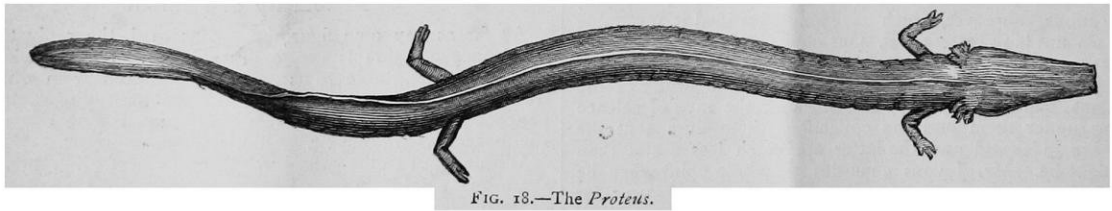

FIG. 18.—The *Proteus*.

mammalian faunas, since marsupial mammals (or pouched-beasts of the opossum kind), are strictly confined to Australia (and its islands) and America.

No Frog or Toad has yet been found in New Zealand.

Africa, considering its size and climate, is poor in species of *Anoura*.

We should be prepared for the fact that in South America Tree-frogs abound, since all kinds of animals in that region assume an arboreal habit.

Monkeys are tree-livers all the world over, but nowhere are all the indigenous species so thoroughly arboreal as in tropical America. There alone do we find monkeys with a prehensile tail capable of serving as a fifth hand, and so affording greater security and facility to locomotion amidst the branches. Only there also do we find beasts so ex-

Continued from p. 13.

clusively constructed to pass the whole of their lives in trees that they can move along the ground only with difficulty—such is the case with the sloths. Porcupines, which in the old world have short tails, in the new world have long and prehensile ones. An animal allied to the Badger—the Kinkajou (*Cercoleptes caudivolvulus*)—similarly acquires in South America a long and prehensile caudal appendage. Even the Fowl and Peacock Order of Birds becomes in South America more strictly arboreal than elsewhere (being represented by the Curassows), and the very geese find there a congener (*Palamedia*) specially adapted to dwell in trees and destitute (like the frog *Phyllomedusa* before mentioned) of a web-like membrane between the toes.

We have now advanced a further stage in seeking a reply to the question, "What is a Frog?" We have now viewed it in the light to be derived from a consideration of the more noteworthy forms of the frog's order.

We may next inquire what are its next nearest allies? What other animals of the class Batrachia constitute an order which approaches nearest to the frog's order *Anoura*?

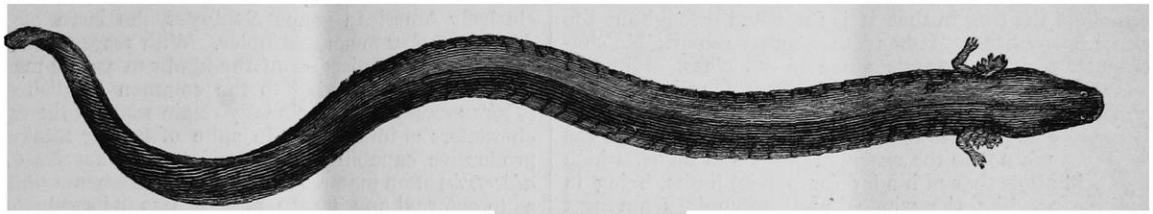

FIG. 19.—The *Siren*.

Almost every pond in England which harbours frogs, harbours also those little four-legged, long-tailed, soft skinned creatures termed *Efts* or *Newts* (of the genus *Triton*) familiar to every schoolboy.

These Newts which are thus by circumstances placed actually in juxtaposition with the frog are also zoologically his nearest allies outside his own (frog and toad) order. Like the frog they undergo a metamorphosis, at first appearing as Eft-tadpoles (with elongated external gills, but devoid of limbs), subsequently losing the gills and acquiring limbs. Efts, as is manifest, are widely and strangely different in form from frogs and toads.

Thus is justified the assertion before made as to the far less exceptional form of the human body than that of the frog. For when, amongst Mammalia, we go outside that *order* to which Man belongs, we find in his *class* other creatures (insect-eating, flesh-eating, and of the squirrel kind) which more or less closely resemble some of the lower members of man's order. When, however, amongst Batrachia, we go outside that *order* to which the frog belongs, we find in his *class* no creatures whatever which present anything like such an approximation to any members of the frog's order as is presented by the mammals above referred to certain members of man's order.

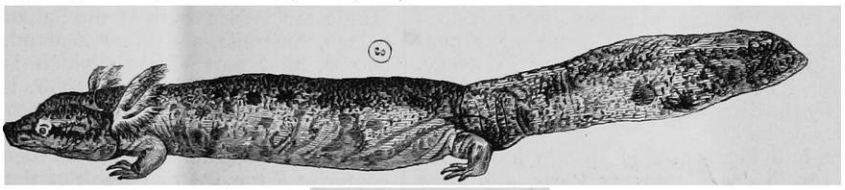

FIG. 20.—*Menobranchus*.

The Efts (or Newts) with their allies—hereinafter noticed—constitute the second order *Urodela* of the class Batrachia.

This order is very unlike the first and already described order (*Anoura*), in that it is composed of creatures which in many respects are strangely divergent; and though most of the species more or less resemble our own Efts (or Newts) in shape, yet the *Urodela* are very far from constituting such a homogeneous group as are the *Anoura*.

It will be well now to review some of the more striking forms contained in the order.

The Land Eft (*Salamandra*), though common in Holland and France (as well as the rest of Europe), is unknown in this country.

Genera allied to the European genera *Triton* and *Salamandra*, and to the American genus *Amblystoma*, may have the body and tail more and more elongated and the legs reduced, as in *Spelerpes*, *Chioglopa*, and *Œdipina*, till they attain the condition of *Batrachoceps*. The greatest excess of this development, however, is found in the North American genus *Amphiuma*, the minute limbs of which have either three or two toes, according to the species. These creatures are called by the negroes "Congo Snake," and are quite erroneously regarded as venomous.

The largest existing Urodele—the gigantic Salamander (*Cryptobranchus*)—is found in Japan, where it attains a length of 5 or 6 feet. A closely allied species inhabits China, and during the tertiary period one also inhabited Europe, the fossil skeleton of which being strangely supposed to be that of an antediluvian man received the curious appellation, "Homo diluvii testis."

In *Cryptobranchus* (as in all the Urodela yet enumerated except *Amphiuma*), though the young have gill openings and external gills, the adults are devoid of both.

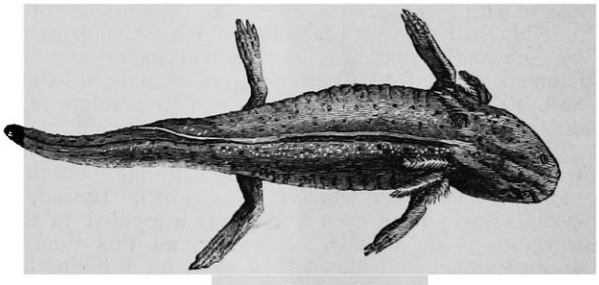

FIG. 21.—The Axolotl.

In a North American genus, however (*Menopoma*), which, though smaller in size, closely resembles Cryptobranchus in figure, there is a permanent gill opening, though the gills themselves disappear in the adult, and the same is the case with *Amphiuma*. Thus in these animals the metamorphosis is less complete.

In the subterranean caverns of Southern Austria (Carniola and Istria) is found the *Proteus*. This is an elongated Urodele, with slender limbs, and but two toes

to each hind foot. Passing its whole life in perpetual darkness, it is blind and colourless, except the external gills, which are red. This animal retains during the whole of life not only the gill aperture on each side, but also the external plumose gills which are transitory in the Anoura and in all the Urodela hitherto mentioned. Here then we first meet with an animal which may be said to be a permanent and persistent Tadpole, yet rather like an Eft-tadpole than like that of the Frog.

A North American Urodele, misnamed (for it is silent enough) *Siren*, also presents us with permanent external gills, and it offers another interesting resemblance to the tadpole of the frog in that it is furnished throughout life with a horny beak. It has also another remarkable character in which it stands alone in its class. Hitherto every relative of the frog has had, like it, four limbs in the adult condition. In the Siren, however, we for the first time make acquaintance with a creature belonging to the class (though not to the *order*) of frogs and toads, which is devoid altogether of hinder (or pelvic) limbs, being in this respect like the whales and porcupines amongst beasts, and like the little lizard, *Chirotes*, amongst reptiles.

Another North American Urodele, *Menobranchus*, possesses throughout the whole of life both gill openings and external gills. But it is furnished with four limbs, and in other respects more or less resembles in appearance, as it does in size, the genus *Menopoma* before noticed.

Finally there is a genus of this order (*Urodela*) which has of late presented circumstances of peculiar interest. This is the Axolotl of Mexico, which was long considered by Cuvier to be a large Eft-tadpole, possessing as it does permanent gills and gill-openings, with some other characters common to the Eft-tadpole stage of existence. At length, however, its mature condition was considered to be established by the discovery that it possesses perfect powers of reproducing its kind.

For some years, individuals of this species have been preserved in the Jardin des Plantes at Paris, and a few years ago one individual amongst others there kept was observed, to the astonishment of its guardian, to have transformed itself into a creature of quite another genus—the genus *Amblystoma*, one rich in American species, Since then several other species have transformed themselves, but without affording any clue as to the conditions which determine this change—a change remarkable indeed, resulting as it does not merely in the loss of gills and the closing up of the gill-openings, but in remarkable changes with respect to the skull, the dentition, and other important structures.

There is, moreover, another and very singular fact connected with this transformation. It is that no one of the individuals transformed (although we must suppose that by such transformation it has attained its highest development and perfection) has ever yet reproduced its kind, and this in spite of every effort made to promote reproduction by experiments as to diet and as to putting together males and females both transformed, also transformed males with females untransformed, and males untransformed with females transformed. Indeed, the sexual organs seem even to become atrophied in these transformed individuals. Moreover, all this time the untransformed individuals have gone on bringing forth young with the utmost fecundity, no care or trouble on the part of their guardians being required to effect it.

A fact more noteworthy could hardly be imagined in support of the view of specific genesis put forward recently.* Here we have a rapid and extreme transformation taking place according to an unknown internal law of the species which transforms itself. No one, moreover, has been able to detect the conditions which determine such transformation (though it takes place under the eyes, and in the midst of the experiments of its observers). This latter fact affords abundant evidence how obscure and recondite may be the conditions which determine the transformations of specific genesis, and how utterly futile are observations as to an apparent homogeneity of readily appreciable conditions. They are so since it seems to be just such recondite ones which really determine the changes just referred to, and probably, therefore, other changes analogous to them.

It may be a question whether the genus *Menobranchus* may not also be a persistent larval * form, and one which now never attains its once adult form. If so, it is most probable that its lost state was similar to that of the exclusively American genus *Spelerpes*, the larva of which *Menobranchus* much resembles. With respect to *Proteus* and *Siren* no conjecture of the kind can yet be made.

Individuals belonging to the common English species (*Triton cristalus*) occasionally retain some of the external characters of immaturity, in spite of having attained reproductive capability; and a European species (*Triton alpertris*) often matures the generative elements while still, as to external appearance, more or less in its tadpole stage of existence. The adult condition, however, is normally and generally attained by it.

The geographical distribution of the *Urodela* is very remarkable. North America is the head-quarters of the order, and, with rare and trifling exceptions, the whole are confined to the Northern hemisphere. The exceptions are certain forms which extend down the Andes into South America, and one or two species of *Amblystoma*, which similarly descend along the highlands of South Eastern Asia. Urodeles are absolutely wanting in Hindostan, Africa south of the Sahara, the Indian Archipelago, Australia, and New Zealand. As might be expected, that part of Asia which is nearest to North America, namely China and Japan, is the region of the old world most richly peopled by species of *Urodela*. Altogether the world's surface may be divided according to its Urodele population into three regions. The first will comprise Europe, Africa north of the Sahara, and North Western Asia. The second will include Japan and Eastern Asia. The third will be formed by North America, with a slight extension southwards into South America—a division which by no means coincides with that indicated by the *Anoura*.

The above two orders (*Anoura* and *Urodela*) comprise all the animals most nearly allied to the common frog, of all those outside its own order. There is, however, another small ordinal group of animals which remains to be here noted, because of all existing creatures they come nearest to the frog, after the *Urodela*.

(*To be continued.*)

* See Genesis of Species, chap. xi.

* The young of the Frog or Eft is called a larva.

INAUGURATION OF THE LINNEAN SOCIETY'S NEW ROOMS

Opening Address by the President

IT is now seventeen years since the Government first recognised the claims of our Society to encouragement and assistance on the part of the State, as one which devoted itself to scientific pursuits unremunerative to its members, but tending directly or indirectly to public benefit; and since then a sense of the justness of such claims on the part of pure natural science has become gradually more general. We are no longer in the days when a Peter Pindar could turn the Royal Society and its president into ridicule as boiling fleas to ascertain whether they turned red like lobsters. The *Times*, instead of a short leader dismissing the British Association meetings in a similar strain of banter, devotes daily, during the time of its session, half a dozen columns to the details of its proceedings. And our own department in natural science is now admitted to be one of the most im-

portant branches of general science, specially important in its relation to our material prosperity. Our food and raiment, the essentials of life, are derived exclusively from the animal and vegetable kingdoms, and biological products contribute largely to many of our luxuries, whilst on the other hand some of the greatest calamities with which we are afflicted are due to the rapid development of animal or vegetable life. Many are the associations, under Government as well as individual patronage, devoted to the improvement and increase of useful animals and plants; and of late attention has been also devoted to the arrest of the ravages of the noxious ones, the balance of natural selection being disturbed by the interference of agriculture and animal education. The due study of the means of restoring this balance, of turning it more and more in our favour, of calling in to our aid more and more of the hitherto neglected available species, or of the hitherto latent properties of those already in use, of checking the progress of blights and murrains, requires a thorough knowledge of the animals and plants themselves, and that thorough knowledge can only be obtained by that scientific study not only of particular animals and plants supposed *a priori* to be useful or noxious, but of *all* animals and plants, which it is the special province of our Society to promote. And in this respect I think it will be generally admitted that we have not been neglectful of our duty, and that we have done our part in rendering effective the support we have of late years received from Government as well as from individuals, and in establishing a sound claim for its increased continuance. Besides the aid afforded to scientific researches by our largely augmented library, the great value of the papers published in the recent volumes of our Transactions and Journal has been acknowledged abroad as well as at home. It is in our Society, for instance, that the great Darwinian theories were first promulgated; and it must be recollected that the five or six hundred copies of our publications regularly sent out, place the researches they exhibit at once at the disposal of the leading followers of the science in all parts of the world. It is true that these great additions to our efficiency are not entirely due to Government patronage, but are the direct results of the reforms introduced by Dr. Hooker in 1855. Those reforms, however, would have lost much of their effect had we remained confined to our old quarters in Soho Square. Cramped for space in those obscure and dingy rooms, it required a strong devotion to science to induce an adequate attendance at our meetings; and saddled with a heavy rent, we could neither purchase books for our library nor find room on our shelves for those presented to us.

In the spring of 1856, however, an opening was made for our obtaining rooms in Burlington House. I was then on the Council, and joined heartily in the conviction of the importance of availing ourselves of the opportunity, notwithstanding the heavy expense it might entail, which I felt confident we could cover by a subscription amongst our fellows. Our President undertook the preliminary negotiations, and at the meeting of our Council on June 11 a letter was officially communicated to us addressed by the Secretary of the Treasury to the President of the Royal Society, allowing the temporary location in Burlington House of the Linnean and Chemical Societies with the Royal Society, upon certain conditions; those which affected us being, that the Royal Society should be put in possession of the main building of Burlington House on the understanding that they would, in communication with the Linnean and Chemical Societies, assign suitable accommodation therein for those bodies, and that the Fellows of the three societies should have mutual access to their three libraries for purposes of reference. Our Society, at a special general meeting held on the 17th of the same month, authorised the Council to take the necessary steps for carrying out the proposal of the Government, and in the following February 1857 the Royal Society assigned to us the rooms which we have since occupied under the above conditions. A subscription was organised which ultimately amounted to nearly 1,100*l.*, sufficient to defray all expenses of parting with our old rooms and fitting up the new ones, with a very small surplus, which was carried to the general account. In the same month of February I was associated with our then active and zealous President and Secretary, and with Mr. Wilson Saunders as a Removal Committee, and on Tuesday June 2 the Society was enabled for the first time to meet in their new rooms.

Our position, however, although so great an improvement upon Soho Square, was not yet quite satisfactory. It was provisional only, and under the wing, as it were, of the Royal Society, and liable at any time to be exchanged for a worse or a better one as the case might turn out. This uncertainty is now removed. The Government, rightly understanding the relations which ought to prevail with the scientific societies judged to be deserving of their support, obtained from Parliament adequate means for providing ample accommodation to the six societies here located, without reserving any right of interference with or control over their scientific operations. Thus our new quarters have assumed a permanent and independent character, the rooms have been built and fitted up expressly for our Society, and, having followed out all the arrangements, I feel bound to acknowledge the effective manner in which the liberal intentions of Government have been promoted and carried out in detail by the architects, Mr. Barry and the late Mr. Bankes. When the plans for the new building were first being prepared, some six or seven years since, we were applied to for particulars of the accommodation we should require for our library and meetings, for the transaction of the business of the Society and for the residence of our librarian and porter. We were not consulted, it is true, about the general arrangements in relation to the other societies, and we have to regret the cessation of that close juxtaposition and intimate intercourse with the Royal Society which was so agreeable to us, but in all other respects our requisitions were fully complied with in the plans prepared and sent to us for approval, and the only alteration since made has been the curtailment of a portion of the basement premises in favour of the post-office, which rather inconveniently limits the stowage room for our stock of Transactions. With this sole exception we have the space we asked for, and the bookshelves and such other fittings as have been provided by Government have been worked out in the most satisfactory manner.

Our removal here has necessarily been attended with considerable expense, the precise amount of which cannot yet be calculated, but it will probably exceed 600*l.* The Council have, however, not thought it necessary to call for any special subscription. The investments made during the past year have been partially with a view to the present occasion, and the gradually increasing sale of our publications and general appreciation of the value of our labours has been so far adding to our receipts that we closed last session with a much larger balance in hand than usual, and we hope to clear ourselves of the liabilities we are incurring, without reducing our invested funds much below 2000*l.* At the same time, we must not conceal from ourselves that we shall be called upon for a considerable increase in our expenditure. Our enlarged accommodation, combined with high prices, will add much to our household expenses. We are threatened with a repeal of the Act which exempts us from parochial rates. Nearly the whole of our library having within the last three weeks passed through my hands, I have become convinced that it will require a large outlay in binding, as well as in filling up gaps to render it really efficient. And, above all, we must bear in mind that the chief means we have of promoting the scientific objects for

which we are associated, the only way in which we can render them available to our numerous Fellows resident in our colonies, is through our publications, and heavy as have been of late years our printer's and artists' bills, they will and ought to become heavier and heavier still. To render fully available the assistance we have received from Government, we require continued and increased support from our Fellows, and from the scientific public. We reckon already among our Fellows the great majority of those who have acquired a name in zoology, or botany, and I sincerely hope that all men of means who take a sincere interest in biological pursuits will think it a pleasure as well as a duty to contribute directly or indirectly to the support of the Linnean Society of London.

With regard to future arrangements in the new phases of life into which the Society has entered, the Council has kept in view three great objects, the endeavour to render our Meetings attractive, the extended usefulness of our library, and the steady maintenance of our publications. On meeting-nights the library will be open at 7 o'clock, the chair will be taken in the meeting-room at 8 o'clock, as at present, and after the meeting the Fellows will adjourn to tea in the Council Room upstairs, opposite to, and in direct communication with the library. The extended shelf-room in the library has enabled a classification of the books which will render those most frequently consulted much more readily accessible than heretofore; and as evidence that there is no relaxation in our publishing department, I have to announce that besides the two numbers of our Journal, one in Zoology, and the other in Botany, which have been sent out since our last meeting, two new parts of our Transactions are in the course of delivery, the concluding one of Volume XXVIII., and the second of Col. Grant's Volume XXIX. The first part of Volume XXX. is in the printer's hands.

INAUGURATION OF THE CHEMICAL SOCIETY'S NEW ROOMS

ON Thursday night last the Chemical Society met for the first time in the new apartments assigned to it in the right-hand front wing of Burlington House. The event was a notable one, and it is not often that such an occasion happens to the president of a hard-working body of scientific men as last Thursday fell to the lot of Dr. Odling when he rose to welcome the fellows to their new home, and he might well feel it his duty to break for once the tradition which imposes silence on the president on the first night of the session.

Dr. Odling accordingly rose and proceeded to bid them welcome to the new rooms, and then to give in a few words a general statement of what had been done in relation to the taking possession of them by the society. This it seems had been by no means an easy matter, as but a few days back the society was still in its old quarters without a book of its library moved, and the present apartments were in a damp and generally unfinished state.

Thanks, however, to the exertions of the Council and especially of the Junior Secretary (Dr. Russell), who were most kindly met and aided in their endeavours by Mr. Barry (the architect) and the Clerk of the Works; the new rooms were got into a habitable condition, the books in great part placed in their cases, and the meeting-room provided with seats in time for the first meeting of the session.

The rooms in question at present in use consist of the library, a noble room on the second floor, well capable of holding the books of the society for some time to come. That for meetings, below the library and overlooking Piccadilly, is capable of seating nearly twice the number of listeners that could be provided for in the old quarters. The seats, however, are somewhat crowded, and though the room is provided with double windows there is a considerable noise from the street. The president, however, held out hopes of a wooden or asphalt pavement being before long laid down in front of the building, and we hope a point of such importance will not long be neglected by the authorities. The most noticeable point, however, is a laboratory, placed on the right-hand side of the meeting-room and opening into it with double doors immediately behind the lecture-table. This, though at present not quite ready for use, is supplied with every fitting of a good laboratory, and will shortly be provided with the necessary apparatus and re-agents. According to the president, "whatever may be its subsequent use, it is intended at present to place it at the disposal of those authors who may wish to illustrate their papers with experiments." We do not know whether the words of the president imply an intention on the part of the society to aid research by granting the use of its laboratory in such cases as it may think deserving, but in any case the society deserves the thanks of every scientific man for so admirable an innovation as a room for the preparation of experiments.

Dr. Odling in his speech alluded to the "childish pleasure, childish in its earnestness and simplicity," with which a chemist looks upon a new experiment. We quite agree with him as to the fact of its existence, but we think that this desire to see answers a far higher purpose than that of mere pleasure. The science of the chemist is essentially a science in which, to quote a popular phrase, "seeing is believing," and nothing can be more wearisome than the constant repetition of the description of reactions, or the recounting of qualitative or quantitative results unenlivened by a single experiment. Such descriptions quite fail to lay hold upon the mind, except at the expense of a wearisome strain, and the consequence is that many a valuable paper loses half or all its effect when read (which should be to raise discussion), simply because in an attempt to describe facts the author loses sight of the necessity of succinctly generalising therefrom.

In the meantime what have the other societies affected by the changes in Piccadilly been doing to provide for the experimental illustration of papers? and especially what has the Royal Society done in the direction to which we have alluded? We are informed on the best authority —nothing! The rooms of the latter consist as did the temporary ones, simply of those requisite for the accomodation of the library and for the *reading* of papers. Now is the Chemical Society right? If so the Royal Society is wrong. It has not done all when it has provided comfortable reading-rooms for its members, and a place where its secretaries can read the papers to a few silent Fellows who are sparsely scattered over the benches. The reading and publication of papers is not all that a great and wealthy society can or ought to do for the advancement of science. Why should its laboratories not exist as well as its library?

There is no reason why the meetings of the societies instead of being, as some of them now are, dull reunions only attended by the Fellows as a matter of duty, should not be made more useful to men of science. What could be better than to see them attended by the more advanced of the younger students of science, as the meetings of the Chemical Society now very often are, who might there see how the better known workers demonstrate their discoveries, and how their papers are examined and discussed. Unless some attempt is made to give the other societies a greater grasp over the several classes of workers to which they more directly appeal, they will infallibly lose the guiding power they have hitherto had, and the advantages conferred by their organisation in the propagation of scientific knowledge will be lost. It behoves the Royal Society in particular to show the way to the others in following in the steps taken with

such signal success by the chemists. If it does not do so, but allows itself to be left behind, it must soon see many of the most important papers sent to the Chemical or to such of the other societies as may choose to provide the means of properly illustrating them.

It may be urged that if papers are to be experimentally illustrated, all cannot possibly be read. We can only say so much the better. Why should not a society's council exercise a wise discretion, and relegate some classes of papers at once to the "Journal," the proper place for many a mass of numerical data now perforce read, but of which discussion is impossible?

F. C. S.

NOTES

WE regret to announce the death, on the 10th inst., of Mr. B. F. Duppa, F.R.S., well known for his numerous and important researches in organic chemistry. He was educated at Cambridge, and was afterwards, in the year 1857, a pupil in the Royal College of Chemistry. Within a period of eleven years he published, partly alone and partly in conjunctton with Mr. W. H. Perkin and Dr. Frankland, no less than twenty papers, most of which appeared in the Transactions and Proceedings of the Royal Society. The most important of these researches related to the action of bromine and iodine on acetic acid, the artificial production of tartaric acid, the formation of organic compounds containing mercury, and the synthetical production of numerous acids of the fatty and acrylic series. Mr. Duppa was elected a Fellow of the Royal Society in 1867. Being a man of independent means, he never applied for, nor held, any scientific appointment, but formed one of that small band of enthusiastic and disinterested amateur workers of whom England may justly feel proud, and to whom she is so much indebted for a very large proportion of the contributions which she has made to the progress of science.

MR. MITCHELL, of Old Bond Street, is, we believe, about to publish a portrait of the late Dr. Bence Jones, engraved by Holl from the beautiful drawing by Mr. George Richmond, R.A.

THE following awards have been made by the French Geographical Society:—2,000 francs to M. Dournaux-Dupéré, who has just set out for Timbuctoo; this gentleman has also received a similar sum from the Minister of Public Instruction; 2,000 fr. to M. Francis Garnier, to aid him in his explorations along the Blue River in China, and which have Yun-nan and Tibet for their objects; 1,500 fr. to MM. Marche and Compiègne, who have already proceeded a considerable distance along the course of the Ogowe with the design of penetrating as far as the great African lakes, and joining Livingstone.

THE subject for the Le Bas Prize (Cambridge) for the present year is "The Respective Functions of Science and Literature in Education." Candidates must be graduates of the University of not more than three years' standing from their first degree when the essays are sent in, which date is fixed before the end of the Easter Term, 1874. The essays must each bear some motto, and be accompanied by a sealed paper bearing the same motto, and enclosing the name of the candidate and that of his college. The successful candidate is required to publish the essay at his own expense.

MESSRS. TRÜBNER AND CO. will publish, in about ten days, Mr. George Henry Lewes' new work, entitled "Problems of Life and Mind."

WITH reference to the paragraph in last week's NATURE on the discovery of the conversion of spherical into plane motion, Prof. Sylvester writes: "I feel it an act of simple justice to another to say that I should never have hit upon the instrument which effects this, had it not been for the previous, wholly original and unexpected, discovery made nine years ago, by M. Peaucillier, of the conversion of circular into rectilinear motion, with which I was recently made acquainted by M. Tchebicheff, and which seems to have been little noticed in the discoverer's own country, and to have remained wholly unknown in this. M. Peaucillier has succeeded by the most simple means in solving a kinematical problem which had baffled the attempts of all mechanicians, from our James Watts downwards, to accomplish, and a simple Captain of Engineers in the French army has actually accomplished by a stroke of inspiration the mathematical solution of a question which many of the most profound and sagacious mathematicians of the age have been long labouring, but necessarily (as it is now obvious) in vain, to prove to admit of none. The conversion of circular into rectilinear motion before M. Peaucillier's discovery was gradually growing to be classed in the same category of questions as the quadrature of the circle, and by a great number of mathematicians was actually deemed to be equally impossible in the nature of things. A working model of Peaucillier's machine constructed by my friend M. Garcia, the brother of Malebran and the inventor of the laryngoscope, is in my possession at the Athenæum Club, and several copies of it have been already made by its admirers, which term comprises all who have seen it. The wonderfully fertile kinematic and mathematical results which I have succeeded in educing from the simple conception involved in this machine may form the subject of another communication to NATURE."

PROF. JELINEK, of Vienna, writes us that the death of Prof. Donati is the only unhappy event connected with the Meteorological Congress of Vienna, which in all other respects has proved successful. The fact of all countries of Europe (France excepted) and the United States of North America being represented at the Congress, and the conciliatory spirit in which all the proceedings were held, the general desire to arrive at an uniform system of observation and publication make us hope, he thinks, that further decisive steps in this direction will be taken. The Congress has expressed the wish, that another Congress of Meteorologists shall meet in three years, and it has appointed a permanent Committee under Prof. Ruys Ballot of Utrecht, as President, and with Prof. Bruhns of Leipzig, Cantoni of Pavia, Jelinek of Vienna, Mohn of Christiana, Director Scott of London, and Director Wild of St. Petersburg, as members to prepare the solution of certain questions especially relative to the best form of publishing meteorological observations and to the extension of the existing system of meteorological observations. The permanent Committee has been also charged with the preparatory steps towards the convocation of a second Maritime Conference (the first having been held at Brussels in 1853). There will be three editions of the proceedings of the Congress. The one German, the other French, the third under the care of Mr. Robert Scott, in English.

RATHER an unusual incident has recently occurred in the Belgian Academy of Sciences, about which, according to the two gentlemen most concerned, erroneous statements have been made in the Belgian papers and *La Revue Scientifique*. The common statement is that at the *séance* of June 7 last M. E. van Beneden, son of the well-known Professor of Zoology at the Catholic University of Louvain, and himself Professor of Zoology at Liége, by appointment of the present Catholic Ministry, read a paper on the results of a voyage which he had recently made to Brazil and La Plata. Speaking of the difficulty of obtaining a dolphin on account of the superstitions of the Brazilian fishermen, he is reported to have referred to the ancient belief in Europe that dolphins were in the habit of bringing dead bodies on shore, and to have said, "The *fable* of Jonah is an embodiment of this belief." Thereupon, it is said, M. Gilbert, Professor

of Mathematics, and M. Henry, Professor of Chemistry at Louvain, in a letter to M. Quetelet, the secretary, protested against the expression being allowed to pass uncensured, as it was a violation of their religious convictions, and an infringement of the traditional law of the Academy, that nothing be said to hurt the religious convictions of any member. At the next meeting of the Academy, October 11, M. Gilbert insisted on this note being read, but by the vote of the Academy the order of the day was at once proceeded with. Thereupon the two aggrieved professors felt called upon to resign their connection with the Academy. The real facts of the case are stated by MM. Gilbert and Henry in a long communication to the last number of the *Revue Scientifique*, from which it appears that the reference to "the fable of Jonah" was not in the paper at all as originally read, but was added in a note to the paper when subsequently printed in the *Bulletin* of the Academy. No doubt the two professors have a greater grievance than the irate Bishop Dupanloup had in the admission to the French Academy of M. Littré; and no doubt it is well in all scientific discussions in a mixed society to steer clear of "the religious difficulty" entirely, but after all it must seem to an outsider as if all this pother about "the fable of Jonah" were a case of "much ado about nothing."

A MEETING of the local executive of the British Association was held on Monday, at Bradford, and the financial account, which was submitted, showed the total expenses of the late meeting in that town to amount to about 3,300*l*. The guarantee fund subscribed amounted to 5,200*l*.

AT a recent meeting of the Manchester Scientific Students' Association at the Royal Institution, Mr. George C. Yates, F.S.A., exhibited a unique specimen of a Neolithic Flint Celt, or axe, which he had obtained at Holyhead a few weeks ago. The specimen, we believe, has been thoroughly authenticated, and Mr. Yates has consented to deposit it in the British Museum.

A SERIES of Birkbeck Scientific Lectures for the People was commenced last week at Leeds, by Mr. J. Norman Lockyer, F.R.S., to be continued by Dr. Carpenter, Mr. Miall, and Prof. Martin Duncan, till Christmas. We believe that the action of the Trustees in thus aiding the spread of scientific knowledge throughout the country will be attended with the best results.

ON Tuesday last a deputation of the Harrow Vestry, representing the residents, tradesmen, and other classes of the parish, had a second interview with the Governors of Harrow School, for the purpose of lodging and explaining thirty-six objections in detail to the proposed statutes for the government of the school. One point most justly insisted on by the deputation is the fact that John Lyon, the founder of the school, intended it mainly for the benefit of the parishioners of Harrow, whereas the Governors, like the Governors of others of our public schools, notoriously throw every possible difficulty in the way of children of common parishioners reaping the benefit of the fund generously left for their education. The Governors try to silence the complainants with a pittance of 250*l*. a year to found a subordinate school. We hope the Harrow Vestry will not cease to agitate the matter, until they obtain all that rightly belongs to them.

WE have received a revised list of those who obtained Queen's Medals at the Science and Art Examinations, May 1873.

A CORRESPONDENT at Cannes, France, informs us that on November 4, about 6 P.M., a beautiful and distinct, though faint, lunar rainbow was seen there, which lasted a quarter of an hour, and then suddenly disappeared just as the first drops of rain were felt.

THE forthcoming number of Petermann's *Mittheilungen* will contain an article by Messrs. E. Behm and F. Hanemann on the most recent discoveries in South-east Australia, accompanied by a map in which these discoveries are embodied.

MESSRS. W. AND A. K. JOHNSTON have published a very useful war-map of the Gold Coast of Ashantee and neighbouring countries, with a sketch-map of Guinea and a small map of the whole of Africa, all carefully disposed on one large sheet.

FOR several winters past courses of lectures, intended mainly for the industrial classes, have been given on scientific subjects in the Edinburgh Museum of Science and Art, by the professors of the University and other gentlemen eminent in their particular departments. The charge for a course of six lectures, the number given on each subject, is only sixpence, and we believe the results have been extremely satisfactory. The following is the programme for the present winter:—"Chemistry of the Common Metals," by Prof. A. Crum Brown, M.D.; "Physiology and Public Health," by Dr. John G. M'Kendrick, F.R.S.E.; "Cosmical Astronomy," by Prof. Tait; "The Carboniferous Formation of Scotland," by Mr. James Geikie, F.R.S.E.; "Weather and Climate," by Mr. Alex. Buchan, F.R.S.E.; "The History of Commerce," by Prof. W. B. Hodgson, LL.D.

THE same journal has the following details concerning the Italian Association of Men of Science:—Inaugurated in 1837 by the Grand Duke of Tuscany (twenty-five years before France had followed the parent movement in England), it fell under the ban of Pope and Bourbon alike, who saw in it the foster-mother of revolution. In spite of police restrictions and other proofs of the dislike with which it was viewed, its meetings gained in attractiveness every year till, in 1846, favoured by the early liberalism of Pio Nono and Charles Albert's ill-will to Austria, it celebrated the centenary of Balilla's throwing off the German yoke in the Ligurian capital. Thanks to Piedmont, it outlived the reaction of 1848; and in 1859-60 it shared in the national jubilee it had assisted in consummating. Rome, proclaimed as the capital in 1861, was to be the scene of its reunion in 1862; but the Vatican, countenanced by Austria and France, frustrated the attempt. The storming of the Porta Pia in 1870 rendered possible the long-cherished design, and, under the appropriate presidency of the venerable Count Mamiani, formerly Prime Minister of Pio Nono during his short constitutional reign, it met on the 20th ult. in the capital. One hundred and fifty was the muster of members—not a numerous one, but counting the most distinguished statesmen and *savans* in the kingdom. Donati had but lately fallen a victim to cholera, but his science was adequately represented by the Padre Secchi, who still clings to the Society of Jesus.

WE have received from Mr. D. Mackintosh a reprint of his article from the *Quarterly Journal of the Geological Society*, "On the more remarkable Boulders of the North-west of England and the Welsh Borders."

THE additions to the Zoological Society's collection during the past week include a Crab-eating Opossum (*Didelphys cancrivora*) from the West Indies, presented by Mr. G. H. Hawtayne; a Common Parodoxure (*Paradoxurus typus*) from India, presented by Mr. C. Maurer; an Indian Jackal (*Canis aureus*) from Penang, presented by Mr. F. H. Fredericks; three Robbin Island Snakes (*Coronella phocarum*) presented by Rev. G. H. R. Fisk; a Little Grebe (*Podiceps minor*), British, presented by Mr. H. P. Hensman; a Black Wallaby (*Halmaturus Ualabatus*) from N. S. Wales, purchased; a Gazelle (*Gazella dorcas*) from Egypt, deposited; an Axis Deer (*Cervus axis*) and a Molucca Deer (*C. moluccensis*), born in the Gardens.

PHYSICAL GEOGRAPHY AND TERRESTRIAL MOLLUSCA OF THE BAHAMA ISLANDS

A PAPER on this subject has recently been communicated to the Lyceum of Natural History, New York, by Mr. Thomas Bland.

The northern end of the Bahama group lies opposite southern Florida, and from this point the islands stretch off in a double series, nearly parallel to the trend of Cuba and San Domingo, and terminate, properly, in the Turk's Island Bank, on which are the last and most easterly of the chain, which extends about 600 miles, from within 70 miles of the coast of Florida to within 100 miles of that of San Domingo.

Several banks are distinguishable, and the islands are generally on the windward sides of these, never exceeding 200ft. in height, and being almost universally environed with reefs or shelves of rock, which extend often to a considerable distance and usually terminate abruptly.

The geological formation appears to resemble that of Bermuda; their form and surface condition being largely due to prevailing winds and currents, but also owing much, probably, to the configuration of the land on which the coral reefs were built up.

Lieutenant Nelson speaks of the Bahamas as the Gulf Stream Delta; thrown down where the stream receives a check from the Atlantic on emerging from the Gulf of Mexico.

In a communication to NATURE, vol. vi. p. 262, Mr. Jones furnished evidence of the subsidence of the Bermudas. In excavations made for the great dock *e.g.*, there was found, at 46 ft. below low-water mark, a layer of red earth, containing remains of cedar trees, and resting on a bed of compact calcareous sandstone.

Mr. Bland examines the evidence afforded (as to subsidence), by the distribution of land shells on the Bahama Islands. The total number of species known is about 80.

Judging from both operculates and inoperculates, the land-shell fauna of the Bahamas is essentially West Indian, and that of the Great Bank (especially), closely allied to the Cuban fauna. Mr. Bland gives a list of inoperculate species common to the Bahamas, the adjacent continent, Bermuda, and certain of the West Indian Islands; which shows in a marked manner the alliance referred to.

The banks and islands of the Bahama chain diminish in size to the south-east, indicating greater subsidence in that direction. Similarly, the submerged Virgin Island bank, Sombrero and the Anguilla bank, terminate the parallel West Indies chain eastward from Cuba; and in Anguilla have been found remains of large extinct mammalia which must have inhabited at one time a much more extensive area.

The author criticises Dr. Cleve's geological grouping of the slands north of Guadeloupe (in two groups, one comprising Bahamas, of post-pliocene date, another of the tertiary Eocene, Miocene, and Pliocene), and points out that the land shell fauna of Saba, St. Eustatius, St. Kitts and Nevis, of Redonda and Montserrat, and of Barbadoes and Antigua, is, in common with most of the islands to the south, to and inclusive of Trinidad, distinct from the fauna of the islands between and inclusive of the Bahamas and Cuba, and the Anguilla bank, on which are Anguilla, St. Martin and St. Bartholomew. This well-defined line of separation must be considered in connection with the past and present geological history of the islands.

Dana traces parallel bands of greater or less subsidence in the Pacific Ocean, and analogous conditions in the Atlantic; the subsidence was probably, he says, "much greater between Florida and Cuba than in the Peninsula of Florida itself, and greater along the Carribbean Sea parallel with Cuba, as well as along the Bahama reefs than in Cuba." Recent soundings, cited by Mr. Bland, confirm this view.

SCIENTIFIC SERIALS

Ocean Highways, November.—In an article on "The Results of the Arctic Campaign, 1873," it is shown that the right direction for Arctic Exploration has been unmistakeably indicated, further proofs have been afforded of the practicability of attaining an advanced position by following that direction, and additional evidence has been accumulated against the route advocated by "unpractised theorists." These conclusions are rightly drawn from the eminently successful results obtained from the *Polaris* expedition and from Captain Markham's fruitful cruise in the *Arctic*, as contrasted with the comparatively unsuccessful attempts made in the Spitzbergen direction by the Swedish Expedition and that of Mr. Leigh Smith. "The learned societies will be able to make their appeal to the Government with even stronger and more cogent arguments than were at their disposal in the end of last year; while in the present Prime Minister and Chancellor of the Exchequer they have an old and staunch supporter of Arctic expeditions, and one who has studied their history and appreciated their uses." There is a carefully constructed map illustrative of Captain Markham's voyage in the *Arctic*. Other articles are, "On the Distribution of Coal in China," by Baron von Richthofen; "South American Progress" (Argentine Republic), by F. J. Rickard; "Highways and Byeways of Naval History," the first of a series of articles by Mr. R. Lendall.

Gazetta Chimica Italiana, Fascicolo V. and VI.—The number commences with a paper on Santonin, by S. Cannizzaro and F. Sestini. Santoninic acid is described; it is derived from santonin by the addition of one molecule of water to one of santonin. The addition is effected by acting on santonin by means of a warm aqueous alkaline solution. The formula of the acid is $C_{15}H_{20}O_4$. $= C_{15}H_{18}O_3 + H_2O$. The properties of the acids and its salts are described, and the action of nascent hydrogen on santonin is then considered.—New researches on benzylated phenol, by E. Paternò and M. Fileti.—On the chemical analysis of some wines grown in the Veronese province, by Prof. G. Dal Sie. The wines in question seem to be somewhat strong, the percentage (volume) of alcohol ranging from 9·4 to 16·4. Very voluminous tables of analyses are given.—A paper on the dry distillation of calcic formate, by A. Lieben and E. Paternò concludes the original portion of the number, which concludes with 155 pages of abstracts from foreign journals.

Annalen der Chemie und Pharmacie, Band 168, Heft 2 and 3, August 30.—The number commences with two papers from Prof. Beilstein's laboratory. The first by W. Hemelian is on a new method of preparing the sulpho acids; the method in question is a modification of that of Strecker. Dr. E. Wroblevsky communicates a paper on certain haloid derivatives of toluol; he describes a number of the meta-brom-toluol compounds, and also deals with the para-brom-toluols and the tri-brom-toluols.—The other papers are: On selenic acid and its salts, by Dr. v. Gerichten. He finds that the seleniates are all isomorphous with the corresponding sulphates, and the double salts also agree with the double sulphates.—On the action of tri-sulpho-carbonate and sulpho-carbaminate of ammonium on aldehyde and acetone, by E. Mulder. A number of the compounds resulting from these reactions are described.—On a new mode of forming ortho-toluilic acid, by R. Fittig and William Ramsay. On meta-toluic acid, by C. Boettinger and W. Ramsay.—On ethyl and di-ethyl-allyamine, by A. Rinne. Ethyl-allylamine is isomeric with methyl crotonylamine, the two bodies having the formulæ—

$$N\begin{cases} C_3H_5 \\ C_2H_5 \\ H \end{cases} \text{ and } N\begin{cases} C_4H_7 \\ CH_3 \\ H \end{cases} \text{ respectively.}$$

The author describes several of the salts of the former. Di-ethyl-allylamine $N\begin{cases} C_3H_5 \\ C_2H_5 \\ C_2H_5 \end{cases}$ is produced by the action of ethyl iodide on allylamine. The author describes it and its hydrochlorate and platino-chloride.—Researches on the isomers of cresol with regard to their occurrence in coal tar, by M. S. Southworth.—Researches on sorbic acid by E. Kachel and R. Fittig.—The number concludes with a very lengthy paper on the actions occurring in the inner non-luminous flame of the Bunsen burner, by R. Blochmann. The author has collected and examined the gases from various parts of the flame, and the memoir is illustrated with two plates showing the apparatus used, and the flames given by the burner under various treatments, and a diagram showing the percentages of CO_2 and H_2O, given by flames when burning, at various heights above the burner up to 120 millimetres.

SOCIETIES AND ACADEMIES

LONDON

Zoological Society, Nov. 4.—Prof. Newton, F.R.S., vice-president, in the chair. The Secretary read a report on the additions that had been made to the Society's menagerie during the months of June, July, August, and September. Mr. G. Dawson Rowley exhibited a singular malformed variety of the Domestic Duck, and the Secretary a collection of fishes (containing six examples of *Ceratodus forsteri*) made by Mr.

Ramsay, in Queensland.—A communication was read from Mr. J. B. Perrin, containing an account of the Myology of the Hoatczin (*Opisthocomus cristatus*).—A communication was read from Capt. R. Beavan, Bengal Staff Corps, containing a list of fishes met with in the River Nerbudda, in India.—A second communication from Capt. Beavan contained some remarks on certain difficulties involved in the acceptance of the Darwinian theory of evolution.—A communication was read from Mr. Montague R. Butler, containing descriptions of several new species of Diurnal Lepidoptera.—A communication was read from Mr. R. Swinhoe, H.B.M. Consul at Chefoo, on the Song-Jay of Northern China, with further notes on Chinese ornithology.—Mr. P. L. Sclater, F.R.S., exhibited and pointed out the characters of fourteen new species of birds collected by Signor Luigi Maria D'Albertis during his recent expedition into the interior of New Guinea.—A communication was read from Prof. J. V. Barboza du Bocage, on the Ground Hornbill of Southern Africa—*Buceros carunculatus cafer* of Schlegel.—A second communication from Prof. Barboza du Bocage contained a note on the habitat of *Euprepes coctei*, Dum. et Bibr.—A communication was read from Surgeon-Major Francis Day, containing descriptions of new or little known Indian fishes.—Mr. R. B. Sharpe, read a paper describing the contents of a collection of birds recently received from Mombas in Eastern Africa.—A second paper by Mr. R. B. Sharpe contained a list of a collection of birds from the River Congo.—Mr. G. B. Sowerby, jun., communicated the descriptions of eleven new species of shells.—A communication was read from Dr. J. E. Gray, F.R.S., on the skulls and alveolar surfaces of Land Tortoises, *Testudinata*.

Linnean Society, Nov. 6.—Mr. G. Bentham, president, in the chair.—Before the commencement of proceedings, this being the first occasion of the meeting of the society in its new rooms in Burlington House, the president gave an address on the present relation of Government towards the learned societies, which will be found elsewhere.—A resolution was then proposed by Dr. Hooker, seconded by Mr. Gwyn Jeffreys, and carried unanimously, recognising the obligations of the Linnean Society towards the Government for the handsome accommodation now for the first time provided independently for it.—On *Hydnora americana*, by Dr. J. D. Hooker. In his monograph of the Rafflesiaceæ in De Candolle's "Prodromus," Dr. Hooker had thrown some doubt on the correctness of De Bary's description *Hydnora*, and on the close affinity which he traced between it and *Prosobanche*. Further investigation has, however, amply confirmed the accuracy of De Bary's description. A very great difficulty is presented, from the point of view of the theory of evolution, in the occurrence of two species of this genus, one in South Africa and one in South America, so closely resembling one another in every point of their structure, and both root-parasites, that it is impossible to look upon them otherwise than as very nearly related. The only possible connection between them would appear to be through *Cytinus*, another nearly allied genus of root-parasites, species of which are natives both of South Africa and of South and North America.

Chemical Society, Nov. 6.—Dr. Odling, F.R.S., president, in the chair.—The president delivered a short address, to which we refer elsewhere, congratulating the Fellows on taking possession of their new rooms in Burlington House. A paper was then read by Mr. David Howard on the optical properties of some modifications of the cinchona alkaloids, being an elaborate investigation of the variations in the rotatory powers of this class of bodies when examined by the polarimeter. The other communications were—a preliminary notice on the oils of wormwood and citronella, by Dr. C. R. A. Wright; on the estimation of nitrates in potable waters, by Mr. W. F. Donkin; and a note on the action of iodine trichloride upon carbon disulphide, by Mr. J. B. Hannay.

Royal Microscopical Society, Nov. 5.—Chas. Brooke, F.R.S., president, in the chair. A paper by the Rev. W. H. Dallinger was read, describing some further researches made by himself and Dr. Drysdale on the development of certain monads, in the course of which they had been able to trace the life-history of a species, although in their earliest stages these organisms were so minute as to require an objective of $\frac{1}{50}$ in. for their observation. A number of beautifully executed drawings accompanied the paper.—Mr. Alfred Sanders read a paper on the art of photographing microscopic objects, in which he described a simple and successful process of manipulation, and showed how the most satisfactory results might be obtained without the aid of expensive and complicated apparatus.—A paper was also read by Mr. S. J. McIntire, entitled "Some Notes on Acarellus," in which he minutely described a species found parasitic upon Obisium, and which he believed to be identical with Hypopus, described by Dujardin. Specimens both mounted and alive were exhibited under the Society's microscopes.—Some photographs of *Navicula lyra* and *Amphipleura pellucida*, taken by Dr. J. J. Woodward, were also exhibited.

PARIS

Academy of Sciences, November 3.—M. de Quatrefages, president, in the chair.—The following papers were read:—An analysis and criticism of an "Essay on the Constitution and Origin of the Solar System, by M. Roche," by M. Faye.—On the mutual action of voltaic currents by M. Bertrand. On the verification of Baume's hydrometer, by MM. Berthelot, Coulier, and d'Almeida.—On certain calorimetric values and problems, by M. Berthelot.—Observations of the solar protuberances during the last six solar rotations (April 23 to October 2, 1873) with some consequences affecting the theory of the spots, by Father Secchi. In this paper Secchi continued his observations, portions of which appeared in the first half of the year. The author again asserted that the spots are the product of eruptions, and observed that some metals were more opaque than others, *e.g.*, a sodium eruption gave a very black spot. He admitted, however, that some spots existed without eruptions.—Researches on the thermic effects accompanying the compression of liquids, by MM. Favre and Laurent.—MM. Morin and Phillips presented a report on M. Graeff's paper on the *régime* of rivers and the effects of a multiple system of reservoirs.—Memoir on experimental teratology, by M. C. Dareste.—On a map of the world on a gnomonic projection, &c., by M. B. de Chancourtois.—The following papers were presented to the Academy:—Observations on M. Dubois' paper on the influence of refraction at the moment of contact of Venus with the Sun's limb, by M. Oudemans.—On a new volatile saccharine matter extracted from Madagascar rubber, by M. Aimé Girard.—On the cooling effects produced by the joint actions of capillarity and evaporation: Evaporation of carbonic disulphide on porous paper, by M. C. Decharme.—Origin and formation of the dental follicule in the mammiferæ, by MM. Magitot and Legros.—On capillary embolism and hemorrhagic infarctus, by M. Bouchut.—Observations on M. Pellarin's note on choleraic dejections as agents in the propagation of that disease, by M. H. Blanc.—On the different practical problems of aërial navigation, by M. W. de Fonvielle.—On the formation of swellings on the rootlets of the vine, by M. Max. Cornu.—Observations on M. Guérin Méneville's suggestion that the *Phylloxera* is a result of the vine disease.—Note on the best dimensions for electro-magnets, by M. Th. du Moncel.—On a proeess for the preparation of active amylic alcohol, by M. J. A. Le Bel.—On the influence which certain gases exercise on the preservation of eggs, and on the influence of certain substances in the preservation of eggs, by Mr. C. Calvert.—On the metamorphism and physiological changeability of certain microphytes under the influence of media and on the relation of these phenomena to the initial cause of fermentation, &c., by M. J. Duval.—On the action of the respiratory apparatus after the opening of the thoracic cavity, by MM. Carlet and Strauss.—On the different properties and structures of the red and white muscle in rabbits and in rays, by M. Ranvier.—On scurvy and its treatment, by M. Champouillon.—On telluric intoxication, by M. L. Colin.—On the calcareous spar of the green marles of Chennevière, by M. Stan. Meunier.

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