BOTANY

British Museum Herbarium

THE national Herbarium at the British Museum, though not equal in extent to that at Kew, is one of very great value to botanists from the numbers of "type-specimens" it contains; that is, specimens named by the original discoverer or describer, thus serving as a standard for reference. According to the official report lately issued by the Curator, Mr. J. J. Bennett, the herbarium has received large and important additions during the past year, by purchase and donation, from all parts of the world, including flowering plants, ferns, lichens, mosses, sea-weeds, the microscopic Diatoms, fossil plants, sections of wood, &c.; while collections previously received have been arranged and incorporated.

Wood for Gunpowder

ALTHOUGH the materials of which gunpowder is made have not varied since its first invention, there has been considerable variety in the kind of wood from which the charcoal has been obtained. Dense woods are always rejected and the lighter kinds chosen, especially those most free from silica, and capable of producing a friable porous charcoal which burns quickly and leaves the least possible quantity of ash; the kind now generally used by gunpowder manufacturers is known as "Dog-wood," and is usually described as being obtained from the small tree popularly known under that name, the *Cornus sanguinea*. Dr. Hooker has, however, recently discovered that this is a popular error, and that the wood is really almost universally obtained from the Buckthorn, or *Rhamnus frangula*; the former tree being now never used for this purpose, if indeed it ever was. Till a few years since, the bulk of the Buckthorn wood used in this manufacture was supplied from English plantations in Suffolk, Norfolk, Essex, and Kent, but the great increase recently in the demand for the finer descriptions of gunpowder has rendered this source insufficient; and it is now cultivated in immense districts of forest and marsh in North Germany, lying between Berlin and Frankfort, where it forms the natural undergrowth. From the high price obtained for the wood, 10*l.* to 15*l.* per ton, its cultivation would be exceedingly lucrative in this country, as it will grow in almost any soil.

Action of Ether on Plants

THE action of ether as an anæsthetic on the animal frame has induced Dr. Maxwell Masters to experiment on its effects on plants. He states that if a drop is placed gently on the leaf of the Sensitive plant, it produces a paralysing effect, rendering it insensible to subsequent contact. If, however, the ether impinges on the leaf with force, or is allowed to drop from a considerable height, contraction of the leaf immediately takes place, the impact of the falling drop counteracting any paralysing power. It is well known that in the contraction of the leaves of the Sensitive plant a certain amount of vital force is expended, and that if often repeated the plant becomes exhausted, and a time of rest is required before the phenomena are repeated.

Viridescence of Leaves

M. PRILLIEUX has established, as the result of a large number of observations on the leaves of barley, that viridescence is more rapid in diffused light than in the direct light of the sun, in contrast to the production of oxygen, which is more abundant the stronger the light. He introduced into a dark chamber a pencil of solar rays, and, by means of a lens, produced a diverging cone, in which he placed the barley at different distances from the lens, consequently under different intensities of light determinable with precision. He found that near the lens, that is, placed in a very intense light, the etiolated leaves scarcely became green, while at a greater distance the viridescence took place more rapidly, and attained its maximum at a distance of three or four metres, beyond which the activity decreased; so that in a too feeble light the effect was the same as in too strong a light. [L'Institut].

MÖLLER has prepared a beautiful microscopic slide, containing 300 distinct species of Diatoms, showing an extraordinary variety of form, and arranged with marvellous regularity. It forms one of the most interesting objects for the microscope we have seen.

THE "Prodromus Systematis naturalis Regni vegetabilis," the work of three generations of De Candolles, is now approaching completion, as it is not intended to continue it beyond the Exogens. The first section of the sixteenth volume, just published, includes two important monographs, the *Urticaceæ* by Weddell, and the *Piperaceæ* by Casimir De Candolle.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 20.—The following papers were read:—

"On the mechanical performance of logical inference," by W. Stanley Jevons, M.A. Lond., Professor of Logic, &c., in Owens College; communicated by Professor E. Roscoe, F.R.S. The author first referred to the general use of mechanical contrivances for the purpose of mathematical computation, and then contrasted this fact with the utter absence of machines for aiding logical operations. This absence he attributed to the incompleteness of the old logical doctrines. The problem of logical science in its complete generality was first solved by Boole. His logical views, when simplified and corrected, give us a method of indirect deduction of extreme generality and power, founded directly upon the fundamental laws of thought. A proof of the truthfulness and power of this system is to be found in the fact that it can be embodied in a machine just as the calculus of differences is embodied in Mr. Babbage's calculating machine. To explain the nature of the logical machine alluded to, it may be pointed out that the third of the fundamental laws of thought allow us to affirm of any object one or the other of two contradictory attributes, and that we are thus enabled to develope a series of alternatives which must contain the description of a given class or object. Thus, if we are considering the propositions,

Iron is metal,
Metal is element,

we can at once affirm of iron that it is included among the four alternatives:—

Metal, element,
Metal, not element,
Not metal, element,
Not metal, not element.

But according to the second law of thought, nothing can combine contradictory attributes, and this law prevents us from supposing that *iron* can be *not-metal*, while the first premise affirms that it is *metal*. The second premise again prevents our supposing that the combination *metal*, *not-element*, can exist. Hence the only combination of properties which the premises allow us to affirm of *iron* is *metal*, *element*. In a similar manner a complete solution of any logical problem may be effected by forming the complete list of combination in which the terms of the problem can manifest themselves, and then striking out such of the combinations as cannot exist in consistency with the conditions of the problem. The logical machine actually constructed represents the combination, 16 in number, of four positive terms, denoted by A, B, C, D, and their corresponding negatives, *a*, *b*, *c*, *d*. The instrument is provided with eight keys, representing these terms when appearing in the subject of a proposition, with eight keys, placed to the right hand of the former, representing the terms when occurring in the predicate of a proposition, and with the certain *operation* keys denoting the *copular* of the proposition, the *full stop* at the end of it, and the conjunction *or*, according as it occurs in the subject or predicate. There is also a key denoting the *finis* or end of an argument, which has the effect of obliterating any previous impressions, and making the machine a *tabula rasa*. If now each of the letter terms, A, B, C, D, be taken to represent some logical term or noun, and propositions concerning them be, as it were, played upon the machine, as upon a telegraphic instrument, the machine effects thereby such a classification and selection of certain rods representing the 16 possible combinations of the terms, that only those combinations consistent with the propositions remain indicated by the machine at the end of the operations. When once a series of propositions is thus impressed upon the machine, it is capable of exhibiting an answer to any question which may be put to it concerning the possible combinations which form any class. The machine thus embodies almost all the powers of Boole's logical system up to problems involving four distinct terms, and to represent problems of any complexity involving any number of terms only requires the multiplication of the parts of the machine. The construction involves no mechanical difficulties, and depends upon a peculiar arrangement of pins and levers, which it would not be easy to explain without drawings. In this arrangement of the parts the conditions of correct thinking are observed; the representative rods are just as numerous as the laws of thought require, and no rod represents inconsistent attributes. The representative rods are classified, selected, or

rejected by the reading of a proposition in a manner exactly answering to that in which a reasoning mind should treat its ideas, and at every step in the progress of a problem the machine indicates the proper condition of a mind exempt from mistake. It is believed that this logical machine may be usefully employed in the logical class-room to exhibit the complete analysis of any argument or logical problem; and it is considered by the author superior for this purpose to a more rudimentary contrivance, the logical abacus, constructed by him for the same purpose. But by far the chief importance of the machine is in a theoretical point of view as demonstrating in the simplest and most evident manner the character and powers of a universal system of logical deduction, of which the first, although obscure solution, was given by Dr. Boole.

"On Jacobi's theorem respecting the relative equilibrium of a revolving ellipsoid of fluid; and on Ivory's discussion of the theorem," by I. Todhunter, F.R.S. Jacobi discovered the theorem that a fluid ellipsoid revolving with uniform angular velocity round its least axis might be in equilibrium. Ivory discussed the theorem, and made several statements regarding the limitations of the proportions of the axis. Ivory's statements contain various errors, and truths based on erroneous reasoning. The object of the present memoir is to correct Ivory's errors, to supply his imperfections, and to add something to what is already known respecting the theorem.

Geological Society, January 12.—Professor Huxley, LL.D., F.R.S., president, in the chair. Messrs. J. Aitken, J.P., president of the Manchester Geological Society; E. Allen, C. Cadle, A. W. Edgell, C. F. Leaf, F.L.S., and S. J. Smith, were elected Fellows. Prof. Otto Torell, of Lund, was elected a foreign correspondent. The following communications were read:—1. "On the geological position and geological distribution of the reptilian or dolomitic conglomerate of the Bristol area." By R. Etheridge, Esq., F.G.S., Palæontologist to the Geological Survey of Great Britain. The author noticed the history of our knowledge of the dolomitic conglomerates of the Bristol area from which the remains of dinosaurian reptiles have been obtained, and then described their mode of occurrence and distribution over the district near Bristol. He regarded these deposits as due to the action of the sea-waves of the later or middle Triassic periods upon the rocks of older Triassic (Bunter) or Permian age during the gradual elevation of the land, and as the probable representatives in point of time of the Muschelkalk, otherwise deficient in Britain. The author then noticed the influence of the conglomerate upon the production of certain minerals, such as calamine and hæmatitic iron-ores, and discussed at some length the probable course of the phenomena of denudation which furnished the materials for the formation of the conglomerate at different levels, in which he recognised two great periods of oscillation, the first witnessing a downward movement of the palæozoic lands and lasting throughout the deposition of the New Red marl and sands, and the second, during which the accumulations of the former were again, at least partly, denuded. With regard to the time at which the remains of thecodont reptiles were imbedded in the conglomerate, the author inferred from the evidence that this took place late in the period of the Keuper. The President inquired on what ground the author considered these reptiles to belong to a late period in the Keuper, and was informed that the author spoke especially with relation to the Keuper of the Bristol area, of which the beds containing them occupied the highest position. Prof. Ramsay considered these conglomerates not merely as of marine origin, but as breccias which had covered the old land surface, which had been worked up by the water of the New Red period. He objected to the term Sea having been introduced into the paper; as, though the tracts may have been islands and promontories, and though the water which surrounded them was salt, there was no open sea, but merely a large inland salt-lake, in which the New Red Marl was formed. The marl was less connected with the New Red Sandstone than with the Lias. The Muschelkalk being absent, it was constantly the case that the marl rested immediately on the palæozoic rocks without the intervention of the Bunter Sandstone. He thought that there were good grounds for connecting the Rhætic beds with the New Red Marl below and the Lias above. The probability was that the change in character was due to a gradual influx of the sea into the inland lakes. He thought that the Thecodont Saurians might also eventually be found even in beds of Liassic age. Prof. T. Rupert Jones remarked that Mr. Tawney and Dr. Duncan had already intimated the St. Cassian aspect and character of the Sutton beds. The freshwater character of some of the Keuper beds was, he remarked, indicated by the presence of *Estheriæ*, and he alluded to the fact of the Bristol palæosaurians having been erroneously used as Permian characteristics in Russia and Carolina. Mr. W. Boyd Dawkins had found at Cheddar that the Dolomitic conglomerate formed two great tongues running up ravines in the older rocks, which had probably been due to subaërial action. Prof. Morris alluded to some sections which seemed to corroborate the views of Mr. Etheridge, and pointed out the relation of the conglomerate beds to the overlying strata at those points. He also mentioned certain peculiarities in the structure of the conglomerate itself. Mr. Etheridge stated in reply that the marls in the Bristol area were the exception, the greater part of the New Red beds being sandstone.

2. "On the superficial deposits of portions of the Avon and Severn Valleys and adjoining districts." By Mr. T. G. B. Lloyd, C.E., F.G.S. The author, after describing the general characters of what he termed the Drifts of the Upper and Lower series, and the freshwater gravels of the Lower Avon, comprised within the district of the Avon Valley between Tewkesbury and Rugby, and of the Severn Valley above and below the town of Worcester, endeavoured to show that there was a balance of evidence in favour of the existence of an upper and lower platform of drift in the main valley of the Lower Avon, the upper one being of marine origin, and probably belonging to the same epoch as the stratified beds of gravel in the neighbourhood of Worcester, which contain marine shells and mammalian remains, whilst the lower one, of freshwater origin, had been derived from the former by fluviatile action, as supposed by the late Prof. Strickland. Further, that there was no evidence to warrant the supposition of the existence of high and low level river-gravels in those portions of the Severn and Avon Valleys under review, and that the apparent absence of any freshwater shells in the gravels of the Severn Valley between Bridgnorth and Tewkesbury led to the inference that the freshwater gravels of the Avon were not represented in the adjoining portions of the Severn Valley, although remains of some of the same species of mammalia occurred in both localities. After stating his opinion that the time had not yet arrived for indulging in theoretical speculations concerning the phenomena of the Drifts of the Upper and Lower series exhibited in so small an area as the one under consideration, the author concluded by expressing hopes that the facts which he had brought forward would contribute their share of help to the further elucidation of the question.

3. "On the surface-deposits in the neighbourhood of Rugby." By Mr. J. M. Wilson, F.G.S. The author commenced by noticing the general configuration of the surface of the district under review, which he stated to consist of an elevated plateau, bounded and rendered irregular in its outlines by valleys. The district consists chiefly of Lower Lias, with a few patches of Middle Lias. The surface-deposits on the plateau and on similar high lands in the neighbourhood consist of—1. Flinty or quartzose drift; 2. Sugary sand, with grains of chalk; 3. Clay, with pebbles, principally of chalk, and distinctly striated. The valleys bounding the plateau were described as belonging to two systems, those of the Avon and Leam. The bottom of each valley is generally a narrow strip of alluvial soil, bordered by sand in some places, and by drift in others. The author has bored down into the surface-deposits in the valley of Low Morton. In one boring, which reached a depth of 53 feet, he stopped in a greyish clay containing chalk-particles; in another, through similar clay to a depth of 57 feet, the rock was reached, and fragments of limestone were brought up.

Mr. Searles V. Wood, jun., had long been aware of the existence of the Middle Glacial Sand near Rugby. He pointed out the difference in the fauna of the sands of the Severn Valley below the glacial clay and those of similar deposits in the east of England, but notwithstanding thought they might be of the same age. Mr. Gwyn Jeffreys was doubtful as to the authenticity of some of the shells which had been brought to Mr. Maw. The fossil shells from the Severn Valley, Wolverhampton, Manchester, and Moel Tryfaen were nearly identical, and indicated raised beaches. He thought it possible that a definite line of such beaches might eventually be recognised through that part of England. Mr. W. Boyd Dawkins did not consider that there was any marked difference in the mammalian fauna of the Avon and Severn Valleys. He had failed to discover any traces of *Elephas antiquus* in either. Mr. Prestwich thought that the author had probably divided

the superficial beds into too many separate deposits, though the facts brought forward were of great value. Mr. Evans mentioned that he had received information of the discovery many years ago of a flint implement in association with the bones of extinct mammals at Lawford. This implement had been exhibited at the time to the Geological Society, but had disappeared after the meeting. Mr. Lloyd and Mr. Wilson briefly replied.

Chemical Society, January 20.—Professor Williamson, President, in the chair. The following gentlemen were elected Fellows:—T. Bell, A. Bird, G. R. Hislop, E. Lapper, H. Seward. The first paper read was a note on the absorption of mixed vapours by charcoal, by John Hunter, M.A., Queen's College, Belfast. The author some time ago, published in the *Journal of the Chemical Society* (May 1868), the results obtained by absorbing the mixture of two vapours by means of cocoa-nut charcoal. He found that the absorption was increased when one of the vapours was at a temperature near to its point of condensation; and he explained the phenomenon by assuming that when a fragment of charcoal is introduced into a mixture of two vapours, the one which is nearest to its point of condensation is first absorbed, and this, in its condensed state, aids the absorption of the other. According to this view, a succession of condensations is going on. The theory is strikingly illustrated in experimenting with a mixture of water vapour and ammonia gas—obtained by heating an aqueous solution of ammonia of spec. grav. 0·88—when the mixture is much more largely absorbed than either the gas or the vapour separately. The mean of a set of experiments made at 100° C and 706·2 mm. pressure was 316·6 vols. of the mixture absorbed by one vol. of cocoa-nut charcoal. The President remarked that the results of the experiments were entirely in accordance with what was expected on theoretical grounds.—The next communication was "On the composition of iron rust," by Dr. Crace Calvert. The author had lately occasion to analyse rust obtained from two different places—from the outside of the Conway Bridge, and from Llangollen, North Wales—and he found both specimens to be composed as follows:—

Sesquioxide of iron	92·900
Protoxide of iron	6·177
Carbonate of iron	0·617
Carbonate of lime	0·295
Silica	0·121
Ammonia	traces
	100·000

This result induced the author to inquire to which of the constituents of the atmosphere the formation of rust is chiefly due. With the view of ascertaining this, carefully cleaned blades of steel and iron were put into tubes filled respectively with oxygen, oxygen and a little carbonic acid, oxygen and moisture, &c. The blades were introduced into gas-collecting cylinders, which were then filled above mercury with oxygen, &c. But this proved to be an unsatisfactory method, inasmuch as always some globules of mercury remained adhering to the iron, whereby a galvanic action was produced which of course induced a rapid oxidation. To avoid this the tubes were filled simply by displacement of atmospheric air. The blades were then left exposed to the action of the different agents for a period of four months. The results were as follows:—

Blades in dry oxygen	No oxidation.
,, moist ,, ...	Out of three experiments only in one a slight oxidation.
,, dry carb. acid . .	No oxidation.
,, moist ,, . .	Slight incrustation of a white colour. (Out of six experiments two did not give this result.)
,, dry carb. acid and oxygen	No oxidation.
,, moist carb. acid and oxygen	Most rapid oxidation.
,, dry oxygen and ammonia	No oxidation.
,, moist oxygen and ammonia	No oxidation.

These facts led the author to assume that it is the presence of carbonic acid in the atmosphere, and not oxygen or water vapour, which determines the oxidation of iron. The author next investigated the behaviour of iron in water in which successively oxygen, carbonic acid, a mixture of the two gases, &c., were conducted. He immersed only a part of the blade in the water. The results were analogous to those above mentioned, inasmuch as the most rapid oxidation took place when a mixture of oxygen with carbonic acid was introduced into the water. The action commenced immediately, and in a short time a dark precipitate covered the bottom of the vessel. Now the oxidation in this case was not due to a fixation of the oxygen dissolved in the water, but to oxygen liberated from the water by galvanic action; the occurrence of large quantities of hydrogen above the liquid in the bottle proved this sufficiently. A striking evidence in favour of the supposition that the iron is oxidised through the decomposition of the water, is to be found in the fact that when a bright blade was introduced into distilled water which had previously been deprived of all its absorbed gases by long-continued boiling, it became, in the course of a few days, covered here and there with rust. The spots upon which the rust appeared proved to be impurities in the iron. It is obvious they induced galvanic action, just as a mere trace of zinc placed on one end of the blade would establish a voltaic current.—Finally, Dr. Calvert investigated the state of iron in alkalies, and he discovered that not only the solution of caustic soda, but that of the carbonate of it as well, protects iron against any oxidising action.

Linnean Society, January 20.—Prof. Babington read a paper, being a revision of the Flora of Iceland. He gave an extempore sketch of the country, its climate and character, and then read the introductory part of his paper containing an historical account of what had been done towards ascertaining the vegetable products of the island. It appears there are about 450 species of phanerogamous plants (the exact number at present recorded is 467), of which only about 60 are not natives of Britain. None are peculiar to the island; all the remainder, with three exceptions, are to be found on the European continent, chiefly in Scandinavia; the three arctic plants not otherwise known as European are *Gentiana detousa*, *Pleurogyne rotata*, and *Epilobium latifolium*. No woods are now to be found in the country, although some existed recently: they have been destroyed by the carelessness of the inhabitants. Now that more care is taken of their remains, it is expected that they will again spring up. The trees were all birch, nor is there any trace of the former existence of pine or other trees. Extensive woods of dwarf birch-trees are found in several places, and some fruticose willows exist, especially an abundance of *S. lanata*. No grain of any kind is grown on the island.

Zoological Society of London, January 13.—John Gould, F.R.S., V.P., in the chair. The secretary called attention to certain additions to the society's menagerie during November and December last, amongst which was particularly noticed a rare American monkey (*Pithecia ouakari*) from the Rio Negro, deposited by L. Joel, Esq., C.M.Z.S.—A letter was read from Lord Lilford, F.Z.S., relating to the exact locality of a specimen of *Otus capensis*, lately living in the society's gardens.—A letter was read from Dr. A. Ernst, of Caraccas, C.M.Z.S., containing some notes on animals recently obtained in the vicinity of that city.—The Rev. H. B. Tristram, F.R.S., exhibited a pair of tawny eagles (*Aquila nævioides*) obtained near Etawah, N.W. India, by Mr. W. G. Brooks, C.E., being the first authentic examples of this species received from that country.—Mr. Swinhoe exhibited and made remarks on some skins of tigers and leopards from various parts of China.—Mr. Gould exhibited a new and very remarkable pigeon, supposed to be from New Guinea, which he had recently described under the name *Otidiphaps nobilis*.—A communication was read from Mr. Henry Adams containing descriptions of a new genus, and of eighteen new species of land and marine shells from the Red Sea, Hainan, and other localities.—A communication was read from Dr. Cobbold containing the description of a new generic type of Entozoa, discovered in a specimen of the Aard-wolf (*Proteles cristatus*), which had recently died in the menagerie. To this were added remarks on the affinities of this Entozoön, especially in reference to the question of parthenogenesis.—A communication was read from Mr. Morton Allport, F.Z.S., containing a brief history of the introduction of the salmon (*Salmo salar*) and other *Salmonidæ* to the waters of Tasmania.—Dr. Murie read a paper containing additional memoranda on irregularity in the growth of salmon. Dr. Murie's observations were founded principally upon specimens hatched and reared in the society's fish-house.

The Institution of Civil Engineers, January 11.—Mr. C. B. Vignoles, F.R.S., president, in the chair. Five candidates were balloted for and declared to be duly elected, viz.: Mr. A. A. Langley, engineer and manager to the Hereford, Hay, and Brecon Railway; Mr. R. White, first-class engineer upon the Great Southern of India Railway; and Mr. E. Wragge, chief engineer on the Toronto, Grey, and Bruce, and the Toronto and Nipissing Railways in Canada, as members; and Mr. W. Rawlinson, engineer and manager of the Brazilian Street Railway Company, and Mr. C. Willman, Middlesbrough, as associates.—A report was brought up from the council, stating that, under the provisions of Sect. IV. of the Bye-laws, the following candidates had recently been admitted students of the Institution:—W. F. Alphonse Archibald, B.A., A. J. Hess, A. Innes Liddell, W. Allingham Magnus, and H. Goulton Sketchley.

Statistical Society, January 18.—William Newmarch, F.R.S., president, in the chair. The following gentlemen were elected Fellows:—Messrs. Iltuduo Thomas Prichard, Henry Hoare, David Maclagan, and Josiah Samuel Parker. Professor Levi read a paper on "the statistics of joint-stock companies from 1814 to the present time; and of companies with limited and unlimited liability formed since the year 1856."

DUBLIN

Royal Zoological Society of Ireland, January 11.—Dr. Banks in the chair. Rev. Dr. Haughton read the report for 1869, from which it appeared that the number of visitors to the Gardens was 9,000 more for 1869 than for 1868, and that the receipts for 1869 exceeded those of 1868 by 137*l*. It would appear that there are now in the Gardens 143 mammals, 219 birds, and 25 reptiles—specimens, not species, we presume—and that their health and condition are excellent. The fact is mentioned that since 1857 twenty lions and 31 lionesses have been bred in the Gardens. The Earl of Mayo was elected president for this year.

Royal Geological Society of Ireland, January 12.—Mr. W. Andrews in the chair. The secretary read a paper by Dr. L. Lindsay on further researches in the gold-fields of Scotland. Rev. Professor Haughton read a paper by Mr. J. D. Latouche on a spheroidal structure occurring in some Silurian Rocks of Wales. As supplementary to the views put forward in Mr. Latouche's paper, Dr. Haughton stated that this spheroidal structure shows on a small scale what cleavage does on a large one, and that he believed that the latent structure was brought out by the weathering, not caused by it; indeed, the cleavage stream of force might be compared to that of a great river—it might flow along for miles through a country in an even uninterrupted course, then some small obstacles came in its way, and as the result a series of eddies were formed. Spheroidal structures were representatives of these eddies of force, and the ordinary cleavage planes were representatives of the uninterrupted stream—the one was the other on an immense scale. Dr. Haughton also showed that it followed rigorously from the mathematical laws of cleavage, that the parallipipedal blocks formed by cleavage must have themselves an internal spheroidal structure, of a concentric kind. This was the latent structure brought out by weathering in the manner shown in the beautiful drawings of Mr. Latouche.—Dr. Macalister exhibited a portion of a skull which had been dug up recently, while some repairs were being made to the vaults of Trinity College Chapel. This fragment was found laid along with other bones, and had evidently been dug up when the foundations of the chapel were being laid, and then, with the other bones found on that occasion, again buried. The skull was of a low type. Rev. Dr. Haughton agreed with Dr. Macalister as to the low type of the skull. Mr. J. J. Lalor did not agree with Dr. Macalister that this skull was of a low type. He had made a series of accurate measurements of skulls in conjunction with Dr. Carpenter, of London, and therefore could speak on the subject. Absence of forehead was no evidence of absence of brain capacity; lowness of skull was considered a mark of beauty by some. He could not venture to say whether it was the skull of a man or a woman, but its brain capacity did not authorise one in saying that it was a low skull; it might have been the skull of a Provost, and certainly was one of more than ordinary capacity. Dr. Macalister in reply stated that he saw no reason to alter his view on the subject, as it had been based on careful measurements and on exact reasoning, neither of which he thought admitted of contradiction.

Institution of Civil Engineers of Ireland, January 12.—Mr. J. Ball Greene, C.E., in the chair. Mr. B. Stoney read a paper by Mr. C. P. Cotton on a novel means of transit for minerals in the county of Sligo. An extensive barytes quarry was worked on the side of a steep hill, the mineral had to be lowered a depth of over 1,000 feet, and this was effected by means of boxes swung on ropes, forming a wire rope railway. Mr. A McDonnell read a paper on workshop machinery driven by rapidly moving ropes.

Royal Dublin Society, January 18.—Mr. John Adair in the chair. Professor Macalister read a paper on "The Curves in the Spine considered from an æsthetical point of view." Dr. J. Emerson Reynolds read some notes on "the determination of the flashing point of petroleum oils, as settled by Act of Parliament." The author described in detail the apparatus directed to be employed, and pointed out the difficulties and sources of error to be guarded against in using the Government test. He suggested the adoption of an uniform mode of estimating the flashing point of mineral oils, which experience proved to be that most suited for affording reliable results; and further proposed that in all doubtful cases—a special method—which he indicated, should be employed in order to serve as a test of the accuracy of the parliamentary process.—A drawing of the Nebulæ in Argos, and Dr. Monckhoven's new light for photography were exhibited.

MANCHESTER

Literary and Philosophical Society, January 11.—Ordinary Meeting.—Mr. E. W. Binney, F.R.S., F.G.S., vice-president, in the chair. The chairman described the aurora borealis, as observed by him at Cheetham Hill on the evening of Monday, the 3rd inst., at 7-30 P.M. Dr. Joule, F.R.S., said he had noticed some remarkable disturbances of the magnetic dip on the 3rd inst., which no doubt were connected with the auroral display. He had also noticed similar disturbances of the dipping needle during the gale on Saturday, the 8th inst.—Letters were read from Mr. A. H. Green and Mr. E. Hull, defending the accuracy of the Geological Survey map in the matter of the red rock fault referred to in Mr. Binney's paper, read before this society on November 16th (see NATURE, No. 7).—The chairman, with all respect to Messrs. Green and Hull, again denied the correctness of their map and sections so far as the "red rock fault" was concerned. He stated that he was prepared to maintain his position on the ground where the sections were exposed between Stockport and Macclesfield.—Dr. Joule exhibited his current meter, and with it, in connection with a galvanometer, made an experiment to determine the horizontal intensity of the earth's magnetism in absolution measure; the result gave 3·83 as the value of this element in the hall of the society. The current employed was produced by a single cell of a Bunsen's battery.

Microscopical and Natural History Section, January 3.—R. D. Darbishire, B.A., F.G.S., in the chair.—Mr. J. Sidebotham read the following paper:—"Notes on the pupa and imago of *Acherontia atropos*." The peculiar cry or squeak of the death's-head moth is very well known. It has been by some observers thought that this sound is produced by the friction of the joints of the prothorax and mesothorax; this conclusion is, in the opinion of the author of the paper, much strengthened by the following circumstance. A few weeks ago, when he was replacing some damp moss on some pupæ, he heard the peculiar cry of the moth, but much weaker. On examining the pupæ he selected the one from which the cry proceeded, and placed it in the palm of his hand; when at rest there was no sound, but the pupa at once produced it on being touched or pressed gently; on taking hold of it between the finger and thumb, if the head alone were confined, there was no sound, but if the tail, the motion of the joints was more energetic and the sound louder. In five days afterwards a very fine female moth emerged from the pupa, apparently none the worse for his experiments. The fact of the pupa ever producing this cry, disproves all ideas as to its being produced by expelling air through cavities, against a membrane, since in the pupa state all the muscles are as it were bound up in a horny case, and only those able to move which work the joints of the thorax and body, and besides this the amount of air which could be taken through the spiracles of the pupa would be obviously insufficient to produce such a volume of sound.

PARIS

Academy of Sciences, January 17.—M. de Verneuil presented and made some remarks upon a geological map of the Ural, published by M. de Moeller, a Russian officer of Mines. He stated that M. de Moeller had referred the sandstones of Artinsk—regarded as Permian by MM. Murchison, Keyserling,

and himself—to the Carboniferous series, on the ground of their containing *Goniatites, Nautili,* and *Productus Caccrini.* M. de Verneuil was not inclined to accept this change, as it is possible that a mixture of Carboniferous and Permian types may occur in the same deposit, as has been found to be the case at Nebraska. A memoir was presented by M. B. Renault on some silicified plants of the environs of Autun. He noticed the structure of the stem in *Zygopteris* and *Anachoropteris,* studied by him in two new species, which he named *Zygopteris Brongniartii* and *Anachoropteris Decaisnii;* also that of the stems of some *Lycopodiacæ.*—M. Delaunay presented a report on a memoir by M. Puiseux, on the secular acceleration of the movement of the moon.—M. Ricour presented a second note on the dispersion of light, and M. Delaurier a memoir containing an account of experiments on electricity, with objections to the electro-chemical theory.—M. Faye presented a note by M. A. Wüllner on the spectra of the simple gases, in which he disputes the results announced by M. Dubrunfant at a former meeting of the Academy (Dec. 13, 1869). A memoir was read by M. Duméry on the results obtained and obtainable on railways by traction on a single rail, in which the author maintained that railways on this principle can be constructed nearly 50 per cent. cheaper than ordinary railways, and can also be worked very advantageously.—M. Baudrimont stated that he had prepared artificial garnets with bases of magnesia, lime, strontian, baryta, and oxide of lead, and had them cut ten years ago. He forwarded specimens for the inspection of the Academy. —M. Maumené read a memoir on a general theory of chemical action, and the necessity of its employment in order to avoid error. No abstract of this memoir is given.—M. Becquerel and M. Dumas remarked upon the electro-chemical deposition of nickel; and M. Wurtz communicated a paper by M. A. Rossi on the synthesis of normal prophylic alcohol by means of æthylic alcohol. The author's process consisted in converting æthylic alcohol, first into cyanide of æthyle, and then into propionic acid; from the latter he prepared propionic aldehyde, and obtained propylic acid by the action of nascent hydrogen upon the aldehyde.—M. P. Levert forwarded for the Bréant prize a note on the action of bitters, especially sulphate of quinine, upon the economy, in the cure of fevers of all kinds; M. A. Marinier exhibited a collyrium for the treatment of affections of the eyelids, and a filtering injector; and M. Guyot presented a notice on the toxical effects of some products of the phenic group, including phenic acid, rosolic acid, and coralline.—A memoir on the "mulberry-tree and the silkworm, considered in themselves and in their relations," by M. Tigri, was read. The author treated of the production of disease with presence of *Bacteria* in the silkworm (*Maladie des morts-flats*), which he ascribed to alterations in the condition of the mulberry-leaves.—M. Robin presented a communication from M. S. Feltz, in which the author denied that the leurocyta, or white corpuscles of the blood, traverse the walls of the capillary vessels, as stated by many writers.—In a note on the movements of the grains of chlorophyll in vegetable cells under the influence of light, M. E. Roze referred to the observations of M. Prillieux, communicated to the Academy on the 3rd January, and stated that by examining the leaves of *Fernaria hygrometrica* under a tolerably high power, he observed that the chlorophyll grains were united by filaments of a viscous, transparent plasma, which undergo a slow displacement, and carry with them the chlorophyll grains.—M. Anez communicated a note on the development and habits of *Phylloxera vastatrix,* and M. Rouby a description of an artificial mineral spring, of which the titles only are given.

Milan

Royal Lombardian Institute, November 25, 1869.—Professors Garovaglio and Gibelli presented a memoir on the Eudocarpeæ of Central Europe and Italy, containing a monographic revision of the species of that group of lichens.—Dr. Andrea Verga presented a communication on chloral. He stated that the hydrate of chloral prepared in the Laboratory of the Society of Encouragement at Milan was in brilliant prismatic crystals, whilst that obtained from Paris formed a white, opaque mass. — A further note on the production of Infusoria in glass vessels sealed hermetically and heated above 212° F. was communicated by Professor G. Cautoni. The author referred to previous experiments of his, in which vibrios were produced in great numbers in rich solutions of organic materials heated to 212°, 221°, 230°, and even 242·6° F. in vessels hermetically sealed and enclosed in a Papin's digester. He now gave the results of fresh experiments made with an aqueous solution of the so-called Liebig's extract of meat, containing about one part of the latter to about 35 parts of water, heated to various temperatures from 212°—244·4° F. maintained for about ten minutes in the digester. The vessels, heated to 230° and more, showed no traces of vibrios in a fortnight, nor were any produced in them for twelve or fifteen days after their interior had been brought into communication with the air by breaking the sealed extremity of their necks. The solutions which had been heated to 212° and 221°, on the contrary, produced, in two days, an abundance of vibrios and *Leptothrix* whilst still in sealed vessels. The author remarked that the above-mentioned liquid contained considerably less of protein matters than solution of natural flesh or yolk of egg, which might tend to lower the limit of temperature for the production of Infusoria. He referred to some other experiments, and argued from them in favour of heterogenism.—Dr. G. Bizzozero presented a report upon the investigations of Dr. G. Milani on some pathological alterations of the lymphatic glands.

Copenhagen

We have received the "Oversigt over det Konglige Danske Videnskabernes Selskabs Forhandlingar" for the first half of the year 1869, which contains only one strictly scientific paper of importance, namely, a Crystallographico-chemical investigation of the double haloid salts of platinum, by M. Haldor Topsöe. The remaining papers are chiefly of antiquarian interest, and consist of a discussion of the plant known to the ancients under the name of *Silphion* or *Silphium,* by Prof. A. S. Oersted, with an appendix on the Vase of Arcesilas, by M. J. L. Ussing, and a dissertation by the latter on the Apollo Belvedere. The *silphium* is regarded by M. Oersted as a species of *Narthex,* allied to the *Asafœtida,* and is named by him *Narthex silphium.* Of the last two papers, abstracts in French are given.

Philadelphia

American Philosophical Society, January 7. — A memoir on Fossils from the Marshall Group of Michigan and adjoining States, by Prof. Alexander Winchell, Director of the Geological Survey of Michigan, was read by Prof. J. P. Lesley. Prof. Cope read a paper on New Etheostomine Perch from Tennessee and North Carolina. Professor Cope gave the results of investigations on the structure of the extinct Saurian, the *Megadactylus Probyzelus* of Hitchcock, from the red sandstones of the Connecticut valley in Massachusetts. He mentioned that in 1867 he had stated it as his belief that the so-called bird-tracks of the above formation were those of Dinosauria, and that in the following year that view had been confirmed by Prof. Huxley. He stated that at the same time he proposed a system of the Dinosauria which was very similar to one very recently proposed by the same excellent authority. The *Megadactylus* was the only species whose remains had been found in the beds and locality in question, in sufficient preservation for determination, and it was clearly one of those which had made the tracks. The fore limbs were four-toed, the hind limbs three-toed, and with a long metastarsus. The animal was a Dinosaur, and a true representative of the sub-order Symphypoda, which was typified by the *Compsognathus* of the Solenhofen beds. As in the latter the astragalus and calcaneum were coössified with the tibia and fibula, and the carpal bones were much reduced. The bones were pneumatic, and possessed of excessively thin walls. The ischiatic bones were projected far backwards, were in contact for much of their length, forming a solid style which supported the animal when in a sitting position. Length about four feet. He also stated that the red sandstone beds in Pennsylvania and North Carolina contained remains of Dinosauria. The Cadontia (Belodon) and Labyrinthodonts, nearly allied to those of the Keuper of Germany. They occurred in the lower part of the series, which he had already parallelised with the Keuper. On the other hand, the occurrence in the upper part of the series of Symphypoda in Massachusetts and Pterosauria in Pennsylvania *Rhabdopelix longis pinis* Cope) rendered it highly probable that an approach to the lias was to be found in those strata, while the intermediate portion of the whole might be found to represent the time intervening between the Triassic and Oolitic (Purassic) periods.—Prof. Lesley remarked that these investigations threw the first rays of light on a very dark part of American geology. Prof. Marsh gave an account of the impressions of the ischiatic bones behind the tracks on specimens in the museum, Yale College, which he had always referred to as such, though some believed they were made by the tail.

BOSTON

Society of Natural History, November 3, 1869.—Mr. W. H. Dall made a few remarks upon the distribution of marine animals, asserting that their range was influenced more by the temperature of the water than by the depth or other conditions. He showed that the floating-ice line of Behring Sea (which passes between the Pribyloff and St. Matthew groups of islands, touching the continent near Kuskoquim Bay) governed the distribution of the fish and molluscs of those waters. It is the northern limit of all the more southern forms, some of which range as far south as Monterey. It is the southern limit of almost all the truly arctic species. The fur seal is never found to the north of it, though often erroneously spoken of as coming from Behring Strait; the polar bear never passes to the south of this line; the cod invariably keep to the south, and the mullet to the north, of it. It is also the limit of distribution of many fuci and seaside plants. Where the water is cooled by northern currents, or by glaciers, deep-water species of molluscs, especially brachiopods, are found at or even above low-water mark. Where the surface-water is warm, these molluscs, which in the north are found near the shore, are only obtained at a depth of many fathoms.

Section of Microscopy, November 10.—Mr. R. C. Greenleaf in the chair. Dr. H. Hagen called the attention of the section to the statements of Professor Listing, of Göttingen, who had recently (Nachr. d. kgl. Gesell. der Wissench., 1869, No. 1, and Poggendorff's Annalen, 1869, T. xvi. p. 467) given some suggestions concerning the further improvement of the microscope. In all microscopes the dioptric arrangement is now analogous to the astronomic spy-glass; they have but one real image, from which the virtual image is formed and brought to the eye of the observer. Professor Listing proposes to have two real images, and in this way to form three successive augmentations instead of two, as before. It is well known that by a prolongation of the draw tube, or by increasing the distance between the objective and the eye-piece, the image becomes successively greater, but the definition and penetration is by no means better. Professor Listing has made some experiments, and states that with an eye-piece of his construction (a double eye-piece with four lenses, similar to those of terrestrial telescopes) the magnifying power of the instrument, and also to nearly the same degree the penetration, is raised, by a tube of 420 millimetres, 20, 28, 55, 97, and 137 per cent. (the latter, of course, with diminution of the field), more than the same objective (Hartnack, s, No. 7) and eye-piece (No. 3) with a tube 200 millimetres in length. The object was *Pleurosigma angulatum*, and Professor Listing assures us that the latent power of the objective is developed by this means in an astonishing manner. He also remarked that the so-called Erectors have long been used, but always with a low power and a short tube. The most advantageous form for the eye-piece would be, for the two superior glasses, achromatic lenses from 15 to 20 millimetres in diameter, and with a diaphragm between, having an aperture of from 8 to 9 millimetres. For the two inferior lenses, a common Huyghen's eye-piece would be the best. Such a combined eye-piece, with a tube 420 millimetres long, would raise the power of the instrument 97 per cent. The use of an achromatic condenser adapted for oblique illumination is necessary for high powers. The experiment was only successfully made with the best objectives of English artists, or with the excellent new Hartnack objectives. According to his calculation, an objective of one millimetre distance will give the first real image at a distance of 200 millimetres from the second chief point of the objective, and combined with an eye-piece in Listing's manner, having a power of 25 diameters by itself, and a tube 405 millimetres long, the magnifying power of the whole instrument would be 5,000 diameters. In the common arrangement of the microscope, the dioptric cardinal points are in the same order as in a concave lens, and the focal distance of the whole microscope (not of the objective) would be equal to —·5 millimetres, with a magnifying power of 400 diameters for a visual distance of 200 millimetres. In the Listing instrument the order of the cardinal points would be inverted and analogous to a convex lens, with a focal distance of the whole microscope equal to × ·04 millimetres, with a magnifying power of 5,000 diameters. In the first case the objective would have a focal distance of 3 millimetres, in the last of 1 millimetre. The difference between the two chief points of the whole microscope is in both cases nearly equal to the whole length of the tube. In the last arrangement the whole microscope is analogous to a convex lens with very short focal distance.

DIARY

THURSDAY, JANUARY 27.

ROYAL INSTITUTION, at 3.—On the Chemistry of Vegetable Products: Prof. Odling.

ROYAL SOCIETY, at 8.30.—Temperature of Strata in Sinking of Rosebridge Colliery: E. Hull.—Action of Rays of High Refrangibility upon Gaseous Matter: Prof. Tyndall, F.R.S.—Eclipse of Sun as observed in United States: J. N. Lockyer, F.R.S.—Theory of Continuous Beams: Mr. Heppel.—Remarks on Heppel's Continuous Beams: Professor Rankine.

ZOOLOGICAL SOCIETY, 8.30.—On Cooking Pits and Kitchen Middens, containing Remains of Dinornis, New Zealand: Professor Owen, F.R.S

ANTIQUARIES, at 8.30.

LONDON INSTITUTION, at 7.30.

FRIDAY, JANUARY 28.

ROYAL INSTITUTION, at 8.—Graham's Scientific work: Prof. Odling.

QUEKETT MICROSCOPICAL CLUB, at 8.

SATURDAY, JANUARY 29.

ROYAL INSTITUTION, at 3.—On Meteorology: Mr. Scott.

MONDAY, JANUARY 31.

ROYAL INSTITUTE OF BRITISH ARCHITECTS, at 8.

INSTITUTE OF ACTUARIES, at 7.

LONDON INSTITUTION, at 4.

MEDICAL SOCIETY, at 8.

TUESDAY, FEBRUARY 1.

ROYAL INSTITUTION, at 3.—On the Architecture of the Human Body: Prof. Humphrey.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Statistics of Income, Expenditure, and Railway management, and their bearing upon future Railway policy: J. T. Harrison, C.E.

PATHOLOGICAL SOCIETY, at 8.

ANTHROPOLOGICAL SOCIETY, at 8.—Negro Slaves in Turkey: Major F. Millengen.

SYRO-EGYPTIAN SOCIETY, at 7.30.

WEDNESDAY, FEBRUARY 2.

SOCIETY OF ARTS, at 8.—On Recent Improvements in Small Arms.

PHARMACEUTICAL SOCIETY, at 8.

OBSTETRICAL SOCIETY, at 8.

THURSDAY, FEBRUARY 3.

LINNEAN SOCIETY, at 8.—Revision of the genera and species of capsular gamophyllous *Liliaceæ*: J. G. Baker, Esq., F.L.S.—On a new form of Cephalopodous ova: Dr. Collingwood, F.L.S.

BOOKS RECEIVED

ENGLISH.—Lichenes Britannici: Crombie (Reeve and Co.)—Elementary Introduction to Physiological Science (Jarrold and Son).—The American Naturalist, No. 11.—The Spherical form of the Earth, a Reply to Parallax; J. Dyer (Trübner and Co).—On the Geographical Distribution and Physical Characteristics of the Coal Fields of the North Pacific Coast: Robert Brown.—Fresenius' Analysis, Quantitative, fifth edition (Arthur Vacher).—Fresenius' Analysis, Qualitative, seventh edition (Arthur Vacher).

FOREIGN.—Ueber die Gährung und die Quelle der Muskelkraft: J. Von Liebig.—Bulletins de la Société d'Anthropologie de Paris.—Pflüger's Archiv für Physiologie — Centralblatt für die medicinischen Wissenschaften, January, 1870.

CONTENTS

ERRATA.—Page 269, first column, last line: for "plan" read "position."—Page 269, second column, second line: for "supplemented" read "supplemented as soon as possible."—Page 269, second column, fourth line: for "should" read "should not"

Printed by R. CLAY, SONS, & TAYLOR, at 7 and 8, Bread Street Hill, in the City of London, and published by MACMILLAN & Co., at the Office, 16, Bedford Street, Covent Garden.—THURSDAY, January 27, 1870.