

mountain ranges, and other local influences; he then enters into a discussion of the mathematical expression for the daily heat; and he concludes with some observations on the theories of temperature and isothermal lines, as affected by the electrical and magnetical conditions of the earth, dependent on its rotation on its axis.

March 10.—Sir J. W. Lubbock, Bart., in the chair. C. W. Johnson, Esq., and J. Toyubee, Esq., were elected into the Society.

The following papers were read:—

1. 'Meteorological Observations, taken in conformity with the Report drawn up by the Committee of Physics, including Meteorology, for the guidance of the Antarctic Expedition, as also for the fixed Magnetic Observatories, at the Magnetic Observatory, Ross-Bank, Van Diemen's Land, for July and August 1841.'—2. 'Meteorological Register kept at Port Arthur, Van Diemen's Land, during the Year 1839,' by Deputy Assistant Commissary-General Lempriere.—3. A paper was in part read, entitled 'Contributions to the Chemical History of the Compounds of Palladium and Platinum,' by Robert Kane, M.D.

March 17.—Sir J. W. Lubbock, Bart., in the chair. 'Contributions to the Chemical History of the Compounds of Palladium and Platinum,' by R. Kane, M.D. The author states it to be his object, in this and in some subsequent papers, to examine specially the composition and properties of the compounds of palladium, platinum, and gold; and to ascertain how far they agree, and in what they differ, as to the laws of combination to which these compounds are subjected. He commences with the investigation of the compounds of palladium, employing for that purpose a portion of that metal with which he was furnished by the Royal Society out of the quantity bequeathed by the late Dr. Wollaston. He describes the mode of obtaining the protoxide of palladium, and enters into analysis of the hydrated oxide, the black suboxide, and the true basic carbonate of that metal; detailing their properties, and the formulæ which express their mode of composition. The chlorides of palladium form the next subject of inquiry; and the author concludes from his experiments that the loss of chlorine which the protochloride undergoes, when kept for some time in a state of fusion at a red heat, is perfectly definite; and also that the loss represents one half of the chlorine which the salt contains. But in the double salts formed by the protochloride of palladium with the chlorides of the alkaline metals, he finds that the similarity of constitution usually occurring between the compounds of ammonium and potassium is violated. From his analysis of the oxychloride of palladium the author concludes that it is quite analogous to the ordinary oxychloride of copper. He then examines a variety of products derived from the action of a solution of caustic potash on solutions of ammonia-chlorides of potassium. Their properties he finds to indicate analogies between palladium and other metals, whose laws of combination are better known. The sulphate, the ammonia-sulphates, the nitrates, and the ammonia-nitrates of palladium, and lastly, the double oxalate of palladium and ammonium, are, in like manner, subjected to examination in a detailed series of experiments. The second section of the paper relates to the compounds of platinum, and comprehends researches on the composition of the protochloride of platinum; on the action of ammonia on biniodide of platinum; and on the action of ammonia on the perchloride of platinum: in which the properties of these substances are detailed and the formulæ expressing their composition deduced.

'Magnetic Observations made at Prague for Sept. 1841,' by C. Kreil.

April 7.—W. T. Brande, Esq., V.P. in the chair.

The following papers were read:—

1. 'Meteorological Observations taken on board H.M.S. *Erebus*, for August and September, 1841,' by Capt. J. C. Ross, R.N.—2. 'Meteorological Observations taken by the Niger Expedition, for May, June, and July, 1841.'—3. 'Meteorological Observations taken at the Magnetic Observatory, Ross-Bank, Van Diemen's Land, for November and December 1840, and January, February, and March 1841.'—4. 'Meteorological Observations taken at the Magnetic Observatory, Cape of Good Hope, for October and November 1841,' by Lieut. F. E. Wilmot, Esq., R.A.—5. 'Meteorological Observations taken at the

Magnetic Observatory, Toronto, for January, February, March, April, and May 1841,' by Lieut. C. W. Younghusband, Esq., R.A.—6. 'Of the ultimate distribution of the Air-passages, and of the modes of formation of the Air-cells of the Lungs,' by W. Addison, Esq.

April 14.—F. Baily, Esq., V.P. in the chair.—The Rev. Henry Christmas, M.A., was elected a Fellow.

1. 'Remarks on the probable Natural Causes of the Epidemic Influenza, as experienced at Hull in the Year 1833; with a Delineation of the Curves of the Maximum, the Mean, and the Minimum Temperature in the Shade, and the Maximum Temperature in the Sun's Rays at Hull, during the Years 1823 and 1833,' by G. H. Fielding, M.D.—The meteorological causes to which the author ascribes the sudden occasion of the influenza at Hull, and its continuance from the 26th of April to the 28th of May 1833, are, first, the unusually cold weather during March, and also the cold and wet which prevailed during April; secondly, the sudden rise of temperature, amounting to 21° Fahr., which occurred in a few hours, on the 26th of April; and, thirdly, the continuance, through May, of extreme vicissitudes of temperature between the day and the night; the burning heat of the days and the cold thick fogs, with easterly winds, commencing generally about sunset, and prevailing during the night.

2. 'Report of a remarkable appearance of the Aurora Borealis below the clouds,' by the Rev. J. Farquharson, L.L.D.—The phenomenon recorded occurred on the night of the 24th of February, when a remarkable aurora borealis was seen by the author, apparently situated between himself and lofty stratus, which extended in long parallel belts, with narrow intervals of clear sky, in a direction from north-west to south-east. The author gives, in detail, the particulars of his observations.

GEOLOGICAL SOCIETY.

April 6, and 20.—Mr. Murchison, President, in the chair.

A notice was first read, 'On the Tetracaulodon,' by Mr. Koch.—The object of this communication is, to support the opinion that the Tetracaulodon is generically distinct from the Mastodon, and, consequently, that the tusks in the lower jaw are not merely sexual characteristics.* Mr. Koch states, that, during his residence in the United States, he examined nearly all the inferior jaws of the Mastodon which have been preserved in public and private collections, but in no one instance did he ever observe any traces of a tusk; and Dr. Hays, of Philadelphia, is reported to have arrived at a similar conclusion respecting at least forty specimens of lower jaws. Mr. Koch refers particularly to the Mastodon in the Philadelphia Museum, and that preserved at Baltimore, both of which, he says, must have belonged to males. He then alludes to the impossibility of the Mastodon, with long upper tusks, making use of inferior ones, such as those forming the subject of the present discussion, and never exceeding twelve inches in length; but these tusks bear, notwithstanding, Mr. Koch says, evident signs of having been employed in rooting and grubbing; and hence he infers that the animal to which they belonged must have had equally short upper tusks. For the purpose of illustrating his views, the author proceeds to offer some remarks on three species of Tetracaulodon, to which have been applied the names of *T. Godmani*, *T. Kochii*, and *T. tapiroides*. The first has been described by Dr. Godman, its discoverer, and by Dr. Hays; but Mr. Koch calls attention to the characters presented by the maxillary and nasal bones, as well as to the additional foramen near the malar bone, and which is wanting in the Mastodon and elephant. Of the *T. Kochii* the author possesses an entire upper jaw, with six molars and two tusks, found resting on the lower jaw, which contained a tusk undisturbed in its alveolus. The upper tusks indicate, Mr. Koch says, that they were designed to be used in harmony with the lower tusk for rooting and grubbing. They are nineteen inches long, more than one-third of the entire length being concealed in the skull; and their greatest circumference, which is nine and a half inches, occurs at the apex, and not at the base. The enamel on the root is very thin, but at the opposite extremity it is uncommonly thick, and this part bears indisputable

proofs of having been much used during the life of the animal. Mr. Koch admits that the left tusk disappears in the adult animal; but he says that both in the old and young individual the tusks have the same peculiarity of being equal in circumference at the root and farther extremity, and that the "bulb" for the reception of the nerve and nourishment of the tusks, resembles that of the upper tusks minutely, both in the old and young animal, which peculiarity would almost give rise to a suspicion of not merely a different variety of the Tetracaulodon, but even of a new genus." The *Tetracaulodon tapiroides* has received its specific name from the resemblance of its first grinder to the molar of the Tapir. An upper jaw, in Mr. Koch's collection, contains two tusks bent downwards like those of the morse, and thickly covered with enamel; and they plainly indicate, he says, that the animal fed on water-plants. In conclusion, the author calls attention to some peculiar vertebrae which were found associated with the skull and lower jaw of the Tetracaulodon, and he is of opinion that they exhibit characters in accordance with the supposed aquatic habits of that animal.

'A Memoir on the Flat Regions of Central and Southern Russia in Europe,' by Mr. Murchison, M. de Verneuil, and Count Keyserling.†—This paper, which occupied a greater part of the first, and the whole of the second evening, included in our notice, described the flat regions of Russia traversed by the authors during the summer of 1841, the second devoted by them to the examination of that empire: and the account of Ural or mountainous districts is reserved for subsequent meetings. The formations which occupy this vast territory belong to the Silurian, Devonian, and carboniferous systems,—to a great series of deposits equivalent in geological position with the magnesian limestone of England, and the Zechstein of Germany; and to certain portions of the oolitic, cretaceous, and tertiary systems, the whole being overlaid by far-spreading masses of northern drift, and other detritus. It is impossible, in a notice suited to our columns, to grapple with the details of a paper, describing, for the first time, the true order of position of strata extending over twelve degrees of latitude, and thirty degrees of longitude; but we will endeavour to give an analysis of the conclusions arrived at by the authors. The centre of Russia, between the parallels of 52° and 54° north latitude, is occupied by a dome of Devonian rocks, which divides the empire into a northern and southern basin, each characterized by marked geological features, but most especially by all the good or workable coal being confined to the southern basin. Over the whole area of European Russia, however, whether it be traversed from Archangel to the Black Sea, from its western confines to the foot of the Ural Mountains, or from St. Petersburg to the Sea of Azof, the strata present a conformable succession and nearly horizontal position, except in the coal regions north of the Sea of Azof, where the carboniferous beds are dislocated and highly inclined, and overlaid unconformably by newer deposits. The Silurian rocks do not occur within the flat, central and southern regions of Russia, but they exist extensively in the Ural Mountains, and will be fully described in future memoirs. The Devonian rocks forming the central dome, before alluded to, differ lithologically from the equivalent strata in other parts of Russia, but they contain the distinguishing ichthyolites of the system, and the same testacea which occur in the Devonian rocks of the south-west of England, the Boulonnais, and the Eifel. They are, moreover, surmounted along their northern frontier by the lowest strata of the mountain limestone. The authors' knowledge of the carboniferous system of Russia was greatly increased during their last expedition. In the northern region, or basin, and ranging from near Moscow to Archangel, it exhibits great uniformity of character, consisting principally of a white limestone, which often resembles the calcaire grossier of Paris, and it contains only one thin bed of very impure coal; but, in consequence of their extended researches, the authors show, that the system may be separated into three divisions, the lowest being characterized by the great *Prooluctus hemisphericus*, the middle one by the *Spirifer Mosquensis*, and many well known carboniferous shells,

* See Report on Prof. Owen's Memoir, *Athen.* No. 748.

† For notices of the researches of Mr. Murchison and M. de Verneuil during 1840, see *Athenæum*, Nos. 676 and 723.

and the upper division by the great abundance of a Foraminifera, to which Fischer de Waldheim has applied the name of Fusulina. The establishment of this triple subdivision has enabled the authors to correct some important errors in previous classifications of Russian deposits. But the most interesting feature in the system, south of the central dome, occurs between the Don and the Dnieper, and consists of a vast interlacement of limestones containing the same fossils as near Moscow, with sandstones, shales and numerous seams of bituminous, as well as anthracite, coal. This series, the authors state, is distinguished from the coal measures of western Europe, by the absence of all beds containing fluviatile, or lacustrine remains. Along the western flank of the Ural Mountains, the carboniferous limestone is overlaid by grits, conglomerates, shales, and flaggy limestones, containing new species of Goniatites and plants common to the whole carboniferous series. These beds are considered by the authors, to be the equivalents of the coal-fields, and the lower newer red sandstone of England, or the rothe-todt-liegende of Germany; and reasons are given for separating the latter, with its British representative, from the newer red sandstone series, and making it the upper but an integral part of the coal measures. The next system of deposits, in ascending order, claimed the particular attention of the authors, on account of the difference of opinion which had been expressed respecting its true geological position, and the most competent observers having begged them to make it an object of careful research. The series consist of inosculating deposits of limestones, marls, and gypsum, with grits, sandstones, and conglomerates, containing copper,—of saliferous marls, sandstones and rock salt, and of bituminous grits; and it is characterized by a peculiar Fauna, but it contains, also, the typical shells of the magnesian limestone of England, and of the zechstein of Germany, as well as the distinct saurians of those formations. The authors, therefore, place it definitively on the parallel of the bed occurring in Western Europe between the carboniferous and triassic systems. Nevertheless, if it had not been for the vast development of this series in Russia, for its possessing an independent Flora and Fauna, and for the want of a term to express a complex series of deposits occupying a geological situation, intermediate between the carboniferous and triassic systems, the authors would have hesitated to have erected these important rocks into a system. They feel, however, that they are fully justified in doing so, and they propose to designate the system by the appellation Permian, on account of its extensive distribution in the government of Perm, and because none of the names, applied to subordinate members of the system in other parts of Europe, express the aggregate characters of the Russian deposits. The system has been long mineralogically known along the western base of the Ural Mountains, where it abounds in copper ores, which are not distributed in veins, but are disseminated through the sandstones and grits, especially in those parts in which vegetables occur, the original plant being often replaced, or charged by carbonates and other ores of copper. In the north of Russia the system is feebly exhibited, consisting of only a bed of inconsiderable thickness. Overlying these strata occurs a deposit of green and red marl and sands, destitute, apparently, of organic remains, but occupying a vast region. Whether these marls are the representatives of the triassic system, or belong to the Permian, the authors decline to offer any opinion, not being provided with that evidence which they consider sufficient. The regular sequence in the ascending order between the Permian, or the beds last noticed, and the cretaceous series, is partially represented in Russia, many of the deposits constituting marked features in the English secondary formations being totally wanting, and others but imperfectly represented. The authors, however, show, that the beds between the red and green marls and the cretaceous series, are separable into two divisions, the lowest consisting of dark shales and ferruginous sands, being the equivalent of the inferior and middle oolitic deposits of England; and the upper composed of earthy and sandy limestones, being on a parallel with the coral rag and Portland oolite; and the correctness of the classification is proved by lists of fossils, including well-known British species. This attenuation of a great European series of rocks was

due, the authors conceive, to changes of level between sea and land, whereby large areas were for a time raised above the ocean, and again depressed beneath it; and they adduce, in support of this opinion, instances of erosion or denudation in the red and green marls before the deposition of the bottom bed of the oolitic series. Though these strata occupy comparatively small areas, especially near Moscow, and on the Volga and Okka, they are extensively distributed in the government of Simbisk and Saratof, also on the south-west flanks of the Ural, and in the steppes of the Kirghiss; but the superior division is only known on the upper Donetz. The cretaceous system of Russia is, in many respects, identical with that of western Europe, and it contains several of the long known characteristic fossils; it occasionally, however, presents discrepancies in composition passing in the highest part into arenaceous strata; so that the fine white chalk is enveloped in masses of marlstone, sands, and ferruginous grit, analogous to the upper and lower green sand series of England. The tertiary strata of Russia are shown by the authors to agree most strikingly with those of England; the lowest bed being lithologically undistinguishable from the Bognor rock, and containing fossils, stated, on the authority of Mr. J. Sowerby, to be identical with Bognor species, and other beds are exact counterparts of the greyweathers of England, or the paving stones of Paris. The next strata, in ascending order, are shown to be of the age of the Vienna basin, or miocene epoch; and the shelly limestones of the steppes are stated to exhibit the finest examples of a transition from the pleiocene to the post-pleiocene series, the organic remains in the uppermost beds being undistinguishable from the shells of the Caspian. Of this most recent deposit, Russia, as the authors observe, possesses peculiarly two distinct accumulations; one, characterized by an arctic Fauna, now living in the North Seas, and the other by a Fauna of temperate zones, or that of the Caspian. In reviewing the phenomena presented by the vast territory which passed under their survey, the authors dwell on the uninterrupted succession of conformable marine deposits throughout nearly the whole of the flat regions of European Russia, or the non-intercalation of terrestrial, fresh-water, and estuary formations, connecting the absence of such strata with the total want of intrusive or other igneous rocks, as well as all evidence of violent disturbance and unconformability, except in the coal-field north of the Sea of Azof. The cause of these peculiarities, or the absence of plutonic rocks, is considered, by the authors, to have also influenced the lithological structure of the formation; some of the oldest of the Silurian strata having quite as recent an aspect as the cretaceous or tertiary beds. Another point of great zoological, as well as geological, interest, connected with the singular structure of Russia, is insisted upon in the memoir. Each formation is clearly marked by its distinct suite of organic remains, even in those cases where there is no unconformability or abrupt transitions between one series of rocks and the next in succession; and, therefore, Mr. Murchison observes, that this distinction, especially in the Silurian, Devonian, Carboniferous, and Permian systems, cannot be due to violent operations, which destroyed one race of animals to make way for another; and consequently, that the theory, founded on such a supposition, and deduced from the investigation of countries which present numerous instances of violent commotions and unconformability, must be greatly modified before it can be admitted. In conclusion, the authors recapitulate the evidences of the marine origin of all the regular formations, to the newest tertiaries inclusive; alluding, nevertheless, to the proofs of the interruption in the sequence of the secondary strata, and the probable influence which the elevation of the central dome of Devonian rocks at a remote period had in the marked difference of the characters of the formations north and south of the dividing region; and they show that the submarine condition of the surface did not terminate with the post-pleiocene epoch, but extended throughout the period when the superficial detritus was accumulated, and in part to within the historic era. Lastly, they allude to the effects produced by the operations of man on the waters of the lakes and rivers of Russia, proving that their diminished volume is due to the felling of the forests, and the cultivation of the soil.

GEOGRAPHICAL SOCIETY.

April 25.—Sir Charles Malcolm in the chair.

A paper 'On the Natron Lakes of Egypt,' was read by the Secretary. It was from Sir Gardner Wilkinson, and dated "On the Nile, Jan. 18." The usual route from the Nile to the Natron Lakes, is from Teraneh, from which place the village of Zakook, the most northerly inhabited spot of the Wady Natroon, is distant twelve hours' march. The road passes over the ruins of an ancient town, which ruins have, of late years, been turned up in every direction, for the sake of the nitre, which abounds in the mounds of all the old towns of Egypt. The road, on reaching the summit of the low hills that skirt the desert, continues upon a high plain, with a slight ascent towards the west, varied by occasional undulations, for about twenty miles; after which it descends towards the Natron valley, the bottom of which is lower than the valley of the Nile. The village of Zakook, founded about twelve years since by the Europeans who established works here for the drying of the natron, now consists of about fifty or sixty huts, with a population of about 200 inhabitants of both sexes. The Natron is found both in the plain and in two or three of the lakes—some of the lakes contain only muriate of soda—most of the lakes contain water all the year round, and some are dried up in summer. In those lakes which contain both common salt and natron, these crystallize separately, the former above, in a layer of about eighteen inches thick, and the latter beneath, in a layer of about twenty-seven inches. All the lakes contain muriate of soda, though few produce natron. When the water of the salt and natron lakes has evaporated, a firm incrustation is left, when the natron called *Sottanee* is collected. The natron is of two kinds, the white and the *Sottanee*, the latter taken from the lakes, the former from the ground surrounding the lakes, and which is not inundated—the latter is of the best quality. The paper then goes on to describe the preparation which natron undergoes to fit it for the market. There are several springs of fresh water in the Natron valley, the purest of which is at the convents to the south; that of Dayr Baramoos being slightly salt. Sir Gardner Wilkinson is of opinion, that the fresh water found here and at the oases, filters beneath the mountains that separate the Wady Natroon from the Nile, and remains fresh from its not meeting with any of the salts on its passage. The process of infiltration is very slow, as the water of the lakes does not rise till three months after the rise of the Nile. The dip of the strata that borders the Natron valley is towards the N.E. Besides the population before stated of the village of Zakook, the four convents reckon together seventy-two inhabitants. The valley produces, in addition to the natron, rushes (*Sumar*) and bulrushes (*Berde*), used for making the well-known mats of Egypt. The best rushes, however, those used in the mats called *Menoofee*, come from the valley called Wady *è Sumar*, to the S.W. of the Natron valley three days' journey. Tamarisk and stunted palms, with the usual herbs of the desert, are the only vegetable productions of these valleys, besides the rushes. Gazelles, jerboas, foxes, and a few others common to the Libyan hills, are the only animals. The length of the Wady Natron is twenty-two miles, and its greatest breadth $5\frac{1}{2}$ from the brow of the hills, the bottom being only two miles broad. The hills and the undulating banks of the Wady are covered with rounded siliceous pebbles, and pieces of petrified wood. Of the Bahr el Fargh, or Bahr-bela-ma, (river without water) Sir Gardner Wilkinson is disposed to deny its ever having been a watercourse; he says it has none of the characters of one, and asks what has become of the alluvial deposit which should be found, if in reality a portion of the waters of the Nile has flowed here?

The Secretary made a few observations on the paper, after which Mr. Cresson favoured the meeting with some account of some of the features and products of the West Coast of Africa, particularly of the colony of Liberia.

Some specimens of Electrotpe Maps were on the table sent from Dresden, and the Secretary informed the meeting that Electrotyping was carried on in Germany with practical advantage, as, by its means, the splendid Atlas of Saxony might now be had for