"In reply to your letter, I beg to say that I have long been of opinion that the Existing Education Department, and all our Public and Literary Institutions should be placed under the general supervision of a responsible Minister. In Parliament I was generally inclined to favour the expenditure of money for scientific objects when the Government thought proper to sanction them; and an Arctic expedition, and various researches, unremunerative in a pecuniary sense, might fairly fall into the list of such objects."

IN June last year Prof. O. C. Marsh, the discoverer of *Dinoceras and Brontotherium*, started on a five months' geological expedition to the Rocky Mountain regions and the Pacific coast, to study, as he had done on previous occasions, the Cretaceous and Tertiary formations, which are there so rich in vertebrate remains. From Fort McPherson, Nebraska, they proceeded to Niobrara under the escort of two companies of United States cavalry, which were indispensable on account of the hostile position of the Indian tribes. Among the other places visited were Fort Bridger, Wyoming; Idaho and Oregon; Colorado and Kansas. The expedition was very successful, and the collections procured were large, containing many new forms. It is much to be regretted that no English geologists have accompanied Prof. Marsh, as most of the fossils peculiar to the regions he is exploring, are quite unknown in this country, except from descriptions.

THERE will be held at Christ Church, Oxford, on Saturday February 28, an election to a Junior Studentship in Physical Science, tenable for five years from the day of election. It will be of the annual value either (1) of 100*l.* (inclusive of an allowance for room rent), if the Governing Body shall so determine; or (2) of 85*l.* (also inclusive of an allowance for room rent), which sum may be raised to the larger sum above-named after the completion of one year's residence, if the Governing Body shall so determine. Candidates must call on the Dean on Wednesday, February 18, at 1.30 P.M. The examination will follow at 2 P.M. Candidates must not have exceeded the age of 20 on the 1st of January last, and must produce certificates both of the day of their birth, and of good character. Papers will be set in Chemistry, Physics, and Biology; but candidates will not be expected to offer themselves for examination in all these subjects.

PROF. COPE has recently explored the beds of the late tertiary formation, called Pliocene, as it occurs in north-east Colorado. He discovered twenty-one species of vertebrata, mostly mammals, of which ten were new to science. Four are *carnivora*, six horses, four camels, two rhinoceroses, one a mastodon, &c. The most important anatomical results attained are that all the horses of the formation belong to the three-toed type, and that the camels possess a full series of upper incisor teeth. The discovery of a mastodon, of the *M. ohioticus* type, constitutes an important addition to the fauna. One of the horses is distinguished by its large head and slender legs, much longer than in the common horse. A full account of these results will shortly appear in the report of Dr. Hayden's Geological Survey of Colorado.

THE additions to the Zoological Society's Gardens during the past week include a Suricate (*Suricata zenic*) from S. Africa and a West African Python (*Python sebæ*), presented by Mr. J. H. Coonley; a Feline Douracouli (*Nyctipithecus felinus*) from Brazil, presented by Mr. G. Hollis; a common Kingfisher (*Alcedo ispida*), British, presented by Mr. A. Yates; a Collared Fruit Bat (*Cynonycterus collaris*), an Axis Deer (*Cervus axis*), and a Molucca Deer (*C. moluccensis*), born in the Gardens; two De Fillippi's Meadow Starlings (*Sturnella de filippi*) from Rio de la Plata, received in exchange.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, Jan. 22.—"On the Physiological Action of the poison of *Naia tripudians* and other Indian Venomous Snakes," II., by Drs. Brunton and Fayrer.

The results of these investigations show that the poison of the cobra is similar in its action to that of Ophiophagus, Bungarus, and other Colubrine snakes, whilst that of Daboia is similar to the virus of Echis, the Trimeresuri, and other viperine snakes, the chief difference between them being the greater tendency in the viperine poison to cause hæmorrhage or more severe local symptoms. The blood of animals killed by the viperine snakes generally remains fluid after death, whilst that of animals killed by colubrine snakes form a firm coagulum.

The conditions caused by the action of the poison are illustrated by the symptoms manifested by man and the lower animals. The Cobra, Ophiophagus Hydrophidæ, and Bungarus are all very deadly. The Viperine Daboia, and Echis are scarcely less so, whilst the Indian Crotalidæ, such as the Trimeresuri, are much less so. A series of experiments is detailed which illustrate the physiological action of the virus on the nervous system, the muscles, the blood, the respiration, the circulation, and the function of excretion, and also the mode in which death is produced.

The fatal action is shown to be due (1) to arrest of the respiration by paralysis of the muscular apparatus, by which that function is carried on. (2) Or by rapid arrest of the heart's action, in cases where the poison has found direct entry by a vein, *e.g.* the jugular. In such, death is almost instantaneous, and the heart is found to have ceased to beat when in systole. The physiological import of this is very interesting and important, and it was demonstrated by Dr. Brunton, who explained its probable mode of action in certain ganglionic centres in the heart; a subject which gave rise to some discussion; (3) or death may be due to a combination of arrest of respiration and of the heart's action; (4) or it may be due where the quantity of poison is small, or its quality less active, to secondary causes of the nature of other septicæmia, a purely pathological question not discussed.

The mode in which paralysis of respiration (the ordinary form of death) is induced, has been most thoroughly investigated, and it may be said that the question is now settled.

The virus absorbed into the blood either by inoculation into the areolar tissue, or by application to a mucous membrane, affects the cerebro-spinal nerve-centres, the nerves and their peripheral distribution, more especially of the motor nerves. The sensory nerves are less and later affected, and the intelligence generally latest of all, and slightly. The complete loss of it, and the convulsions which precede death, is mainly caused by the circulation of venous blood, the result of the impeded respiration.

Muscular force and co-ordination are gradually lost; paralysis and asphyxia being the evidence thereof. In ordinary cases, the heart goes on beating vigorously long after apparent death, and with artificial respiration, may be kept up for many hours.

The investigations recorded, were made with cobra and daboia poison, sent to England from Bengal in the dried state, a condition in which it resembles gum arabic, and its activity is great. The animals experimented on were dogs, cats, rabbits, guinea-pigs, fowls, pigeons, small birds, frogs. Its action on all these, and the mode in which functions and tissues are affected, are recorded in detail, as well as the extent to which the action of the poison is modified when introduced through different channels.

It has now been clearly shown that the poison acts, when introduced into the stomach, or when applied to a mucous or serous membrane. The idea that it was only effective when injected directly into the blood, is erroneous. It is, no doubt, more certainly and rapidly fatal when it enters the blood direct.

It is also shown that it may be eliminated by the excreting organs, and that there is, therefore, reason to hope that life may be saved if it can be artificially sustained long enough to admit of complete elimination being accomplished, as in the case of curare poisoning; but from the more complex action of the cobra poison this remains a subject of doubt.

By artificial respiration the circulation has been maintained, both here and in India, by Dr. Ewart and Mr. Richards, for many hours; and in one case, after complete paralysis had occurred, symptoms of reaction and elimination were obtained; but no

complete recovery has yet occurred. The doubt still remains whether the nervous system that has sustained so much damage, is capable of ever resuming its functions, even though elimination be complete.

The so-called antidotes appear to be inert; all that have been submitted to trial, including the intra-venous injection of ammonia, have failed to have any satisfactory effect. Artificial respiration has certainly prolonged life, and partial recovery has followed, but no life has actually been saved by it.

The microscopic appearances of the blood are described, but no very remarkable change was observed beyond crenation of the corpuscles or diminished aggregation into rouleaux. Chemical examination of the blood and its gases is still needed and further analysis of the poison is desirable.

It is shown that the activity of the poison is scarcely impaired by drying, excepting perhaps so far as regards its *local* action.

Dilution with water, glycerine, liq. ammoniæ, and liq. potassæ did not destroy its activity, nor did coagulation by boiling in the ordinary way. The boiling for half-an-hour under a temperature of 102° C. seemed to destroy the activity of one specimen which was injected into a bird.

The poison acts on all life, on the lower and higher vertebrata, the invertebrata, and even on vegetable life; for it retards, although it may not arrest the germination of seeds. But it acts most vigorously on the warm-blooded animals.

The most remarkable fact connected with it is that it has little or no effect on poisonous snakes. They can neither poison themselves nor their congeners; or if at all, very slightly so, whilst the poison acts rapidly and fatally on innocent snakes, lizards, fish, and mollusca.

With reference to the means of preventing death, it may be said that those that mechanically prevent the entry of the poison into the circulation by means of the ligature, excision, or cautery are the most reliable, but that they are only so when applied immediately.

No means that offer any hope of benefit should be neglected, and it is possible that stimulants such as alcohol and ammonia may be useful; and in some cases, where the poisoning has been severe but not fatal, do good and even determine recovery where death would have otherwise resulted. The so-called antidotes, however, beyond any actions of this kind that they may possess, are apparently quite inert.

Transfusion of blood is alluded to, but the experiments hitherto proposed have not met with success. A more perfect way of accomplishing it may be more successful.

Zoological Society, Feb. 3.—Dr. E. Hamilton, vice-president, in the chair. The secretary read a report on the additions that had been made to the society's menagerie during the month of January, 1874, amongst which were specially noticed a female Water-Deer (*Hydropotes inermis*), a pair of Pink-headed Ducks (*Anas caryophyllacea*), and a Dusky Monkey (*Semnopithecus obscurus*), acquired by purchase, and two Vulturine Guinea-fowls (*Numida vulturina*), presented by Dr. J. Kirk.—An extract was read from a letter addressed to the secretary by Mr. Luigi M. L. Albertis, containing an account of a new species of kangaroo, of which he had lately obtained a living specimen from New Guinea, and which he had proposed to call *Halmaturus luctuosus*.—Dr. Cobbold communicated the second part of a series of papers entitled "Notes on the Entozoa;" being observations based on the examination of rare or otherwise valuable specimens contributed at intervals by Messrs. Charles Darwin, Robert Swinhoe, Charles W. Devis, the late Dr. W. C. Pechey, Dr. Murie, and others.—Mr. Garrod read a paper in which he proposed a new classification of birds, details of which will be found in another page.

Chemical Society, Feb. 5.—Prof. Odling, F.R.S., president, in the chair.—The secretary read a preliminary notice on the action of benzyl chloride on the camphor of the Lauraceæ (*Laurus camphora*), by Dr. D. Tommasi.—Dr. C. R. A. Wright had a paper on the Isomeric Terpenes and their derivatives: Part III. On the essential oils of wormwood and citronelle; being a detailed account of his experiments on these substances, a preliminary notice of which was communicated to the society some time since.—The other communications were a preliminary notice on the perbromates, by M. M. Pattison Muir, F.R.S.E.; and on the coals from Cape Breton, their cokes and ashes, with some comparative analyses, by Henry How, D.C.L. The latter paper giving the amount of coke produced by slow and quick coking, from the main seam coal of Sydney mine, Nova Scotia, and the Lingan coal, also analyses of the ashes left by these coals.

Royal Microscopical Society, Feb. 4.—Anniversary meeting.—Chas. Brooke, F.R.S., president, in the chair. The report of the council and the treasurer's statement of accounts were submitted and adopted, and the officers and council for the ensuing year were elected. The president delivered an address, and concluded with obituary notice of Fellows deceased since the last annual meeting. The following gentlemen were elected as officers and council. President—Chas. Brooke, F.R.S. Vice-Presidents—Dr. Braithwaite, F.L.S.; J. Millar, F.L.S.; W. Kitchen Parker, F.R.S.; F. H. Wenham, C.E. Treasurer—J. Ware Stephenson, F.R.A.S. Secretaries—H. J. Slack, F.G.S.; C. Stewart F.L.S. Council—J. Bell, F.C.S.; F. Crisp, B.A.; Dr. W. J. Gray; J. E. Ingpen; S. J. McIntire, H. Lee, F.L.S.; W. T. Loy; Dr. H. Lawson; H. Perigal, F.R.A.S.; A. Sanders; C. Tyler, F.L.S.; T. C. White. Assistant Secretary—Walter W. Reeves.

Royal Horticultural Society, Jan. 21.—Scientific Committee.—A. Smee, F.R.S., in the chair.—The Rev. M. J. Berkeley sent portions of holly stems pierced by the larva of the wood leopard moth (*Zeuzera Æsculi*).—Prof. Thiselton Dyer exhibited a small branch of *Vitis gongylodes* from the Victoria House at Kew. The end appeared to have been broken off, and the adjacent internodes had (apparently in consequence) swollen into a mass like a small cucurbitaceous fruit.—Prof. Lawson remarked that an Indian vine (*Vitis quadrangularis*) ordinarily had the internodes swollen, though not to anything like the same extent.—A conversation then arose as to the production of aërial roots by vines.—Mr. Worthington Smith, F.L.S., detailed the results of a series of experiments made with the object of ascertaining how far perfectly sound potatoes can be contaminated by contact with infected ones.—Mr. Andrew Murray, F.L.S., made some remarks on interesting plants suitable for horticulture which he had met with in the Rocky Mountains.

General Meeting.—Mr. W. A. Lindsay, secretary, in the chair.—Prof. Thiselton Dyer made some remarks on a parasitic fungus, which was proving exceedingly destructive to holiyhocks. It has been identified by Berkeley in this country, and subsequently by Durieu de Maisonneuve, in France as *Puccinia Malvacearum* of Montagne; it was first described from specimens collected in Chili by Bertero.

EDINBURGH

Geological Society, Dec. 18, 1873.—On some points in the connection between Metamorphism and Volcanic action, by Prof. Geikie, president. After adverting to his previously published views regarding the connection between the protrusion of granite and ordinary volcanic rocks, the author proceeded to point out that the facts were probably capable of a wider interpretation. The metamorphism of large areas was well known to be intimately related to the contortion and plication of rocks, highly metamorphosed regions being those where the rocks had undergone the most intense pressure and crumpling. Heat would necessarily be evolved in the process of compression, and might have been in some parts sufficient actually to fuse the rocks. Such fused portions were probably recognisable in the masses of granite, syenite, porphyry, and other so-called igneous rocks so common in metamorphosed regions. These views were shared by many able geologists of the present day. The author, referring to the recent memoir of Mr. Mallet, pointed out that such conditions as those indicated by the facts of metamorphism were eminently suggestive of the probability that volcanic action had accompanied metamorphism. The extensive crumpling of the rocks of a region indicates a weak part of the crust of the earth through which the internal heat would for a time be more easily transmitted to the surface, while the effect of that crumpling would be greatly to increase the store of heat out of which volcanic energy arises. Hence both by the access given along the line of weakness to the internal heated mass of the earth, and by the increased temperature due to the contortion, water finding its way downward from the surface would encounter conditions eminently favourable for the production of volcanoes. If this speculation has any ground of truth, we should expect to find some evidence of the association of volcanic masses with wide tracts of metamorphism. Without travelling beyond our own country, we seem to have corroboration of it all along the flanks of the highly-contorted, and, over the Highlands, intensely-metamorphosed Silurian hills. The author then gave some details as to the probable thickness of rock under which the present metamorphosed rocks of the Highlands lay at the

time of their metamorphism, and showed that it was probably comparatively small. They were in great measure, if not entirely, metamorphosed before the time of the Lower Old Red sandstone. But the process of metamorphism was no doubt a very prolonged one, and we should therefore be prepared to find proofs of its progress at widely separated periods. It is now well known that low down in the Old Red sandstone of the Midland Valley of Scotland enormous sheets of felspathic lavas and tuffs occur, forming such chains of hills as the Saidlaws, Ochils, and Pentlands. No earlier traces of volcanic action have yet been met with in Scotland, but these masses prove that when that action began it was developed upon an enormous scale. The author believed the inference might with much probability be drawn that this vast effusion of volcanic material was a consequence, or it might even be to some extent an accompaniment, of the crumpling and metamorphism of the older Silurian rocks. He drew attention to the way in which these volcanic rocks bordered the Silurian areas on both sides of the broad lowland valley, and to the numerous remarkable bosses of granite, syenite, and porphyry by which the Silurian tracts were pierced. That many of these bosses were formed by the actual fusion of the stratified rocks themselves seemed to him highly probable. But he held also that some of them marked the lower parts of the actual orifices out of which the volcanic materials of the Old Red sandstone had issued. He alluded especially to the singular rounded or dome-shaped hills of granite, felstone, and quartz-porphyry by which the Silurian uplands of the southern counties are dotted, and which, from their general form and their relations to the surrounding stratified rocks recall some of the characters of true volcanic "necks." The sheets of lava and tuff have been preserved in the broad lowland valley owing to faulting and subsidence, while they have been removed from the surrounding hills by denudation, so as to uncover the roots of the pipes or funnels from which they were emitted. After the enormous masses of volcanic materials erupted during the period of the Lower Old Red sandstone, the underground forces gradually declined in vigour, and as the author had shown, became reduced in Permian times to the production of a few small cones scattered over the midland valley, and down the valley of the Nith. The remainder of the paper was devoted to the Tertiary volcanic rocks of the western Highlands. The author showed that in Skye, Raasay, and Mull, masses of granite and quartz-porphyry were associated with the volcanic rocks in such a way as to suggest a community of origin. Even at a distance from the main mass of the basalt plateaux, granite occurred which was almost certainly of Tertiary date. The picturesque granite of Arran, for example, which had long been known to be at least post-carboniferous, he now firmly believed to be of the same age as the terraced hills of Skye and Mull, that is, younger in date than the soft clays on which London is built, and it appeared to be associated with actual *coulées* which had, in some cases, suffered an enormous denudation like that of the Scur of Eigg. He had not yet been able to show that the renewed and prodigious outburst of volcanic action in Tertiary times had been associated with the metamorphism of any wide region, and perhaps no data are obtainable to throw light upon this question. But the extravasation of granite rocks at several places seemed to indicate that metamorphism had taken place, and at least showed, as Mr. Jukes long ago pointed out, that molten granite might be associated with true volcanic action, though it did not reach the surface as granite.—On fossil cones from the Airdrie black-band ironstone, by G. A. Panton.—Notes on the geology of India, by Andrew Taylor.

MANCHESTER

Literary and Philosophical Society, Jan. 27.—R. Angus Smith, F.R.S., vice-president, in the chair.—"On a Source of Error in Mercurial Thermometers," by Thomas M. Morgan, Student in the Laboratory of Owens College. While engaged in distillation, the thermometer, which was placed in a Wurtz tube so that the column of mercury was entirely surrounded by the vapour of the distilling liquid, was found after some days to indicate three degrees too little—a discrepancy caused by volatilisation from the surface of the column of mercury and condensation on the upper part of the tube. By causing the mercury to flow to the end of the tube and back, the condensed portion was gathered up and the correct temperature indicated. It has since been observed that after each day of distillation, with liquids boiling between 60° and 100° C., a quantity of mercury equal to 1° or 1°·5 volatilises.—"Notes on fossil Lithothamnia so-called Nulliporæ)," by Arthur Wm. Waters, F.G.S. These attain their greatest development in the Leithakalk, a miocene formation which is principally, in some cases almost entirely, composed of these algæ. But they are in no way confined to the Leithakalk, being also very abundant in the eocene, especially the upper division; the so-called granit-marmor, or Bavarian marble, a nummulitic formation, is very largely composed of this concretionary-looking body. In North Italy it abounds in the eocene formations which are so largely developed in the Veronese and Vicentin. In many places the formation is some hundred feet, much more than half composed of the Lithothamnium. It occurs abundantly in Hungary and Switzerland. The so-called pisolithic limestone of Paris is according to Gümbel about eight-tenths stone algæ; also M. Mario, Astrup; the pleiocene of Castel Arquato; and in fact it seems to be found in most of the tertiaries on the Continent; it is further found in the chalk at Maestricht, and in the jurassic sponge beds at Schwabenbergs. The object of this paper is to draw attention to the great masses of these bodies and the importance of always noticing their occurrence in geological formations, since it should be a very material help in regard to the climate, and the conditions of the coasts and currents, besides being of great stratigraphical assistance; nor is it of less importance to note carefully the growth of recent ones, for only through a knowledge of the present can we interpret the past.

PARIS

Academy of Sciences, Jan. 26.—M. Bertrand in the chair.—The following papers were read:—Note on magnetism, in answer to M. Gaugain, by M. J. Jamin.—Direct demonstration of the equation $\int \frac{dQ}{T} = 0$ by M. A. Ledieu. This was a continuation of the paper read at the last session of the Academy by the same author.—Note on the Rhone irrigation canal, by M. A. Dumont.—Several papers on the action of water on lead, were received.—Organogenesis compared with androgenesis (*l'androcée*), by M. Ad. Chatin. This part of the paper dealt with the *Saxifrages* and *Crassulaceæ*.—On the lateral solfataras of the Chili volcanoes, and on certain new minerals, by M. L. Domeyko.—On the history of the question as to the passage of birds through the air, by M. A. Penaud.—On the shocks of earthquake at Nice, by M. Prost.—Determination of the pluckerian numbers of envelopes, by M. H. G. Zeuthen.—On the apparent orbit and period of revolution of the double star ζ Herculis, by M. Flammarion.—On the variable state of voltaic currents, by M. P. Elazerna. This was an answer to M. Cazin's recent remarks on the subject.—On a new saccharometer and a new method of obtaining an absolutely monochromatic sodium flame, by M. Laurent. The latter object is attained by interposing a cleavage plate of a crystal of potassic dichromate between the polariser and the flame. This absorbs nearly everything but the yellow light of the flame.—Researches on the flow of liquids through capillary tubes, by M. A. Guerout.—On a new laboratory balance, by M. Deleuil.—On ethylic oxalurate and oxamethane cyanurate, by M. E. Grimaux.—On the grafting of dental follicles and of their constituent organs, separately by M. Legros and Magitot.—Remarks on M. Martin's paper on the comparison of the anterior member of the "*Montotremès*," with those of birds and reptiles, by M. E. Alix.—Note on the ammoniacal fermentation of urine, by M. A. Lailler.—On the pretended emission of ozone by plants, by M. J. Bellucci. The author had made a number of comparative experiments on this subject. He found the colouration of the test paper to be due to the combined action of light and moisture.

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