

have been engaged during the past week in measuring the new site, which is to extend from Boswell Court, Carey Street, to Bell Yard, Temple Bar, extending back towards the Strand, thus bringing the courts close to Lincoln's Inn and the Temple, and midway between the east and west, and north and south portions of London. The plans will be carried out by Mr. Barry, the celebrated architect, and, combined with the new streets, north and south, east and west, referred to above, will indeed be a boon to the public, as well as a vast advantage to the metropolis in a healthful as well as a moral point of view.—*Observer*.

FIFTEENTH MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

[From our own Correspondents.]

WEDNESDAY.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

'On the Principles of Geometry,' by Mr. H. WEDGWOOD.

'Description of an Engine for Finding the Numerical Roots of Equations and for Tracing a Variety of Useful Curves,' by Mr. BASHFORTH.

'On the Measurement of two Arcs of the Meridian in India,' by Col. EVEREST.—Colonel Everest described the measurement of the great base and the base of verification, and exhibited and described drawings illustrative of the several parts of these operations.

'On the Origin of the Aurora Borealis,' by the Rev. G. FISHER.—The author professes to establish the following proposition: "The principal displays of the aurora occur near the edge, or exterior limits of the frozen sea, where the process of congelation goes on with the greatest rapidity. The aurora is an electrical phenomenon, and arises from the positive electricity developed by the congelation of humid vapours and the consequent induced negative electricity of the surrounding portions of dry atmosphere. It is the accompanying indication of the restoration of the electrical equilibrium, which is effected by the intervention and conducting power of minute frozen particles, which particles are rendered luminous by the transmission of the electricity, and thereby give rise to the phenomenon of the aurora."

'Researches on Shooting Stars,' by M. COULVIER GRAVIER.—The observations were made at Reims and at Paris, and were continued without intermission from July 1841 to February 1845 inclusive. The mean number seen in an hour observed a remarkable law of progression throughout the year. The hourly mean number for January was 3.6, for February 3.6, for March 3.7, for April 3.7, for May 3.8, for June 3.2, for July 7.0, for August 8.5, for September 6.8, for October 9, for November 9.5, for December 7.9; thus during the first six months the hourly number is nearly the same each month, while in the next six months there is a progressive increase, first until August, and then until October or November, periods at which the hourly number is more than double those of the other six months, which well agrees with the facts proved in those countries as to August and November. The second part of the memoir contains tabulated results of the hourly variations of the shooting stars observed from six in the evening to six in the morning, which also observed a remarkable progression from 3.3, the hourly mean number observed between six and seven P.M., to 8.2, the hourly mean of those seen between five and six A.M. This result was illustrated by curves exhibiting the hourly progression, in which a very obvious law of progression was to be observed.

Sir W. HAMILTON then gave an exposition of his system of Quaternions, which, however, we could neither condense within any reasonable limits nor hope to make generally intelligible to our readers. In this system letters did not mean quantities but directions, and the operations analogous to addition, multiplication, &c. had neither the same meaning nor were they governed by the rules of these operations in common algebra. It was to an explanation of their meaning and exemplifications of the application of this calculus, and the facility which it afforded of arriving very simply at results of difficult attainment by the ordinary methods, that Sir W. Hamilton confined himself in this communication. Sir W. Hamilton said that he wished to have placed on the records the following conjecture as to a future application of quaternions: is there not an

analogy between the fundamental pair of equations, $ij=k$, $ji=-k$, and the facts of opposite currents of electricity corresponding to opposite rotations?

'On a Lunar Meteorological Cycle,' by Mr. L. HOWARD.—Mr. Howard reports that the facts of the two last years compel him to modify his anticipations as to the extent to which the lunar cycle will enable him or others to become a weather prophet. But he says the deferred heat (to be expected from the corresponding period of the cycle in 1825 to 1828) may prove to be only defeated cold, and the absence of so great an elevation of the mean temperature now, may spare us a repetition for many seasons to come of the cold which occurred between the years 1835 and 1840. To show, however, that causes exist for these periodical alternations of warmth and cold, much more extended in their effects than any which are peculiar to our own climate, he proceeded in detail to place in review together the annual mean temperatures for eighteen years (ending with 1823) at Geneva and London.

Prof. CHALLIS then gave a 'Description of a Universal Stand for Telescopes,' by Prof. BOGUSLAWSKI, by means of which the instrument may be converted into a portable transit-circle, or an altitude and azimuth instrument, or an equatorial, all the parts being in each case exactly counterpoised, and the telescope placed in a position convenient for the observer.

'On the Caustics produced by two Mirrors in Rotation,' by Prof. ANDERSON.—Prof. Anderson exhibited the curves traced on the ceiling by the reflected light from the two revolving mirrors placed in a beam of sunlight, and pointed out several mathematical rules for tracing the curves for the several angles at which the mirrors might be set, and the angle which the beam of sunlight makes with the plane of rotation.

SECTION B.—CHEMISTRY AND MINERALOGY.

'On the Oil of Assafoetida,' by Drs. TILLEY and MACLAGAN.—The principal result was that the oil of garlic from a siliceous plant—the oil of mustard—a compound of allyl with sulpho-cyanogen from the cruciferae—the oil of assafoetida, so much used in India, as a condiment, from the umbelliferae, all contain the same organic radical, and form a parallel case to the tea, the coffee, and the Paraguay tea plant, which also contains the same substance, *thein*, and are all used for similar purposes.

'Contributions to Actino-Chemistry.—On the Chemical Changes produced by the Solar Rays, and the Influence of Actinism in disturbing Electrical Forces,' by Mr. R. HUNT.—These contributions were a continuation of the experiments brought forward by the author at York.

'On the Hydrate of Nitric Acid,' by Prof. SCHÖNBEIN.—The Professor stated that nitrous acid had the power of immediately absorbing ozone. After referring to many chemical peculiarities of nitrogen and oxygen in their various combinations, and showing their several conditions, he called attention to the fact that the per-oxide of hydrogen is, in all probability, the principle which is active in the production of nitric acid.

'On the Germination of Barley, and the use of the Husk to the Young Plant,' by Prof. JOHNSTON.—Prof. Johnston made a short communication, to show that the roots of the young plant contained a large per-centage of silica, which was found to be supplied by the husk.

'On the Composition of certain Slate Rocks, and of the Soils formed from them,' by Mr. NORTON.—The analyses were undertaken with the view of determining how far rocks of the same formation varied as to their chemical composition. The specimens were seven in number, collected in Wigtonshire, and in the variation of the per-centage of lime alone might be found an explanation of the conflicting opinions respecting its use as a manure.

SECTION C.—GEOLOGY AND PHYSICAL GEOGRAPHY.

'On the Ventilation of Coal-Mines,' by Prof. ANSTED.—Prof. Ansted gave an outline of the methods of working coal-mines, and then proceeded to narrate the particulars of certain accidents, the circumstances of which seemed capable of suggesting improvements in future; and he referred more particularly to the fact, that, in the Haswell explosion, a considerable number of the persons employed in other panels might have been saved if the communication between them

had been more effectually shut off, and if, also, there had been a separate passage or air-drift to the upcast shaft. He also described the explosion in the Killingworth Colliery, where, if the Davy lamp had been in use, the accident would, in all probability, not have happened; and Prof. Ansted urged the necessity of certain conditions being observed in all collieries. 1. That there should never be less than two shafts, because an explosion can scarcely happen without destroying the partition at the bottom of the shaft, and thus checking or entirely stopping the ventilation. 2. That the panels should always be of moderate size, and the air-courses never exceed a certain length. 3. That separate air-drifts should always be made from distant workings direct to the pit bottom. 4. The exclusive use of the Safety Lamp in those mines, at least, where the escape of gas from fresh workings, faults, &c. rendered the working at all dangerous.

Prof. FARADAY said, the subject of mining accidents had long occupied his attention. The more he pursued the inquiry, the more he was disheartened at the apparent hopelessness of finding out any good general remedy. The explosions were not simply the effects arising from the mixture of gases, but from the combustion of the coal-dust and coal-gas which the first explosion made. In the fatal case at Haswell, the place where the accident originated had been ascertained; and the progress of the fire could be traced on the scorched beams and props of the galleries, and the deposits of coke made from the coal-dust which the explosion raised. To this circumstance the great force of the explosion was due, and not to the first escape of gas. A similar explosion had been known to take place in a cotton-wadding manufactory, the whole atmosphere of the place being fired by means of the particles of cotton in it. Of all the workmen killed in the Haswell accident, perhaps not one was really burned to death, but suffocated by the *choke-damp*. In one part of the workings the explosion had produced sharp vibrations, like the firing of gunpowder, and in another the burning went on slowly, like a common fire. But although two panels were blown into one, and solid stoppings of brickwork thrown down, there was no indication of the accident in the shaft. If the stoppings had not been blown down, and the supply of air had continued, the mine would have taken fire, and the men been burnt instead of choked. Since the late investigation, Mr. Faraday and Mr. Lyell have had many hundred plans submitted to them, urging ill-considered and contradictory measures. They had examined every part of the Haswell Colliery, accompanied by the mine-viewer, and received recommendations from the best-informed men upon the spot; and they were convinced that the conditions under which the accident happened were so variable, that no general practical rule could be obtained. Far more information, however, was required. The plan of splitting the air-courses was good, as far as the power of the upcast shaft admitted; but, if carried too far, it would produce stagnant points, which could not be prevented by any arrangement consistently with the ever-moving condition of the works. The abolition of the use of gunpowder and lighted candles would, in some cases, double the price of coals. But the great source of danger was the mental condition of the miners. With regard to the present race this was so hopeless, that nothing could be done for them; although smoking was strictly forbidden, they had been known to contrive to light their pipes in dangerous workings even from the Davy lamp; and Mr. Faraday had himself on one occasion sat down with an open candle to watch the preparations for blasting, and when he inquired for the gunpowder was told he was sitting on it. Mr. Faraday took an opportunity, also, of expressing his firm conviction of the safety of the Davy lamp when properly used, and of its being a complete and practical contrivance, to which he would willingly trust his own life, as he had already done on many occasions.

'Second Report on the Extinct Mammals of Australia, with Additional Observations on the Genus *Dinornis*, of New Zealand,' by Prof. OWEN.—In his previous Report, Prof. Owen had demonstrated the former existence in Australia of two genera of Marsupial animals, rivalling in size the rhinoceros and hippopotamus of the old continent. Since the reading of his first Report, Prof. Owen had received three

molar teeth belonging to the upper jaw of the Diprotodon; the crown of each tooth was divided into two principal transverse ridges, like those of the lower jaw, and the enamel presented the wrinkled and punctate surface peculiar to the genus. With these was found a large scalpriform incisor, whose bevelled cutting edge showed that it worked upon a similar tooth in the lower jaw. The Diprotodon, therefore, had molars like the kangaroo; but, instead of the two large incisors in the lower jaw being opposed to six smaller in the upper, as in the kangaroo, it had two large incisors above as well as below, agreeing in form and structure, and relative size, with those of the Wombat. Prof. Owen considered himself justified in concluding that the Diprotodon combined the characters of Phascodomys with those of Macropus, exhibiting both upon a gigantic scale, and constituting one of those links in the chain of being which the course of time has broken and destroyed. Prof. Owen also stated that a large collection of bones of the Dinornis had been obtained from a new locality by Mr. Percy Earle. This collection contains four of the species of Dinornis already described, including the three most remarkable for gigantic stature. One of these, with a stature nearly equalling the ostrich, presents in all the bones of its leg double the thickness in proportion to their length, and must have been the strongest and most robust bird in proportion to its size that ever existed. Of the gigantic species, vertebræ, ribs, and an almost entire sternum, most resembling that of the Apteryx, have been obtained. The Rev. Mr. Williams has also transmitted the cranial portion of a skull related in size to the *Dinornis struthoides*, manifesting many peculiarities and a striking resemblance to the same part in the Dodo and Apteryx.

'Notice of some Additions to the Fossils of the Silurian Rocks,' by J. W. SALTER.—Late researches in the Silurian rocks indicate a greater abundance of organic forms, and a nearer approach to the assemblages in modern deposits than has been generally supposed; and Mr. Salter referred to species which had been found in the oldest fossiliferous rocks of Wales, and in the upper Ludlow formation of Westmoreland.

Mr. E. HALL made another communication respecting the Toadstones of Derbyshire.

'On the Fossil Bodies regarded by M. Agassiz as the Teeth of a Fish, and upon which he has founded his supposed genus *Sphenonchus*,' by Mr. CHARLESWORTH.—The object of this communication was to call attention to the history of the fossil bodies from the lias and newer secondary rocks, upon the character of which M. Agassiz proposes to establish a new genus, under the supposition that they are teeth; but he adduces no facts in support of this view, nor does he attempt to invalidate the previously published evidence in favour of their being dermal species. Mr. Charlesworth considers that an Ichthyolite in the possession of Mr. E. T. Higgins, of Clifton, in addition to other evidence which he has collected upon the subject, is conclusive as to the fact of these fossil bodies being spines, and not teeth.

Mr. CHARLESWORTH then made some observations 'On the Occurrence of Oolites in the London Clay and Coralline Crag;' and Mr. TURNER exhibited specimens of fossil fish from Antigua.

TUESDAY.

SECTION D.—ZOOLOGY AND BOTANY.

'On the Fossil Elephantine Animals of India,' by Dr. FALCONER.—In this communication, which was illustrated by diagrams of the Crania, the author gave the results of the investigations by Capt. Cautley and himself regarding the fossil Mastodons and Elephants of India, and endeavoured, by a series of teeth sections, to show that there was a gradual and continuous passage, in the structure of the teeth, between the Mastodon and the Elephant,—the forms which have been included under the name of *Mastodon Elephantoides* by Clift, and an undescribed Indian species, constituting the intermediate links.

M. SELYS DE LONGCHAMPS exhibited several species of the genus *Arvicola*. He also read a paper 'On the Libellulidae of Europe.'

'On the Germination of Plants,' by Dr. LANKESTER.—The author took the following view of the phenomena:—That the only essential process in germination is the growth of the young plant, or embryo.

The process of development of the embryo, from primitive cytotlasts developing its tissues, is precisely the same as that of every other part of the plant, and from an identity of structure, an identity of function might be inferred. But the ordinary theory of germination gave a different function to the tissues of the embryo. The author regarded the absorption of oxygen, the disengagement of carbonic acid gas and ammonia, as the consequence of the decomposition of the starch and protein contained in the albumen or perisperm of the seed; and that the growing cells of the embryo appropriated the carbonic acid, ammonia and water, just in the same way as all other cells in the vegetable kingdom.

'On the Influence of Galvanic Electricity on the Germination of Seeds,' by Prof. E. SOLLY.—In a series of experiments, in which the seeds of barley, wheat, rye, turnips and radish were exposed to the influence of a feeble current of electricity, the plants came up sooner and were healthier than others that had not been electrified. On the other hand, a number of experiments on other seeds had given opposite results,—proving, either that the germination of some seeds was retarded whilst that of others was facilitated by electricity, or that the effects observed in both cases were accidental. Out of a series of 55 experiments on different seeds, 21 appeared in favour of electricity, 10 against it, and 25 showed no effect whatever; and in carefully counting the whole number of seeds up in the entire series, there were found 1,250 of the electrified, and 1,253 of the non-electrified. In conclusion, Prof. Solly stated that he felt doubtful whether the effects observed were really due to the influence of electricity.

Mr. WESTWOOD made some remarks on Entomology.—After shortly noticing the general economy of the hive bee as to the production of queens and the swarming of casts, he contended, from the analogy between the circumstances connected with the latter event and those which accompany the swarming of ants, gnats, white ants, mayflies, &c.—1st, That the swarming of insects has for its principal object the union of the sexes; 2nd, That, from analogy with other insects subject to swarming, it is to be inferred that that species does not differ in this respect from other swarming species; and, 3rd, That it is the newly hatched, and not the old queen which leads off the swarm.

'On the Specific Characters of Plants, considered in Morphological Connexion,' by Mr. J. BALL.

Mr. C. W. PEACH made a communication on the result of his researches during the past year on the Marine Fauna of Cornwall.

WEDNESDAY.

The Section met for a short time only.

The SECRETARY read a Report from Mr. Denny, on the progress he was making in the description and illustration of the undescribed species of the genus *Anoplura*.

Capt. L. L. V. S. IBBETSON exhibited a collection of electrotyped plants. Most of the specimens belonged to the family Orchidaceæ, but there were many specimens of other plants, and some fungi, with their forms beautifully preserved.

'Notes on the Irish Species of Robertsonian Saxifrages,' by Mr. ANDREWS.—The author having studied the Irish Saxifrages, and compared them with those of the Pyrenees, had come to a different conclusion from Mr. Babington, and believed that there were only two true species in Ireland, the *Saxifraga umbrosa* and the *S. Geum*. The other species described by Mr. Babington in his 'Manual,' he regarded as varieties of one or other of these forms.

The reading of this paper terminated the business of the Section.

TUESDAY.

D.—SUB-SECTION, ETHNOLOGY.

'Report of Committee appointed to Diffuse Queries regarding the Human Race,' by Dr. HOPKIN, was read; from which it appeared that the past year has not been fruitless in Ethnological or Ethnographical productions. If no remarkable work on this subject has appeared from the English press, travellers and missionaries have made us more acquainted with tribes, which, though not wholly unknown, have been imperfectly understood. A recent traveller who has visited most of the important India Islands, has furnished some particu-

lars of the present state of the three small remnants of the Caribs, by whom these islands were well peopled in the time of Columbus. In St. Vincent's, the Caribs are supposed not at present to exceed 300 persons. Their number is declining. The northern part of the island was formerly conceded to them, but now only two small portions of this territory are retained by them. They cultivate the soil, and are engaged on the water, being skilful in managing their boats. They have schools in which they are taught the English language, the native language being extinct. These Caribs present two varieties. The Red or Eastern having lank hair, and being more evidently of American origin. The Western are blacker, and have much of the Negro character. The same gentleman visited the Caribs of Dominica, who possess lands, but the limits and titles of these lands are neither defined nor secured. The Caribs of Dominica resemble the red Caribs of St. Vincent's. They live in scattered huts.

Dr. KING reported that in the Journal of General Miller, Consul-General for the Pacific, which had been forwarded to him, light was thrown upon the manners and habits of the South Sea Islanders, and upon many of the complicated or debated problems connected with the population and its intermixture with the Red man of America; upon human sacrifice, cannibalism and infanticide; and upon its effect of isolation and savage solitude upon runaways from ships and from convict labour. Lengthened extracts from General Miller's Journal, upon these several points, were read.

'On the Egyptians and Americans,' by the Marquis di SPINERO.—A large collection of rough notes, which require classification to be understood.

'On certain traces of Roman Colonization in Lancashire,' by Dr. BLACK.—From historical notices and inferences, conjoined with the affinities mentioned to have existed between the social institutions and languages of the Saxon conquerors and other contemporary emigrants and those of our Briton-Frisians, Dr. Black concludes that the latter would mostly remain in the country, become amalgamated in spirit, action, and habits with the newly imported tribes from Germany, rather than seek to keep up a forced conventional polity with their old neighbours, the Britons. They would indeed soon become incorporated with the Saxons; take with them their fate as a nation; and, from their numbers in the south of Lancashire, would probably constitute the greatest portion of the population. That many of the inhabitants of this district, especially in the inland and rural parts, have long, and to this day, shown a distinctive variety of form, feature and vernacular dialect from those in the other parts of England, has been remarked by not a few observers. And the man of Heaton and the dark-eyed Lancashire witch, still maintain—the one for the picturesque in manners and speech, and the other for her characteristic beauty—their wide-spread distinction among the hardy sons and fair daughters of England.

Dr. KING presented to the Section a number of tables drawn up by Mr. Brent, illustrative of the height, weight and strength of man. It appears that there are in 100 Englishmen of all classes—

6 ft. to 6 ft. 3 in. (very tall)	4
5 ft. 9 in. to 6 ft. (tall)	26
5 ft. 6 in. to 5 ft. 9 in. (middle height)	40
5 ft. 3 in. to 5 ft. 6 in. (short)	26
5 ft. 0 in. to 5 ft. 3 in. (very short)	4
	100

In 100 Paupers in Marylebone Workhouse.	In 100 persons deceased.	In 100 Amateur Rowers.	In 100 Cornish Wrestlers.
Tall 7	Tall 19	Tall 94	Tall 63
Middling 26	Middling 37	Middling 6	Middling 30
Short 67	Short 44	Short 0	Short 7
100	100	100	100

From a calculation of the weight of the Venus di Medicis at different heights, from 4 ft. 6 in. to 6 ft. 9 in., her weight, supposing her height to have been 5 ft., and her dress of the ordinary kind, would be 8 stone 9 lb.—being in the same class with the Discoboli. From a calculation of strength in different classes from slender to exaggerated, the Hercules Farnese being in the exaggerated, the Gladiator being in the middle class, taking the strength of a slender