

rainy, when suddenly streamers of light were seen in the northern sky running from west to east. They were seen twice, the first time lasting about a minute, but the second very short. The light was so intense that the streets became quite light.

THE Museum of the Kendal Literary and Scientific Institution possesses a valuable series of Carboniferous fossils. Most of the zoological groups are well represented, especially in relation to Brachiopoda and Gasteropoda, the former containing large examples of *Productus giganteus*, Martin, and the latter important specimens of *Euomphalus crotolostomus*, M'Coy, and *Phanerotinus cristatus*, Sowerby. The fossils are chiefly local, many of them having been collected by the once well-known geologist of Kendal, John Ruthven, who prepared the geological map for Miss Martineau's "English Lakes." This collection has recently been named, classified, and catalogued by Mr. R. Bullen Newton, F.G.S.

IN the letter by M. Antoine d'Abbadie in NATURE for May 29 (p. 101), the passage, "it was then 24m. 8s. past midnight," should be omitted.

THE additions to the Zoological Society's Gardens during the past week include two Squirrel Monkeys (*Chrysothrix scitorea* ♂ ♀) from Brazil, presented by Mr. Robert Thom; two Black-eared Marmosets (*Hapale penicillata* ♂ ♂) from South-East Brazil, presented by Mr. C. D. Middleton; a Common Squirrel (*Sciurus vulgaris*), British, presented by Mrs. Grover; a Marsh Ichneumon (*He pestes galera*), a Dusky Ichneumon (*Herpestes pulverulentus*) from South Africa, presented by Dr. Holub; C.M.Z.S.; two Sociable Vulturcs (*Vultur auricularis*) from Africa, an Angolan Vulture (*Gypohierax angolensis*) from West Africa, presented by Sir Donald Currie; a Gray Amphibæna (*Blanus cinereus*) from Spain, presented by Mr. W. C. Tait, C.M.Z.S.; a Burchell's Zebra (*Equus buchelii* ♀) from South Africa, two Common Camels (*Camelus dromedarius*) from Egypt, five Horned Lizards (*Phrynosoma cornutum*) from North America, deposited; five Goldeneyes (*Clanzula glaucion*), five Common Snakes (*Tropidonotus natrix*), twenty-four Green Lizards (*Lacerta viridi*), European, purchased; a Japanese Deer (*Cervus sika* ♀), a Mexican Deer (*Cervus mexicanus* ♀), a Long-fronted Gerbille (*Gerbillus longifrons*), born in the Gardens.

#### OUR ASTRONOMICAL COLUMN

THE OBSERVATORY OF PARIS.—Admiral Mouchez's report on the state of this establishment and the work accomplished therein during the past year commences with some details of his scheme for erecting a succursal observatory at a distance from Paris, where the disadvantages of location in the midst of a great city would be avoided. His proposal was to dispose of a part of the actual grounds of the Observatory, a step which would be likely to realise a sum adequate to the erection of the new building, at the same time retaining the present one to form the head-quarters of the Bureau des Calculs, the Archives, and the Museum, the two establishments to remain under the same direction and to constitute together the Observatory of Paris. This scheme, it is known, has not met with general acceptance at the hands of the scientific authorities.

M. Lœwy, in charge of the Meridian Service, has been occupied with the reobservation of stars in the Catalogue of Lalande, while a large number of observations of the sun, moon, and planets has also been made, eighteen observers taking part in this work in the course of the year. The equatorials of 12 and 14 inches aperture and the equatorial *coudé* were employed on observations of comets and small planets. The Ecliptical Charts Nos. 12, 19, 48, and 67 have progressed, and attention has been paid to double-star measures. M. Mouchez reports that the construction and installation of the great telescope (0.74 m.) has been retarded by the difficulty of establishing it in the grounds of the Observatory at Paris. In the Department of Astronomical Physics MM. Thollon and Trépiéd had been occupied for six weeks on the Pic du Midi, where, with M. Naussinat, in

present charge of the Observatory, they studied the advantages of the station, more especially for solar observations, concluding that great scientific interest would attach to work that might be accomplished during the four or five weeks of the fine season in a small observatory at that point. Funds for the purpose are not yet available.

M. Mouchez further reports upon the distribution of time in Paris, the additions to the Museum during the year, which consist of instruments of the last century found in the Observatory of Toulouse, a portrait of Copernicus, &c.; the work of the Bureau des Calculs, which remains in charge of M. Gaillet; the publications of the Observatory during the year, including vol. xvii. of the *Annales*, in which are some important memoirs theoretical and practical; and the personal work of the staff.

A plan of the grounds of the Institution is appended, on which are distinguished those portions which M. Mouchez had proposed to alienate with the view to providing means for the erection of an observatory at a distance from Paris.

THE GREAT COMET OF 1882.—In an appendix to the Washington Observations, 1880, is an account prepared by Mr. W. C. Winlock, at the desire of the Superintendent of the Naval Observatory, Admiral Shufeldt, on the great comet of 1882 as observed at Washington, first with the 9.6 inch and subsequently with the 26-inch refractor. The latest date on which the comet's position was determined is April 4, 1883. Micrometrical measures of the nucleus were made on a number of evenings, and from a plate showing its aspect and formation between February 1 and March 3 the difficulty of deciding upon the proper point for observations of position, owing to the existence of several almost equally luminous condensations in the head of the comet, is very apparent. For a similar reason, in another plate the points observed with the transit-circle from September 19 to March 3 are shown. There has rarely, if ever, existed a greater need for precautions of this nature, to assist in the combination of the places obtained at various observatories, for the accurate determination of the orbit. The comet was first seen at Washington shortly after noon on September 19, and was visible for several hours to the naked eye about twenty-eight minutes preceding the sun and 1°.2 further south. In the 9.6-inch equatorial "it presented the appearance of a bird with wings extended," a description that applies to other comets that have been seen in daylight or in a very strongly illuminated sky, as for instance the first comet of 1847, figured in Johnston's "Atlas of Astronomy."

#### GEOLOGICAL NOTES

CANADIAN COALS AND LIGNITES.—Dr. G. M. Dawson collects and publishes, chiefly from the Reports of the Geological Survey of Canada, some useful Notes on the Coals and Lignites of the Canadian North-West. These mineral fuels are all of Cretaceous and Tertiary age. They are extensively developed near the Bow and Belly Rivers and their tributaries, extending eastward from the base of the mountains to about the 111th meridian; but as this is the only region yet examined in detail by the Survey, there may yet prove to be other districts of equal value. Where the Cretaceous rocks have been much disturbed and folded, the coal passes into the condition of anthracite, of which a seam occurs on the Cascade River near its confluence with the Bow River and close to the line of the Canadian Pacific Railway. Out on the plains, however, the strata are nearly flat, and as they recede from the mountains the coals show a larger percentage of water, and assume more or less completely the character of lignites.

BELGIAN ERRATICS.—To the already cited examples of fragments of Scandinavian rocks in the post-Tertiary deposits of Belgium Mr. E. van den Broeck has recently added the discovery of a piece of granite (measuring 0.8 × 0.5 × 0.6 metre) in the most northern part of the kingdom, embedded in the fine Campinian sands of Wortel—apparently the first Belgian example of any fragment large enough to claim perhaps the name of an erratic block (*Ann. Soc. Géol. du Nord*, xi. p. 2).

POSITION OF THE CALLOVIAN ROCKS.—M. Paul Choffat protests against the inclusion of the Callovian among the Upper Jurassic formations, as was decided at the last Conference of the International Commission on Geological Nomenclature. This decision, based on the palæontological affinity of the Callovian and Oxfordian stages he believes to be theoretically false and to be practically impossible of application in any general map of the whole of Europe. He gives a *résumé* of obser-

vations which in his opinion demonstrate that in the chain of the Jura, the east of the Paris basin, and in Portugal the lower part and even the whole of the Callovian are locally replaced by an extension of the Bathonian deposits. — (*Jornal de Sciencias Mathematicas*, &c., Lisboa, No. xxxvii., 1884.)

THE GLACIAL BOUNDARY IN OHIO.—Prof. G. F. Wright has for ten years past been studying the glacial phenomena of the Eastern States of the Union. Beginning with the kames of the Merrimac Valley in Eastern Massachusetts, he has followed the last edge of the glacial trail from the Atlantic border across to the southern part of Illinois. How much further he may have to trace it westwards he is at a loss to know. Meanwhile he gives an interesting outline of his labours in a pamphlet just issued by the Western Reserve Historical Society of Cleveland, Ohio. The edge of the deposits left by the ice-sheet of the Glacial Period or "terminal moraine," as the American geologists call it, has been traced by him from the western part of Pennsylvania across the southern counties of Ohio and the northern margin of Kentucky to near the Miami and Ohio Rivers. It then enters Indiana and makes a great northward sweep as far as Martinsville, a little south of Indianapolis, whence it turns south-westwards and passes into Illinois a little above the confluence of the Wabash with the Ohio. The Report gives detailed maps of the "moraine" in its passage across Ohio, with descriptions of the nature and form of the drift ridges in the different counties and townships.

HYPERSTHENE-ANDESITE AND TRICLINIC PYROXENE IN AUGITIC ROCKS.—The United States Geological Survey has begun the issue of a *Bulletin* designed to appear from time to time in single parts, each containing a single paper complete in itself. These papers are to be such as relate to the general work of the Survey, but do not properly come within the scope of the Annual Reports or Monographs. The first number is devoted to the rocks of Buffalo Peaks, Colorado. A sketch of their geology by Mr. Emmons, the geologist in charge of the Rocky Mountain Division of the Survey, is followed by a detailed description of some volcanic masses by Mr. Whitman Cross, in which he continues his interesting researches on pyroxenic rocks. As fragments among the beds of tuff and likewise in place on the shoulder of the main Buffalo Peak, there occur certain augite-andesites the microscopic study of which reveals some important peculiarities. The pyroxenic constituent shows that a rhombic mineral, probably hypersthene, is largely predominant, while a great number, if not all, of the remaining crystals must be considered as triclinic. The occurrence of triclinic pyroxene had already been detected by the author among the crystalline schists of Brittany. He has been led to re-examine many pyroxenic rocks (diabase, melaphyre, basalt, &c.) from widely separated localities, with the result of finding, in some common rocks from well-known localities, that the augite, when placed between crossed Nicol prisms, is extinguished at a very decided angle from the diagonals of the prism. This abnormal action he thinks must show either that the mineral in question is triclinic or that there is an "optical anomaly." Following the example of Fouqué, who isolated and analysed the normal augite and unsuspected hypersthene of the Santorin andesite, Mr. Cross isolated the rhombic pyroxene of the rock of Buffalo Peaks, and proved its crystalline form by examining detached crystals under the microscope. He likewise submitted it to chemical determination, which proved it to be true hypersthene. These researches induced him to test the character of the pyroxenic constituent in other andesites from all parts of the world. He has found that a rhombic pyroxene is much more abundant in porphyritic crystals than augite. He suggests the need of a reclassification of andesite rocks, of which he thinks three main groups may be distinguished. At one extreme are the varieties with a trachytic character rich in felspar, often containing quartz or tridymite, and with a more crystalline ground-mass. At the other extreme are some basalt-like masses, but with little or no olivine. The normal "augite-andesites" form the intermediate group.

### KRAKATOA AND THE SUN-GLOWS

IN the last issue of the *Bulletin of the St. Petersburg Academy of Sciences* (vol. xxix. No. 2), M. Rykatcheff publishes a very interesting paper on the atmospheric waves produced by the Krakatoa eruption. General Strachey and Mr. R. H. Scott

(NATURE, vol. xxix. p. 181) have already shown how the eruption must have produced an atmospheric wave which has been noticed by the barometers at many meteorological observatories. The wave was propagated in concentric circles, increasing in diameter until it reached the great circle; then, it contracted until reaching a point on the antipode of Krakatoa, whence the wave returned in the same way to its point of origin; then, gradually diminishing in intensity, it made for a second and third time its way around the earth. M. Rykatcheff now publishes the curve of the barograph of Pavlovsk for August 27 to 30, where the influence of the atmospheric wave is pretty well seen; and he discusses the results obtained from observations at thirty-one different stations (Pavlovsk, St. Petersburg, Berlin, Leipzig, Magdeburg, Brussels, Paris (I. and II.), Toulouse, Greenwich, Kew, Aberdeen, Stonyhurst, Liverpool, Glasgow, Falmouth, Armagh, Valentia, Georgia Island, Coimbra, and Toronto). It appears from these observations, when calculated according to Gen. Strachey's method, that is, by taking the time between two successive passages of the wave at the same station, that, for European stations, on the average the wave took 36h. 38m. to make its way around the earth when it was going from east to west, and 35h. 54m. when going from west to east. The accordance of the figures for different observatories is striking (excepting Tolosa), the greatest deviation from the average being only + 33m. and - 38m. in the first case, + 27m. and - 39m. in the second. The average speed would thus be: for the first wave, 303.3 metres, and 316.1 metres for the second. The calculated time of the Krakatoa eruption would be between 9h. 6m. and 9h. 42m. Krakatoa mean time; or, on the average, 9h. 23m. When the calculations are made on M. Wolf's method (which admits the same speed in both directions), the average speed of the wave is 334.3 metres, and the time of the eruption would be 10h. 39m. Krakatoa mean time. Finally, M. Rykatcheff makes the calculations by deducing both speed and time of eruption from observations made at two stations next to Krakatoa (Pavlovsk and St. Petersburg), and then he calculates from equations made for all other stations the error of the two observations. He receives thus 321.4 metres for the speed of the wave, and 10h. 16m. for the time of the eruption at Krakatoa. These results are more in accordance, he says, with the result obtained by Herr Wolf's method, and, combining both, M. Rykatcheff takes as probable 327.9 metres for the speed, and 10h. 27m. for the time of the eruption. As to the amplitudes of the oscillations of the barometers at different stations, they vary from 0.9 to 1.7 mm. and reach 2.5 mm. at Georgia Island.

To the *Meteorologische Zeitschrift* for 1884 Dr. G. Hellmann contributes a learned paper on the recent glows. No theory is advanced as to their origin, and the interest of the paper is mainly historical. The oldest reference to similar phenomena the writer has been able to discover is that of the Flemish physician, H. Bruceus, who, in 1570, dedicated a "Tractatus de Crepusculis" to Tycho Brahe. In this work occurs the passage: "Cum autem diluculum initium sumat, ubi aer splendescere incipit, idque eveniat cum lumen solis ab aere, ob vapores permixtos crassiores, versus horizontem reflectitur, patet non in eadem distantia solis ab horizonte crepuscula semper incidere, quod non una sit semper aeris densioris sive vaporum, a quibus fieri possit radiorum reflexio, altitudo."

In the *Annales de Chimie et de Physique*, sixth series, vol. i. 1884, MM. Perrotin and Thollon deal with the same subject from the physical standpoint. They give an able *résumé* of the various accounts that have appeared, especially in NATURE, and seem on the whole disposed to accept the theory of the volcanic origin of the after-gloves.

A correspondent, F. A. R. R., sends us the following communication on the subject:—

The matter projected into the upper atmosphere appears to have passed round the globe westwards with great velocity, and to have diffused itself towards north and south much less rapidly. A stratum of fine dust thus formed itself at an elevation probably exceeding the altitude of the known upper currents. This stratum caused the sun to look green or blue on the Gold Coast, in the West Indies, at the Sandwich Islands, in India and the Indian Ocean, and last, as late as September 24, in the Soudan, nearly a month after the eruption of Krakatoa. The moon and stars were frequently greenish in Europe in December and January, up to four months and a half after the eruption, and the sun whiter than usual towards setting. The finely divided matter which thus deprived the sun and moon of