ness, and shares with Tibet the honour of being among the least-known countries in the world. Now, however, that both England and the United States have persuaded the Coreans to throw open four of their ports to commerce, we hope that our ignorance of an interesting land will soon be dispelled. Corea is almost half the size of France, and its population is variously estimated at from nine to fifteen millions. M. Elisée Réclus, in his "Geographie Universelle," compares the peninsula to Italy. Like Italy, it has a mountain chain running down the centre of the country, and giving off lateral valleys; as in the Apennines, the gentlest slopes and most fertile valleys are in the west, while the east is more precipitous and barren. As with Italy, Corea has in the north-west an Alpine mass, which guards her from intrusion there, though the mass does not really cover all the boundary. Of the geology we know but little, though many valuable minerals, including coal, are supposed to abound, and the country as a whole is capable of great development with proper guidance and suitable machinery. We trust before the inevitable Europeanising process is complete, that accurate information on the habits and customs, language, and ethnology of the Coreans will be obtained.

IN presence of the numerous and contradictory hypotheses as to the former geological history of the delta of the Amu-daria, it is obvious that no satisfactory scientific result as to the change of beds in the basins of the Amu and Syr-daria can be arrived at, without a thorough geological study of the different deposits of the rivers of the great Aral depression. A first step in this direction was made by the Amu-daria expedition; and now M. Hedroitz publishes, in the *Izvestia*, a valuable paper, giving the result of his researches in the same direction. Of course, one year is too short a time for thoroughly exploring this wide field; and M. Hedroitz's researches, however safe his method, and valuable his observations on the geological structure of alluvial deposits of different rivers of the Aral depression, on the motion of sand-dunes in the steppe, &c, are not yet sufficiently advanced to bring the author to a few general conclusions from his observations. His paper contains more valuable data than ready-made theories, and we hope that he will again return to the Amu to continue his researches. But one of his conclusions is worthy of notice. He does not admit that the Uzboy was a branch of the Amu-daria, as was admitted by the first explorers of this old bed. He supposes that there was a time (before the tenth century) when the Amu reached the Caspian, but by means of another bed which was situated south of the Sary-kamysh depression, leaving here the beds of "Amu-alluvium," which are seen in the lower parts of the Uzboy, but are missing in its upper parts. As to the Uzboy, it was but a temporary and irregular outflow of Lake Aral towards the Caspian, being rather a series of salt lakes and ponds, than a true river. Its name, Uz-boy (or "Uz-boyu," "along ponds"), would seem to confirm this hypothesis. The geological exploration would thus again call in question our established theories as to the former aspect af the Aralo Caspian basin.

HARTLEBEN, of Vienna, is issuing in parts a seventh German edition of Balbi's Universal Geography, under the editorship of Dr. Josef Chavanne, whose name is well-known as a scientific geographer and cartographer. Dr. Chavanne, to judge from the parts issued, is doing his work of editor conscientiously. In the mathematical and physical sections he seems to us to have brought the classical work abreast of the latest researches; and among the good points in the political geography are the statistics obtained at the recent censuses of 1881 and 1882, of all the leading countries of the world. While neither so detailed nor so picturesque as Réclus' "Geographie Universelle," the new edition of Balbi is perhaps more systematic and better adapted as a text-book, though it is published as a "house-book." With an exhaustive index the work will serve all the purposes of a succinct gazetteer.

THE leading article in *Petermann's Mittheilungen* for July is a long account of the unfortunate *Jeannette* expedition, with a map showing its drift from East Cape, north-west, to Bennett Island, and the route of the boats south-west to Lena mouth, after the loss of the vessel. The course of the expedition within two years was thus within very narrow limits, and the gains to science can be of comparatively small moment. A long letter from Dr. Emin-Bey describes his journey in the east of Bahr-el-Jebel, in March, April, and May of last year. Among the notes is a letter from Dr. Schweinfurth, describing the results of his journey in April and May this year, along the Nile above Siut, for the purpose of collecting data for his map of the Nile valley; he gives some notes on the geology of the region.

THE following extract from a letter from Mr. W. Thomas, Meteorological Office Reporter at Scilly, to Mr. Robert H. Scott, F.R.S., Secretary to the Meteorological Council, has been sent us for publication:—"Scilly, July 14, 1882. I beg to inform you of a curious disturbance of the sea at 9 a.m. yesterday, July 13, about low water, the wind S.S.W. The water flowed rapidly up to 3 feet perpendicular, and then ebbed out again. It flowed and ebbed three times; the second and third time was not so high as the first. From the first to the last was about half an hour.

THE *Bolletino* of the Italian Geographical Society for May and June contains a detailed account of the work of the expedition under Capt. Cecchi in Shoa, with a map.

THE Danish Arctic Exploring Expedition under the command of Naval Lieut. Hovgaard, sailed on Tuesday on her expedition.

THE Geological Society of Stockholm has despatched an expedition to Spitzbergen, having for its special object the increase of our knowledge of the vegetable palæontology of the island.

## BAROMETERS

THE subject is so old and well-worn that it is impossible to add anything new to it, still it is so large that there is no fear of its being exhausted by the few following notes. It will be going back quite far enough if we begin with Hook (*Phil. Trans.* i., 218, 1666), who invented the wheel barometer, and point out that *his* (1666) method consisted in using a mercury trough formed of two short open cylinders communicating near the bottom). Into one of these the lower end of the barometer tube was inserted while the float connected with the index rested on the mercury in the other. Derham (*Phil. Trans.* xx., 45, 1698), avoided the uncertainty caused by the float, cord, and index-bearings, and took his readings by means of a rod (terminating in a point) connected with the index by a rack and pinion. Gray (*Phil. Trans.* xx, 176, 1698) in the same year proposed the very method that is now in use for taking observations with the standard barometers, for he left the barometer tube free of all fittings and attachments, and read off the actual height of the mercurial column by means of a microscope (*sic*) sliding on a vertical scale. Fitzgerald (*Phil. Trans.* lii., 146, 1761) attached two movable indexes to the dial of the wheel barometer to show the highest and lowest points reached during any given period; and he also gave the float nearly the full range by having the upper part of the tube three inches in diameter, while the short upturned end was only half an inch diameter. In 1770 (*Phil. Trans.* lx., 74) he increased the range of the index by introducing a system of levers with arms of unequal length.

The earliest suggestion for increasing the sensitiveness of the barometer was made (1668) by Hook, who fixed over the mercury a narrow tube containing spirit. Descartes also proposed that same form of instrument which was made by Huyghens; but the uncertainty caused by the vapour-tension of the spirit rendered the readings so valueless that Huyghens (and this method was also claimed by De la Hire) connected the capillary tube with the shorter upturned end of the barometer, and thus did not interfere with the vacuum. Rowning employed the same principle, but bent the fine tube over, so that (though still parallel to) it was below the mercurial column; Hook's (*Phil. Trans.* xvi., 241, 1686) method of 1686 consisted in having enlargements at both surfaces of the mercury and another, open, over the capillary. Above the coloured spirit and water which came to a convenient height in the fine tube, he placed turpentine sufficient to partly fill the open enlargement. As the rise in the spirit-column was thus compensated (or nearly so) by the shortening of the turpentine column, it had no appreciable effect on the level of the mercury. The conical or pendant barometer of Amontons (1695) consists of a conical tube of very fine bore, containing the mercurial column, suspended with the wider end downwards. When the pressure of the air increases the mercury rises in the tube, but owing to the diminished diameter it occupies a greater length; when the pressure is less the column descends, until on reaching a wider part of the tube it is sufficiently shortened to restore equilibrium. Theoretically the range may be increased to any extent by having a tube of only very slight taper, but in order that the column may not break the bore must be so small that friction and capillarity render correct graduation impossible. Whiting (*Pogg. Ann.* cxvii., 656, 1862) proposed in place of that to use two tubes of different diameters joined together with, at lower surface of mercury, an ivory plate with a little glass bulb attached above it. In the horizontal barometer of Bernoulli and Cassini the longer range is obtained by enlarging the tube at the upper level of the mercury and replacing the cistern by a tube of fine bore bent at a right angle. In Sir Samuel Moreland's *diagonal* barometer the top part of the tube is bent more or less from the perpendicular. It is said to have been invented by Derham, as he refers to his "former communication about a crooked tube." The instrument at South Kensington bears date 1750, and was made by Watkins and Smith, London; that at Peel Park, Salford, is by T. Whitehurst, Derby, 1772; there is also one in the museum at King's College. Hicks (*Prov. Prot.* No. 740, 1862) proposed to increase the range by terminating the tube at the top in a coil. The *maximum* registering barometer of Traill is the same as the diagonal, but with the addition of a short steel rod in the tube above the mercury; his *minimum* is on the same principle as the horizontal barometer, but the bottom open tube forms a smaller angle than a right angle with the vertical tube. The steel rod is placed in this open tube above the mercury. Howson's (*Pat.* No. 1616, 1861) is on an entirely different principle, as in it the cistern is supported by the floating power of a sealed glass tube which is inserted in the mercurial column, and is attached to the bottom of the cistern. This was reproduced by Vidi (*Les Mondes*, iii., 25, 1863) two years later.

As the absence of air above the mercury renders the tubes very liable to fracture, from the bumping of the column against the top, when barometers are carried or moved, the means of rendering the instruments more or less portable has occupied the attention of several. Nairne long ago overcame this difficulty by making the lower half or two-thirds of the tube of very fine bore. Passemente (1758) adopted the expedient of twisting the middle of the tube so as to form two or three coils of a flattened spiral. Spry (*Phil. Trans.* lv., 83, 1765), who unfortunately gave no illustration, wrote, "The small bowl at the top with beads therein, render it far less liable to break by the mercury's ascent, the bowl giving it an immediate expanse from the column, and the beads counteracting in force as so many springs." Uzielli (*Deut. Chem. Ges. Ber.* v., 1055, 1872) makes a somewhat similar proposal: "Above 800 mm. a glass valve is inserted in the tube, so that by inclining the tube the mercury rises above the valve; then, on bringing the tube upright again, the air is above the valve and the valve is sealed by mercury."

*Recorders.*—In Fontana's arrangement the barometer tube and short open tube are cemented into elbows at either end of a short horizontal tube (in this there is a stopcock). A float on the surface of the mercury in the open tube transmits its motion to a small section of a horizontal cylinder about 700 mm. in diameter, and covered with paper. Every hour an impression is made on this paper by a steel point moved by a clock. Kreils used a siphon barometer, and connected the float with the shorter arm of an unequal lever. The longer end of the lever carried a pencil, which, being struck every five minutes by a hammer moved by a clock, made a dot on a sheet of paper fixed to a frame drawn horizontally in front of it. Negretti and Zambra attach the float by means of cords attached to a balance with unequal arms to a pencil fastened to a square collar. This collar moves freely up and down a vertical rod of square cross-section; the rod is near the vertical cylinder round which the paper is wrapped, and the same clockwork which causes the cylinder to revolve moves the rod (at regular intervals) so as to bring the point of the pencil against the paper. Keith (*Encyc. Metrop.* 1845) attaches the recorder to the float rigidly by means of a thin steel rod; but he obtains nearly the whole of the movement of the mercurial column in the open limb by attaching to the upper limb a horizontal tube of large diameter. He thus makes the movement of the upper surface of the mercury scarcely perceptible. Redier (Symons' *Met. Mag.* x., 33, 1875) connects one pole of a battery to the float, and the other pole to a metal point which is lowered at regular intervals to make contact. The same clockwork which lowers the point draws a pencil along (but not touching) the paper which is wrapped round a horizontal cylinder. At the instant at which electrical contact is made the pencil marks a dot on the paper; it is then drawn back, and remains at rest for a certain time, when the operation is repeated. By this arrangement the ratio between the movement of the pencil and that of the float can be increased to any extent without offering any resistance to the movements of the latter. The same principle is employed by Hough; but as his instrument is a complete meteorograph, the mechanical details are varied in order that the movements of the barometer may be recorded on the same paper as those of the other instruments. Theorell's is a very similar instrument; but, by means of type, the record is made in printed numerals. It is not easy to decide under what heading Russell's instrument should be described, but this seems its most appropriate place. The barometer tube is fixed, but the cistern (which is a small one) floats in a vessel of mercury. The pen is attached to a rectangular framework which is drawn backwards and forwards once a minute in front of the paper. On electrical contact being made between a lever attached to the cistern and the side of a wire triangle attached to the pen-frame, the pen is pressed against the paper, and thus the position of the cistern is recorded.

*Photographic Recorders.*—In Brooke's (1846) apparatus a lever with arms of very unequal length has its short arm attached to a float, which rests on the mercury in the lower end of a large syphon barometer. The long arm carries a screen with a small hole in it; through this hole the light from a lamp produces a mark on a sensitive paper which is wound round a vertical cylinder moved by clockwork. Ronalds (Brit. Assoc. Rep. 346, 1851), 1847, of whose apparatus in the South Kensington Museum the only part visible is the *case* which, for aught one knows, *may* contain nothing, made the surface of the mercury trace its own line without the intervention of a movable screen. A lamp is placed behind the barometer tube and a lens is so adjusted that the surface of the mercury may throw its image on a sheet of prepared paper or a daguerrotype plate, which is moved horizontally by clockwork. At the same time correction is made for temperature by means of the metal rods which support the cistern of the barometer. In the improved form (Rep. Met. Comm. Roy. Soc. 40, 1867) of the instrument the sensitive paper is wound on a cylinder driven by clockwork, and the time is recorded by a stop which intercepts the marking for four minutes every two hours. The temperature-compensating apparatus is attached to the vertical slit at the barometer, so that an alteration in the temperature is indicated by a variation in the base line on the sensitive paper.

Volpicelli (*Compt. rend.* lxx. 334, 1870; *Les Mondes*, xxii. 365, 1870) constructed a barometer of which the following are the main details:—The millimetre scale is on a sheet of glass, and is photographed with the barometric variations. A solution of alum is interposed between the lamp and the mercurial column to intercept the heat-rays. It is arranged to allow the barometer to be read off without moving any of its parts. The interior of the casing is freely ventilated, and the clock which moves the paper makes a mark every hour, so that the record is uninterrupted.

*Balance Barometers.*—The Steelyard barometer (Moreland) is one of the oldest forms of the above. The tube is suspended to the shorter arm, and is balanced by the longer arm, at the end of which is the pointer, which moves over a graduated arc. The cistern is but very little wider than the tube; thus when the atmospheric pressure increases, the pointer rises, and *vice versâ*. The static barometer (Magellan) is very similar, except that the balance has arms of equal length, and the tube is balanced by a weight; the pointer is attached under the beam, and the extremity of it moves to and fro along a horizontal scale. Wild, in his recording-barometer, uses a tube with an enlarged upper extremity, so that the variations in weight produced by the alterations in the pressure of the air may be considerable. A pencil at the end of the pointer, which is fixed below the beam, records on a horizontal cylinder. The balance has a bent beam, the arm from which the tube is suspended being horizontal, and the arm to which the counterpoise is rigidly attached descending obliquely. Secchi (1867) used a slightly-bent beam with arms of equal length; the pointer which descended from the beam terminated at its lower extremity in a hinge, to which was attached one end of the horizontal rod, which carried the recording-pencil; parallel motion was obtained by a rod to which the other end of the horizontal rod was hinged. The record was made on a flat descending sheet of paper. Brassart (1872) did not in any way alter the principle of the instrument, but arranged it in a slightly different manner, so as to render more compact the meteorograph of which it formed a part. Schreiber makes his instrument record on a vertical revolving cylinder by means of a pencil attached to a rod suspended from the other arm of the balance; this rod hangs free, and is hit by a hammer, moved by clockwork, at intervals of ten minutes.

O'Reilly's is a balance barometer, but not at all similar to the foregoing, as the cistern is fixed to the tube, and the instrument is inclined from the vertical, and suspended by knife edges. The variations in the length of the mercurial column cause it to incline more or less, the amplitude of movement showing itself on a graduated arc by means of an index.

Cantoni employs a balance, but he has the tube fixed, and suspends the cistern, which is a small one, from one arm of the beam, to which is attached (underneath it) a pointer. Cecci adopts the same principle, but traces the record on smoked glazed paper (wound round a horizontal cylinder) by means of a long pointer fixed over the beam. The floating barometer of McGwire (Irish Acad. *Trans.* iv. 141, 1791) is a balance barometer, as its weight is counterpoised, or nearly so, by the wooden ring attached to the bottom of the tube. A very similar instrument was patented by McNeill (Patent, No. 1733, 1861).

*Cistern Arrangements.*—Prins maintained that by the following arrangement he obtained a constant level in the cistern. The reservoir has a glass cover a little below its rim; this cover has a hole in the centre rather larger than the tube which passes through it, through this space the mercury rises and spreads more or less over the cover. In Gloukhoff's barometer the mercury in the cistern is forced by means of a screw to pass through a hole, and to cover a glass ring. Then the movable scale is lowered so as to make the steel end touch the surface of the mercury. Amagat proposed to adjust the level in the cistern by means of an iron or glass cylinder which was forced down by a screw. Poleni (1740) adjusted the level by the immersion of a screw. Austin (Roy. Irish Acad. *Trans.* iv., 99, 1791) kept the level of the mercury in the cistern constant by overflow from an aperture in the side into a bag underneath. Hamilton (Roy. Irish Acad. *Trans.* v., 95, 1792) fitted his barometer with an ivory cistern, the upper part of which was closed by a cork ring; this being porous allowed air to pass through, but retained the mercury. The cistern which is most used is that of Fortin; it is a short, wide, glass cylinder which is fixed by three pillars, the ends of which have screws passing through an upper and a lower brass plate, by means of which the necessary pressure can be applied to make it mercury-tight. At the bottom of the cistern is a leather bag, which is raised or lowered by an adjusting screw, so that the surface of the mercury may be brought into contact with an ivory point which forms the zero of the scale; this point is seen through the glass cistern. The cistern of Green's barometer, which is used by the United States Signal Service, is essentially the same as Fortin's. Negretti and Zambra (Patent, No. 238, 1861) patented the following. The cistern is screwed at the upper part to fittings near the bottom of the tube, so that by turning it round it will be raised until a cushion or pad placed at the bottom of the cistern is brought up against the open end of the tube. Alvergnat (*Rev. Hebd. d. Chim.* March 1870) proposed a very elementary form on the same principle. Paul de Lamanon ("Observations sur la Physique," xix., 3, 1782) in order to determine to what extent the expansion of the mercury influenced the height of the column, marked a zero point on the shorter limb of a siphon barometer. Gay-Lussac (*Ann. de Chim.* i., 113, 1816), who pointed out that, by having the tube of the same diameter at both surfaces of the mercury, correction for capillarity was unnecessary, also made his barometer portable by sealing the top of the shorter limb with the exception of a very fine hole. At the same time he made the lower portion of the longer tube and the bend of tube of sufficiently small diameter to keep the mercurial column from breaking. Bunten introduced a great improvement by inserting an air-trap in the barometer tube. This he effected by drawing off the lower extremity of the upper half of the tube to form a capillary; he then sealed the lower half of the tube to the shoulder of the contraction, so that any air accidentally entering the tube would collect round this shoulder and not break the continuity of the column or destroy the vacuum. Lefranc (*Pogg. Ann.* lxxiv, 462, 1849) objected to Bunten's tube as being very liable to fracture, and proposed to guard against the admission of air by drawing off the lower limb of the siphon to a capillary tube, and then fitting to this tube by means of a perforated cork a short tube which is, midway, contracted to a very small diameter. De Luc used the siphon barometer, but made the instrument portable by inserting in the shorter limb an ivory stop-cock which had a cork plug, but with a small ivory tube in the cork. Blondeau constructed a very similar instrument, but made it of iron, and took his readings by means of a float. Stevenson's is an iron siphon barometer provided with stop-cocks at both limbs, so that it can be easily charged or emptied. Bogen (Patent, No. 2532, 1877) patented the following barometer:—The long leg of the siphon is closed at one end, and is supplied with a glass stopper, with a fine hole through it, at the other. The tube is filled, the stopper is inserted, and, the hole through the stopper being closed by the finger, the tube is inverted and a portion of the mercury allowed to flow away to produce a vacuum. The short leg is of the same diameter, and is formed with a semicircular bend at one end, which is ground to receive the open end of the long limb. The short limb is then partly filled with mercury, the two parts are fitted together, and the tube is brought to a vertical position. The level is read off by the same method as that employed by Derham, but with screw in place of rack and pinion. It stands on a centre, so that by turning the instrument round it can be seen whether the column is vertical. Greiner (Dove's *Repert. d. Phys.* i., 31, 1837), 1835, drew the bend off to a capillary, which entered the bottom of the open limb of the siphon. A short distance from the bottom this tube is contracted, and when the barometer is to be moved a plug is pressed into this contraction. W. Symons (Patent, No. 813, 1863) proposed to have no contraction, but to make the plug close the capillary opening. Dorwin (Patent, No. 1386, 1862) suggested a siphon barometer with cistern and stopcock in place of open limb; the cistern to be covered with chamois leather, and the stopcock to have india-rubber connectors above and below. Bohn constructs his instrument with enlarged tubes at the two surfaces of the mercury; the lower one surmounted by a narrow tube for the purpose of filling, and the upper one by a stopcock to facilitate the operation.

JAS. T. BROWN

## ON MONOSTROMA, A GENUS OF ALGÆ

NOW that so much time and thought are devoted to the study of the green algæ, Dr. Wittrock's elaborate Monograph of the genus Monostroma[1] will be found a most desirable addition to our knowledge of these plants. The following abstract of this very interesting work may therefore not be unacceptable to the reader.

In the Introduction Dr. Wittrock, who writes in Swedish, relates all that is known concerning the history of the formation of the genus, the discovery of the species, the changes which have taken place in the classification, and the works which treat of the subject.

The genus Monostroma was formerly included in Ulva. Kützing was the first who divided the species of Ulva into those which were formed of one layer of cells and those which consisted of two layers. The former he called Ulva, the latter Phycoseris. Thuret afterwards formed the species with one layer into the new genus Monostroma. According to his arrangement Monostroma is included in the second order Zoosporeæ, sub-order, 1, Chlorosporeæ.

Of the affinities of Monostroma it will be sufficient to say that, through the bladder-like form at an early period of growth of two species, *M. bullosum* and *M. Grevillei*, (the *Ulva lactuca* of Harvey), it approaches to Enteromorpha, from which it differs in acquiring, at a later period, an expanded leaf-like form, whereas Enteromorpha always retains its tubular character. But a more effective distinction is found in the structure of the frond, which shows a nearer affinity with Tetraspora (which belongs to the Palmellaceæ). The chief distinction between Monostroma and Tetraspora lies in the zoospores, which, in *M. bullosum*, are (as in the other Ulvaceæ) oval, with the smaller end somewhat drawn out into a kind of beak (rostrum), to which cilia are attached. In Tetraspora the zoospores are nearly round, without a rostrum, but with two long cilia fastened to the zoospores, which can only be distinguished by their lighter colour.

To Prasiola Monostroma is also near. From this it is distinguished by the position of the cells, which are here never arranged in quadratic or rectangular groups, and by the holdfast or root-organs.

The frond (thallus) in Monostroma, at least in mature specimens, is a flat, membranous expansion. In two of the species it is, when young, in the form of a bladder or closed bag, which soon splits

[1] Försök till en Monographi öfver Algslägtet Monostroma, af V. B. Wittrock. Upsala, 1866.