surface of the ice to a very choppy sea, on to which has rained innumerable stones and rocks. The depressions are often 100 feet deep. On this moraine were found shale and slate granite quartz, with sulphates and pyrites and copper. After several ineffectual attempts Mr. Topham and his companions decided to ascend St. Elias on the south-west side, west of the Chaix Hills. The party ultimately, from their camp 1500 feet high, reached the brink of the crater, 7600 feet above sea-level and 5000 above the Tyndall glacier; another six hours found them at a height of 11,461 feet. They were then on the northern and upper rim of the crater, and judged the summit to be another seven or eight thousand feet above. The crater is full of ice, and upon its precipitous cliffs are a number of over-hanging glaciers, splashed, as it were, upon the rocks and unattached from the snow-fields above. This is characteristic of a number of the glaciers in the neighbourhood. There they are —right on the rocks, with yawning crevices upon them broken up and ready to topple over upon you. Perhaps in a few years they will have melted entirely away. Everything, Mr. Topham states, around St. Elias bears evidence to the conclusion that the long period of ice through which the land has been passing is now coming to an end; a conclusion which is certainly rash. Mr. Topham gave a detailed description of the panorama to be seen from the highest point reached. There is, he states, vegetation upon the south-east slopes of the hills to a height of 1500 feet above the glacier. The greatest height at which he found vegetation, exclusive of lichens, was 4500 feet above the sea, but the place was exposed to the full glare of the sun, and no other vegetation was found for an interval of 1500 feet below. A characteristic of the Alaskan glaciers is the curious way in which small isolated bits of moraine show up here and there above the ice. For example, you may walk down the centre of the Tyndall upon white ice without seeing more than a few stones to suggest the existence of a moraine, and suddenly you will come upon an island of *débris*, disconnected from any regular moraine. It springs from nowhere, is quite isolated, and appears to have no reason for being there.

BIOLOGICAL NOTES.

THE RATTLE OF THE RATTLESNAKE.—The habit of sloughing is common to all serpents: a short time before the removal of the old skin takes place, the new epiderm makes its appearance beneath the old. The mode of growth of the new and the removal of the old is the same in all snakes, with the exception that, in those with a rattle, that portion of the slough that covers the tip of the tail is retained to form one of the rings of the rattle. The attachment is simply mechanical; the rings are merely the sloughs off the end of the tail. The terminal bone of the tail is formed of vertebræ that have coalesced and changed in great measure their shape; in the different species the number of vertebræ included in this bone varies considerably, and sometimes it varies in individuals of the same species. With the purpose of indicating the manner of growth of the rattle, and as far as possible determining its origin, Mr. S. Garman has followed up its appearance in several species, full details of which, with figures, have been lately published. In the very young rattlesnake, while the vertebræ are still separate, there is no rattle, but about a week after birth a well-marked button is seen; with the first slough the first ring is set free, the button being pushed forward, and a third button is gradually perfected. In time the traces of the vertebræ in the terminal bone are almost obliterated; the bone becomes thickened, pushed forward at its edges, and otherwise enlarged. In a full-grown rattlesnake the hinder seven of the rings belong to the period of the snake's most rapid growth—they form the "tapering rattle" formerly used in classification of the species; while four of the rings and the button are formed while the gain in size was less rapid, and form the "parallelogrammic rattle" of the old classifiers. Many serpents besides those possessed of a "crepitaculum" are addicted to making a rattling noise by vibrations of the end of their tails. In illustration of the extent to which the tail has been modified in different cases, Mr. Garman figures the tails of several species, among others that of *Ancistrodon contortrix*, Lin., the copperhead of the United States. The tip of its tail is directed downwards as well as a little backwards; most often the button has one or two swellings in a degree resembling those on a ring of the rattle. A living specimen of this snake, kept for a year or more, would take to rattling on the floor whenever it was irritated; the sound was made by the terminal inch of the tail, this part being swung from side to side in the segment of a circle, so that the tip might strike downward. The result was a tolerable imitation of the sound made by a small rattlesnake.—(*Bulletin Museum Comp. Anatomy*, vol. xiii. No. 10, August 1888.)

A NEW SPECIES OF LAMINARIA.—The discovery in the Mediterranean Sea, midway between Marseilles and Algiers, of a Laminaria, not only new to the shores of Europe, but an addition to the group—one, too, neither small in size nor obscure in its characteristics—is a very interesting fact for botanists. *Laminaria rodriguezii* has been described by Dr. Ed. Bornet in a recent number of the Proceedings of the Botanical Society of France. It was taken by M. J. Rodriguez a few miles south of Port Mahon, on a rocky bottom, in a depth of from 125 to 150 metres. It was also taken on the east and north coasts of Minorca. It appeared to be abundant in the first-mentioned of these localities. The fronds grow to a height of 2 metres. In general aspect, consistence, and colour this new species somewhat resembles *L. saccharina*, but it cannot be for a moment confounded with this well-known form. It is attached to the stones upon which it grows by a series of little root-like processes, which emanate from stolons running over the surfaces of the stones. From these stolons the young fronds arise, and in specimens with adult fronds, a whole colony of small fronds will be found springing from the stolons. *Lam. bongardiana* and *L. longipes* of Kamchatka, *L. japonica* from Japan, and *L. sinclairi* from California, are the only known species, with simple fronds, which possess these rooting stolons, but none of these can be confounded with the present new form. Of the five species of Laminariaceæ which have been from time to time recorded as occurring in the Mediterranean, this is the only one that is without any doubt a native. *Phyllaria reniformis* may possibly be indigenous, but *Ph. purpurascens*, *Lam. saccharina*, and *Sac. bulbosa* are almost certainly waifs that have been only met with in the neighbourhood of ports. The *Lam. saccharina*, Ardissone, found growing at Syracuse, in Sicily, proves, however, to be Bornet's new species, which is the sole representative on the Atlantic sea-board of the Pacific Ocean forms above referred to. —(*Bull. de la Soc. Bot. de France*, tome xxxv. pl. 5.)

THE ENVELOPES IN NOSTOCACEÆ.—M. Maurice Gomont has printed a brief abstract of his researches on the investing envelopes of the filamentous Nostocs. The thallus in these consists of the simple row of cells, the trichome, and the protective envelope, more or less marked (the gaine); when the hormogones are dispersed, this latter disappears. In a 33 to a 50 per cent. solution of chromic acid, the gaine becomes swollen and dissolves, leaving only a tube-like pellicle; next the protoplasm of the trichome cells becomes greatly changed, leaving the cell-walls clearly defined. These consist of an external layer, seemingly intermediate between the membrane met with in the hyphæ of Fungi and the cuticle of the higher plants; it has a remarkable power of resisting the action of acids: in a 33 per cent. solution of chromic acid or in concentrated sulphuric acid, it remains unchanged for a space of twenty-four hours; it is insoluble in hydrochloric or acetic acids, or in caustic potash; it is dissolved in a 50 per cent. solution of chromic acid, but only after several hours; with aniline or fuchsine it assumes a brighter hue than ordinary cuticle. The interior layer gives the reactions of cellulose. The chemcal properties of the gaine prove it to be a true cuticle.—(*Journal de Botanique* for 1888.)

THE SCOTTISH METEOROLOGICAL SOCIETY.

AT the half-yearly meeting of the Society, held on Monday, April 1, it was stated in the Report of the Council that new stations had recently been added in the Newington District of Edinburgh, and in the Botanic Garden, these additions to the observing staff being regarded with much satisfaction, particularly in view of the facilities which a somewhat thickly planted series of stations in Midlothian offer, in the observation of the physical data required in investigating the various meteorological gradients, as proposed by the late Mr. T. Stevenson. Dr. Archibald Geikie, Prof. Crum Brown, and Prof. Bayley Balfour were elected Members of Council.

The inspection of the fishery barometers of the Meteorological Council at fifty-four of the fishing ports on the Scottish coasts has now been completed by Mr. Dickson, who gave much

attention, by short lectures to the fishermen, conversations with them, and otherwise, to awaken an interest in weather forecasts and their intelligent interpretation. Though the giving of the lectures is practically limited to the Saturdays, when the fishermen are disengaged, yet opportunity was taken to deliver eleven lectures, which were attended by audiences varying from 40 to 250. The method of proceeding was to give, by the help of weather charts, a short explanation of the law of storms, and an account of the weather of the week immediately preceding the lecture. The fishermen were then invited to ask questions, and raise discussions on the subjects of lecture.

During the winter Prof. Balfour engaged Mr. Turnbull to give fourteen lectures to the *employées* of the Garden on meteorology, in which marked prominence was given to the practical side of the science, explaining and teaching them to handle each instrument—why it is placed in the position it occupies, and not elsewhere; and showing the methods of reducing the observations. The efficient training of a body of men from which the Council largely draws its observers is a matter of no small importance. A suitable site has been procured in Fort William for the proposed low-level observatory, and plans of the buildings prepared by their architect, Mr. Sydney Mitchell, and submitted to the Directors and the Meteorological Council, and approved of. The plans and specifications are at present in the hands of the contractors, and the building will forthwith be commenced.

Mr. Herbertson exhibited to the meeting an instrument, named the stephanome, designed by Prof. Tait, for use at the Ben Nevis Observatory for measuring the angular size of halos, fog-bows, glories, &c.; also a valuable collection of sixteen photographs taken at the Observatory, of which the following are of special interest: a cirrus cloud in the northern horizon, taken at midnight in June, when the clouds are seen to be brightly illuminated; St Elmo's Fire, at 11 p.m. on the top of the stove-pipe; and views of the Observatory after continued fog and strong wind, but no fall of snow, when everything is covered with long crystals of ice formed out of the fog.

Dr. Buchan read a paper on the distribution of storms round the Scottish coasts, based on the observations made at the lighthouses during the past seven years. The year is divided by the equinoxes into two strongly contrasted portions as regards storms of wind. The minimum occurs in July, and the maximum in January. Over the whole country there is an annual average of 431 hours of storm occurrence. Dividing Scotland into seven districts, the following is the order of occurrence: Firth of Clyde, 327 hours; Tweed to Aberdeen, 373 hours; Aberdeen to Caithness, 379 hours; Fort William to Islay, 408 hours; Cape Wrath to Mull, 435 hours; the Irish Sea, 508 hours; and Orkney and Shetland, 562 hours. From a report prepared by Mr. Omond it appears that, on an average of the past five years, the wind at the Ben Nevis Observatory has risen to or exceeded the rate of 45 miles an hour, 849 hours per annum.

Mr. H. N. Dickson read a paper on "The Weather Lore of Scottish Fishermen." The fishermen had a very complete and generally accurate knowledge of weather phenomena as far as it was purely a matter of observation. In the course of his inquiries he had got a great deal of miscellaneous information from them on prognostications. The prognostications which received the greatest acceptance among the fishermen were those of halo, coronæ, and mock sunrises. It is a belief current from Aberdeen to Wick that, if a sun-dog preceded the sun, it was a sign of good weather, but if it followed the sun it was a sign of bad weather. Another very general belief in prognostications was the existence of spiders' webs amongst the cordage of ships and in sails. That was a very general belief all along the coast. There was another prognostication which was currently believed in by the fishermen, taken from the occurrence of broken rainbows, which are called "packmen," from the fact that the packmen sold pieces of coloured ribbon. As regards the cirrus cloud, in Shetland and Orkney and on certain parts of the west coast, but not on the east coast, there was an almost universal belief in "weather-heads." If these "weather-heads" ran in the direction of north-east to south-west, it was a sign of good weather, but if it ran south-east to north-west, it was an unfavourable sign. If the aurora rises in the north, and does not come past the zenith, it is a sign of good weather; but should the streamer extend beyond, a gale of south wind is expected. The only other point with regard to the aurora was that in Shetland it was supposed to be near a very severe gale if the aurora emitted a sound resembling the shaking of a blanket. Another prognostication, very interesting in its way, and which all fishermen had seen, is the "false dawn." The "false dawn" was when the dawn seemed to break, and then disappeared. There was some question as to whether it was a prognostication. At St. Andrews they were almost unanimous in believing it as a prognostication, and in other places he got individuals who believed it was a sign of good or bad weather. It was interesting in this way that he had never heard of the "false dawn" as a prognostication before, and he made some investigations as to whether it was common in other parts of the world, and he found it was also current among the Negroes of South America. In Shetland there was a class of prognostications which did not appear anywhere else. It was a sign of a coming gale if the surface of the water became stiff and bubbles remained in the wake of a boat, and if the wake of a boat remained visible for an unusually long time. Another prognostication was known as "cheepers." A sound was heard as if a lot of little birds were floating above the boat, and gave a sort of cheeping sound. That was also called "foul air" by another class of fishermen. In the Outer Hebrides the state of the air was almost the only thing the men paid attention to. It was current all down the west coast that a heavy surf was the sign of a gale approaching, but on the east coast one did not hear much of the heavy surf. He had found among the fishermen much less superstition than they usually got credit for, especially at the largest stations. In the smaller stations, where the boats were very small, there was still a good deal of superstition. In the larger stations, where the boats were large and the men went far out to sea, there was a great deal of faith in weather prognostications and a strong desire for instruction.

Mr. H. N. Dickson also added a note on the temperature of the water round the east coast of Scotland. The curve of the daily variation of temperature in the North Sea was as nearly as possible symmetrical above and below the mean. That was the case where there was reason to believe the water was almost stationary. In observations taken in the North Atlantic and on the west coast of Scotland in warm currents of water, as long as the curve was below the mean, it was almost quite straight, and when above the mean the maximum was intensified and sharpened. In observations taken in the cold Polar current off the Island of Jan Mayen the opposite was the case, the curve being deep below the mean and flat above it.

Mr. Philip Sewell gave a few notes of a voyage he made to Siberia last summer. From the temperature observations and other information submitted, he considered trading to the mouths of the Obi and Yenissei to be practicable in ordinary summers.

TWO-NOSED CATENARIES.[1]

THE curve to be given to an ideal linear chain or rib under uniform-vertical-load area between itself and a horizontal straight line is well known to be a Transformed Catenary, having its ordinates in a constant ratio to the corresponding ordinates of a Common Catenary inverted, with the horizontal straight line as directrix (Rankine, "Civil Engineering"; Church, "Mechanics of Materials," &c.).

Thus, the equation of the Common Catenary being—

$$\frac{y}{m} = \cosh \frac{x}{m},$$

using the notation of the hyperbolic functions, then the equation of the Transformed Catenary will be—

$$\frac{y}{m} = r \cosh \frac{x}{m},$$

r being a fraction, greater or less than unity.

The authors of this paper appear to have been the first to notice the elegant mathematical fact that, for values of r numerically less than $\frac{1}{3}\sqrt{3} = 0{\cdot}577$, the Transformed Catenary possesses two points, equidistant from the vertex, at which the curvature is a maximum; so that in the practical design of masonry arches, which are almost always made circular, a better

[1] "Two-Nosed Catenaries and their Application to the Design of Segmental Arches." By T. Alexander, C.E., Professor of Engineering, Trinity College, Dublin, and A. W. Thomson, B.Sc., A.M.I.C.E., Lecturer in the Glasgow and West of Scotland Technical College. (From the Transactions of the Royal Irish Academy, vol. xxix. Part 3, 1888.)