

monthly wind-directions as estimated from the observations of the month. This chart shows high pressures over the whole country, with northerly and north-westerly winds, the two combined producing the generally cold weather of the month. The extremes of cold, however, were not so great as is usual in January. The mean lowest minimum temperatures, from 47 stations of the signal-service in the different states, is  $-6.8^{\circ}$ , while the same places indicate a mean greatest cold for all the years of observation of  $-13.3^{\circ}$ . The following are exceptions: Pike's Peak,  $-37^{\circ}$ ,  $4^{\circ}$  lower than in the same month for the last eight years; Dubuque, Io.,  $-26^{\circ}$ ,  $2^{\circ}$  lower; Pioche, Nev.,  $-17^{\circ}$ ,  $3^{\circ}$  lower than before observed in Nevada; Santa Fé, N. Mex.,  $-13^{\circ}$ ,  $4^{\circ}$  lower; and Spokane Falls, Washington Territory,  $-28^{\circ}$ ,  $20^{\circ}$  lower than before noted in the territory. The lowest temperature reported from any station was  $-54^{\circ}$ , at Elko, Nev., on the morning of the 19th. The range of air-pressure was much less than during any January for five years.

There were sixteen storms traced within the United States and Canada. The following table gives the number of storms within the United States in each January since 1877. For the purpose of comparison, there are added the mean velocity, in miles per hour, of the storms in each month, as taken from the annual reports of the chief signal-officer.

TABLE OF JANUARY STORMS AND THEIR MEAN VELOCITY.

Year.	Number.	Velocity.	Year.	Number.	Velocity.
1877	14	37.7	1881	9	32.3
1878	12	26.3	1882	13	42.8
1879	8	35.5	1883	16	39.8
1880	14	37.6			

The heaviest snowfall was 52 inches, at Fort McDermitt, Nev.

The total movement of the wind ranged from 27,561 miles, on Mount Washington, to 1,853 miles, at Jacksonville. 100 miles per hour, and over, were reported from Mount Washington on the 3d (152, maximum for month), 4th, 12th, 18th, 20th, 21st, 24th, and 31st.

There were ordered up 149 cautionary signals, of which 79.9 per cent were fully justified.

No marked displays of the aurora were noted. Sun-spots were reported by Mr. D. P. Todd of Amherst, Mass., as seen on 11 days. They were least numerous at the first and last of the month, with a maximum frequency about the 16th.

An earthquake-shock was felt early on the

morning of the 11th in Nashville, Jackson, Clarksville, and Memphis, Tenn.; Paducah, Ky.; Cairo, Anna, and Collinsville, Ill.; and at St. Louis and Protem, Mo.

A drought of great severity was reported from parts of Maine and Vermont.

Among numerous other statistics, are tables of monthly rainfall and mean temperature at Sacramento, Cal., for thirty years, — from 1853 to 1882 inclusive.

### THE GEOLOGY OF LAKE SUPERIOR.

MR. SELWYN, the director of the Geological survey of Canada, has given in *SCIENCE* for Feb. 9 (p. 11) a note on the age of the rocks on the north shore of Lake Superior. The uncrystalline strata of the region, more or less associated with igneous rocks, are, as is well known, unconformable to and distinct from the Huronian. Mr. Selwyn includes them in ascending order in three groups, which will be found described in detail in the *Geology of Canada* in 1863.

1. Blackish and bluish argillites, with chert, and black or dark-gray magnesian limestones and sandstones, often with magnetite, the series being generally colored by carbonaceous matter.

2. Red and white sandstones and conglomerates, with red, white, and mottled shales, dolomites, and dolomitic marls, constituting the Nipigon group of Black bay and Nipigon bay. With these he classes, following Logan, the great mass of strata, including melaphyres, amygdaloids, and tufas, with native copper, — the Keweenaw or cupriferous series of Michipicoton, Mamainse, and Pointe Aux Mines.

3. The sandstones of Sault St. Mary.

Between these three groups, according to Selwyn, 'there may be slight unconformities;' but he would include the whole of them in "those divisions of the great lower paleozoic system which underlie the Trenton group," and would call them lower Cambrian; asserting that there "is at present no evidence whatever of their holding any other place in the geological series," and "no sufficient reason for inventing or adopting new and unknown names for them."

These conclusions, it should be noticed, are arrived at after a first visit of a few weeks to certain parts of a vast, new, and peculiar region, which has engaged the attention, during the past forty years, of many skilled observers, who have collected, with regard to the whole of the Lake Superior basin, a great body of facts, and have reached conclusions with which Mr. Selwyn would seem to be wholly unacquainted. The problems presented by the rocks in question are far from being as simple as he supposes.

Mr. Selwyn includes in his second division both the Nipigon group of Bell and Hunt, and the Keweenaw or cupriferous series, of which he conceives the third division, or St. Mary sandstone, "may be only the upper part, without any intermingling of volcanic material." This view of the continuity of the cupriferous series with the Potsdam (St. Mary) sandstone was maintained by Whitney; but Logan, in 1863, put forth strong, and to most minds conclusive, reasons for believing that the highly inclined cupriferous rocks at the east end of the lake pass unconformably below this sandstone (*Geol. Canada*, p. 85; also *Geol. report Canada for 1866-69*, p. 474). His conclusions have since been confirmed by other observers, notably by Strong and Irving in Wisconsin,

where the fossiliferous beds of the Potsdam rest horizontally on the upturned edges of the Keweenawian, and are made up, in part, of its ruins. Parts 1 and 6 of the third volume of the *Geology of Wisconsin* (1880) will show the accumulation of evidence with regard to the stratigraphical relations of the Keweenawian; and few will be found to-day to question the propriety of the conclusion announced by me in 1873, and subsequently by Major Brooks in 1875, that the copper-bearing rocks of northern Michigan constitute, in his words, "a distinct and independent series, marking a definite geological horizon," which has been designated the Keweenaw series, Keweenawan, or, more euphoniously, Keweenawian.

These rocks, so carefully studied by Brooks and Pumpelly on the south shore of Lake Superior, and largely displayed on Isle Royale, Michipicoton Island, Mamainse, and Pointe Aux Mines, on the north shore, were by Logan supposed to be the same with the red and white sandstone and marls, with dolomites and brine-springs, found along Nipigon Bay, Black Bay, and Thunder Cape. He recognized beneath these, in this region, the black slates, etc. (1 of Selwyn), which Logan supposed to form a lower subdivision of what he called the upper copper-bearing series, to distinguish it from the lower copper-bearing or Huronian series, which is overlaid unconformably by these black slates.

This lower subdivision, which I have called the Animikie group, though seen at Thunder Cape between the Huronian and the Nipigon series, is wanting in Black Bay, where Logan found the latter to rest directly upon the Laurentian; and also, according to Bell, on Lake Nipigon, where the Nipigon series reposes on Laurentian and Huronian. Apart from the evidence of its distinctness deducible from the absence of the Animikie in this area at the base of the Nipigon series, I have described a locality near Silver islet, where the basal beds of the Nipigon, resting upon the Animikie, hold pebbles of the characteristic rocks of the latter.

The mineralogical and lithological characteristics of the Nipigon rocks differ so much from the Keweenawian as to create a suspicion that they may belong to two distinct series. In this connection an observation of Macfarlane is important. He found the true Keweenawian at Mamainse to be unconformably overlaid by a series of bluish sandstones and shales unlike those of the St. Mary series, and, on the contrary, closely resembling those of the Animikie group, to which he compares them. A summary of the evidence regarding these rocks will be found in my *Azoic rocks* (*2d geol. survey of Penn.*, report E, pp. 230-241).

Meanwhile, it may be regarded as established that we have, in the Lake Superior basin, (1) the Keweenawian or cupriferous series, resting unconformably upon the Huronian and other crystalline rocks, and (2) lower Cambrian (Potsdam) strata lying unconformably upon the Keweenawian. We have, moreover, (3) the Animikie and (4) the Nipigon group, — two series of strata distinct from each other, and apparently from both of the preceding divisions. The observation of Macfarlane makes it probable that the Animikie belongs to a series newer than the Keweenawian; in which case the lithological unlikeness of the still younger Nipigon group both to the Cambrian and the Ordovician (Siluro-Cambrian) rocks of the Lake Superior basin, would, as I have remarked in the report just cited, raise a suspicion that these red and variegated sandstones and marls, with dolomites and brine-springs, which we have called the Nipigon group, may belong to a higher geological horizon.

The name of the Quebec group was, as is well

known, given by Logan to what, under the name of upper Taconic, had been long before described by Emmons as a great development of strata of the age of the calciferous and Potsdam divisions of New York. In the disturbed belt where this series is displayed, from the lower St. Lawrence to the Hudson-river valley, and beyond, it is now well known that there are included, besides rocks of this horizon, others of Trenton-Lorraine (Ordovician) and of lower Helderberg age, together with older rocks, embracing the lower Taconic of Emmons and the still more ancient crystalline (Huronian) schists called by Logan 'altered Quebec group.' So far as known, there is nothing in this belt of disturbed, faulted, and often inverted strata which can be taken to represent the great Keweenawian series. Logan, however, assumed the St. Mary sandstone to be of the age of the Chazy division of the New-York series, and then proceeded to call the underlying Keweenawian calciferous or Quebec group, suggesting that the Kamanistiquia slates (Animikie series) might represent the Potsdam. These references, so far as regards the Chazy and calciferous, are embodied in Logan's maps of 1864 and 1866.

This view, which was never any thing more than a crude speculation, was soon shown to be untenable by the establishment of the Potsdam age of the sandstones overlying the Keweenawian, both in Wisconsin, as we have already seen, and in northern Michigan, where Rominger finds these upper sandstones to be overlaid by calciferous and Chazy beds.

Unless we assume that every thing uncrystalline below the Trenton group is to be relegated to the Cambrian, there is no ground as yet for extending this name to the Keweenawian; while the convenience of having a distinctive appellation for this vast metalliferous series will assure the name Keweenawian a distinct and permanent place in geological nomenclature.

T. STERRY HUNT.

Montreal, March 3, 1883.

### THE AINOS OF JAPAN.

THE following is an extract from an article on Yezo, in the transactions of the Berlin *Gesellschaft für erdkunde*, 1883, No. 1. The article was written by Professor Dr. Brauns of Halle, who, during his recent geological excursion to Yezo, visited the large settlement of Saghalin Ainos, in the neighborhood of Sapporo.

The Aino race belongs to a type entirely different from that of the Japanese, to whom they are now subject. The fear that the number of the Ainos is diminishing, in consequence of the immigration of the Japanese into Yezo, to an extent that would soon lead to their extinction, is not well founded. According to the estimate of the Japanese government, the total number of Ainos in Yezo, Saghalin, and the Kurile islands, is less than 18,000. While some authors have accepted this estimate, others have set the number of Ainos in Yezo alone as high as 50,000, which, with the addition of those now living under Russian control in Saghalin (from 10,000 to 12,000), and in the southern part of Kamtschatka, would give a total of from 60,000 to 70,000. Although the latter estimate, which is based on a number of reports from different sources (e.g., the missionaries of Hakodate), comes nearer the mark, still the number of Japanese who have settled in Yezo is already greater than that of the Ainos. The Japanese government reports 100,000