POLAR VERSUS EQUATORIAL CLIMATOLOGY.

The great international campaign for the study of the meteorology and magnetism of the arctic and antarctic regions which was prosecuted by many nations simultaneously and, according to a well-arranged programme during the years 1882–'83, resulted in the publication of a noble series of volumes containing the results, and in a few cases a preliminary discussion of the general bearing of the results on some of the problems of terrestrial physics. By general agreement no one was expected to give a general résumé of the subject until all the observational data had been fully published, and as this has not been entirely accomplished one need not wonder that this great storehouse of data has not yet been exhaustively utilized. For a century to come these volumes of observations will be quoted as we advance further in our knowledge of the secrets of nature. The latest contribution to the original data has lately been published as the third volume of the records of the polar expedition sent out by Finland. This expedition occupied a station at Sodankyla north of Finland (N. 67° 27′, E. 26° 36′) as also a temporary station, Kultala (N. 68° 30′, E. 26° 46′); observations were also made in cooperation with the station Kautokino (N. 69°, E. 23°) in the province of Finmark, Norway, and occupied by the Norwegian student of auroras, the late M. Tromholt. Among other specialties, observations were also made upon the electric currents and the auroral flames visible to the naked eye in the neighborhood of the mountain Oratunturi (N. 67° 21′, E. 27° 17′).

The three volumes that contain the work done by the Finnish Expedition are due principally to Prof. Selim Lemstrom, Chief of the Expedition and Professor of Physics at the University of Helsingfors, and Dr. Ernest Biese, Chief of the station of Sodankyla and Director of the Central Meteorological Institute at Helsingfors. These, and the fifty or more corresponding volumes published by other European countries, together with the handsome volumes published by the United States Government for the polar stations occupied by General Greely and Captain Ray, stand as monuments to the conviction that formerly prevailed among scientists, to the effect that the meteorological and magnetic phenomena of the globe depends to a large extent upon what is going on in the polar regions.

On the other hand it is clear that the meteorology of the temperate zones depends to an equal extent upon what is going on in the equatorial regions and there is an increasing need of meteorogical explorations on the ocean and meteorological stations on the land throughout the torrid zone. A hundred years ago, the explorations of Humboldt in this zone, awakened an enthusiasm that should never be allowed to die out. During the past fifty years, the Spanish, Portuguese, French, and Dutch colonies throughout these zones have contributed, according to their ability, to climatological investigations; but now that German, English, and American energies have been awakened, we may hope that still more will be accomplished within the Tropics.

ROCKALL AS A METEOROLOGICAL STATION.

The Scottish Geographical Magazine for August, 1898, contains an article by Mr. Miller Christy, historical and descriptive of the famous rock in the North Atlantic Ocean known as Rockall, but in former centuries more commonly Rocol, Rochol, or Rokol. The island is but a rocky pyramid standing solitary and alone at N. 57° 36′, W. 13° 42′; it has a diameter of about 80 feet and the summit is about 70 feet above the surface of the water. It is about 470 miles from Iceland and 160 from St. Kilda, in the Outer Hebrides, and was probably known to the merchants of Bristol, who, from the earliest times, carried on a trade in dried fish with Iceland. Mr. Christy's article summarizes all that is known as to the nature, position, history, and modern scientific exploration of this interesting speck of oceanic land and the reefs and fishing banks immediately adjoining it. To the meteorologist a particular interest attaches to this rock. Several explorers have landed upon it and thus demonstrated the possibility of occupying it as a permanent meteorological station, at least during a portion of the year. But the fact that in winter time the waves undoubtedly wash over its summit may well cause one to doubt whether the maintenance of a lighthouse or an observing station will ever be a practical possibility. On the other hand, Mr. Christy suggests that it would be more feasible to moor a light-ship on some portion of Rockall Bank and utilize that as a meteorological station.

The desirability of connecting this station with the mainland by a submarine telegraph cable has been indorsed by Dr. R. H. Scott, F. R. S., secretary of the Meteorological Council and superintendent of the meteorological office at London, who has said: "If a station on Rockall could possibly be established and maintained, its value to weather telegraphy would be incalculable."

Mr. Christy estimates the cost of the submarine cable at 35,000 or 40,000 pounds sterling; the annual expense of maintenance of the light-ship would undoubtedly be large, but still feasible, and in the end economical, considering its value to the British marine.

It would seem that the character of the stone of which this rock is composed is of a new and interesting type, entirely different from that found anywhere else on the globe; Professor Hull has given it the distinctive characteristic name, rockallite, and he suggests that the nearest resemblance to it is found among the Post-Silurian dykes near Christiania, and it may be that in Rockall we have a similar intrusive mass of the same period that has escaped destruction by denudation. It is plausible that as lately as two or three centuries ago the main rock that is now still standing was surrounded by a small sand dyke and that adjacent reefs had a greater exposure than now, and that one or more additional islets then existed. Of course, the rock is a breeding place for rare birds, and Mr. Christy's article will doubtless stimulate some naturalist to explore this region more thoroughly. He says:

> It is perhaps, improbable, after the failure of the recent expedition to effect a landing, that another properly equipped expedition will be undertaken on purpose; but there are surely plenty of British and American yachtsmen, owning stout, sea-going steam yachts, who would be glad to have a definite and useful object for a short ten days' cruise, accompanied by some scientific friend, during next summer. To any such, a trip to Rockall may be recommended. Any such expedition should not be undertaken earlier than the middle of May or later than the beginning of July, between which dates the birds frequenting the rock would be found breeding, and there would be a fair probability of meeting with fine weather. It is true that there would always be a possibility that the weather at the time of the visit might not permit of a landing being effected, but a few days' dredging on the bank would certainly afford results of much interest to students of marine zoology; and, even if nothing of scientific interest were accomplished, a cruize would have been enjoyed.

INTERNATIONAL METEOROLOGICAL SYMBOLS.

In publishing scientific works that are likely to be used by students of all nations it is desirable to avoid the use of words from any one specific language, and to employ symbols that shall be universally acceptable and intelligible. The progress of science has, in general, been greatly favored by the agreement to adopt uniform notations and expressions. Mathematicians, musicians, botanists, chemists, architects and many others have their specific symbols and terms, the use of which favors the clear expression and quick comprehension of the idea that has to be conveyed. A set of special meteorological symbols was devised by the Permanent Committee appointed by the International Meteorological Con-

gress, held in Vienna in September, 1873; the symbols were slightly modified in Munich in 1892, and were recommended for use to the American observers in a circular issued by the Chief of the Weather Bureau dated January 1, 1894. These symbols are convenient for use in manuscript records and are now almost universally employed in the publications of the various international weather bureaus. They are, therefore, here presented again to the attention of the readers of the MONTHLY WEATHER REVIEW as a matter with which all should be familiar.

The absence of an exponent written above and to the right of the symbol denotes a phenomenon of moderate intensity; the exponent (^{0}) indicates slight intensity; the exponent (^{2}) indicates a phenomenon of great intensity.

The great saving of space and time attained by the use of the symbols is indicated by the following example and translation:

1 ≺ 9 p — 10 p in E; 3 ○ 11 p —; 4 ◎ —10 a., ⌐≺ 3 p — 5 p.

The translation of the above is as follows: "On the 1st, sheet lightning was observed from 9 to 10 p. m., in the east; 3d, rain began at 11 p. m. and continued during the night (a dash indicates the continuance of a phenomenon); 4th, rain ended at 10 a. m. and a thunderstorm prevailed from 3 to 5 p. m.

The international symbols and abbreviations and their explanations are as follows:

1. ○ RAINFALL—Indicates that an appreciable quantity of rain (one hundredth of an inch or more) has fallen during the day or since last observation; also that the day is a rainy day as distinguished from snowy or clear days.

2. ✳ SNOWFALL—Indicates that an appreciable quantity of snow has fallen during the day. ✳^{0} may be used to denote flurries of snow.

3. ▲ HAILSTONES.—Hard semitransparent ice, whether small or large, crystalline or rounded. ▲^{0} small quantity of hailstones; ▲^{2} large quantity of hailstones.

4. △ SLEET—Or pellets of snow or soft hail without any crystalline structure. This symbol is used by the Germans for *Graupeln*, or snow pellets, and for the semitransparent mixture of snow and ice that in the dry weather of central Europe nearly corresponds to the sleet of the coasts of England and America. △^{0} small quantity of sleet; △^{2} much sleet.

5. ⋁ SILVER FROST—(English, "silver thaw," French, *givre*, German, *rauhfrost* or *duft-anhang*); this refers to an accumulation of snow and sleet on the limbs of trees, in which the snow is the main feature, so that the external appearance is silvery white and rough.

6. ⌀ GLAZED FROST—(French, *verglas*, German, *glatteis*); this refers to an accumulation of snow and ice on the trees, in which the ice is in excess and the external appearance is smooth and transparent. In using the symbols for "silver frost" and "glazed frost," the Munich Conference requests that these terms be considered as descriptive of the resulting phenomena, no matter how they are brought about, therefore the definitions avoid any statement as to the conditions attending the formation of the depositions. The same rule applies to the use of the symbol for "hoar frost."

7. ← ICE-NEEDLES—(Not yet well defined by international usage).

8. ⊣→ DRIFTING SNOW—(German, *schneegestober*); this symbol indicates that strong winds are raising the snow from the ground, filling the air with it like dust, and transporting it horizontally; this may occur under a clear sky. The symbol does not refer to snow falling from the clouds, nor to the mere fact that the snow is lying in drifts on the ground. When the air is filled with blinding snow dust, use the symbol ⊣→^{2}, but for light winds and light snow dust use ⊣→^{0}.

9. ⊠ SNOW-COVERING—Or quantity of snow lying on the ground; when more than half the soil in the neighborhood of any station is covered with snow this is indicated by ⊠; if the snow covering is thin, use ⊠^{0}; but if it is considered deep for that station use ⊠^{2}.

10. ≡ FOG—Enveloping the observer; ≡^{0} thin fog or mist enveloping and above the observer; ≡^{2} heavy fog or mist, such as the Scotch mist, drizzling down upon the observer. Neither of these fog symbols is to be used when an observer at a high station notices fog in the valley below him; such an observation as this should only be expressed by a note in the daily journal.

11. ∞ HIGH HAZE—Such as makes distant mountains appear hazy, or such as covers the sky in the case of Indian summer haze or prairie fires; German, *moorrauch*. If clouds are also prevalent in connection with this haze, the additional cloud symbol should be given. The intensity, or density, of the haze is expressed by ∞^{0} for light haze and ∞^{2} for dense haze. The symbol ∞ indicates merely the hazy condition, or the optical result, without considering whether the haze is caused by dust or moisture.

12. ⌓ DEW; ⌓^{0} LIGHT DEW; ⌓^{2} HEAVY DEW—As the formation of dew depends upon the nature and exposure of the horizontal surface on which dew is deposited, the observer should use the same horizontal object uniformly throughout the season.

13. ⌐ HOAR FROST; ⌐^{0} LIGHT HOAR FROST; ⌐^{2} HEAVY HOAR FROST, injurious to vegetation—The expression "frosty weather" refers to the low temperature as such; but the expression "hoar frost" to the crystalline ice deposited upon the surface of solids in the open air. Hoar frost is deposited on horizontal objects generally under a clear sky at night.

14. ⟙ STRONG WIND—An arrow with four feathers indicates a wind whose strength is 8, 9, 10, 11, or 12 on the Beaufort scale, or 8, 9, or 10, on the international scale, or anything in excess of 50 miles per hour or 20 meters per second in absolute measures; ⟙^{2} a remarkably strong wind or one exceeding 11 on the Beaufort scale, or 80 miles per hour, or 35 meters per second.

15. ⌐≺ THUNDERSTORM—Namely thunder, whether with or without lightning, rain, hail, or wind.

16. ≺ HEAT LIGHTNING—Distant lightning or any form of lightning that occurs without audible thunder, even when it occurs in the zenith, which is sometimes the case (this latter occurrence should be especially described in the journal of the observer); ≺^{0} infrequent lightning, or lightning that is confined to a small region of the sky; ≺^{2} lightning that occurs very frequently or extends over a large region of the sky. When distant lightning appears at a definite direction in the horizon, the observer should add the letters indicating the points of the compass, for instance, ≺^{0} NW. 10 p. indicates that occasional heat lightning occurred in the distant northwest at 10 p. m.

17. ⨁ SOLAR AUREOLA, CORONA, or GLORY—German, *Kranz, lichtkron*, "Corona," *Sonnenhof*. These are small circles of prismatic colors surrounding the sun, the radii of these circles are usually less than 6°, but in the extreme case of Bishop's ring, its radius was 15°. Several concentric circles are sometimes visible; each circular band of prismatic colors has its red on the outside, and its blue, violet, or purple on the inside, with respect to the sun; such rings are generally formed when the sun shines through a thin cloud and may be seen if the sun is viewed through neutral-tinted glass or by reflection in water. Similar circles surrounding the shadow of the observer's head are called "anthelia," "aureolæ," "glories," or "fog-shadows," (German, *Gegensonne, Brockenspectra*).

18. ⌓ LUNAR AUREOLA or CORONA—(German, *Mondhof*); circles surrounding the moon similar to the solar corona.

19. ⊕ SOLAR HALO—(German, *Sonnenring*); these are larger circles surrounding the sun whose sizes are quite definite, namely, about 22° and about 40° radius from the sun; they are easily distinguishable from the coronæ by the fact that the colors are feebler, and are so arranged that the red light is inside or nearest the sun, and the blue light is outside; the greater part of the breadth of the halo is white. Complex combinations of halos, parhelia, horizontal circles, and vertical columns sometimes occur, all of which may be indicated in general by the symbol ⊕^{2}, where the figure ^{2} indicates that the display is more brilliant than usual; a detailed statement of the radii or diameters of the rings and columns and of their arrangements should be given in the text.

20. ⊍ LUNAR HALO—(German, *Mondring*); phenomena surrounding the moon similar to the solar halo.

21. ⌒ RAINBOW—Double rainbows and those with adjacent supernumerary bows may be indicated by ⌒^{2}.

22. ⌔ AURORAL LIGHTS—Namely, any display of the Aurora Borealis.

ABBREVIATIONS RECOMMENDED FOR USE.

TIME.

a. antemeridian; p. postmeridian; n. noonday; m. midnight; h. hour. (The hours will be counted from 0 to 12, commencing with midnight.)—[The count from 0 to 24 is now widely adopted.—ED.]

TEMPERATURE.

° degrees of temperature or of a circle; F. Fahrenheit; C. Centigrade; max., maximum of temperature, pressure, or other element; min., minimum of temperature, pressure, or other element.

LENGTHS.

mi. miles; ft. feet; in. inches; kil. kilometers; m. meters; cm. centimeters; mm. milimeters.

CLOUDS.

C. cirrus; KC. cirro-cumulus; CS. cirro-stratus; K. cumulus; KS. cumulo-stratus; S. stratus; Nim. nimbus.

THE FIRST WELLMANN EXPEDITION.

Our readers will remember that in 1894 Mr. W. Wellmann, an American journalist (not a German-American as he is sometimes mistakenly called), conducted an expedition to Spitzenbergen, from which point he intended to make a journey toward the North Pole by sleds and boats. His party included Mr. B. O. French, of the Coast and Geodetic Survey,