was dissipated by several memoirs that established the fact that the wind and weather were entirely subordinate factors and that the spread of the disease followed the lines of travel, especially the principal steamboat and railroad routes, and that, therefore, the germs were carried by diseased individuals or by articles that had been used by or had come in contact with them, and not by the winds. Of course the wind, in the narrow sense, may have carried the germs a few feet or rods from one individual to another, but not for distances of many miles. Several epidemics, such as the yellow fever, smallpox, and cholera, have been traced back to the direct importation of their contagia (whether animate or inanimate) by human agencies. Furthermore, it appears probable, from experimental data, that few disease germs can maintain their vitality more than a few hours when freely exposed to the air and sunshine, as would probably be the case if they were carried in the atmosphere as minute particles of dust. Therefore we think it probable that the winds and the rain must not be considered as the means by which diseases are spread between places that are any considerable distance apart. The limit to which living germs can be carried in the free air is not yet accurately known, but is believed to be quite small. The upper currents of air carried the vapor dust from Krakatoa, in 1883–'84, over the whole Northern Hemisphere, but many months were required to do this, and what little we know of the life history of disease germs teaches that they could not survive the sunshine, the dryness, and, perhaps, the cold of the upper currents. This is not to deny that the winds and the ocean currents can carry the coarser seeds of plants and fungi for many miles without injury; but the bacterial disease germs have a far more delicate organism than those seeds, and what would seem to be an allowable analogy between the transportation of seeds and germs fails when applied on a large scale. The wind may carry the germs to a great distance in the free air, but probably will kill them in so doing; local breezes may carry living germs a few hundred feet, but the diseased man or the convalescent, or the clothing and articles used by these, or the water we drink, or the food we eat, may carry them hundreds and thousands of miles. In the particular case of the spread of the epizootic and influenza epidemics of 1872–'73 among horses and cattle it was shown that they spread against the wind, or when there was a calm, quite as often as they spread with the wind.]

The following extract shows the result of an extensive investigation by the medical department of the Prussian army into the spread of the grip epidemic of 1889–90. It illustrates what we have above said and shows that we must not exaggerate the influence of the lower winds or the upper currents:

If we now collect together the results of experience as to the spread of the grip in the German army, we find that the view still holds good which prevailed at the beginning of the epidemic to the effect that the influenza is a disease that owes its origin to certain miasmatic external causes. On the other hand there does not appear to be any sure evidence of the influence of weather, climate, wind, or soil, or the season of the year. To the contrary the number of those cases in which the spread and the mode of spreading of the grip is to be attributed to human intercourse, is considerably increased by the experience of the last epidemic. It is not yet clear whether in this intercourse there is a direct carriage of the infectious material from person to person, or whether the infection is carried by the intervention of inanimate objects through the air. We are still ignorant of the real germ that causes the disease. A correspondent from Bavaria gives the following example which leads him to believe that inanimate substances may house the real germs of the disease and carry them far away: The medical officer of the garrison at Germersheim at a time when as yet not a single case of grip had occurred at that place, received a package from a place in Russia at which the disease prevailed severely. A short time after opening this package he fell sick of the grip, and soon after also his whole family. If it should be further demonstrated that dead substances can thus contribute to the spread of the disease germs, then, perhaps in this way we shall explain the appearance of the disease upon ships on the high seas. The germs attached to the cargo carried by a ship can, by spreading among the seamen, give rise to a violent, sudden outbreak of the grip.

Those interested in studying the distribution of disease and in defending the general atmosphere from calumny will find a mass of information in the Handbook of Geographical and Historical Pathology by Dr. August Hirsch, translated and published by the new Sydenham Society, London, 1883. The data there given show that not only influenza but nearly every other form of epidemic has a secondary dependence upon favorable weather. Some diseases that are characteristic of tropical climates have been known to break out in midwinter when the ground is frozen and covered with snow; these occurrences depended upon the habits of the people, the temperature and cleanliness of their houses, the food they ate, and the water they drank, rather than on any special meteorological conditions.

The "climate" of the sanitarian considers not merely the sunlight, temperature, moisture, and wind of the meteorologist, but many other factors that constitute the environment of man and have a bearing on health and disease.

DO THUNDERSTORMS ADVANCE AGAINST THE WIND?

The note from Mr. Hicks, published in the MONTHLY WEATHER REVIEW for April, page 131, has called forth the following letter from Mr. C. A. Perdue, voluntary observer, Beloit, Kans. (W. 98° 05′, N. 39° 30′, 200 miles west of the Missouri River), and the editor will be glad to obtain still other notes on this point.

In the report for April, which I have just received, I notice the statement of Mr. E. D. Hicks, observer at Marceline, Mo., of which I have heretofore seen no notice in print. This fact I have frequently observed since my residence here and can confirm his observation. It is probable that the same phenomenon will be shown to occur over all those treeless plains so much above sea level when further observations are made.

THE CAUSE OF THE LOW TEMPERATURES FOR AUGUST.

Mr. George N. Salisbury, Director of the Washington State Weather Service, writes in the August REVIEW, as follows:

This was an excessively dry month in all sections of the State. Practically no rain occurred until the rainy period, which began in the northwestern part of the State on the 19th, and ended in the eastern part on the 21st. Prior to this the drought had been of six weeks' continuance. West of the mountains the average rainfall was a trifle more than last year, but much less than that of any other August on record. East of the mountains it was a trifle less than last year, and less than any August on record. It was the coolest August of which there was any record here, notwithstanding the fact that there was so little rain and cloudiness. This is probably accounted for by the fact that on many days that were otherwise clear the sun was almost entirely obscured by excessive smoke from forest fires, which extended over a great part of the eastern as well as the entire western section of the State.

[NOTE.—The interesting suggestion here made has led the editor to compare the mean maxima for August, 1895, with those for August, 1894, and to do the same, also, for the monthly mean of the minima. The details, as given in the following tables for the eastern and western portions of the State, show that, as compared with 1894, the average and maximum temperatures of 1895 were, indeed, lower. The lowering of the maxima might be attributed to the direct effect of the absorption of solar rays by the smoke, but as the minimum temperatures were also lower, and that, too, even more so than the maxima, it becomes evident that the obscuration of the sunlight by the smoke is not the only, nor indeed the principal cause, of the average low temperature. The data for surrounding States show that the temperature was below the normal throughout the Pacific Coast, the Plateau Region, Montana, and the Canadian Provinces of Alberta, Saskatchewan, and Manitoba. Over the northwest part of this region the pressures were above the normal, and over all of it the rainfall was below normal. Everywhere, moreover, the lowest minima on record were reported.

Temperature extremes and differences in the State of Washington for the years 1894 *and* 1895.

Stations.	1894. Mean of—		1895. Mean of—		Difference.	
	Max.	Min.	Max.	Min.	Max.	Min.
Western part.						
Blaine	76.9	47.6	75.1	42.2	−1.8	−5.4
West Ferndale	78.8	44.0	76.6	46.1	−2.2	+2.1
East Sound	69.2	53.4	70.6	50.3	+1.4	−3.1
Olga	70.6	53.6	68.4	50.7	−2.2	−2.9
Tatoosh	62.2	51.8	59.4	49.8	−2.8	−2.0
Neah Bay	69.3	50.7	66.9	48.0	−2.4	−2.7
Port Angeles	67.1	51.5	64.6	47.9	−2.5	+3.6
Stillaguamish	77.4	46.9	73.1	42.8	−4.3	−4.1
Snohomish	72.6	51.5	74.2	46.2	+1.6	−5.3
Seattle	75.7	56.1	71.6	52.5	−4.1	−3.6
Tacoma	76.9	53.5	72.5	48.9	−4.4	−4.6
Olympia	80.0	49.9	79.6	45.4	−0.4	−4.5
Fort Canby	66.7	56.2	63.9	52.2	−2.8	−4.0
Means	73.6	51.3	71.9	47.6	−1.7	−3.7
Eastern part.						
Bridgeport	94.4	56.5	90.8	46.1	−3.6	−5.4
Fort Spokane	92.5	51.2	88.9	45.0	−3.6	−6.2
Lakeside	87.2	65.8	85.1	59.7	−4.1	−6.1
Spokane	86.8	56.0	82.8	52.3	−4.0	−3.7
Rosalia	84.9	44.8	81.8	44.7	−3.1	−0.1
Colfax	82.6	50.3	81.4	45.7	−1.2	−4.6
Moxee	90.3	55.3	87.9	50.5	−2.4	−4.8
Fort Simcoe	87.7	59.8	84.7	57.6	−3.0	−2.2
Kennewick	92.5	63.3	84.4	54.4	−8.1	−8.4
Ellensburg	83.4	52.8	85.8	54.3	+2.2	+1.5
Hunters	80.7	45.3	76.5	39.6	−4.2	−5.7
Waterville	87.3	51.9	81.1	50.0	−6.2	−1.9
Walla Walla	91.2	62.4	86.9	58.1	−4.3	−4.3
Pomeroy	79.7	64.7	83.2	60.7	+3.5	−4.0
Dayton	88.8	57.4	85.4	53.3	−3.4	−4.1
Mean	87.4	54.6	84.2	50.3	−3.2	−4.3
Mean of whole State	80.7	52.7	77.9	48.9	−2.8	−3.8

We thus see that we have here to do with a wide-spread phenomenon, in which the smoke from forest fires plays a very subordinate part; there must have been some general cause at work. The centers of areas of low pressure have rarely passed over this region during the current month, and the centers of areas of high pressure have been unusually persistent; but we do not go backward very far toward the cause when we say that the low temperature and the dryness were due to the excess of pressure, as these three climatic features are generally associated together, and neither one can be spoken of as the cause of the other, but they all alike follow from one feature in atmospheric motion that immediately precedes them, namely, the slow descent of the upper air toward the earth's surface. The charts of monthly mean temperatures and pressures and winds for the Northern Hemisphere show that an area of high pressure whose center is over the eastern Pacific ocean between latitudes 20° and 40° moves northward during half of the year, say from April to August, and thence slowly backward. It usually reaches its northern position in latitude 40° during August, at which time it also approaches nearest to the coasts of Washington, Oregon, and British Columbia; sometimes an arm stretches far northeastward over these States. Such an area of high pressure, with comparatively clear, cool, dry air is an area of descending air, and when abnormally cool, dry weather prevails over Washington and the surrounding country, as in the current month, it simply means that there has been an unusual flow of northerly winds over that region due to the unusual position of the area of high pressure; that is to say, the region in which air descends to the earth's surface has been pushed to the north and east a little beyond its ordinary position. Perhaps we may infer from this that the regions where air ascends have been pushed correspondingly far to the south and east. In order, therefore, to arrive at a fundamental explanation of the cause of the cold August in the State of Washington it will be necessary for us to explain how the region of descending air and high pressure came to be so far toward the northeast. We shall not attempt to present in detail the mechanics of this process, but in general we may say that the atmosphere moves in complex curved paths around and out of, and again around and into, the regions of high pressure and low pressure. No simple drawing could present the irregularities of the path of the air as it passes from the high to the low pressure, and from the upper strata to the lower strata, or vice versa. If we follow a particle in its path we shall find it subject to forces and pressures that push it now toward and now from the equator, now upward and now downward toward the surface of the earth. Its motion is largely determined by its own intrinsic density; the denser it is by reason of coldness or dryness the more it is drawn down to the surface by gravity and driven toward the equator by centrifugal force, and, on the contrary, the lighter it is, by reason of its warmth and moisture, the more it is pushed upward and toward the polar region. What is true of the smaller masses will be true of the large aggregations. If the region of high pressure (which is properly called a pleiobar) over the Pacific were, during August, 1895, fed by air a little colder or drier than usual, and therefore a little denser than usual, it would assume a more southerly position and bring lower temperatures to Washington; if the air within this pleiobar descended more slowly than usual, giving it more time to cool by radiation, then it would reach the earth's surface colder, and would bring lower temperatures to Washington. It is by some such process as this that the editor would explain the low temperatures of August, 1895. We are not yet ready to foresee when the pleiobars and meiobars, or the great areas of high and low pressure, will have positions unusually far to the north or south, or east or west of their normal positions, but that they must change, and for the reasons just given, is sufficiently evident. We must master this feature in the mechanics of the atmosphere before we attempt to explain the variations of the seasons by introducing any other principle.]

AN AURORA IN SOUTH CAROLINA AND KENTUCKY.

The Weather Bureau observer at Charleston, S. C., Mr. Lewis N. Jesunofsky, describes the aurora of the 26th, as follows:

An aurora was observed at 10.47 p. m. to 10.58 p. m. Altitude, 24°; azimuth (counted from S. to W. to N., &c.), 110° to 190°. A dark segment or arch rose to 17°, with a crown of light to 24°, one large streamer lasting from 10.51 p. m. to 10.53 p. m.; azimuth, 116° to 122°, and altitude 30°. The display was accompanied by a thin veil of vapor, through which the stars could be seen.

The voluntary observer at Greendale, Fayette Co., Ky. (Mr R. I. Spurr), also notes an aurora on the 26th.

These widely separated stations certainly experienced two independent auroral displays. Both stations were near areas of thunderstorm development. No other stations near by record having seen an aurora.

These cases relate to those interesting sporadic auroras whose occurrence illustrate the general principle that the auroral light is frequently and probably always low down in the atmosphere, emanating from a layer of electrified vapor lying between regions of cold, dry, and warm, moist air, respectively. In the winter season the warm, moist air is generally above the cold and dry air, but in the summer season instances may occur where, for a short time and over small areas, the cold, dry air is above and, of course, slowly settling down. In the present instance South Carolina and Kentucky were covered with a lower layer of warm, moist air, but above this thunderclouds existed, with a great display of lightning over these and the adjoining States. An extensive West Indian hurricane to the south of Cuba was moving westward. It was mentioned by the present Editor as early as 1874 that a region of auroral displays is often bounded on the