

the assistance of other forces arising from the motion of the air and the rotation of the earth) the horizontal differences of pressure arising therefrom are the active forces, as I, among others, have explained in the Austrian Z. O. G. M., 1882, p. 91, where (in the foot-note) I have warned against the too frequent overestimation of the influence of the warming of the air at the base.

"We have thus come to the limit where the geographical element is less important than the physical; where climatology passes over into meteorology. Of course, however, climatology is in the highest degree interested in the progress of meteorology since the connection between its individual isolated facts is in great part to be expected from it. Especially is it true that the explanation of the nature and development of atmospheric whirls or, the regions of high and low pressure, their changes with altitude, their origin and disappearance, will be of the greatest importance for climatology as well as for meteorology. Our knowledge of the movement of whirls has made good progress, but as to their changes in intensity we know nothing except some isolated empirical rules and many vague assumptions. In order to make further advance in this matter we need, above all, a more accurate insight into the distribution of temperature and pressure in the higher strata above cyclones and anticyclones. About five years ago Hann published the sensational discovery that in the Alpine region in anticyclones, notwithstanding the great cold at the surface of the soil, the mean temperature of the column of air between this ground and the level of 3,100 meters above the sea, was higher in the centre of anticyclones than in cyclones. A further extension of this investigation to other portions of the world promises further important conclusions. In such work observation and study must go together in order to further the advancement of science."

FOG IN NEW YORK HARBOR.

Owing to the clear sky that prevails within areas of high pressure the radiation of heat from the ground or the ocean surface and from the lowest stratum of air, proceeds more rapidly and, as is well known, during such periods mist and fog are formed in the lower air. Radiation proceeds uninterruptedly during the night time from the upper surface of foggy air and the depth of the layer of fog steadily increases, so that oftentimes the heat of the sun, in the middle of the day, is not sufficient to dissipate the fog formed at night. It has often been remarked that the lookout at, or above, the main top overlooks the ocean of fog. In general, a dense fog implies clear sky above it and by attention to the movement of areas of pressure it becomes possible to predict fog on our coast.

On Tuesday, December 17, and Wednesday 18, high pressure prevailed off the middle Atlantic Coast with north-east winds shifting to southwest at New York, N. Y. During Tuesday night and the greater part of Wednesday dense fog prevailed in both the upper and lower bay; the Sound steamers did not attempt to come through Hell Gate; the ocean steamers were detained below quarantine; nothing could be seen at Sandy Hook and all movements were guided by the sound of the fog signals. This fog was attributed by some to the unseasonably warm weather prevailing all along the neighboring coasts. The extreme temperatures were as follows:

Locality.	17th.		18th.	
	Min.	Max.	Min.	Max.
Nantucket	0	0	0	0
New York	32	36	32	50
Philadelphia	26	42	34	48
Atlantic City	26	44	34	50
Atlantic City	24	38

These figures do not show any temperatures that are unusually high for this region, neither is the occurrence of fog unusual at this season; it is, in fact, the ordinary accompaniment of areas of high pressure in the winter time over the ocean.

SNOWFALL IN NORTH DAKOTA.

With regard to the snowfall in North Dakota, Mr. B. H. Bronson, in his November bulletin says:

The principal feature was the unusually early fall of snow, which became general over the State by the 5th instant, and was very heavy in many localities. Old settlers in this section remark that this early snow is the earliest that has occurred during their residence here, and has rendered the hauling of grain by sleds more practicable than by wagons. The snowfall promises an abundance of moisture for the ground when the spring plowing shall commence, but at the present time it renders the pasturage very poor, as the cattle are unable to get at the grass and low herbage. The snowfall is greatly appreciated as it prevents the further destruction of crops and property by prairie fires. The observer at Fort Berthold, in McLean County, reports the pasturage in that section as the poorest in many years, on account of the recent prairie fires, which have also devastated many other sections of the State.

METEOROLOGY AND LOCAL STATE FAIRS.

The need of personal acquaintance between the voluntary observers and the directors of the respective State services is alluded to in the Weather and Crops for January, 1896, by the director of the Illinois Service, and he states his intention to provide for such a need at an early date. On several occasions the presence of some official of the Weather Bureau at a county fair, a State fair, or a general exposition has been productive of many advantages to the Weather Bureau observers who attended such meetings. This was notably so in the case of the expositions at Atlanta and Chicago. In general, State fairs offer an important means of exhibiting, day by day, to crowds of visitors the methods of observation pursued by the Weather Bureau and the numerous ways in which its work can be made useful to the people. In recognition of this general principle a special "Board on Expositions" has been organized at the Central Office, and instruments or publications that are appropriate for exhibition will, it is hoped, always be kept on hand ready for use.

POSSIBLE ADVANCES IN THE WEATHER SERVICE.

We make the following extracts from an excellent address by J. R. Sage, published in the current number of the Iowa Monthly Review:

The weather has been the subject of daily observation and remark in all ages, yet the science which undertakes by rational and philosophical methods to account for the varied phenomena of the atmosphere is comparatively new. By far the greater portion of all that has been achieved in the solution of the intricate problems relating to the weather has been wrought out within the latter half of the nineteenth century. The Weather Bureau, including the State branches, was instituted to serve the people, and to do this efficiently it must be progressive, and the advances that are not only possible, but also most desirable, should be along educational and practical lines. There is need of popularizing the science of meteorology, and more widely disseminating a knowledge of the salient facts that have been learned in this new field of investigation. * * * The special need of this age is science made popular and widely disseminated. To this end there is need of workers and students in this field who are in close touch with the common people and who are able to translate the most scholarly and profound scientific writings into the language of ordinary people. The scientific lore of this age can not be shut up in cloisters nor monopolized by favored classes, but must be scattered broadcast to take root and bear fruitage in the world. I am glad to make note of the fact that the Weather Service is doing excellent work along the line of popular education.

In practical horticulture success depends absolutely upon adaptation of plant or tree to the climate. And the Weather Service should furnish the necessary data for the study of the effects of climate upon all classes of vegetation.

For the advancement of both horticulture and the Weather Service, a more close and intimate relation should be established between them.

Every man engaged in practical horticulture as his chief vocation, should be a thorough meteorological observer, with a full equipment of the best scientific instruments to be obtained. * * * When the horticulturist is fully equipped and trained as a meteorologist he should then join the corps of voluntary observers connected with the State and National Weather Services, thereby adding his quota to the general fund of knowledge for the benefit of the public.

But, after all, those who serve the public thus gratuitously are recipients of direct benefit in the form of scientific knowledge, and the satisfaction resulting from serving their State and nation.

We are just beginning to study some elementary lessons in the costly school of experience; to learn how to retain our vast patrimony of soil fertility and how to handle the rainfall so as to dispose of the surplus and provide for the storage of moisture for occasional seasons of deficiency. The tendency of the climates of all mid-continent regions is toward extremes. The means may be constant through long periods, but the wide departures and sharp reactions are the special features of the climate that test the hardy qualities and vitality of all forms of animal and plant life.

I have only attempted to suggest some of the possibilities of advancement in this branch of the public service, along these economic and educational lines. To make this service most valuable to the public there is required the active cooperation of a large number of intelligent observers. Large masses of facts and figures should be collected and tabulated, and experts should give them careful study to find out what they mean. There is mighty little in any of the books to help us in the solution of the many intricate problems that perplex us. We must closely study the facts and question nature. The text-books of meteorological science are mainly in the fields, groves, forests, and on the mountain tops. All the elements are vocal with instruction; the revolving old earth and the great dome of the sky above are thickly set with object lessons for our study.

OBSERVATIONS AT HONOLULU.

Meteorological observations at Honolulu, Republic of Hawaii, by Curtis J. Lyons, Meteorologist to the Government Survey.

Pressure is corrected for temperature and reduced to sea level, but the gravity correction, -0.06, is still to be applied. The absolute humidity is expressed in grains of water, per cubic foot, and is the average of four observations daily. The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 10. Two directions of wind, connected by a dash, indicate change from one to the other; also same for force. The rainfall for twenty-four hours is given as measured at 6 a. m. on the respective dates.

Table with columns: November, 1895. Pressure at sea level (9 a.m., 3 p.m., 9 p.m.), Temperature (6 a.m., 2 p.m., 9 p.m., Maximum, Minimum), Humidity (Relative: 9 a.m., 9 p.m., Absolute), Wind (Direction, Force), Cloudiness, Rain measured at 6 a.m. (Ins.).

Mean temperature: 6+2+9+3 is 73.1; the normal is 74.1; extreme temperatures, 85° and 59°. *Omitted from original report.

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The monthly summary for December is: Mean temperature, 6+2+9+3 is 72.3; extreme temperatures, 81° and 59°. A thunderstorm occurred on the 30th at night.

THUNDER AND LIGHTNING IN DECEMBER.

Mr. John Butterworth, voluntary observer at Detroit, Oreg., writes as follows:

At 12.05 p. m., December 23, while in the midst of a driving snow-storm at Niagara, we were astonished to see a vivid and long-continued flash of lightning, followed quickly by a long and loud peal of thunder. As thunder in Oregon is unusual its occurrence in connection with a snowstorm is worthy of record.

Mr. C. Scholz, voluntary observer at Mammoth, Kanawha Co., W. Va., writes that a terrible storm passed over that place between 4.15 and 6 p. m. of December 26; winds of hurricane force doing great damage to timber; lightning observed in the southwest, followed by thunder; snow from 7 p. m. to 9 p. m., after which it cleared up, followed by heavy frost.

FROSTS IN SOUTHERN CALIFORNIA.

Attention has been called to the statement made in the MONTHLY WEATHER REVIEW for September, 1895, page 341, on the authority of Mr. James Boyd, of Riverside, Cal., to the effect that "as a matter of fact the thermometer has seldom been known to fall between sunset and sunrise more than 10° in a cold wave, or from 7 to 8 o'clock at night to the same hour next morning." It seems that this statement represents a popular belief in that section of the country and, that relying upon its truth, many agriculturists are liable to feel at ease in regard to their crops, and omit to take precautions against frost when there is really more danger than they apprehend. In order to give more precise information on this subject the Editor has examined the meteorological records for Riverside, as furnished by our voluntary observer, Dr. F. M. Gardner, beginning with November, 1894, when records for 9 p. m. (Pacific time) as well as the maximum and minimum began to be reported. A table giving the fall from the maximum of the afternoon to the minimum of the following morning shows that the diurnal range may, in extreme cases, be as large as 60°, and is rarely lower than 10°. Of course, the greater part of this fall occurs in the afternoon. The fall