The phenomena differed notably from the description and the cuts usually given in text-books, which describe them as moving swiftly, whereas these moved slowly and vessels in their vicinity were able to avoid them. The books also picture them as tapering to a point at the lower end, but these and others like them were of the same size all the way up. The books represent the spouts as being vertical, but one-third of these had a slant of at least 60°. The one that took the form of a dagger was at first a short spur, not more than 3° long, just peeping out from an overhanging cloud at an angle of 45° and grew quite slowly.

Seven diagrams which are individually reproduced on Plates I and II. The legend at the bottom of each gives many additional particulars so that the student can easily follow the historical order of development in each waterspout.

In addition to the data here given, and in reply to a letter from the Editor, Mr. Boynton sends the following items under date of July 16:

I have a nephoscope and can estimate the field of activity pretty well, and get bearings from the angles of neighboring buildings, and I remember that the waterspouts were at nearly equal distances apart. I also feel confident that I can estimate the height of the columns with quite a degree of accuracy.

Top of columns above bases, 18°.

General width of columns, ½°.

Width of columns at top, where they opened into the cloud, 3°.

Width of columns at base, including water in commotion, 5°.

Distances of columns apart between first and second on the left, 5°; between the others, 4°.

Area of vertically falling water on the right of the field: Altitude, 18°; width, 12°; field of activity, including said area, 40°.

The greater number of the waterspouts were not tapering, like the typical waterspouts, but, except at top and bottom, were of one size all the way up. Therefore, I can not furnish largest diameter, of columns, except at top and base. But there was one notable exception; it was the curved column with a bar across it: Fig. VII.—Spout No. 6. The bar seemed to be 4° long and 1° wide.

Am not able to furnish any account from people aboard ship at the time.

The temperature of the air, etc., can be furnished with perfect accuracy, because the phenomena began just as I began the morning observation: Dry thermometer, 81.0°; wet thermometer, 74.0°; wind, north; wind velocity, 4 miles per hour.

WATER TEMPERATURES OF THE GREAT LAKES.

By NORMAN B. CONGER, Local Forecast Official and Marine Agent.

The study of the distribution of fog on the Great Lakes, which has now been carried on for upward of two seasons, shows among other things the importance of a knowledge of the temperature of the surface water. In 1892, 1893, and 1894 the Weather Bureau collected observations of water temperatures made by masters of vessels plying between Lake ports, and in the last named year the writer was one of a small party that visited Lake Superior and made many surface observations and also a number of observations at depths of 10, 20, and 100 feet. A brief statement of the results of these observations is here given.

Lake Superior.—The lake closes to navigation with the closing of the St. Mary's Canal about December 1, but ice rarely forms in the open lake before the beginning of January. In some of the harbors it does not form much before February 1. Ice on the open lake may form to a thickness of from 1 to 4 feet; it is frequently piled up, however, to a much greater depth. The ice in the open lake breaks up in April and is drifted about by the winds until it finally disappears. The water temperatures in May in shallow bays average about 40°, being slightly warmer at the western end of the lake than along the shore from Marquette eastward. In the middle of the month the average temperature of the water over the great body of the lake is about 37°, being slightly lower in a few localities. In June the temperature of the surface water along shore, where the depth is not great, averages from 48° to 54°, being, as before stated, warmest at the western end of the lake. The temperature is lower toward the deeper parts of the lake, reaching a minimum of 37° in midlake, but the area of 37° is less than during the preceding month. In July the temperature of the surface water in midlake has risen to 40°, while shore temperatures have risen to 60° and over in some of the shallower bays. The difference between the temperature of the water in midlake and along shore is greatest in July and August, viz, 20° and upward. In August the area over which water temperatures of 40° occurs is less than for July and can be found only in the center of the lake. The influence of the warmer air temperatures of June and July is now felt in the general warming up of the waters. Large areas of water show an increase in temperature from the month preceding of about 10°. The maximum temperature of the water in the great body of the lake occurs in September about a month after the highest air temperature. It is to be noticed, however, that the temperature of the water along shore has begun to fall, the maximum of the year being registered in August. During October the temperature of the water falls from 5° to 10° over the great body of the lake. Shore temperatures range from 45° to 50°, decreasing from those amounts to about 40° in deep water. In November the temperature of the water around the shore and in deep bays is about 40°, diminishing to 37° in midlake.

We have thus seen that the surface temperature of the water along shore and in the larger bays increases from 32° in winter to about 60° in August, a total range of 28°. In midlake the increase is very much less, from 32° to 40° or 45°, certainly not more than half of what it is for shore waters.

Lake Michigan.—The observations for the remaining lakes are not sufficiently numerous to discuss the months in detail; our remarks will apply to July only. The coldest portion of Lake Michigan is found in the center of the northern two-thirds where the mean temperature for July is 55° or less, but above 50°. Surrounding this area of relatively cool water is a region of warmer water, 60°, broken only in the northwest where the temperature of the water is about 55°. The temperature of the northeastern part of the lake is between 60° and 65°. The warmest part of the lake, as might be expected, is around the southern end where mean temperatures above 65° may be found.

Masters of vessels occasionally report low water temperatures in summer off the Michigan coast in the vicinity of Grand Haven and Muskegon. Additional observations are required before we are justified in assigning an abnormally cold area to this locality.

Lake Huron.—The observations on this lake are naturally confined to the west shore. The temperature of the water in July is about 65° from near Thunder Bay Island southward to near Port Huron. Colder water may be found in bands extending southeastward from the east and west ends of Drummond Island. The differences between the water temperatures along shore and some distance out in the lake are not so great as in the case of Lake Superior, nor are the differences between water and air temperatures so well marked. In July at Mackinaw the average temperature of water at the surface in a depth of about 11 feet was 63°; the average temperature at the bottom was 62°, while for the same time the average temperature of the air was 69° (average of four years).

In the Detroit River the average surface temperature for July in water 24 feet deep was 69.7°; at the bottom, 69.6°, while the air temperature for the same time was 77.7°, a difference of 8°. Probably the difference between water and air temperatures over Lakes Michigan and Huron is not more than 7°.

Lake Erie.—The temperature of the water in this lake approaches more closely to the temperature of the air than is the case on any other lake. Generally the mean water temperatures range between 70° and 75°.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined list of titles has been selected from the contents of the periodicals and serials recently arrived in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Meteorologische Zeitschrift. Wien. Band 16.

Danckelman, A. Ueber das Harmattanphänomen in Togo. P. 289.

Moller, A. Arbeitsvorgänge bei auf wie absteigenden Luftströmen und die Höhe der Atmosphäre. P. 306.

Polis, P. Ergebnisse der Temperaturbeobachtungen zu Aachen 1838-1897. P. 310.

—— Regenfall am Fusse des Kamerun-Pik. P. 312.

[Hann, J.] Schliessung des Jamaica Weather Service. P. 312.

—— Halo-Phänomen. P. 312.

—— Das kalte Küstenwasser, Entdeckung der Ursache desselben. P. 313.

—— Klima von London. P. 314.

—— Scheitelwerth und Mittelwerth in tropischen Klima. P. 314.

—— Resultate der meteorologischen Beobachtungen in der Depression im Herzen des asiatischen Kontinents, zu Luktschun bei Turfan. P. 315.

Polis, P. Anwendung von meteorologischen Beobachtungen in der medicinishen Klimatologie. P. 317.
——— Der tägliche Gang des Luftdruckes zu Manila, Mauritius, Hong-Kong und Zi-Ka-Wei. P. 319.
[**Hann, J.**] Täglicher Gang des Luftdruckes in Pavia. P. 321.
——— Die Westindia-Cyklone vom September 1898. P. 322.
——— Zur täglichen Periode und Veränderlichkeit der relativen Feuchtigkeit. P. 322.
——— Meteorologische Beobachtungen zu Bismarckburg, Togo-Land. P. 324.
Schwalbe, G. Bemerkung zu meiner Mittheilung über "Die jahrliche Periode der erdmagnetischen Kraft." P. 325.
——— Wolkenformen. P. 325.
——— Klima-Tabelle für Tokio. P. 325.
——— Zur Theorie der allgemeinen Cirkulation der Atmosphäre. P. 327.
——— Jährliche Periode der Gewitter in Norwegen. P. 328.
——— Regenfall in den Bocche di Cattaro und in der Crivoscie.
——— Meteorologische Beobachtungen in New Guinea. P. 330.
Wolfer, A. Provisonische Sonnenflecken-Relativzahlen. P. 331.
Das Wetter. Berlin. 16 Jahrgang.
Bornstein, Prof. Ueber Witterungsdienst. P. 169.
——— MONTHLY WEATHER REVIEW. P. 173.
Clayton, H. H. Elias, H. Ergebnisse der Drachen-Aufstiege vom 24 und 25 November, 1898, am Blue Hill Observatorium. (Fortsetzung). P. 181.
Weise. Wolkenbildung, Regen und Wald. P. 186.
Memorie della Societa degli Spettroscopisti Italiani. Catania. Vol. 28.
Chistoni, Ciro. La formula di Bouger per il calcolo degli spessori atmosferici e della trasparenza dell' aria. P. 133.
Scientific American Supplement. New York.
Lyon, A. B. Climate of the Hawaiian Islands. P. 19,788.
Murry-Aaron, E. West Indian Hurricane. P. 19,804.
Annalen der Physik und Chemie. Leipzig. Band 68.
Bock, A. Der blaue Dampfstrahl. P. 674.
Grutzmacher, Fr. Thermometrische Correctionen. P. 769.
Walter, B. Ueber die Entstehungsweise des elektrischen Funkens. (2 Mittl.) P. 776.
Eschenhagen, M. Werthe der erdmagnetischen Elemente zu Potsdam für das Jahr 1898. P. 917.
Appleton's Popular Science Monthly. New York. Vol. 55.
Dexter, E. G. Influence of Weather on Crime. P. 653.
Symon's Monthly Meteorological Magazine. London. Vol. 34.
[**Symons, G. J.**] Definition of a protracted drought. P. 97.
MacDowall, A. B. Moon in relation to air temperature. P. 104.
Dines, W. H. The Moon and the Weather. P. 117.
Nature. London. Vol. 60.
Buchanan, J. Y. Thermometric Scales for Meteorological Use. P. 364.
——— Ribbon and Dark Lightning. P. 423.
——— Forecast of the Monsoon. P. 438.
Wood, R. W. Dark Lightning. P. 460.
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Taisserenc de Bort, L. Sur la température et ses variations dans l'atmosphère libre, d'après les observations de quatre-vingt-dix ballons sondes. P. 417.
Science. New York. Vol. 10. N. S.
Wood, R. W. Dark Lightning. P. 337.
National Geographic Magazine. Washington. Vol. 10.
Garriott, E. B. West Indian Hurricane of August 7–14, 1899. P. 343.
Bigelow, F. H. International Cloud Work of the Weather Bureau. P. 351.
Archive des Sciences Physiques et Naturelles. Genève. 4me série. Tome 8.
Gautier, R. Résumé météorologique de l'année 1898 pour Genève et le grand Saint-Bernard. P. 136. (Suite et fin). P. 209.
Ciel et Terre. Bruxelles. 20me Année.
Arctowski, H. Résultats préliminaires des observations Météorologiques faites pendant l'hivernage de la *Belgica*. Pression barométrique. P. 269.
Ventosa, V. La direction du vent et la scintillation (suite). P. 275.
——— Deux stations météorologiques de haute altitude. P. 284.
Pernter, J. M. Réponse aux Remarques de M. Spring sur la couleur bleue du ciel. P. 301.
Spring W. Lettre adressée à M. Lancaster au sujet de l'article précédent. P. 305.
——— Deux stations météorologiques de haute altitude. II. La station de la *Bielasnica*. P. 307.
Solvay, E. Genèse d'électricité atmosphérique. P. 315.
Himmel und Erde. Bruxelles. 11 Jahrgang.
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Annalen der Hydrographie und Maritimen Meteorologie. 27 Jahrgang.
Plan zu einer Herausgabe von Dekadenberichten der Witterung durch die Deutsche Seewarte. P. 435.
Popular Science. New York. Vol. 33.
Hazen, H. A. The Moon and the Weather. P. 229.
Journal of School Geography. Lancaster. Vol. 3.
Ward, R. DeC. Equipment of a Meteorological Laboratory. P. 241.

CONDUCT AND THE WEATHER.[1]

By EDWIN GRANT DEXTER, Ph. D.

The paper under the title given above, of which this present article is an abstract, is an attempt to demonstrate by empirical methods a causal nexus between weather states and human activities. That such a relation exists has been popularly recognized for centuries, and, as scientific investigation is for the most part but a more exact determination of what has been common belief, so this study partakes largely of the nature of a quantitative measurement of what had been, at least, qualitatively suspected.

A writer in one of the British magazines some years ago very aptly said:

> There are many persons who are simply victims of the weather. Atmospheric influences play upon them as the wind plays upon the strings of an aeolian harp, with the difference that the latter never utter discords in reply. A leaden sky weighs upon them with a crushing weight, and suggests all manner of unpleasant anticipation. Then the gloomy side of life comes out. The bitter sayings of friends are remembered. The old groundwork of forgotten quarrels is remembered. Uneasy questions arise with regard to the future. One gets tired of life. A sort of indefinite dread is the general mental influence, a faint continuation of the superstitious fancies which mark the childhood of nations and men.

Yet modern science is not satisfied with the mere knowledge of the existence of such influences. Is the cause capable of analyzation into components, each of which may contribute in its peculiar way to the indicated result? To this our answer is "yes." Those states and conditions, mutations and changes in our cosmical environment to which we give the name weather, do not form a unit, but a composite. The various meteorological conditions, ringing in as they do combinations innumerable, are the ever-changing elements of the cause whose relation to human conduct and emotions we are attempting more definitely to define. It is, for the most part, a study of those weather components and their discernible relations to human activities of which this paper treats. The problem carried on is twofold: First, the tabulation and discussion of replies to questions sent to nearly two hundred teachers of all grades from the kindergarten to the high school, superintendents of asylums and reformatories, and wardens of prisons and penitentiaries; second, an inductive study of several hundred thousand data, comparing the occurrence of data of the various classes studied, under definite meteorological conditions, with the normal prevalence of those conditions.

The study was made for the cities of New York, N. Y., and Denver, Colo.

The data considered were taken from the various public records of those cities and consist of misdemeanors in public schools and in penitentiaries, arrests for assault and battery (males and females considered separately), arrests for insanity, the death rate, suicides, clerical errors in banks, and strength tests in the gymnasium of Columbia University. A period of more than ten years is covered, and something over 400,000 data considered.

As a basis for this study, the mean temperature, barometer, and relative humidity, the total movement of the wind, the character of the day, and the precipitation, as recorded at the office of the United States Weather Bureau for each day of the period covered are used.

[1] Conduct and the Weather, an inductive study of the mental effects of definite meteorological condition. Monograph-supplement No. 10 to the Psychological Review. pp. 104.