The last few pages of the Journal are occupied by an address delivered last February by Prof. Wm. M. Davis "On the Circulation of the Atmosphere." In this article Professor Davis endeavors to correct some errors that are sadly prevalent both in Great Britain and her colonies. Explanations that were accepted many years ago are still repeated in spite of the great advance that has taken place during the past thirty years in the views of those who are recognized as the leaders of modern theoretical meteorology. Professor Davis' address reminds us of the following remarks lately made by the Editor:

There are those who adhere to the opinion that the observer and statistician is the one best calculated to determine the causes and the processes that lie behind his observed phenomena. There are others who think that the pure mathematician and mechanician can best deal with these problems of cause and effect. A third class holds that the experimental physicist is the highest authority. Thus it happens that meteorology has during the past century been taught by three classes of authorities, each of whom found it difficult to perceive the force of the arguments of the other side. At the present moment, England, France, Germany, and America, respectively, still have distinguished members of each of these schools busily disseminating different views of the same subject. Fortunately, however, the leading tendency is everywhere toward a proper combination of observation, experiment, and theory; and we are rapidly nearing the day when the good work done in the mechanics of the atmosphere by Ferrel, Helmholtz, Oberbeck, von Bezold, Bjerknes, Margules, James Thomson, and other mathematical writers will be fully understood and appreciated by every real student, and when the experimental work of a host of prominent physicists will also be assimilated by all. Among recent works it is those of William Ferrel that most prominently stand out as cosmopolitan. Meteorological statistics, experimental data, and mathematical mechanics were drawn upon by him at every point in his efforts to elucidate atmospheric phenomena. His work still stands at the head of all, and if in any point it is to be amended in the future, it will only be when newer observations and higher mathematical powers become available for the attack on the difficult problems of meteorology.

To the ordinary reader the report on "Government Meteorological Organizations in Various Parts of the World," an address delivered on January 18 by F. Campbell Bayard, L. L. M., President of the Royal Meteorological Society, will be esteemed as the most satisfactory, most complete and authoritative statement yet published of the condition of official meteorology throughout the world. The address proper occupies eighteen pages and the appendix, giving original details, fills thirty-five pages additional. Thirty-five different organizations are enumerated as maintained by a corresponding number of countries or colonies. Of course it is impossible here to summarize the innumerable details. Perhaps the importance of meteorological work at the present time is best expressed by the table given by President Bayard, showing the amount of money granted specifically for meteorology. In most of these cases the sums appear small as compared with that expended by the United States, but they would generally be largely increased if other countries paid in cash for telegraphy, and employed the whole time of many men in distributing maps and forecasts, answering telegrams and telephones, and otherwise devoting themselves wholly to meteorological work. The annual appropriation by the United States averages about 32 cents per square mile of territory, or 1½ cents per inhabitant. In the other countries the rates vary considerably, but in no case are they at all comparable with the vast interests that are protected and benefited.

The Royal Society has earned a debt of gratitude by collecting and publishing these sixty pages of meteorological information.

THE DIURNAL VARIATION OF THE BAROMETER.

This subject is one that has been treated most exhaustively from an observational point of view by Hann who has, in numerous papers, summed up the results of his own and other investigations. In general he concludes that the twenty-four hour or daily component of the regular barometric oscillation must be due to the direct action of the sun's heat, but that the twelve hour, or semi-diurnal term which exhibits the greatest uniformity over the whole globe must be due to some cosmic influence, whose nature has not yet been suggested or suspected.

In the presence of Hann's exhaustive monographs and this check upon his efforts to arrive inductively at some reasonable explanation of the origin of these variations, it now seems necessary to stop for a while in this course of study and investigate the subject deductively. We must follow out to their logical conclusions all the laws of mechanics and physics that we know to be at work in the atmosphere. The Editor has collected many of these and is safe in stating that there are many diurnal movements and changes going on in the atmosphere that can produce second or third terms in the harmonic development, but it is not always easy to foresee what their relative importance may be. Hann, as a meteorologist, has now brought the problem up to a stage in the inquiry where the ablest mathematical students must take hold of it, and they will, doubtless, find it worthy of their genius. We doubt not that the source of the semi-diurnal terms will be found within the atmosphere itself.

RIVER DISCHARGES IN COLORADO.

The total quantity of water discharged per second by various rivers in Colorado, together with the height of the river at the gage, is published by Mr. F. H. Brandenburg in the July report of the Colorado Section. The measurements are made by the Hydrographic Division of the United States Geological Survey. The majority of the streams maintained an unusually high average during July. The discharge of the Arkansas was 46 per cent, and that of the South Platte, 38 per cent above the normal. The discharge of the Rio Grande was 146 per cent above normal, or nearly 2½ times the normal. The importance of rain-gage stations at high points in the mountains, so as to represent the whole watershed of the rivers has already been mentioned in the MONTHLY WEATHER REVIEW by Messrs. Newell and Pressley of the United States Geological Survey.

BACK NUMBERS OF THE MONTHLY WEATHER REVIEW.

Prof. H. A. Rowland, Johns Hopkins University, desires to obtain the numbers of the MONTHLY WEATHER REVIEW for the year 1882 to complete his set.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Chief of Division of Records and Meteorological Data.

PRESSURE.

The pressure distribution for the month is graphically shown on Chart IV. As in the preceding month, the pressure was relatively high on both coasts, being lowest in the Plateau region and at the mouth of the St. Lawrence. The great high areas of both the Atlantic and Pacific, especially the latter, seem to have maintained their winter positions longer than usual. Pressure in the interior of the continent was also higher than usual. As compared with the preceding month pressure fell in the lower Lake region and generally

on the Atlantic and Pacific coasts. Pressure rose in Assiniboia, Manitoba, and generally along the eastern slopes of the Rocky Mountains, the Plains, and the upper Missouri valley.

TEMPERATURE OF THE AIR.

There were no periods of unusually high temperature. In the upper Lake region and over an irregular area extending southwestward to the Mexican boundary, temperature was slightly below normal. It was also below normal on the south Atlantic coast and Florida, and along the Pacific coast from San Diego to Tatoosh Island. Elsewhere it was generally above normal, although the excess rarely exceeded 2°. Maximum temperatures of 100° and over occurred in Georgia, South Carolina, central Texas, central Louisiana, and southern Arkansas, and from Texas northward to North Dakota and Montana. West of the Rocky Mountains maximum temperatures of 100° and over were registered in Arizona, the Colorado River Valley, southern Utah, the Great Valley of California and in the Snake River Valley in Idaho, Washington, and Oregon. Minimum temperatures of 40° and less were registered over three small areas, the first in southwestern Montana and southeastern Idaho, the second in eastern Oregon, northern Nevada, and the northwestern corner of Utah, and the third in northern New Hampshire and Vermont.

In Canada.—Professor Stupart says:

Temperature was a little above the average in British Columbia, Manitoba, and the extreme eastern portion of the Maritime Provinces, and average or a little below in all the larger remaining portion of the Dominion. The greatest amount above average, namely, 4°, was recorded at Minnedosa, and the greatest amount below average, 3°, was at Bissett, on the Ottawa.

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	68.5	+ 0.3	+ 1.3	+ 0.2
Middle Atlantic	12	74.7	0.0	− 2.0	− 0.3
South Atlantic	10	79.6	− 0.3	− 2.1	− 0.3
Florida Peninsula	7	81.3	− 0.2	+ 0.8	+ 0.1
East Gulf	7	81.1	+ 0.1	− 5.5	− 0.8
West Gulf	7	81.9	0.0	− 6.0	− 0.9
Ohio Valley and Tennessee	12	77.4	+ 0.5	− 3.7	− 0.5
Lower Lake	8	71.5	+ 0.3	+ 1.6	+ 0.2
Upper Lake	9	66.7	− 0.6	− 5.7	− 0.8
North Dakota	7	68.9	+ 0.2	−19.0	− 2.7
Upper Mississippi	11	75.1	− 0.1	− 9.4	− 1.3
Missouri Valley	10	74.8	− 0.5	−12.5	− 1.8
Northern Slope	7	69.1	− 0.5	−24.8	− 3.5
Middle Slope	6	75.0	− 1.4	−12.0	− 1.7
Southern Slope	6	77.6	− 2.3	− 2.8	− 0.4
Southern Plateau	13	78.8	− 0.7	− 5.8	− 0.8
Middle Plateau	9	71.9	+ 0.2	− 9.1	− 1.3
Northern Plateau	10	70.3	+ 1.4	−10.4	− 1.5
North Pacific	9	61.7	+ 1.0	−11.1	− 1.6
Middle Pacific	5	63.5	− 1.0	− 2.2	− 0.3
South Pacific	4	70.4	− 0.3	− 1.8	− 0.3

PRECIPITATION.

The distribution of precipitation is graphically shown on Chart III. On the whole a little more than the average amount of rain fell, although there were localities in which the fall was markedly deficient. Drought conditions prevailed in western New York, portions of Georgia and South Carolina, central Pennsylvania, Kentucky, central Illinois, western Iowa, eastern Nebraska, the southeastern part of South Dakota, southwestern part of Minnesota, and in lower Michigan. On the other hand, unusually heavy rains fell in North Carolina, central Florida, Alabama, Arkansas, northeastern Oklahoma and southeastern Kansas, and central Michigan.

The precipitation from January 1 to July 31 of the current year was generally slightly below normal. The deficiencies are, however, slight and of no practical importance except over very small areas. Precipitation was considerably above normal over the middle and southern slopes, as was the case a year ago, thus illustrating the tendency of a year of abundant rains being followed by another of the same character.

In Canada.—Professor Stupart says:

The distribution of rain over the Dominion during the month was, in many respects, very remarkable. This was especially the case in Ontario, where in several counties contiguous to Lakes Erie and Ontario and also on the south shores of Lake Huron, the amount of rain was exceedingly small, while in more northern localities rain fell frequently and heavily, and in some places the total fall for the month was abnormally large. A striking instance in the discrepancy in the rainfalls over different portions of the Province is shown between Wooler, near the Bay of Quinté and Ottawa City; the former place records a total fall for the month of oniy 0.3 inches, the latter 7.6 inches, and Ottawa Experimental Farm as much as 9.9 inches. The rainfall was also much above average in many portions of the Northwest Territories and throughout Quebec and the Maritime Provinces. At Montreal and Yarmouth the average amount was exceeded by 3.6 inches, and at St. John by 4.2 inches.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	3.68	106	+0.2	−0.5
Middle Atlantic	12	4.35	100	0.0	−1.5
South Atlantic	10	6.63	105	+0.3	−2.3
Florida Peninsula	7	6.64	102	+0.1	−1.1
East Gulf	7	7.14	116	−1.0	−6.8
West Gulf	7	3.90	126	+0.8	−3.3
Ohio Valley and Tennessee	12	3.48	85	−0.6	−2.3
Lower Lake	8	2.68	87	−0.4	−2.8
Upper Lake	9	3.54	116	+0.5	−1.2
North Dakota	7	2.25	82	−0.5	−1.0
Upper Mississippi Valley	11	3.47	95	−0.2	+1.2
Missouri Valley	10	2.83	70	−1.2	−3.0
Northern Slope	7	1.53	94	−0.1	−0.1
Middle Slope	6	4.60	164	+1.8	+2.2
Southern Slope	6	6.73	266	+4.2	+5.0
Southern Plateau	9	2.06	132	+0.5	−1.2
Middle Plateau	13	0.42	81	−0.1	+0.7
Northern Plateau	10	0.26	46	−0.3	−1.5
North Pacific	9	0.34	33	−0.7	+3.5
Middle Pacific	5	0.00	00	0.0	−1.9
South Pacific	4	0.00	00	0.0	−1.7

HAIL.

There was much hail in several regions and, coming as it did at the time of harvest, many acres of wheat and other grains were destroyed. The destruction seems to have been greatest in the Dakotas and Minnesota, although hail fell much oftener in Colorado and Utah.

The following are the dates on which hail fell in the respective States:

Alabama, 30. Arizona, 1, 13, 19, 30, 31. California, 14. Colorado, 2, 3, 4, 7, 8, 12, 13, 14, 15, 16, 17, 22, 26, 27, 28, 29, 30. Connecticut, 12. Florida, 4. Georgia, 18. Idaho, 3, 24. Illinois, 2, 11. Indiana, 7, 28. Iowa, 6, 10, 31. Kansas, 1, 5, 7, 19, 29. Kentucky, 28. Louisiana, 4. Maryland, 12, 13, 15, 16, 23. Massachusetts and Michigan, 26. Minnesota, 2, 3, 6, 16, 25, 26, 31. Mississippi, 17. Missouri, 6, 10. Montana, 3, 4, 7, 14, 20, 21, 27, 29. Nebraska, 4, 5, 15, 31. Nevada, 1, 11, 12, 14, 28. New Hampshire, 4, 12, 21, 22. New Jersey, 8, 12, 22, 27, 29. New Mexico, 3, 19, 21. New York, 4, 12, 17. North Carolina, 8, 17. North Dakota, 8, 12, 13, 15, 22, 31. Ohio, 4, 7, 11, 13. Oklahoma, 15. Oregon, 29. Pennsylvania, 7, 12, 22, 25, 26. South Carolina, 5, 8, 17. South Dakota, 5, 14, 23, 25, 28, 30, 31. Utah, 1, 2, 3, 10, 11, 12, 13, 14, 25, 27, 29, 31. Virginia, 30. West Virginia, 5, 7. Wisconsin, 18, 24. Wyoming, 3, 4, 5, 6, 7, 12, 13, 14, 22, 25, 26, 29.

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Bismarck, N. Dak.	22	56	nw.	Miles City, Mont.	30	52	e.
Cape Henry, Va.	30	50	nw.	Mount Tamalpais, Cal.	21	61	n.
Cleveland, Ohio	7	50	nw.	New York, N. Y.	27	50	nw.
Helena, Mont.	21	55	sw.	Pocatello, Idaho	22	52	sw.
Knoxville, Tenn.	16	60	w.	Do.	29	53	sw.
Lander, Wyo	22	52	w.	Sandusky, Ohio	7	56	nw.
Miles City, Mont.	21	62	n.				

LOCAL STORMS AND TORNADOES.

There were not so many thunderstorms during the current month as in the corresponding month of last year. There were no violent tornadoes. Three fully developed tornadoes were observed—one in Brown County, Nebr.; one in Montgomery County, Ky.; and one in Hillsboro County, N. H. A diminutive tornado was observed about twenty-five miles east of Cheyenne, Wyo., being the first known instance of the development of a tornado in that region. Tornadoes have been observed in western Kansas and indeed in eastern Colorado, but the funnel cloud and the force of the storm have suggested in each case an overgrown whirlwind rather than a well developed tornado.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table VII, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 5,476 thunderstorms were received during the current month as against 5,713 in 1898 and 5,253 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 16th, 294; 6th, 278; 5th, 272; 8th, 268.

Reports were most numerous from: Colorado, 295; Ohio, 256; New York, 244; Pennsylvania, 221.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, 18th to 26th.

The greatest number of reports were received for the following dates: 3d, 11; 7th, 5; 10th and 31st, 4.

Reports were most numerous from: Ohio, 8; Massachusetts and South Dakota, 5.

In Canada.—Auroras were reported as follows: Quebec, 10th; Montreal, 7th; Minnedosa, 4th, 7th; Swift Current, 26th; Banff, 16th.

Thunderstorms were reported as follows: St. Johns, 6th, 22d, 29th; Grand Manan, 13th, 21st, 22d; Yarmouth, 8th, 9th, 21st, 22d; Charlottetown, 5th; Father Point, 12th; Quebec, 6th, 10th, 12th, 13th, 15th, 17th, 27th; Montreal, 5th, 17th, 21st, 27th; Toronto, 4th, 28th; White River, 20th, 24th; Ottawa, 5th, 6th, 8th, 12th; Port Stanley, 5th, 8th, 11th, 29th; Saugeen, 10th; Parry Sound, 3d, 7th, 17th, 26th; Port Arthur, 20th, 22d, 24th, 26th, 27th; Winnipeg, 9th, 19th, 21st, 23d, 27th, 31st. Minnedosa, 11th, 14th, 19th, 22d, 23d, 31st; Qu'Appelle, 19th, 21st, 22d; Medicine Hat, 2d, 3d, 4th, 7th, 8th, 9th, 10th, 13th, 14th, 21st, 22d, 23d, 25th; Swift Current, 2d, 4th, 5th, 10th, 14th, 21st, 22d; Calgary, 8th, 16th; Banff, 7th, 19th, 20th, 30th, 31st; Prince Albert, 8th, 11th, 13th, 18th, 19th; Battleford, 3d, 9th, 11th, 19th, 21st, 23d, 24th, 25th, 27th; Esquimalt, 29th; Barkerville, 19th.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	79	0	Missouri Valley	67	0
Middle Atlantic	75	+ 3	Northern Slope	54	+ 2
South Atlantic	78	— 2	Middle Slope	68	+ 7
Florida Peninsula	80	0	Southern Slope	68	+10
East Gulf	76	— 3	Southern Plateau	41	— 1
West Gulf	75	+ 2	Middle Plateau	30	— 2
Ohio Valley and Tennessee	68	— 1	Northern Plateau	40	— 3
Lower Lake	70	+ 2	North Pacific Coast	72	— 5
Upper Lake	77	+ 6	Middle Pacific Coast	58	— 9
North Dakota	66	0	South Pacific Coast	64	+ 1
Upper Mississippi	68	0			

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.0	+0.1	Missouri Valley	4.8	+0.4
Middle Atlantic	5.1	+0.3	Northern Slope	4.2	+0.4
South Atlantic	5.5	+0.5	Middle Slope	4.8	+0.8
Florida Peninsula	5.8	+0.8	Southern Slope	4.4	+0.6
East Gulf	4.5	−0.5	Southern Plateau	3.3	0.0
West Gulf	4.4	+0.2	Middle Plateau	3.1	+1.1
Ohio Valley and Tennessee	4.7	+0.1	Northern Plateau	2.7	−0.4
Lower Lake	4.6	+0.1	North Pacific Coast	4.0	−0.4
Upper Lake	5.1	+0.4	Middle Pacific Coast	3.5	+0.6
North Dakota	3.8	−1.0	South Pacific Coast	2.1	−0.6
Upper Mississippi	4.4	+0.1			

NOTES ON THE WEATHER IN THE WEST INDIES.

No general disturbances were observed.

Santo Domingo: A severe local storm visited this place on the 28th. The wind blew steadily from the north and northeast with heavy rain all day, culminating in a severe squall at 7:30 p. m., maximum wind velocity, 40 miles per hour. Three small sailing vessels anchored in the outing were driven on the rocks and totally destroyed.

Basseterre: Severe thunderstorms on the 14th, maximum wind velocity, 30 miles per hour.

Curaçao: Heavy sea swell from 8 to 10 a. m. on the 29th.

Santiago: Lightning struck a cocoanut tree near the wharf and set it on fire on the afternoon of the 20th.

Puerto Principe: A fall of 20° in temperature, from 96° to 76° occurred during a thunderstorm on the 10th. Being in the interior of the island the daily range of temperature is much greater than at coast stations. During July the daily range was never less than 14°, and on two days it was as high as 27°, the average being 20°.

The rainy season had not set in over Cuba at the close of the month; the rainfall throughout the islands was generally light, except at San Juan, Porto Rico.

Chart VIII shows the pressure and temperature distribution, and the prevailing winds in the West India region for the month being a continuation of the series begun in the April 1899 REVIEW.