Yates Center, Kan., 18th; Independence, Kans., 4th to 11th, 14th, 17th to 29th; Ft. Sill, 25th; Dodge City, 7th and 9th; Ft. Gibson, 2nd, 4th, 6th, 8th, 9th, 10th, 11th and 22nd; Chattanooga, Tenn., 24th and 25th.

Sun Spots.—The following record of observations, made by Mr. D. P. Todd, Assistant, has been forwarded by Prof. S. Newcomb, U. S. Navy, Superintendent Nautical Almanac Office, Washington, D. C.:

DATE— Feb., 1880.	No. of new—		Disappeared by *solar rotation.*		Reappeared by *solar rotation.*		Total number visible.		REMARKS.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
1st, 10 a. m...	0	5	0	0	0	0	2	14	
2nd, 9 a. m...	0	0	0	0	0	0	2	14	Faculæ.
3rd, 4 p. m	1	3	0	0	1	3	3	11	
4th, 9 a. m...	0	0	0	0	0	0	3	11	} Faculæ
5 p. m...	0	0	0	0	0	0	3	11	
5th, 3 p. m...	0	0	0	0	0	0	3	11	
6th, 3 p. m...	0	0	0	0	0	0	3	11	
7th, 2 p. m...	0	0	0	0	0	0	3	11	
8th, 9 a. m...	0	7	0	0	0	0	3	18*	
9th, 2 p. m...	0	0	0	0	0	0	3	18*	
11th, 3 p. m...	0	0	2	11	0	0	1	8	
14th, 8 a. m	0	0	1	8	0	0	0	0	Several extensive fields of faculæ. Spots probably disappeared by solar rotation.
21st, 3 p. m...	1	3	0	0	1	3	1	3	
22nd, 11 a. m..	0	3	0	0	0	3	1	6	
23rd, 9 a. m...	0	0	0	0	0	0	1	6	
24th, 8 a. m...	0	0	0	0	0	0	1	3	
4 p. m.	0	0	0	0	0	0	1	3	
25th, 9 a. m...	0	3	0	0	0	0	1	6	
26th, 3 p. m...	0	0	0	0	0	0	1	1	
27th, 2 m......	0	0	0	0	0	0	1	1	
29th, 12 m......	1	1	0	0	0	0	2	2	Several broad areas of faculæ.

*Approximated.

Mr. Wm. Dawson, at Spiceland, Ind., reports: "1st, a large group of 12 spots in NE. quadrant, one large spot south of the group; both group and spot 4′ from E. edge; 3rd, 3 groups, 18 spots; one new spot at E. edge; 4th, 3 groups, 8 spots; 5th, 3 groups, 8 spots; 6th, 3 groups, 22 spots; 8th, 4 groups, 15 spots; 10th, 4 groups, 25 spots; 15th, no spots; 20th, one spot very close to edge; 21st, 3 spots near E. edge; 22nd, 3 spots, 1 group; 24th, 6 spots, 1 group; 26th, 1 large spot and 2 little ones near it, nearly S. of centre." Mr. F. Hess, at Ft. Dodge, Ia., reports: 1st, noon, 2 groups in NE. quadrant—upper, 2 large and 10 or 12 small spots and faculæ; lower, 1 large spot and faculæ; 2nd, 9 a. m., same—in all, 3 large and 6 small spots, no faculæ; 3rd, 9 a. m., same, and a large new spot near NE. limb and 1 in SE. quadrant and faculæ; 4th, no sun all day; 5th, 9 a. m., two large and one small spot in NW. quadrant, one large spot in SW. quadrant, one large spot in NE. quadrant and faculæ; 6th, 9 a. m., same four large spots and several small ones—nothing new since yesterday; 7th, 9 a. m., same four large spots nearer to W. limb—nothing new; 8th, 10 a. m., four groups, 3 in NW. quadrant, 1 in SW. quadrant; 9th, 10 a. m., five groups, 4 in NW. quadrant, 1 in SW. quadrant—in all 15 distinct spots and many faculæ; 10th, 10 a. m., same five groups of 15 spots—3 spots very large; 11th, 10 a. m., only 6 spots; first two groups have disappeared by rotation; 12th, 10 a. m., four large and seven small spots and many faculæ in NW. quadrant; 13th, 10 a. m., one large and five small spots, a new group of faculæ near E. limb; 14th, 10 a. m., no spots, but two groups of faculæ near NE. and NW. limbs; 15th to 20th, no spots or faculæ; 21st, noon, one large spot and brilliant faculæ near SE. limb; 22nd, noon, one large spot and 2 distinct smaller ones besides a number of others indistinct; 23rd, noon, one large spot and two smaller ones, no faculæ; 24th, noon, same as on previous day; 25th, no observation made; 26th, 8. a. m., same group near centre E. and W., nothing new; 27th and 28th, no observations; 29th, noon, one large spot in SW. quadrant and a group of faculæ near SE limb.

NOTES AND EXTRACTS.

[*Nature, February* 5, 1880.]

Results of an Inquiry into the Periodicity of Rainfall.—Mr. G. M. Whipple, the author, has collected the following series of rainfall observations, all of which contain more than fifty years' records:

Station.	Periods.	No. of years.	Authority.
Paris	1689–96, 1699–1754, 1773–97, 1804–75	161	Annuaire de l'Observatoire de Montsouris, 1879.
Padua	1725 to 1878	154	MSS. from P. Denza.
England (Symons' table)	1726 to 1865	140	B. A. Report. 1866.
Milan	1764 to 1878	115	MSS. from P. Denza.
London	1813 to 1878	66	Dines and Symons.
Madras	1813 to 1877	65	NATURE, vol. xviii, p. 565.
Philadelphia	1810 to 1867	58	Smithsonian Tables, p. 97.
Edinburgh	1822 to 1878	57	NATURE, vol. xviii, p. 97.
New Bedford	1814 to 1867	54	Smithsonian Tables, p. 90.
Rome	1825 to 1878	54	MSS. from P. Denza.

To these he added an eleventh, forming a series by combining together the annual rainfall for 1822 to 1875 at London, Paris and Edinburgh, which increased the total number of years of observation to 978.

These he has discussed after a method described at length in the paper, and determined for every series the curves which represent the variation in the means of the amount of annual rainfall for each of the years comprising the series on the assumption of the presence of a cycle, which he varies in duration from five to fifteen years.

The computed curves are then compared with the actual curves representing the observations, and the number of coincidences and non-coincidences in the epoch of maximum and minimum determined.

The results show that in no one case is there any indication of a period of any integral number of years from five to thirteen inclusive running through them.

It also became evident that for the same epoch the curves of variation differ widely for localities comparatively close together. For example, taking the eleven-year cycle for Padua and Milan, stations only about 130 miles apart, both well situated for observing rain, and no mountain range intervening, the variation curves are as follows:

Year	1800 +11*n*	1801 +11*n*	1802 +11*n*	1803 +11*n*	1804 +11*n*	1805 +11*n*	1806 +11*n*	1807 +11*n*	1808 +11*n*	1809 +11*n*	1810 +11*n*
Padua	−1.3	−0.3	−1.7	+1.1	+4.2	+4.2	−4.9	+3.4	−2.8	−2.8	+1.7
Milan	−5.0	+1.5	+0.2	−1.9	−2.5	−0.0	+3.0	+4.7	−5.6	+2.6	+3.3

These show that the years of greatest rainfall at Padua are represented by the formula [1804 or 5 + 11*n*], and of least by [1806 + 11*n*], whilst for Milan the maximum occurs at [1807 + 11*n*], and the minimum at [1808 + 11*n*].

Numerous other instances of incongruity are found in every one of the cycles, leading forcibly to the conclusion that either no short term of exactly five, six, seven, eight, nine, ten, eleven, twelve, or thirteen years exists in the annual amount of rainfall at any of the stations whose observations have been discussed in the paper, or that the effect of abnormal falls is so great that it cannot be eliminated by upwards of a hundred years' observations.

In any case the author thinks it may now be stated with certainty that all predictions as to rainy or dry years, based upon existing materials, must in future be considered as utterly valueless.

Movements of Storms.—In his twelfth contribution to Meteorology Prof. Elias Loomis writes as follows:

Rate of progress of barometric minima.—Dr. Neumayer has given for each month in the years 1876 and 1877 the average daily progress of barometric minima in Europe expressed in myriameters. I have reduced these values to English miles per hour, and the results are shown in column 4th of the following table. For the purpose of comparison, I have placed in column 2nd the velocities deduced from three years observations in the United States as published in this Journal, vol. x, p. 1. I have also reduced to a tabular form the velocities given in the monthly reports of the Signal Service since November, 1875,

	Loomis.	Sig. Ser.	Europe.		Loomis.	Sig. Ser.	Europe.
January	26.7	33.8	15.8	July	24.9	27.6	14.7
February	32.0	28.5	14.0	August	18.4	22.8	14.5
March	30.5	30.2	18.2	September	22.9	21.5	15.0
April	27.5	24.1	14.9	October	25.8	21.4	19.7
May	23.5	23.6	12.7	November	29.0	25.5	15.8
June	21.6	23.5	14.5	December	29.3	34.0	15.8
				Year	26.0	26.3	15.5

and have determined the averages for each month. These results are shown in column 3rd of the table. They are derived from forty-four months of observation, and refer to the region between the Atlantic Ocean and the meridian of 100° from Greenwich.

The average velocity of storm-centres in the United States is seen to be 69 per cent. greater than it is in Europe. In my tenth paper (this Jour., vol. xvii, p. 3) I determined the average velocity of storm-centres on the Atlantic Ocean to be 14 miles per hour, which is somewhat less than the value above found for the continent of Europe.

It appears then to be an established fact that storms travel more rapidly over the eastern portion of the United States than they do over the Atlantic Ocean or the continent of Europe. What cause can be assigned for this inequality? The winds on the Atlantic Ocean are certainly stronger than they are over either of the continents, and it is believed that the winds of Central Europe are generally stronger than the winds of the United States. * * * In my first paper (this Jour., vol. viii, p. 7) from a comparison of a large number of cases, I showed that generally the stronger the wind on the west side of a storm the less the velocity of the storm's progress. If the more rapid progress of storm-centres in the United States results from a difference in the velocity of winds it seems probable that the effect is produced by means of the vapor which is precipitated. From the Rocky Mountains to the Atlantic Ocean storms advance from a dryer to a more humid atmosphere. In Europe, while storms travel eastward, they advance from a humid to a dryer atmosphere. Upon the Atlantic Ocean the vapor on the western side of storm-centres generally has a greater tension than it has upon the eastern side, owing to the warm water of the Gulf Stream. In my eighth paper (this Jour., vol: xv, p. 11) I have shown that in the vicinity of Newfoundland storms are frequently delayed several days, and this result is apparently due to the abundant precipitation of vapor in that region. In my first paper (this Jour., vol. viii, p. 6) I have shown that when a storm-centre advances eastward most rapidly, the rain-area generally extends to an unusual distance on the east side; and the storm-centre advances less rapidly than usual when the rain-area extends but little on the east side. These facts seem to indicate that in Europe the center of rain-area must precede the center of least pressure by a less distance than it does in the United States. I have endeavored to decide this question by a comparison of observations. * * * * *

From these observations we must conclude that storms may travel eastward even though the center of the rain-area is somewhat west of the center of low pressure. In my tenth paper (this Jour., xvii, p. 12) I have shown that the change of wind which accompanies a barometric minimum generally begins at the surface of the earth. before it does at elevated stations, indicating that the west wind in the rear of the storm pushes under the east wind, lifting it from the surface of the earth, so that a change of wind and an increase of barometric pressure is observed at the surface before there is any change of wind at the elevation of 2,000 or 3,000 feet. This movement of the winds does not prevent the storm-centre from advancing eastward, but the storm advances less rapidly than when the centre of the rain-fall is considerably east of the centre of low pressure, as is generally the case in the United States.

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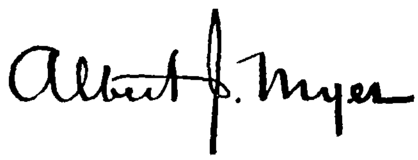

Brig. Gen. (Bvt. Assgd.) Chief Signal Officer, U. S. A.

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