An extraordinary phenomenon of thunder and lightning occurred last night, which is of such rare occurrence in this region that the oldest inhabitants assured me to-day that they never experienced anything like it, some of them having lived around here since 1845.

Last evening at about 10:25, distant horizontal flashes of lightning commenced at the southeast, temperature 63°; no thunder was audible and the lightning was frequent, extending over a long range from extreme southeast to nearly east. This continued until after 11:15 p. m., when I retired. No doubt this must have continued further, for at 12:20 a. m. I was awakened by roaring thunder. Getting up at once, I watched the southeast and east horizon, which I viewed from this station, as formed by the Cascade Mountains, just about 50 miles distant.

Such intense flashes of lightning, illuminating the sky and country to the extent of almost bright sunlight, I have never before seen. What seemed to me very strange, however, was the fact that not once did the streaks of lightning form zig zags like those seen by me in the East and in Europe, in my youth. Last night's flashes were all vertical and inclined about 10° down to points either just west or just east of the Cascade Range. The streaks of lightning were mostly like half a spiral or corkscrew. But three times I saw a perfect "n" and once an "m." The thunder peals which followed were tremendous. I must remark that for half an hour I invariably counted intervals of from twenty to twenty-three seconds elapsing between the lightning and the thunder; for over half an hour the flashes occurred regularly every twenty-five to thirty seconds. The rain here during two hours amounted to only 0.29. At 1:15 a. m. the phenomenon ceased. The entire storm lasted two hours and fifty minutes, the longest continuous lightning and thunder I ever experienced.

METEOROLOGY IN FRENCH INDO-CHINA.

We copy from the Annales de Geographie, March, 1900, IX, p. 178, the following paragraph which shows that meteorological observations are now well established in a portion of the world from which we have hitherto received very fragmentary information.

For a long time past we have regretted the almost complete absence of meteorological observations in French Indo-China. This gap was especially to be lamented, from a scientific point of view, because it prevented us from extending our studies over one of the most interesting portions of Asia and, from a practical standpoint, because a knowledge of the climate is of primary importance for hygiene, colonization, and the rational utilization of the soil. The Central Meteorological Bureau of France had several times opened negotiations with the successive governors of Indo-China for establishing an adequate network of meteorological stations in that immense region, and the project was for a short time on the point of being realized by M. de Lanessan, when the latter was obliged to leave our colony. The project has just been revived and brought to a happy conclusion, thanks to the enlightened initiative of the present Governor-General M. P. Doumer.

The network of stations for the year 1900 has been constituted as follows, the principal stations being printed in capital letters:

In Cochin-China: SAIGON, CAPE SAINT-JACQUES, POULO-CONDORE, Ong-Yem, Tay-ninh, and Soc-trang.

In Annam: NHA-TRANG, LANGSA, TOURANE, Quin-hone, Hué, Dong-Hoi, Vinh, and Than-hoa.

In Tonkin: HANOI, Haiphong, Quang-Yen, Hon-gay, Mon-cay, Lang-son, Cao-bang, Lao-kay, Ha-giang, Bac-kan, and Van-bu.

In Laos: VIEN-TIANE, Luang-Prabang, Savannakhek, Khong, and Attopeu.

In Camboge: PNOM-PENH, Kampot, and Pursat.

In Yunnan and China: YUNNANSEN, Semao, Mongtzé, Langtchéou, Pakhoi, Hoï Hou, Kouang-Chau-Wan (Kouang-tchéou Ouan).

In the Gulf of Siam: Chantaboun, Bankok, and Singapore.

To these stations will be added a first class observatory, which will probably be established near Haiphong and where regular magnetic observations will also be made. All the scientific outfit of this observatory is due to the well-known liberality of M. Bischoffsheim; the greater number of these instruments have just been sent there.

It will thus be seen that this network of stations has been well conceived and very interesting results may be expected from the observations that have just begun to be made there. There are only two other things to be wished for, viz, that the new establishment may be permanent, and that on the other hand the means may be found for publishing the observations regularly—the only means of rendering them really valuable.

A RAIN OF SMALL FISH.

Mr. J. W. Gardner, voluntary observer at Tillers Ferry, S. C., reports that during a heavy local rain about June 27 there fell hundreds of little fish (cat, perch, trout, etc.) that were afterwards found swiming in the pools between the cotton rows in a field belonging to Mr. Charles Raley.

It is a well-known fact that in such rains all sorts of foreign objects, whether sticks or stones, frogs or fish, or even débris of destroyed houses and crops, occur occasionally not only in America but in Europe and elsewhere. It is very rare that we are able to trace these objects back to their sources, but there can be no reasonable doubt that they were carried up from the ground by violent winds, such as attend thunderstorms and tornadoes. Light objects, such as sheets of paper, have been identified as falling at points twenty or fifty miles distant from their starting point, but it is hardly likely that heavier objects, such as fish, could be carried so far without coming to the ground.

SUN SPOTS AND METEOROLOGY.

The question as to a possible relation between sun spots and terrestrial meteorology seems to have been started by Riccioli in 1651, as soon as physicists and astronomers fairly began to follow in the footsteps of Galileo. In 1800 Herschel suggested a relation between sun spots and the crops as depending upon the temperature of the earth. The memoirs of Fritsch, Vienna, 1854; Gautier, 1844; Arago, 1855; Zimmermann, 1856; Wolf, 1859, represent about all that was known on the subject before 1870.

In 1869, by comparing Wolf's sun-spot figures with various meteorological tables, I satisfied myself that the variations of solar radiation affect the terrestrial temperature so slightly that they are generally marked by local climatic peculiarities, but a special study of the observations on the summit of the Hohenpeissenberg near Munich (see American Journal of Science, 1870, vol. 50, p. 345) showed that the daily 2 p. m. observation gave a clear indication of the direct heating power of the sun and that the midday air temperature decreased at the rate of 0.008° R. for each unit of Wolf's tabular sun-spot numbers. There was also an indication of a period embracing about five sun-spot periods or 55.5 years, and a further possibility that the periodic changes in spots may have to do with planetary tides in the solar atmosphere.

Dates of maximum and minimum temperature.		Dates of maximum and minimum sun spot.
In the Tropics.	Beyond the Tropics.	
.....	1815 5	1816 8*
1822 5*	.....	1823 2
.....	1825 8*	.....
1830 1	.....	1829 5*
.....	1831 9	.....
1833 1*	.....	1833 8
.....	1834 2*	.....
1836 4	.....	1837 2*
.....	1837 8	.....
1842 8*	.....	1844 0
.....	1846 4*	.....
1847 6	.....	1848 6*
.....	1850 3	.....
1854 7*	.....	1856 2
.....	.....	.....
.....	.....	1860 2*
.....	1861 6	.....
.....	.....	1867 2
.....	1868 7*	.....

*The maxima are indicated by the star.

Koeppen states that at that same time he began collecting his material for an investigation on the broadest possible foundation, the results of which he published in the Meteorologische Zeitschrift, 1873, Vol. VII, pp. 241 and 257. He collated all available series of observations at stations embracing three years or more of continuous work and wove them into a homogeneous system of groups, twenty-five in all, representing the years 1731–1871 and covering the whole

Northern Hemisphere as far as practicable. Koeppen concludes that in the tropical regions the maximum temperature of the air occurs from one-half year to one and a half years before the minimum of solar spots, but that outside of the Tropics the temperature maxima occur later than the spot minimum to the extent, in one case, of three years; further, that the regularity and magnitude of the periodic variations of temperature diminish with great regularity from the Tropics toward the pole, so that, for instance, the variation which is very pronounced between the years 1830 and 1840 becomes almost inappreciable as we pass from the Tropics to the Arctic regions. This relation is summarized in the preceding table.

In connection with the above table, Koeppen has compared the minimum temperatures with the maximum sun spots. On the average, he finds that the minimum precedes the maximum sun spot by a year in the Tropics and the maximum temperature precedes the minimum sun spot by a similar amount. If, however, we adopt a slightly different way of comparing the data, we find that in the Tropics the maximum temperature follows the maximum sun spot and the minimum temperature follows the minimum sun spot by about four years. Now, there is, a priori, no reason why this latter arbitrary comparison is not just as rational as the one adopted by Koeppen, since the average temperature of the atmosphere at any place is affected by the wind and cloud indirectly quite as much as it is by the sun directly. This principle is recognized by Koeppen when he says that the systematic change of period in passing from the Tropics toward the pole is difficult of explanation, but must depend upon the general circulation of the atmosphere with its evaporation, cloud, and rain.

Like most other investigators, Koeppen concludes that we have overwhelming evidence of an intimate connection between the spots and the temperature, the extreme range of temperature being about 2° C. for the extreme range of sun spots, but we have not yet any clear idea of the precise nature of the connection. We may, however, be certain that the spots do not act simply by darkening a portion of the solar disk, for the temperature of the earth's surface is a summation of the solar influence so that a change at the earth must occur later than the change in the solar radiation.

In the article by Mr. H. H. Kimball, printed on a preceding page, he brings out the general principle that the question as to whether the thermal radiation of the sun has a periodicity similar to that of the sun spots can not easily be settled by observations of temperature on the earth because of the complications introduced by our atmosphere, but that on the other hand it may be plausibly attacked by the study of the lines in the solar spectrum; that the widening of the lines in connection with the increased number of prominences bespeaks an increase in the temperature and if these run parallel to the sun-spot phenomena, then some relation between solar spots and solar temperatures is made out, whence we may plausibly argue that there should be a thermal effect somewhere on the earth, although not necessarily at the base of the earth's atmosphere, since the variable solar radiation may be absorbed only in the upper air. This appears to be the line of thought adopted by Sir Norman Lockyer in investigating the question whether the solar radiation absorbed in the upper air may not directly affect the clouds and the rainfall although inappreciable to the thermometer at the earth's surface. The latest paper on the subject, by the younger Lockyer (William J. S.) is published in the Proceedings of the Royal Society, June 24, 1901, LXVIII, pp. 285–300. In this article, "On the solar activity, 1833–1900," he compares the total amount of spotted area and the variation in magnetic and other terrestrial phenomena. As to the magnetic phenomena there can be no doubt; it has always been recognized that the parallelism was so close as to bespeak a common origin. It was in attempting to understand the nature of this connection that Prof. F. H. Bigelow was led to his hypothesis that the variation in solar radiation was of such a nature that it might be treated as an electro-magnetic effect, since, according to modern physics, electric phenomena are simply cases of wave motion in the ether, entirely analogous to light and radiant heat, and are mutually interconvertible. Lockyer finds also a 35-year period in the sun spot, and as this agrees with Brückner's 35-year period in terrestrial climates, he seems to suggest that there must be a connection between the sun and the earth, such that the slight 35-year variations in climate depend upon the rather more pronounced 35-year period in the sun spot, the aurora, and the magnetic storms. He finds no indication of the 55-year period suggested by Dr. Wolf.

We are informed that at a meeting of the Astronomical and Physical Society of Toronto, apparently held in May, 1901, Prof. R. F. Stupart communicated the results of a new inquiry into the relation between sun-spot figures and the rainfall of the lower Lake region. An official copy of this paper has not yet been received, but according to a letter of Mr. Arthur Harvey in the Toronto Mail and Empire—

It appears that from the conditions prevailing in October those which are to prevail the next May can be foretold with great probability. If this statement is correct, it would seem that long-range forecasting has entered upon a new stage of development.

As the periodicities in sun spots, the width of the spectrum lines, the magnetic and auroral phenomena are sufficiently well marked to be satisfactorily demonstrable while the corresponding variations in pressure, temperature, wind, and rainfall are small, elusive and debatable, we must caution our readers against being carried away by optimistic promises. It certainly is impressive to the thoughtful mind to realize that there is even a slight connection between solar and terrestrial phenomena but the delicacy of this connection is such that it still remains true that the study of meteorology is essentially the study of the earth's atmosphere as acted upon by a constant source of heat, the sun. None of these astrophysical studies should tempt the meteorologist to wander far from the study of the dynamics of the earth's atmosphere and the effect of the oceans and continents that diversify the earth's surface.

METEOROLOGY IN THE UNIVERSITIES.

Among the announcements of changes at the Johns Hopkins University we find the following line: "Oliver L. Fassig, Ph. D., now instructor, promoted to be associate in meteorology." This recognition of Dr. Fassig's good work, both as a teacher of meteorology and an officer of the State Weather Service must be encouraging, not only to him personally, but to those who hope to see meteorology firmly established as a university course at all of our larger institutions of learning.

In general, meteorology continues to labor under the disadvantage of failing to secure distinct and independent recognition in our colleges and universities. Some treat it as a small branch of geography, others as belonging to geology; many class it with the mathematical and experimental physics; in a few cases it keeps its ancient association with chemistry and natural philosophy. One might wonder whether the atmosphere is of such vital importance to all that all clamor for the honor of teaching what little we know about it. There can be no objection to giving it a place under geography if that title be made to include the whole range of studies pertaining to our globe, but as this is never the case we believe that our subject is of sufficient practical importance and intellectual dignity to warrant giving it full recognition. Call it by its own name and give it a home of its own.