in vacuo, is read hourly during the daytime. Parallel with this are the readings of the heliograph, so that we have both the intensity and duration of the sunshine. Apparently the heliograph is of the Campbell-Stokes pattern, in which the sun's rays, concentrated by a lens, char a bit of wood or cardboard. Of course these forms of apparatus still need to be supplemented by the more recent and very convenient actinometers of Ångström, Chwolson, or Violle. If this can be done at Belgrade, that observatory will surpass all others in the value of its sunshine records. The record of the heliograph shows that the total duration of bright sunshine was 2303.8 hours during 1902, or 48 per cent of the total possible. The average reading of the black bulb in vacuo was 24.85° C., and of the bright bulb in vacuo 15.88° C. The maximum reading of the black bulb was 39.42° C. The average temperature of a thermometer in the shade was 10.81° C. and in full sunshine 10.95° C. These two latter figures are the averages for day and night, and the temperatures of an unsheltered thermometer are as certain to be below the true temperature of the air by night as they are above it by day. The annual evaporation from a water surface within a thermometer shelter was 67.3 millimeters, while the annual rainfall at the station during 1902 was 563 millimeters. Of course the evaporation would be much larger if the water surface was outside the shelter and fully exposed to the sunshine and wind. Being within the shelter, the evaporation of 67.3 millimeters must be correlated with the observations of the wet-bulb thermometer. This latter, or the psychrometer, is observed regularly, and, as no artificial ventilation is employed, the evaporation from its surface will only differ from that shown by the plane water surface of the evaporometer by reason of the texture of the muslin surface, and possibly the more or less perfect supply of water to the muslin covering. According to the formula of Fitzgerald, we may compute the average humidity of the air from the rate of evaporation, viz, the average vapor tension equals the vapor tension corresponding to the temperature of the water, which in this case is the temperature of the wet bulb, minus the expression $CE/(1+1/2W)$, where E is the quantity evaporated in one hour, and W is the velocity of the wind per hour. The coefficients C and $1/2$ need to be determined in each special case, and it is to be hoped that some addition to our knowledge may be secured by making such determinations frequently at the Belgrade Observatory.

Mean temperatures of the soil at various depths at Belgrade, Servia.

Depth.	1902 August.	1902 December	1902 Annual.	Depth.	1902 August.	1902 December	1902 Annual.
Meters.	° *C.*	° *C.*	° *C.*	*Meters.*	° *C.*	° *C.*	° *C.*
0.01	24.52	0.70	12.51	3.00	14.56	12.61	12.59
0.05	24.19	0.74	12.28	4.00	13.83	13.54	12.75
0.10	24.27	0.74	12.25	5.00	12.90	13.65	12.69
0.15	23.82	1.02	12.21	6.00	12.28	13.50	12.72
0.20	23.41	1.53	12.24	8.00	12.60	12.97	12.81
0.30	22.64	1.66	12.20	10.00	12.80	12.80	12.83
0.50	22.34	3.17	12.54	12.00	12.90	12.80	12.89
0.60	21.77	3.91	12.55	14.00	12.90	12.90	12.90
0.90	20.79	6.18	12.86	16.00	13.00	13.00	13.00
1.20	19.20	8.17	12.72	18.00	13.00	13.00	13.00
1.50	18.73	8.50	12.57	20.00	13.10	13.10	13.09
2.00	17.22	10.58	12.68	24.00	13.30	13.20	13.30

In his introductory note of August 20, 1903, Nedelkovitch announces that through the kindness of Konkoly he is about to establish a Vincentini seismometer as modified by Konkoly himself, and constructed at the workshop of the meteorological institution at Budapest. To Konkoly also he is indebted for the magnetic apparatus constructed on Lamont's system, so that Belgrade is now able to carry on all the works that are considered appropriate to a modern meteorological establishment. Of course, magnetism and seismology are not essentially meteorological, but it is important that the records be kept, and it is convenient to have the meteorologists do this. The same may be said of the temperatures of the soil and of the waters of the lakes and oceans, but these have some important connection with meteorology. The remarkable series of soil temperatures maintained at Belgrade, and published in daily and monthly means, shows that in the year 1902 the lowest temperature at the surface of the soil occurred on January 21, namely, —0.28° C. The highest temperature at the surface of the soil occurred August 9, 28.43° C. The mean monthly temperatures are given in full in the annual summary, and we reproduce in the preceding table the means for the months that have the highest and the lowest surface temperatures, namely, August and December, and also the annual mean.

THE CLIMATE OF SOUTHWESTERN IDAHO.

At a meeting of the Idaho State Horticultural Society on January 17, 1902, Mr. S. M. Blandford, Section Director, read an interesting paper on "Mildness of the climate of southwestern Idaho."

He states that the exceptionally mild section of Idaho may be said to extend from Shoshone, Lincoln County, in the Snake River basin, on the south to Lewiston, Nez Perces County, on the Clear Water River, on the north. Adopting the temperature of Boise, Ada County, as fairly representing the average temperature for this southwest valley section, and comparing it with the temperatures of other cities on about the same parallel of latitude, he shows it to be very considerably warmer. Thus, the annual mean temperature of Boise is 51°, while that of Milwaukee, Wis., is 46°. Going farther south, Salt Lake City, Utah, has an annual mean temperature of 51°, or the same as Boise; Pocatello, Wyo., 46; Cheyenne, Wyo., 44; Santa Fe., N. Mex., 48°.

Comparing with stations to the westward, Baker City, Oreg., has an annual mean temperature of 45°; Portland, Oreg., 52°; Roseburg, Oreg., 53°; Eureka, Cal., 51°; San Francisco, Cal., 56°; San Louis Obispo, Cal., 58°, the last two being, of course, farther south than Boise.

Lewiston has an average annual temperature of 53°; Garnet, on Snake River, 56°.

Mr. Blandford also mentions the light winds as a feature of the climate, Boise and Lewiston records showing an average velocity for the year of 4 miles per hour.

In discussing the causes of the extreme mildness of this section, Mr. Blandford says:

> The valley of the Snake River, from a topographical view, is a trough in the great American Plateau. For 400 miles eastward from its intersection with the western boundary of the State the surface of this valley ranges from 1000 to 4000 feet above sea level, while the mountains that surround it on the north, east, south, and west vary in height from 6000 to 10,000 feet. Briefly, these are the prominent topographical characteristics of the State of Idaho that bear on our subject.
>
> From the foregoing it is clear that the air in reaching the Snake River basin and neighboring valleys must flow over the summits of mountains and descend, and consequently be compressed, thereby having its temperature raised. * * * There is no possible way for air entering Snake River basin and adjacent valleys to escape this compression and warming, except it enter from the northwest through the narrow gorge of the Snake River. The residents in the Boise, Payette, or Snake River Valley will observe that the southerly, easterly, and northerly winds are the warm winds, while the northwesterly wind is almost invariably cool.

Mr. Blandford then goes on to discuss the effect of mountain ranges upon the temperature of air currents blowing over them. The printed abstract of his remarks seems to have been too brief and needs to be supplemented by an important consideration. The current of air that ascends the windward side of a mountain is cooling by reason of its expansion as it comes under lower barometric pressure. It cools at a nearly uniform rate, approximately the adiabatic rate, which is about 1° C. to 100 meters, or 1° F. for 186 feet of ascent. But when, finally, it has cooled to the dew-point, and haze or cloud begins to be formed, and rain or snow falls, an appreciable amount of heat that was before latent is now retained by the cloud, while the rain or snow falls to the ground. When the cloud passes the

mountain crest and begins to descend, the air is warmed by compression at the same rate as before. The cloud is soon evaporated and the air becomes clear, but as it continues to descend it is frequently much warmer than it was at the same level on the windward side. Doubtless heat is lost by radiation during the descent, but it is also being lost during the ascent, so that, as a general rule, the descending winds on the leeward side must be warmer and drier than the ascending winds on the windward side in proportion to the amount of moisture lost and latent heat retained, and also in proportion to the excess of gain by insolation over loss by radiation.

These descending warm winds are usually called "chinook winds" in the Rocky and Cascade mountains, while in the Alps they are called Foehn winds. Mr. Blandford says:

> These warm winds * * * always come from the direction of the mountains. In Montana the chinook is a westerly wind, while in Idaho it comes from any direction except west. At Boise it comes from the east.
>
> We should assign the mildness of the climate of southwestern Idaho to local causes rather than to a supposed current in the Pacific a thousand miles to the westward.

FLOW OF SPRING WATER AFTER FIRST KILLING FROST.

Mr. Woodruff Ball, of Nebraska, has submitted to Mr. H. McP. Baldwin, Assistant Observer in charge of the Weather Bureau station at Valentine, Nebr., some interesting observations, which are corroborated by the testimony of a number of other persons, about as follows:

Natural springs of water in the region where Mr. Ball lives, about fifty miles south of Valentine, are observed to rise or increase their volume about the time of the first killing frost, which is about the 15th of September. The flow continues through fall, winter, and spring. The springs generally begin to show a perceptible decrease about the first of June. It is not known how far below the soil the springs originate, but the rise in the well water is noticeable.

Any explanation of the above phenomenon must involve geological considerations, combined with the time and quantity of rainfall. We shall be glad if those who are familiar with the geological structure underlying Nebraska would elucidate this matter for the benefit of the readers of the WEATHER REVIEW.

AN OLD DESCRIPTION OF AMERICAN CLIMATES.

Our attention has recently been called to a description of the climate of different sections of the eastern part of the United States in Carey's American Pocket Atlas, published in Philadelphia in 1796, from which the following extracts have been obtained, and these apply as well to the present time as they do to the eighteenth century:

Page 13. New England; climate and diseases.—New England has a very healthful climate. It is estimated that one in seven of the inhabitants live to the age of 70 years, and one in thirteen or fourteen to 80 years and upward.

Winter commonly commences in its severity about the middle of December; sometimes earlier, and sometimes not till Christmas. Cattle are fed or housed in the northern parts of New England from about the 20th of November to the 20th of May; in the southern parts not quite so long.

Pages 45-46.—The Second Grand Division of the United States comprehends: New York, New Jersey, Pennsylvania, Delaware, and the Territory northwest of Ohio. It is bounded north by upper Canada, from which it is separated by the lakes; east by the New England States; south by the Atlantic Ocean, Maryland, Virginia, and the Ohio River, which separates it from Kentucky; west by the Mississippi River.

* * * * * * *

Climate.—The climate of this Grand Division, lying almost in the same latitudes, varies but little from that of New England. There are no two successive years alike. Even the same successive seasons and months differ from each other every year. And there is perhaps but one steady trait in the character of this climate, and that is, it is uniformly variable. The changes of weather are great and frequently sudden.[1]

There are seldom more than four months in the year in which the weather is agreeable without a fire. In winter the winds generally come from the northwest in fair and from the northeast in wet weather. The northwest winds are uncommonly dry as well as cold. The climate on the west side of the Allegheny Mountains differs materially from that on the east side, in the temperature of the air, and the effects of the wind upon the weather, and in the quantity of rain and snow which falls every year. The southwest winds on the west side of the mountains are accompanied by cold and rain. The temperature of the air is seldom so cold or so hot, by several degrees, as on the east side of the mountains.

On the whole, it appears that the climate of this division of the United States is a compound of most of the climates in the world; it has the moisture of Ireland in the spring; the heat of Africa in summer; the temperature of Italy in June; the sky of Egypt in autumn; the snow and cold of Norway, and the ice of Holland, in winter; the tempests (in a certain degree) of the West Indies in every season, and the variable winds and weather of Great Britain in every month of the year.

From this account of the climate of this district it is easy to ascertain what degree of health and what diseases prevail. As the inhabitants have the climates, so they have the acute diseases of all the countries that have been mentioned. Although it might be supposed that with such changes and varieties in the weather there would be contracted epidemical diseases and an unwholesome climate, yet on the whole, it is found in this district to be as healthy as any part of the United States.

Page 91. Maryland.—Here are also large tracts of marsh, which during the day load the atmosphere with vapor that falls in dew in the close of the summer and fall seasons, which are sickly. The spring and summer are mostly healthy.

Page 96. Virginia; climate.—It is remarkable that, proceeding on the same parallel of latitude westerly, the climate becomes colder in like manner as when we proceeded northward. This continues to be the case till we attain the summit of the Alleghenies, which is the highest between the sea and the Mississippi. From thence, descending in the same latitude to the Mississippi, the change reverses, and it becomes warmer there than it is in the same latitude on the sea side.

Page 100. Kentucky; climate.—Healthy and delightful, some few places in the neighborhood of ponds and low ground excepted. The inhabitants do not experience the extremes of heat and cold. Snow seldom falls deep or lays long. The winter, which begins at Christmas, is never longer than three months, and it is commonly but two, and is so mild that cattle can subsist without fodder.

Page 107. Tennessee; climate.—Temperate and healthy. In the tract lying between the Great Island, as it is called, and the Kanawha, the summers are remarkably cool and the air rather moist. Southwest of this, as far as the Indian towns, the climate is much warmer, and the soil better adapted to the products of the Southern States.

ON LIGHTNING RODS.

Mr. Henry P. Curtis, of Boston, writes to the Editor on the efficacy of lightning rods. He mentions several large hotels, scientifically protected by lightning conductors, that remained unscathed in a region of violent thunderstorms where he, at the same time, personally witnessed the destruction of unprotected buildings. One landlord said:

> He could charge a Leyden jar by holding it close to the foot of one of the conductors in a thunderstorm.

Mr. Curtis describes his experience during a thunderstorm at a mountain hotel in New York. He was standing on the piazza when—

> The most tremendous shock or concussion conceivable took place. I had a sudden sun dazzle in the eyes, a bitter taste in the mouth, a violent singing in the ears, a pungent sulphurous odor in the nose, and a severe headache. Then I learned that the house had been struck by lightning, that is to say, that the conductors had functioned effectively and had safely conducted the electricity into the lake, instead of the discharge falling upon the hotel and wrecking it.

FOREST FIRES IN NOVEMBER, 1819.

We are indebted to Mr. Albert Matthews for the following extracts from the old files of a Boston paper, the Columbian Centinel, relative to the forest fires of November, 1819.

From the Columbian Centinel, Wednesday, November 24, 1819, No. 3717, pp. 2-3:

> The late smoky atmosphere was experienced at nearly the same time far at sea, in the Canadas, and in the Eastern, Western, and Southern States, attended with colored rain. At sea the mariners found it difficult to take observations. The appearance was the most *murky* in Canada, where a general dread appears to have prevailed; and it is reported that many of the inhabitants of Montreal, in expectation that the darkness was a forerunner of an earthquake which would engulph their city, actu-

[1] See Monthly Weather Review for January, 1902. Vol. XXX, p. 19, note 2. Carey evidently took this sentence from Dr. Rush's article.—ED.