Summary of observations at the Weather Bureau station, Honolulu, Hawaii, for 1903.

Latitude 21° 18′ north. Longitude 157° 50′ west. Ground above sea, 43 feet. Thermometer above ground, 9; barometer 7 feet. Rain gage above ground, 1 foot. Exposure southwest.

Month.	Precipitation. 1903.	Precipitation. Normal.	Precipitation. No. days.	Precipitation. Normal.	Temperature. Average, 1903. 6 a. m.	Temperature. Average, 1903. 9 a. m.	Temperature. Average, 1903. 2 p. m.	Temperature. Average, 1903. 9 p. m.	Temperature. Average, 1903. Min.	Temperature. Average, 1903. Max.	Temperature. Average, 1903. Mean.	Temperature. Normal mean.	Temperature. 1903. Lowest.	Temperature. 1903. Highest.	Temperature. 1903. Mean daily range.
January . .	4.05	3.10	12	16	67.0	71.8	74.4	68.0	63.5	75.5	69.8	70.3	56	79	12.0
February .	5.86	5.48	12	15	64.1	69.1	71.9	66.2	61.3	73.2	67.3	70.2	53	76	11.9
March	1.03	3.76	9	18	63.0	70.4	73.0	66.1	61.3	74.5	67.3	70.7	56	78	13.2
April	2.35	2.90	25	17	69.1	74.1	75.7	70.9	67.0	77.0	71.9	72.5	61	82	10.0
May	1.86	2.68	25	19	71.3	76.3	78.3	72.9	69.0	80.0	74.2	74.1	66	83	11.0
June.	1.36	1.52	15	19	72.9	78.1	80.7	74.3	69.9	82.2	76.0	76.0	65	85	12.0
July	2.08	1.72	22	19	72.8	78.8	81.6	73.7	72.8	83.0	77.6	77.3	70	87	10.2
August . . .	2.48	1.97	24	18	75.4	78.8	82.5	76.3	72.8	83.4	77.9	77.7	70	85	10.5
September	5.74	1.98	19	18	75.0	79.1	81.5	76.0	72.6	83.0	77.5	77.5	69	84	10.3
October . . .	2.17	2.76	17	19	72.0	77.3	79.2	74.0	70.3	80.4	75.1	76.2	64	83	10.1
November	2.26	5.15	16	17	70.8	75.9	77.6	72.5	69.2	78.9	73.6	73.8	63	82	9.7
December.	1.44	3.92	11	16	68.0	74.6	77.6	71.0	67.0	78.4	72.2	71.5	62	80	11.4
Year. . . .	32.68	36.95	207	211	70.1	75.4	77.8	71.8	68.1	79.1	73.4	74.0	53	87	11.0

Month.	Barometer. Average, 1903. 9 a. m.	Barometer. Average, 1903. 3 p. m.	Barometer. Average, 1903. 9 p. m.	Barometer. Average, 1903. Mean.	Barometer. Normal mean.	Barometer. 1903. Highest.	Barometer. 1903. Lowest.	Humidity means. Grs. of moisture per c.ft.	Humidity means. Normal.	Humidity means. Mean dew point.	Humidity means. Mean normal.	Humidity means. Relative humidity.	Humidity means. Normal humidity.	Direction of wind. NE. quadrant.	Direction of wind. SE. quadrant.	Direction of wind. SW. quadrant.	Direction of wind. NW. quadrant.	Normal days of trade wind.	Wind force.	Cloudiness in tenths.	Normal cloudiness.
January . .	30.070	29.970	30.047	30.020	29.972	30.22	29.72	5.89	6.27	60.5	62.5	73.8	76.7	15	7	4	5	14	2.1	4.5	4.4
February .	30.048	29.957	30.034	30.003	29.966	30.21	29.66	5.24	6.24	57.0	62.5	71.4	76.7	17	0	5	6	15	2.7	4.7	4.9
March	30.011	29.930	30.004	29.970	30.010	30.17	29.77	5.32	6.05	57.5	61.5	72.3	71.7	15	1	10	5	18	1.8	4.2	4.6
April	30.042	29.968	30.047	30.005	30.029	30.15	29.88	6.22	6.42	62.3	63.5	72.8	73.0	27	2	1	0	20	3.2	5.1	5.1
May	30.078	30.010	30.082	30.044	30.030	30.15	29.94	6.39	6.53	63.2	63.9	69.7	72.5	26	4	1	0	24	3.0	4.8	4.4
June.	30.017	29.961	30.016	29.989	30.009	30.12	29.98	6.74	6.83	64.9	65.0	70.1	70.7	28	0	2	0	26	2.3	3.8	4.0
July	30.025	29.976	30.016	30.000	29.995	30.09	29.91	6.73	6.81	65.0	65.0	67.9	68.5	30	0	0	1	29	3.1	3.2	4.0
August . . .	30.032	29.971	30.026	30.001	29.980	30.08	29.94	7.07	7.01	66.5	66.0	70.0	68.5	31	0	0	0	29	2.1	4.1	4.0
September	30.024	29.957	30.023	29.991	29.968	30.08	29.90	6.96	7.06	66.1	66.0	69.7	68.5	30	0	0	0	26	2.3	3.5	4.0
October . . .	30.007	29.938	30.004	29.972	29.968	30.07	29.72	6.87	7.06	65.6	66.0	73.9	70.5	23	2	6	0	22	2.2	4.3	4.3
November	30.028	29.953	30.019	29.990	29.958	30.10	29.85	6.49	6.93	63.8	65.7	73.1	75.8	25	0	5	0	17	1.3	3.5	4.8
December.	30.035	29.960	30.022	29.998	29.969	30.13	29.84	6.42	6.32	63.5	63.0	75.8	73.8	24	0	7	0	16	1.0	2.9	4.4
Year. . . .	30.035	29.963	30.028	29.999	29.988	30.22	29.66	6.36	6.63	63.0	64.2	71.7	72.2	291	16	41	17	256	2.3	4.05	4.37

Temperature mean = (6 + 2 + 9) ÷ 3. Observations are taken in standard time of 157° 50′ west of Greenwich.
Pressure corrected for temperature and reduced to sea level, and the gravity correction —.06, applied. Mean = (9 + 3) ÷ 2.
Direction of wind. Each quadrant includes the cardinal point to the right of it, i. e., NE. includes E., etc. Force of wind, Beaufort scale, and during daylight.

JULIUS R. FREDERICK.

Julius R. Frederick was born at Dayton, Ohio, July 21, 1852, Thirteen years later he entered service as a messenger in Chicago, and within six years he became, successively, a brakeman, fireman, and engineer in the employ of the Pennsylvania Railroad, and remained in the last-named position until 1874, when, as a participant in the great strike, he left the company's service, although offered a life position to remain. He enlisted in the Army September 11, 1876, and served through the Sioux and Nez Perces wars. His superior physique and the good judgment and courage displayed by him in those wars doubtless prompted his assignment to the Lady Franklin Bay Expedition in April, 1881. The story of that unfortunate voyage bears frequent mention of Frederick's name in words of praise, admiration, and gratitude. A single incident, taken from the official report, will perhaps best illustrate his character. While at Camp Clay, on the last fearful days of that expedition, it was thought necessary to make an effort to recover 100 pounds of beef left at Bairds Inlet the year before. For this service Frederick and another member of the expeditionary force volunteered, Lieutenant Greely consenting reluctantly, fearing fatal results to the men in their enfeebled condition. They set out on the 6th of April, and, after encountering severe storms, reached their destination only to find no trace of the beef. Sadly disappointed, but courageously, they set out on their return. In a short time his companion began to fail, and soon died in Frederick's arms. After burying him as best he could, Frederick resumed his journey to camp. He says at this time he felt more like remaining to perish by the side of his companion than like making another effort; but the thought of those who would be sent out to find him if he did not return spurred him to continued exertions, and he reached camp on the 13th.

Frederick distinguished himself in this disastrous journey, and brought in the entire load hauled out by the two, and, remarkable to say, did his work on the scanty ration of 6 ounces of meat and 6 ounces of bread, not availing himself of the additional increase authorized in case of extraordinary circumstances.

Among other encomiums from his commanding officer, is the following:

> His extremely valuable services as one of the supporting party to the "Farthest North", as engineer at the critical point of our retreat, as cook during the terrible winter, and as hunter and general worker in the more disastrous spring, all showed the stamp of no ordinary man.

Frederick entered the meteorological branch of the Signal Corps August 1, 1884, by transfer from the line of the Army, and, by an act of Congress, approved June 21, 1902, was placed on the retired list of the Army as a first-class sergeant, Signal Corps.

After his transfer he was first detailed for special duty at Portsmouth, N. H., and afterwards at Washington, D. C., and on the 9th day of February, 1885, he was assigned as assistant at Indianapolis, Ind., where he remained in the Signal and Weather Bureau Services until the time of his death, January 6, 1904, enjoying the respect and esteem of all who knew him.—*D. J. C.*

NOTES AND EXTRACTS.

METEOROLOGY IN SERVIA.

The meteorological service of Servia was organized by Prof. Milan Nedelkovitch, and has been maintained by his personal efforts since 1887, when the observatory was founded at Belgrade. Step by step he has added stations of the second order, until now there are 18 of these, 4 of which are furnished with self-registering apparatus for pressure, temperature, and rain. There are also 44 stations of the third class, and 117 of the fourth. The annual appropriation for expenses is 10,000 francs for the salaries of observers and necessary expenses at the central observatory and the other stations; 2000 francs for the printing of the monthly bulletin; 3000 or 4000 francs for those primary schools that maintain meteorological stations; 10,000 or 12,000 francs for the various local governments (corresponding to our counties and cities) to defray their expenses in the matter of meteorology. The regular publications of the central observatory are the monthly bulletins and the annual volumes. The bulletin gives, in that detail which is demanded by modern climatology, all monthly data relative to the atmosphere, not only the pressure, moisture, temperature, cloudiness, wind, and rain, but also in many cases the records of the heliograph and the actinometer, and especially the temperature of the soil at various depths beneath the surface, 24 in all, from 0.01 meter (0.4 inch) down to 24 meters (78 feet). This is undoubtedly the most important series of soil temperatures ever yet undertaken, and arrangements should be made for keeping it up indefinitely for as many years as possible. We ought, however, to add that as a check against the uncertainties of deep thermometers, it is very desirable that electric thermometers, more especially the thermophone of Warren and Whipple, be established at several different depths and read simultaneously with the Lamont mercurials.

The Arago-Davy actinometer, or bright bulb and black bulb 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 $CE/(1+1/2\,W)$, 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