METEOROLOGY IN PAPUA.

The annual report of the territory of Papua (British New Guinea) for the year ended June 30, 1907, contains the results of meteorological observations at three stations—Port Moresby, Samarai, and Daru—for the period July, 1906–June, 1907, inclusive. The northwest monsoon generally begins at these stations about the end of November and continues until March or April; the southeast trades prevail the rest of the year.

Instruments have been ordered for thirteen additional stations, so there is a prospect that Papua will shortly have a climatological service more nearly commensurate with its agricultural requirements.

METEOROLOGICAL WORK IN THE SOUTH ORKNEYS.

In the Scottish Geographical Magazine for July, 1908, Mr. R. C. Mossman describes the meteorological work carried on at Laurie Island, South Orkneys, (latitude 60° 44′ S, longitude 44° 39′ W.), by the Scotch observers who have entered the service of the Argentine Meteorological Office. The station was established by the *Scotia* Expedition in March, 1903, and since the departure of the *Scotia* in February, 1904, has been maintained by the Argentine Government, at an annual expense of $22,500. Mr. Mossman states that—

> Including the year's observations obtained by the Scottish National Antarctic Expedition, data covering five years are now available. The observations for 1904 are in the press and will be issued immediately, and the detailed values for the following three years will be in type about the end of this year, together with a complete discussion of the material for the whole period. The station on Wandel Island in 65° south, occupied by Doctor Charcot in 1904, will, it is hoped, be reestablished next summer by the Argentine Meteorological Office. The most pressing necessity now is for one or two years' observations at a continental station in from 70° to 74° south, between the meridians of 40° and 70° west. In this way the full value of the meteorological observations at the South Orkneys would be obtained, and the causes of the ebb and flow of the antarctic atmospheric circulation rendered apparent.

Observations are likewise carried on in South Georgia (latitude 54° 14′ S., longitude 36° 33′ W.), and the author presents an abstract of the results at both stations during the year 1907. Some interesting peculiarities of pressure distribution during August, 1907, are noted, which Mr. Mossman ascribes to an unusual extension northward of the "antarctic anticyclone" or permanent high-pressure area over the supposed Antarctic Continent.

THE LATE PRINCE YAMASHINA.

H. I. H. Prince Yamashina, of Japan, died May 2, 1908, in his thirty-second year. He was known to western science chiefly as the founder of an excellent meteorological observatory[1] on the summit of Mount Tsukuba, 65 kilometers northeast of Tokyo, together with a base station and a station at an intermediate altitude. The Prince received a part of his education in Germany, which explains why the results of the observations at his observatory have been published in German, under the title, "Ergebnisse der meteorologischen Beobachtungen auf dem Tsukubasan."

CHANGES AT THE HONGKONG OBSERVATORY.

The latest annual report of the Hongkong Observatory records the retirement in September, 1907, of Dr. W. Doberck, after twenty-four years' service as director. He is succeeded by F. G. Figg, late first assistant. Mr. Figg has been at Hongkong since 1883, having previously served as assistant and magnetic observer at Kew. A new first assistant has been appointed in the person of C. W. Jeffries, formerly at the Royal Observatory, Cape of Good Hope.

DEATH OF DOCTOR CRULS.

Nature (London) announces the death, in Paris, of Dr. Luiz Cruls, director since 1881 of the Observatory of Rio Janeiro. Doctor Cruls was the author of a memoir on the climate of Rio Janeiro. He was, however, probably best known to meteorologists in connection with his unsuccessful efforts, in the latter eighties, to interest meteorological institutions thruout the world in the compilation of a universal climatological dictionary.

NEW OBSERVATORY AT CIENFUEGOS, CUBA.

The director of Belen College Observatory, Havana, writes that a new meteorological and seismological observatory is to be opened shortly at Cienfuegos, under the direction of his assistant, R. S. Sarasola, S. J.

MEETING OF BRITISH METEOROLOGISTS IN CANADA.

The meeting of meteorologists from all parts of the British Empire that was to have been held at Quebec in July of this year, in connection with the tercentenary celebration, has been postponed until 1909.

METEOROLOGY AT THE DRESDEN PHOTOGRAPHIC EXPOSITION.

At the International Photographic Exposition to be held in Dresden in October, 1909, special attention is to be given to scientific photographs, and one of the subsections is to be devoted to meteorology. Besides photographs of interesting meteorological phenomena, exhibits of photographic apparatus for meteorological measurements are desired; also publications relating to meteorological photography. Particulars regarding the meteorological part of the exposition may be obtained from Professor Süring, Nassauische Strasse 16 a, Wilmersdorf bei Berlin, Germany.

AERIAL OBSERVATIONS IN TROPICAL AFRICA.

The Scottish Geographical Magazine for August contains particulars regarding the African expeditions organized in connection with the "international week" of upper air observations arranged for July, 1908. Professor Palazzo, director of the Central Italian Bureau of Meteorology, was to embark at Zanzibar during July on the torpedo cruiser *Caprera*. One object of the expedition was the investigation of the monsoon winds on the coasts and in the interior of East Africa. Simultaneously British, French, and German expeditions were to carry on similar investigations in the subtropical zone of the interior. The German expedition was organized under the immediate patronage of the German Emperor, who contributed 50,000 marks ($12,500) for the purpose of meteorological research on Victoria Nyanza.

THE CLIMATE OF SPOKANE, WASH.

By CHAS. STEWART, Local Forecaster. Dated Spokane, Wash., January, 1908.
[Reprinted from 16th Annual Report, Board of Health of the city of Spokane.]

Spokane is situated in eastern Washington, latitude 47° 40° N., longitude 117° 25′ W., between the Rocky and Cascade mountains, at an elevation of about 1,900 feet above sea level.

The U. S. Weather Bureau office in Spokane was established February 1, 1881, giving up to date, January, 1908, meteorological records for over twenty-six years. In the preparation of the accompanying tables only whole years have been considered, leaving out the years 1881 and part of 1908, thus giving a record for twenty-six years, from 1882 to 1907, both years inclusive.

Owing to limited space, it is not practicable to remark fully upon these tables, and we shall, therefore, simply make a few statements, principally bearing on hygiene.

In comparing climates many people are inclined to be satisfied with a mere knowledge of the mean temperature, extremes of temperature, and perhaps the precipitation, of a place; forgetting that several places may have an equality of temperature in every respect, yet, owing to other important meteorological factors, differ widely as to climate.

The higher temperatures are shown to have risen above 90° each year, rising as high as 104° August 8, 1898; this might lead one unacquainted with the climate of Spokane to suppose

[1] This observatory is described in Monthly Weather Review, October, 1904, XXXII, p. 463.

that prostration from heat, "sunstroke," occurs at this place, but such is not the case. On the contrary, here little inconvenience seems to accompany temperatures that in other places induce prostration from heat—"sunstroke" is entirely unknown here, save by name.

There are two climatic factors worthy of particular attention with regard to Spokane, viz: the mean daily change of temperature, and the "sensible temperature." The mean daily change of temperature is the change between the mean temperature of one day and that of another from day to day. This change is sometimes known as "variability of temperature," and is most important in determining the character of a climate; the more equable climates have the smallest changes of mean daily temperature. At Spokane the mean daily change of temperature for several years is 3.4°. This shows that the transition from cold of winter to heat of summer, or vice versa, occurs gradually by comparatively small changes of mean daily temperature from day to day. Sudden violent changes of temperature seldom occur here.

In order to understand what is meant by "sensible temperature" let us take the definition given in the MONTHLY WEATHER REVIEW[1] of the U. S. Weather Bureau.

The *sensible temperature* experienced by the human body and attributed to the atmosphere depends not merely upon the temperature of the air, but equally upon the dryness and the wind. It would seem that the rapid evaporation from the skin in dry, hot weather reduces the temperature of the layer of nerve cells at the surface of the body. This reduction, or sensible coolness, may be measured by the difference between the dry and wet-bulb thermometers, in which case the resulting sensible temperatures are simply the temperatures of the wet-bulb thermometer as obtained by the whirling apparatus used in the shaded shelter, and correspond to the temperature felt by persons standing in the shade of trees or houses, exposed to a natural breeze of at least 6 miles per hour. The temperature of the wet-bulb thermometer and its depression below the dry bulb are the fundamental data for all investigations into the relation between human physiology and the atmosphere.

There is no difference in construction between the dry-bulb and wet-bulb thermometers, excepting that the thermometer selected as wet bulb has its bulb carefully covered with specially prepared muslin and is dipped in pure water before observation; hence the terms dry bulb and wet bulb, for the purpose of indicating which thermometer is meant. Immediately after dipping in water evaporation sets in from the bulb of the wet thermometer. This evaporation produces lowering of temperature, and the dryer the air the greater the difference between the readings of the wet bulb and the dry bulb, the reading of the latter indicating the temperature of the air.

To fully appreciate the hygienic value of a relatively low sensible temperature during the warm seasons, consider the afternoon observations taken at Spokane August 2, 1895. The temperature was 94° in the shade, and the temperature of the wet thermometer, or sensible temperature, was only 62°; that is, a person in good health and in the shade experienced a temperature of only 62°, although the air temperature at the time was 94°—a difference of 32° between the air temperature and the sensible temperature. This is worthy of notice, as it is somewhat explanatory of the freedom from prostration from heat, "sunstroke," for which this section is noted. The sensible temperature is influenced by the relative humidity, and the low relative humidity during the warm portions of the year is one of the most important factors in freedom from sunstroke at Spokane.

Table 1 gives the average relative humidity for this place as 65.8 per cent; but during the warmer months of the year, the relative humidity often falls in the afternoon, about the warmest part of the day, to as low as 10 per cent, sometimes lower. For example, at the afternoon observation (taken in Spokane at 5 p. m., Pacific time), August 16, 17, and 18, 1895, the relative humidity was, respectively, 8, 7, and 5 per cent; but at the morning observation (5 a. m., Pacific time), August 17, 18, and 19 the relative humidity had risen to 51, 52, and 53 per cent, showing that the air does not remain long enough "dry" to be hurtful in some respects.

Each year, excepting the years 1895, 1897, 1901, 1903, 1904, and 1906, the temperature has fallen below zero at Spokane; but it is also shown that during the winters of 1888–89, 1894–95, 1895–96, 1897–98, 1899–1900, 1902–3, and 1903–4 the temperature did not fall as low as zero at this place. The lowest temperature recorded at Spokane since the opening of the Weather Bureau office here was —30.5°, January 16, 1888, but it should be borne in mind in this connection, that the winter of 1887–88 was one of great severity thruout the whole country. The lower temperatures do not prevail for many days at a time, but have days with much higher temperature between them.

The prevailing winds are from the southwest and have a marked influence in tempering the cold of winter or heat of summer. The greatest velocity of wind ever recorded at Spokane was 52 miles per hour, July 15, 1902, but this velocity lasted only a few minutes. This place is remarkably free from violent winds, due in a great extent to the topography of the surrounding country. The violent and destructive tornado is not experienced here.

Thunderstorms are rare and seldom, if ever, of the violent kind experienced in the Eastern States—many of the thunderstorms recorded in Table 1 have been reported for only a peal or two of distant thunder.

It has been estimated by agricultural experts that from 15 to 20 inches of precipitation per year suffice for the production of good crops in the agricultural sections near Spokane. Weather Bureau reports referring to Washington and Oregon indicate that agricultural operations are more fruitful with a small rainfall than in some sections of other States with considerably larger precipitation. An examination of Table 1, which shows the amount of precipitation for the greater part of the agricultural year, indicates that a sufficiency of precipitation for agricultural needs has always fallen in this section; and the same table shows that, in general, the rainfall has been well distributed during the period critical for agriculture.

In Table 1 it is shown that on an average Spokane has 100 clear days, 112 partly cloudy days, and 153 cloudy days in the year. On many of the cloudy days, however, as well as the partly cloudy days the sky is not fully overcast, or is overcast by a thin stratum of cloud that permits some technically "cloudy" days to be days of sunshine.

The "actual atmospheric pressure" given in the forepart of the tabular statement should be of interest to physicians and others from a physiological point of view.

Not once, since the opening of the U. S. Weather Bureau office (over twenty-six years ago) in this place, has there been an instance of loss of life or property at Spokane caused by extreme meteorological conditions, such as occur yearly in other parts of the country.

The topography of the country surrounding Spokane is well adapted to give to this place its peculiar climate. Situated in eastern Washington at an elevation of about 1,900 feet above sea level, and about midway between the Cascades and Rocky mountains, Spokane is near enough to the vast Pacific Ocean to be under its climatic influence to a great extent, while the Cascade Range intercepts precipitation from the northern Pacific coast that might otherwise be excessive, and the mighty range of the Rocky Mountains to the eastward and spurs to northward of Spokane deflect far to eastward of this place the intense "cold wave" that yearly comes from the extreme north and pours down along the eastern slope of the Rocky Mountains into middle, eastern, and southern portions of the United States.

[1] Monthly Weather Review. 1895, XXIII, p. 84-5.

The following table of average temperatures for Spokane was obtained by taking the average of the mean temperatures for each month in the year for the period extending from the opening of the Weather Bureau office in Spokane up to December, 1903, a period of nearly twenty-three years.

Average temperature at Spokane for each month of the year.

	°F.		°F.
January	26	July	69
February	30	August	68
March	40	September	58
April	48	October	48
May	56	November	37
June	62	December	32

Snowfall by winters, inches and tenths.

1885–86	17.6	1893–94	50.1	1900–1901	31.9
1886–87	36.7	1894–95	37.7	1901–2	14.5
1887–88	42.8	1895–96	47.5	1902–3	28.6
1888–89	22.1	1896–97	65.3	1903–4	45.8
1889–1890	79.1	1897–98	52.6	1904–5	11.1
1890–91	30.1	1898–99	56.4	1905–6	27.8
1891–92	38.5	1899–1900	19.2	1906–7	44.2
1892–93	69.3				

The above table gives the total amount of snow that fell during each winter from that of 1885–86 to date; it does not give the greatest depth of snow on the ground at any one time, but at Spokane traffic is seldom, if ever, seriously interfered with by a large amount of snow on the ground.

TABLE 1.—*Meteorological data for Spokane, Wash., for twenty-six years, 1882–1907.*

Years.	* Barometer.			Temperature.				Rainfall and melted snow.			Distribution of rain during period critical for agriculture.			Wind.	
	Mean annual.	Highest.	Lowest.	Mean annual.	Highest.	Lowest.	Annual range.	Total amount.	Agricultural year, greater part of September to June, ten months.		May.	June.	July.	Prevailing direction.	Highest hourly velocity.
	Inches.	*Inches.*	*Inches.*	°*F.*	°*F.*	°*F.*	°*F.*	*Inches.*	*Years.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*		*Miles.*
1882				46.5	101.5	—17.0	118.5	**25.99**	1881–82	**23.01**	1.54	1.17	0.88	sw.	44
1883	**28.01**	28.68	27.33	46.8	96.7	—27.7	124.4	14.37	1882–83	22.06	2.11	0.60	0.00	sw.	37
1884	27.96	28.62	27.11	*45.5*	97.5	—17.8	115.3	20.56	1883–84	14.59	0.56	2.58	1.06	sw.	29
1885	27.98	28.50	27.45	**50.1**	99.3	—14.0	113.3	19.01	1884–85	18.84	1.53	3.40	0.39	sw.	33
1886	27.96	28.59	27.26	48.7	100.3	—10.5	110.8	15.86	1885–86	15.21	0.92	0.56	0.37	sw.	42
1887	27.98	28.61	27.15	47.2	97.3	—11.0	108.3	20.10	1886–87	18.69	1.06	2.07	1.41	sw.	31
1888	28.00	**28.75**	**27.47**	48.7	101.8	*—30.5*	**132.3**	17.69	1887–88	18.40	1.24	5.12	0.06	sw.	30
1889	28.00	28.57	27.41	49.1	96.0	—10.0	106.0	14.27	1888–89	*12.35*	1.70	0.89	0.46	sw.	30
1890	27.97	28.63	27.25	47.4	102.0	—23.0	125.0	16.57	1889–90	19.45	1.59	1.98	0.38	sw.	48
1891	27.95	28.58	*26.98*	49.0	97.0	—10.0	107.0	16.69	1890–91	*12.35*	0.60	3.28	1.12	sw.	48
1892	27.98	28.45	27.34	48.4	96.0	— 5.0	101.0	16.78	1891–92	14.45	2.40	0.72	1.22	s.	36
1893	27.97	28.60	27.28	45.7	99.1	—19.0	118.1	22.00	1892–93	20.08	2.50	0.42	0.36	s.	36
1894	27.97	28.61	27.32	48.2	97.5	— 1.9	99.4	17.84	1893–94	20.09	1.01	1.13	0.29	sw.	39
1895	28.00	28.52	27.27	48.0	95.0	8.0	*87.0*	18.46	1894–95	12.66	1.58	0.42	0.42	sw.	42
1896	27.96	28.56	27.38	48.6	100.0	—13.0	113.0	20.82	1895–96	14.78	2.29	0.73	0.17	sw.	37
1897	27.96	28.56	27.24	48.2	100.0	3.0	97.0	23.84	1896–97	21.43	1.05	3.51	0.98	sw.	37
1898	27.97	28.62	27.46	48.2	**104.0**	— 2.0	106.0	*13.08*	1897–98	18.64	1.63	1.21	0.43	s.	41
1899	*27.94*	28.50	27.23	47.2	98.0	—21.0	119.0	20.08	1898–99	13.27	1.02	0.56	0.30	s.	36
1900	27.96	28.66	27.25	49.8	100.0	—10.0	110.0	18.72	1899–1900	17.38	2.12	0.42	0.34	sw.	48
1901	27.97	28.58	27.42	48.9	99.0	**10.0**	89.0	15.99	1900–1	18.81	1.26	1.05	0.61	s.	38
1902	27.95	28.51	27.14	47.9	*94.0*	—12.0	106.0	19.23	1901–2	15.79	1.83	0.45	1.71	sw.	**52**
1903	27.99	28.54	27.12	47.5	97.0	4.0	93.0	16.55	1902–3	13.96	1.34	1.35	1.13	s.	40
1904	27.96	28.48	27.10	49.9	100.0	6.9	93.1	13.97	1903–4	16.65	0.13	1.24	0.34	s.	40
1905	27.98	28.53	27.37	48.2	103.0	— 7.0	110.0	16.68	1904–5	12.59	1.98	4.16	0.06	ne.	40
1906	27.97	28.54	27.17	49.4	99.1	6.9	92.2	17.60	1905–6	14.86	3.42	1.02	0.02	sw.	36
1907	27.96	*28.43*	27.25	47.1	96.9	— 3.1	100.0	17.69	1906–7	17.40	2.60	0.96	1.00	s.	40
Average	27.97			48.1			107.4	17.90		16.82	1.58	1.56	0.60	sw.	

Years.	Number of days.						Mean relative humidity. †	Thunderstorms.	Number of days, and month in which temperature fell to zero.	Winters during which the temperature did not fall below zero.	Mean daily change in temperature.	Average velocity of wind.	Frost.			
	Clear.	Partly cloudy.	Cloudy.	.01 inch or more rain or snowfall.	Temperature above 90°.	Temperature below 32°.							First.		Last.	
													Light.	Killing.	Killing.	Light.
							Per cent.					*m. p. h.*				
1882	92	132	141	141	17	121	68.6	17	8, Jan			5.6	Sept. 30	Nov. 2	Mar. 20	May 20
1883	181	126	58	94	14	136	67.1	2	6, Jan., 11, Feb.			4.2	Oct. 3	Nov. 2	Mar. 16	April 5
1884	113	151	97	123	10	128	69.4	10	7, Feb., 9, Dec.			3.5	Sept. 12	Sept. 7	April 18	May 13
1885	141	137	87	116	15	84	75.5	10	4, Jan			4.6	Oct. 5	Nov. 3	Mar. 19	April 25
1886	176	114	75	104	14	113	70.6	6	6, Jan			*4.6*	Sept. 28	Oct. 10	Mar. 2	April 5
1887	105	153	107	126	15	137	78.2	8	9, Feb	1888–89		3.9	Sept. 22	Sept. 20	Mar. 4	May 7
1888	98	111	157	106	28	115	68.4	4	9, Jan			4.3	Sept. 23	Oct. 18	April 17	May 21
1889	74	132	149	97	19	115	64.0	5	1, Dec		3.7	4.1	Sept. 24	None.	Feb. 19	April 17
1890	98	120	147	117	14	122	62.0	3	5, Jan., 4, Feb		3.7	4.1	Sept. 12	None.	Jan. 11	May 30
1891	82	122	161	123	17	108	61.0	5	3, Mar		3.7	5.3	Oct. 1	Nov. 13	June 8	May 9
1892	104	124	138	119	10	103	62.0	2	2, Jan		3.4	5.5	Sept. 16	Sept. 21	Feb. 18	May 4
1893	78	105	182	144	12	123	68.0	4	1, Jan., 3, Feb		3.8	5.8	Aug. 10	Oct. 14	Jan. 15	June 20
1894	62	118	185	137	19	107	64.2	6	1, Jan., 2, Feb	1894–95	3.9	6.5	Sept. 23	None.	April 3	June 11
1895	81	126	158	98	8	121	60.0	5	None	1895–96	3.6	6.1	Sept. 6	None.	None.	June 14
1896	97	99	170	118	22	92	63.3	3	3, Nov		3.4	6.0	Sept. 16	Oct. 27	April 20	May 27
1897	118	69	178	134	17	119	66.0	8	None	1897–98	4.0	5.6	Sept. 9	Oct. 3	April 12	April 27
1898	131	97	137	101	21	119	62.0	7	1, Dec		3.5	6.2	Oct. 1	Oct. 5	May 7	May 24
1899	90	112	163	134	8	95	65.0	5	5, Jan., 4, Feb		3.9	6.4	Sept. 7	Oct. 14	Mar. 17	May 15
1900	66	86	213	124	12	79	66.0	17	1, Nov		3.6	6.0		Sept. 26	April 9	June 9
1901	90	109	166	118	14	103	65.0	7	None		3.2	5.6	Sept. 15	Nov. 2		June 11
1902	71	87	207	127	8	92	66.0	5	5, Jan., 1, Feb	1902–3	3.5	5.9	Sept. 17	Nov. 5	Mar. 3	June 6
1903	79	86	200	104	9	124	65.0	11	None	1903–4	3.6	6.1	Sept. 13	Nov. 10		May 28
1904	85	87	194	112	27	102	63.0	7	None		3.5	6.5	Sept. 11	Oct. 28	April 17	June 24
1905	102	78	185	118	17	128	65.0	16	2, Feb	1905–6	3.6	5.8	Sept. 1	Oct. 9	May 1	May 25
1906	91	91	183	113	25	109	64.0	9	None		3.5	6.0	Sept. 11	Oct. 21	None.	May 5
1907	74	140	151	106	4	107	67.2	14	2, Jan		3.4	5.9	Sept. 21	Nov. 6	None.	June 15
Average	100	112	153	117	15	112	65.8	8					Sept. 17	Oct. 17	Mar. 23	May 19

* Barometer corrected for instrumental error and temperature (actual atmospheric pressure). † Mean of 7ᵃ+3ᵖ+11ᵖ prior to July 1, 1888; mean of 8ᵃ+8ᵖ after that date.
In Table 1 full faced figures indicate the highest and italic figures the lowest values of each element.