

**Pennsylvania.**—Twenty-second Annual Report of the Board of Directors of the Philadelphia Maritime Exchange. Philadelphia, 1897. 8vo. 101 pp.  
**South Carolina.**—Third Annual Report of the West Virginia State Board of Agriculture, 1895 and 1896. Charleston, 1897. 8vo. 195 pp.  
**Uruguay.**—Honoré, Carlos. El Sol. Montevideo, 1897. 8vo. 230 pp.

**CLOTHING AND TEMPERATURE.**

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To acquire some concrete idea of the influence of general meteorological conditions upon personal comfort and upon the efficiency of clothing in different conditions of weather, the writer undertook a series of observations of the temperature of certain parts of the clothing and of the body.

The series comprised observations of temperature between the coat and vest, the vest and linen shirt, the linen shirt and woolen undershirt, the undershirt and skin, and the temperature of the body under the tongue.

The series may, for convenience, be subdivided into four sets or subseries: 1st, a set of observations made indoors; 2d, a set made after free exposure out of doors for ten minutes; 3d, a set made after free exposure out of doors for twenty minutes; 4th, a set made ten minutes after returning indoors. All observations were made in the shade; the first and fourth sets in a room in the Weather Bureau building, and the second and third in the shade of the same building, and in situations so chosen as not to interfere with the free movement of the wind.

The thermometers were in position for ten minutes before

the readings were recorded for the first set, and the readings for the other sets were made at the consecutive ten, twenty, and thirty minute periods thereafter.

The period of the day selected for the series was that between 1:50 and 2:30 p. m. This period was selected in order that the outdoor sets might coincide approximately with the 2 p. m. local meteorological observation made by the Weather Bureau in this city (Washington).

The first observations of the series were made on February 4, and the last on February 16, 1897, eleven days in all. The continuity of the record of the temperature of the body in the mouth was broken by an injury to the clinical thermometer on February 11; a new one was obtained and used on February 16. The series was terminated sooner than contemplated by an attack of bronchitis, rendering it imprudent to continue the personal exposure involved in the prosecution of the observations in cold air.

The clothing worn during the series consisted of a serge coat and vest, a linen shirt, and woolen undershirt. This weight of clothing was very comfortable while indoors, and with the addition of an overcoat was ample for outdoors, but while making the observation no overcoat or additional clothing was worn. The coat and vest were single lined with a light-weight material, the linen shirt of the usual quality, and the woolen undershirt of the material known as fleecelined flannel.

The following are the average values of each of the subseries, and also the average of the 2 p. m. local meteorological observation. The details of each are shown in the appended table.

*Details of observations of bodily temperature and that of clothing, etc.*

	February, 1897.											Average.	
	4	5	6	8	9	10	11	12	13	15	16		
<b>First set. Indoors:</b>													
Temperature—													
of room.....	79.1	77.8	78.0	78.0	78.0	76.5	78.0	75.0	76.5	76.0	76.0	76.0	76.5
of body.....	98.7	98.4	98.5	98.4	98.4	98.3	98.3	98.3	98.3	98.3	98.3	98.3	98.5
between undershirt and skin.....	95.0	96.0	95.2	95.5	95.6	95.8	94.2	96.5	95.4	95.0	95.2	95.2	95.5
linen shirt and undershirt.....	92.8	89.0	90.0	88.5	89.3	90.3	93.0	92.3	88.5	91.3	89.0	89.0	90.3
vest and linen shirt.....	90.7	88.5	88.2	85.5	86.4	86.8	87.2	88.8	87.5	86.2	85.5	85.5	87.4
coat and vest.....	89.6	84.5	86.0	83.0	83.2	84.8	85.2	86.0	83.8	83.6	84.2	84.2	84.9
<b>Second set. Outdoors ten minutes:</b>													
Temperature—													
of body.....	98.4	98.2	98.2	98.3	98.3	98.2	98.2	98.2	98.3	98.2	98.2	98.2	98.3
between undershirt and skin.....	94.6	93.0	95.2	93.8	93.0	94.6	92.2	94.8	93.6	94.3	92.2	92.2	93.6
linen shirt and undershirt.....	82.2	80.0	82.0	81.0	78.7	81.4	81.3	81.8	79.0	87.2	80.5	81.3	81.3
vest and linen shirt.....	71.5	71.2	76.4	78.6	71.4	76.0	70.0	77.0	73.0	80.6	74.5	74.6	74.6
coat and vest.....	63.0	62.8	70.2	68.0	59.0	66.7	60.0	65.2	62.5	74.5	66.5	66.5	65.3
<b>Third set. Outdoors twenty minutes:</b>													
Temperature—													
of body.....	98.0	98.0	98.1	98.1	98.0	97.8	97.8	97.8	97.8	97.8	97.8	97.8	98.0
between undershirt and skin.....	92.3	91.8	94.0	93.2	92.2	94.0	90.6	94.4	92.2	93.5	90.0	92.6	92.6
linen shirt and undershirt.....	77.9	78.0	79.0	76.7	76.7	77.0	73.6	76.3	76.3	84.5	76.0	78.1	78.1
vest and linen shirt.....	65.2	67.2	77.4	73.3	67.0	69.0	64.3	69.5	72.2	73.0	67.3	68.7	68.7
coat and vest.....	57.5	60.0	66.8	62.0	56.6	61.4	55.5	61.5	59.4	71.0	60.6	61.1	61.1
<b>Fourth set. Ten minutes after returning indoors:</b>													
Temperature—													
of room.....	73.3	77.0	77.4	73.0	77.0	75.0	74.0	76.5	74.8	75.7	75.0	75.7	75.7
of body.....	98.0	97.9	98.1	98.1	98.0	97.7	97.7	97.7	97.7	97.7	97.9	97.9	98.0
between undershirt and skin.....	94.0	92.0	95.0	93.6	93.0	94.6	90.8	94.6	92.2	93.3	91.0	93.1	93.1
linen shirt and undershirt.....	90.4	86.5	88.0	85.5	82.2	87.0	87.0	85.0	84.8	83.2	83.5	83.5	83.5
vest and linen shirt.....	85.3	79.3	83.7	81.3	76.0	82.7	77.3	79.3	82.5	83.0	78.5	80.8	80.8
coat and vest.....	82.8	75.5	81.0	77.4	73.2	80.0	75.2	77.0	78.8	79.5	76.5	77.9	77.9
<b>2 p. m. meteorological observation:</b>													
Dry thermometer.....	37.8	35.0	51.0	34.2	37.0	37.2	33.2	32.6	41.0	50.5	43.2	39.3	39.3
Wet thermometer.....	81.0	82.0	50.0	34.0	33.0	33.7	31.2	32.1	37.0	45.0	37.0	36.0	36.0
Relative humidity (per cent).....	44	73	93	98	65	69	80	95	68	65	55	73	73
Absolute humidity (grains per cubic foot).....	1.19	1.74	3.95	2.94	1.67	1.75	1.82	2.00	2.05	2.70	1.82	2.06	2.06
Velocity of wind (miles per hour).....	9	10	15	2	14	3	5	5	5	6	14	8.3	8.3
<b>Subjective sensation:</b>													
Indoors.....	Very warm; slight perspiration.	Warm.	Warm and dry.	Comfortable.	Very warm; slight perspiration.	Warm.	Very warm.	Warm.	.....	.....	.....	.....	.....
Outdoors.....	Cold; fingers painful.	Cold as preceding day.	Cold, but not unpleasant.	Cold and chilly.	Cold, but not chilly.	Cool, agreeable.	Cold and chilly.	Cold and chilly.	.....	.....	.....	.....	.....

*First set. Indoors. Average of eleven days.*

	° F.
Temperature of room .....	76.5
Temperature between coat and vest.....	84.9
Temperature between vest and linen shirt.....	87.4
Temperature between linen shirt and woolen undershirt.....	90.3
Temperature between woolen undershirt and skin.....	95.5
Temperature under the tongue (average of six days).....	98.5

*Second set. Outdoors ten minutes. Average of eleven days.*

Atmospheric temperature.....	39.3
Temperature between coat and vest.....	65.3
Temperature between vest and linen shirt.....	74.6
Temperature between linen shirt and woolen undershirt.....	81.3
Temperature between woolen undershirt and skin.....	93.8
Temperature under the tongue (average of six days).....	98.3

*Third set. Outdoors twenty minutes. Average of eleven days.*

Atmospheric temperature.....	39.3
Temperature between coat and vest.....	61.1
Temperature between vest and linen shirt.....	69.7
Temperature between linen shirt and woolen undershirt.....	78.1
Temperature between woolen undershirt and skin.....	92.6
Temperature under the tongue (average of six days).....	98.0

*Fourth set. Ten minutes after returning indoors. Average of eleven days.*

Temperature of room.....	75.7
Temperature between coat and vest.....	77.9
Temperature between vest and linen shirt.....	80.8
Temperature between linen shirt and woolen undershirt.....	86.3
Temperature between woolen undershirt and skin.....	93.1
Temperature under tongue (average of six days).....	98.0

*Average of 2 p. m. meteorological observations for eleven days.*

Temperature of air.....	39.3
Temperature of wet-bulb thermometer.....	36.0
Relative humidity.....	73.0
Absolute humidity (grains per cubic foot).....	2.08
Velocity of wind (miles per hour).....	8.3

From the limited character of these observations it is not expected that the values derived from them will have other than a very restricted application. The chief reason for publishing them in their present shape is that the field of inquiry suggested by them is an extensive one and should yield to more complete investigation many facts of great practical utility; and, furthermore, because with the exception of some similar observations quoted by Van Bebber as having been made by Rubner they are the only ones of the kind known to the writer.

The following values are given by Van Bebber (*Hygienische Meteorologie*, W. J. Van Bebber, 1895, p. 132):

	Atmospheric temperature.	
	50° F.	70° F.
Temperature between coat and vest .....	73.6	88.8
Temperature between vest and linen shirt.....	75.9	84.7
Temperature between linen shirt and woolen shirt.....	77.4	85.3
Temperature between woolen shirt and skin.....	90.9	89.9

The statement of the atmospheric temperature is the only information given relative to the meteorological conditions under which these values were obtained.

At the present time it would evidently be imprudent, with the scanty data available, to dogmatize as to the relative importance of either the different meteorological elements or the various parts and qualities of clothing, but the following points appear noticeable enough to mention: The temperature of the different layers of clothing was influenced decidedly by the prevailing temperature of the immediate surroundings, the former rising and falling with rises and falls in the latter, but the degree of change was variable, and perhaps, if not certainly, was very much affected by the velocity of the wind. There was one point wherein a result of the writer's experiments differed from a corresponding one as given by Van Bebber, i. e., that the

lower the atmospheric temperature the lower also was the temperature between the woolen shirt and the skin, this was contrary to Rubner's experience, and is worth calling attention to, inasmuch as Rubner appears to have attached much significance to the increased temperature between the skin and undershirt at the lower atmospheric temperature.

Another point noticed was in connection with the temperature of the body as shown by that taken in the mouth. Upon going outdoors the body temperature always fell, and the fall was greater in proportion to the time of exposure. Furthermore, upon returning indoors it did not rise quickly, but ten minutes afterwards remained as low as the last observation outdoors. Although no systematic observations were made with reference to ascertaining the time required for the body to regain its original degree, yet in the few casual experiments that were made it took from twenty to thirty minutes.

Coincident with the thermometric observations an attempt was made to estimate the subjective sensations while outdoors with reference to cold and warmth, and to express them in a few words ordinarily used. The degree of success or failure is shown in the column headed "subjective sensation" in the table appended.

**THE STANDARD SYSTEM OF COORDINATE AXES FOR MAGNETIC AND METEOROLOGICAL OBSERVATIONS AND COMPUTATIONS.**

By Prof. FRANK H. BIGELOW, dated June 22, 1897.

Uniformity of method in observation and also in computation constitutes one of the canons of modern science. As matters now stand, the comparative study of the published results of the observations in terrestrial magnetism and meteorology discloses an annoying variation in units and coordinate systems; a similar conflict prevails throughout the papers devoted to an analytic discussion of the observations. Since final general deductions can be best secured for science by cooperation, based upon uniform standards of coordinates, notation, and fundamental constants, it is the first duty of investigators to come to a sound agreement regarding these standard systems. In order to exhibit the present status, especially in the writings of the authorities who have chiefly influenced the development of these subjects, the coordinate axes and directions employed by them have been collected in tables for inspection. The papers cited are as follows:

1. *Gauss*.—General Theory of Terrestrial Magnetism, Taylor's Translations. 1839.
2. *Erman and Petersen*.—Erscheinungen des Erdmagnetismus. 1874.
3. *Maxwell*.—Electricity and Magnetism. 1881.
4. *Mascart and Joubert*.—Electricity and Magnetism, Atkinson's Trans. 1883.
5. *Schuster*.—Diurnal Variation of Terrestrial Magnetism. 1889.
6. *Schmidt*.—Entwicklung der allgemeinen Formeln, etc., Deutsche Seewarte. 1889.
7. *Schmidt*.—Neue Berechnung des Erdmagnetischen Potentials. 1895.
8. *Von Bezold*.—Über Isanomalen des Erdmagnetischen Potentials. 1895.
9. *Von Bezold*.—Zur Theorie des Erdmagnetismus. 1897.
10. *Carlheim-Gyllensköld*.—L'attraction magnetique de la terre. 1896.
11. *Laplace*.—Mécanique Céleste. Bowditch Trans. 1829.
12. *Ferrel*.—Professional Papers. S. O. VIII. Waldo. 1882.
13. *Ferrel*.—Meteorological Researches. U. S. C. & G. S. Report. 1877.
14. *Ferrel*.—Recent Advances in Meteorology. S. O. 1885.
15. *Oberbeck and Margules*. Abbe's Translations. 1891.
16. *Sprung*.—Meteorologie. 1885.