

# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thorshavn, County of Faroë Islands, in Lat. 62° 22' N, Long. 6° 43' 8'' E, Distance from Sea 50 miles.

Height of Cistern of the Barometer above Mean Sea-level 40 feet, above Ground 4 feet.

During the MONTH of January 1875.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS under Ground.				GENERAL REMARKS.	Days of Month.		
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H Cup Anemometer No. 78.		9 h. A.M.		9 h. P.M.		No. of hours in which it fell.	Amount in inches.	9 h. A.M.		9 h. P.M.		No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of WELL at Depth of feet, No.		
		Barometer.	Attached Thermometer No. 91.	Barometer.	Attached Thermometer No. 91.	Max. No. 7165.	Min. No. 3237.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	9 h. A.M.	9 h. P.M.	Velocity (0-6) and Direction.	Amount (0-10) and Species.	Velocity (0-6) and Direction.	Amount (0-10) and Species.	Hours.	Temperature at 9 A.M. and 9 P.M.	Temperature at 9 A.M. and 9 P.M.	Temperature at 9 A.M. and 9 P.M.	Mention the hour at which Storms began and ended.					
1	29.888	50.	29.504	54.5	41.5	37.	40.8	37.	41.	37.8	SE	4	SE	5	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	Rain & hail. High surf.	2	
2	29.104	47.5	29.188	61.5	47.	40.	42.5	41.	45.8	41.	SE	4	SW	4	0.45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
3	29.224	54.	29.512	57.	46.5	38.	42.6	41.	42.2	40.6	SE	2	Calm	0.	0.05	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	
4	29.468	52.	29.472	58.	45.5	37.	43.2	41.6	43.2	41.2	SE	4	S	3	0.08	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	
5	29.610	51.5	29.592	60.	44.	40.5	43.	41.2	43.5	42.2	SE	3	SE	4.	0.15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	
6	29.576	56.	29.600	61.5	46.	42.	45.2	44.5	45.	44.	S	3	S	2	0.56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	
7	29.766	56.	29.856	62.	47.	42.	44.6	43.5	44.4	41.	SE	3	SW	3	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8	
8	30.012	54.	30.014	62.5	45.	39.	43.5	42.	42.	41.	Calm	0.	SE	2	0.06	—	—	—	—	—	—	—	—	—	—	—	—	—	—	9	
9	29.774	56.	29.672	62.	44.	40.	43.	41.3	43.2	42.2	SE	3	SE	2	0.12	—	—	—	—	—	—	—	—	—	—	—	—	—	10		
10	29.488	53.	29.666	66.	44.5	35.5	41.	39.8	40.	39.	Calm	0.	Calm	0.	0.30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11	
11	29.764	55.	29.918	63.5	43.	38.5	41.4	40.5	41.	40.	Calm	0.	E	2	0.10	—	—	—	—	—	—	—	—	—	—	—	—	—	12		
12	29.960	54.5	29.934	58.	41.5	35.	36.	34.4	41.	39.7	E	3	E	3.	0.08	—	—	—	—	—	—	—	—	—	—	—	—	—	13		
13	29.948	55.	29.944	62.	44.	40.	43.6	42.7	44.	42.8	SE	4	SE	4.	0.17	—	—	—	—	—	—	—	—	—	—	—	—	—	14		
14	29.728	54.5	29.698	62.	45.5	42.	44.8	44.	45.	44.	SE	3	W	2	0.11	—	—	—	—	—	—	—	—	—	—	—	—	—	15		
15	29.636	56.	29.130	60.	47.	41.	43.	42.	43.	42.	Calm	0.	NE	4.	0.29	—	—	—	—	—	—	—	—	—	—	—	—	—	16		
16	29.040	55.	29.184	64.	48.	41.	46.	43.	43.	42.	S	2	S	2	0.39	—	—	—	—	—	—	—	—	—	—	—	—	—	17		
17	29.372	57.	29.402	63.	45.	34.	42.8	41.5	42.	41.	Calm	0.	E	2	0.31	—	—	—	—	—	—	—	—	—	—	—	—	—	18		
18	29.230	51.	29.174	58.	44.	33.	38.5	37.	35.	34.	E	4	NE	5.	1.00	—	—	—	—	—	—	—	—	—	—	—	—	—	19		
19	29.050	50.	29.164	57.	37.	30.5	34.	33.	31.8	29.5	NE	5	NE	5	0.49	—	—	—	—	—	—	—	—	—	—	—	—	—	20		
20	29.324	52.	29.320	58.	34.	24.	37.	25.	31.	30.	NE	5	N	3.	0.17	—	—	—	—	—	—	—	—	—	—	—	—	—	21		
21	29.320	54.	29.488	57.	33.	24.	30.	29.	31.5	29.	N	4.	N	4.	0.24	—	—	—	—	—	—	—	—	—	—	—	—	—	22		
22	29.674	50.	29.710	58.	32.	19.	28.5	27.6	21.	20.2	N	1	NW	1.	0.21	4½	—	—	—	—	—	—	—	—	—	—	—	—	23		
23	29.438	47.	29.184	58.5	38.5	19.	34.8	32.	38.	36.5	SE	3	SE	4.	0.25	—	—	—	—	—	—	—	—	—	—	—	—	24			
24	29.054	48.	29.272	60.	40.5	34.5	39.8	38.2	37.	32.2	E	5	NE	4.	0.14	—	—	—	—	—	—	—	—	—	—	—	—	25			
25	29.680	53.5	29.894	58.	38.	30.5	34.	30.	32.	28.	NE	3.	SE	3.	—	—	—	—	—	—	—	—	—	—	—	—	—	26			
26	29.720	52.	29.538	59.	4																										

## INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different Observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is, therefore, hoped, that those persons who register the greatest heat from the sun's rays, and the least radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "Maximum" should be freely exposed to the sun, and the "Minimum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

*Verification of Thermometers.*—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers as are *not* graduated on the stem, but merely on nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the "clouds" column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky *overhead* is *half covered* by clouds, 5 is entered as the *observation*, and so on. Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner;—In the column "Velocity

6, S. W.

lished by the Society, an entire comparableness among the Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

*Hour of Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, For comparison of Thermometers, a properly tested Thermometer

or at the top of the schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

*Barometer.*—*Weather glasses* and *Aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment* or *compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

Two moderate-priced Barometers have been approved by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers, are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean and moist*, and the water *pure*.

In frosty weather observation is a matter of much trouble. Two moderate-priced Thermometers are placed, *Temperature of the Sea.*—A knowledge of the temperature of

water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances. One form of "Mason's" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which otherwise arises from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the zero-point of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the index-line on this little piston-rod is brought, by the adjusting screw, to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this preliminary adjustment is made with a telescope, converging slightly, so as to bring the index-line into coincidence with the zero-point of the scale.

setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*. When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then screw up the mercury to within a quarter of an inch of the top of the tube, Thermometers, especially of the wet and dry *bulbs*, must be on the scale, that the wind is from the N.W., and that its force with the force and direction of the wind at the time of observation, in the following manner:—thus  $\frac{3}{4}$ <sup>N.W.</sup>, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as “3” It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus  $\frac{3}{4}$ <sup>N.W.</sup>, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as “3”

and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of, by inverting the column is too narrow, but un-  
on the scale 0-6 is “4”; *i.e.*, that it is *blowering fresh*.  
*Electricity.*—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory.  
*Remarks.*—The “*Remarks*” column is too narrow, but un-

**Wind.**—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, and always when the wind is feeble, reference must be made to the direction of the lower strata of clouds overhead, and to the direction of smoke, etc.

In *taking an Observation*, the attached Thermometer is first noted: the tube must then be gently tapped and the cistern-adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the tube. It must be perfectly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire.

Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, difference in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remark ought to be made on the occurrence of meteors, aurora borealis remarkable depressions and elevations of the barometer, thunder

Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results. Dr. Chenevix of observations the state of the weather at 9 A.M. on Jan. 3, 1833, recorded that snow began to fall about 8 A.M., and continued to do so until 1 P.M.

The Council would strongly recommend that every observatory be furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind can be ascertained. For indicating the Force of the Wind, at any particular hour of observation, merely local influences. The laths forming the sides and doors of the box, painted white outside, and black within, and fixed 4 feet above grass in an exposed position, free from mere weathering, will give a true indication of the force of the wind.

*Observations* in connection with the periodic return of the seasons," possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to the months of September, October, November, December, January, February, March, April, May, June, July, August, and September.

Rutherford is recommended when graduated on the glass stem on which the rain fell.

Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—when a Snow shower occurs it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the column of spirit breaks, it may be re-united by striking the instrument on the back; when the instrument has been inverted, the column of the liquid will have risen to the same height as before.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments register observations only, and nothing that mistakes of the instrument repeated before purchasing new instruments, should communicate with one another upon, as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to present for comparison, does not afford him satisfaction.

*Mr ALEXANDER BUCHAN*

*Secretary of the Meteorological Society of Scotland,*

EDINBURGH.

BOOK-POST

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OPSEBRAVATIONS IN CONNECTION WITH THE PERIODICAL BETTERY OF THE SEASONS

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One of the objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a perfect uniformity in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from the Returns from any two Stations, so very considerable as to which may easily be made, or modified, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulls from observation, or even from the use of differently constructed instruments. It is therefore hoped, that those who kindly furnish Reports to the Society will by a scrupulous attention to accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

*Hour of Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once morning or evening for other instruments, in the following manner. In the top of the Schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

*Barometer.*—*Weather-glasses and Aneroids.*—Aneroids, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological observations that is not supplied with such means of adjustment or compensation as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a Standard Barometer, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always clean and moist, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be insulated by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

*Reading of the Thermometer.*—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will read—39°, 40°, 40° 1; or again, 40° 4, 40° 5, or 40° 6, according as it indicates a little under, an exact coincidence with, or a little over, 40°, or 40° 5, respectively. So also 40° 5, and 40° 7, more or less must, be registered 40° 2, or 40° 3, and 40° 7, or 40° 8 respectively. In reading Rutherford's "Max." thermometer, the indication of that end of the scale is *index*, which is next to the surface of the mercury or alcohol in the cistern. Readings of the Thermometers, especially of the wet and dry bulb, must be rapidly taken, being so readily indicated by a little ivory float, whose stem passes freely through the lid and ease of the cistern. When the *index* on his little piston-end is brought, by the adjusting screw, to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting is alone noted. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument, the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air being admitted, the instrument will be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by rattling the ivory pestle), and gently tapping it; and if this plan fails, the instrument must be repaired.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then screw up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it should then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument, the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air being admitted, the instrument will be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by rattling the ivory pestle), and gently tapping it; and if this plan fails, the instrument must be repaired.

The Barometer should be suspended in a good light, which may be improved by putting a piece of white paper behind the tube. It must be brought into the plane of the back and front of the sun's direct rays nor the heat of a fire.

In *taking an Observation*, the attached Thermometer is first noted: the tube must then be gently tapped and the eastern surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and adjustment carefully made. By raising and lowering the eye, usually the lower edge of the cistern, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken with a lens will at the time of observation may be ascertained by the direction of smoke, etc.

Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a schedule is, to say the least, unsatisfactory.

The Council would recommend that every observer be furnished with a Hemispherical-Cup Anemometer—a self-registering instrument which shows the amount of Wind that passes it per hour; from which also the Velocity of the Wind at any particular hour of observation is ascertainable. The Force of the Wind at any particular hour of observation passes it per hour; from which also the Velocity of the Wind at any particular hour of observation is ascertainable. The Lind's Anemometer may also be recommended; the method of Registering Wind Force by such tables as that given in the "Remarks."

"Observations in connection with the periodic return of the seasons," possess not only great scientific value, as well as such notes on the occurrence of meteors, aurora borealis, remarkable atmospheric falls of snow, hail, or rain, the hours of storms, the strata of clouds, the colour of the sky, etc.

Remarks.—The "Remarks" column is too narrow, but unavoidable so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given to this column, to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper depths, and to the occurrence of meteors, aurora borealis, remarkable atmospheric falls of snow, hail, or rain, the hours of storms, the strata of clouds, the colour of the sky, etc.

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# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thornton, County of Faro Islands, in Lat. 62° 21' 1", Long. 6° 43' 8", Distance from Sea 50 feet miles

Height of Cistern of the Barometer above Mean Sea-level 40 feet, above Ground 4 feet.

During the MONTH of April 1875.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	BAROMETER.				SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER, No. 832 x 829.				WIND.				RAIN.				CLOUDS.				THERMOMETERS under Ground.				GENERAL REMARKS.	Days of Month.				
	9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H.Cup Anemometer, No. 70.		No. of hours in which it fell.		9 h. A.M.		P.M.		9 h. A.M.		P.M.		9 h. A.M.		P.M.		Temperature of W.E.P. at depth of 10 feet, No. 10.		Temperature at 11 feet, 9 A.M. 9 P.M.		Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.
	Barometer, * No. 91.	Attached Thermometer, No. 91.	Barometer, No. 7163.	Attached Thermometer, No. 3237.	Max. No.	Min. No.	Max. in Sun.	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Force.	Direction.	Force.	Direction.	Force.	Direction.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	Hours.	No. 8 inches.	No. 12 inches.	No. 22 inches.	Temperature of W.E.P. at depth of 10 feet, No. 10.	Temperature at 11 feet, 9 A.M. 9 P.M.	Temperature at 11 feet, 9 A.M. 9 P.M.	Temperature at 11 feet, 9 A.M. 9 P.M.				
1	30.182	58.	30.154	61.	50.	43.5			48.8	45.	44.8	40.8	SW	4	NW	3		0.02				3.	0	0	0	0	42.8	42.8	42.8	42.8	rain & hail	1		
2	29.944	55.	29.688	58.	45.	37.			41.4	38.	38.	33.	W	3	NW	2		0.26															2	
3	29.540	53.5	29.466	57.	39.	30.			34.	30.	31.	28.	NE	2	NE	2					8.											3		
4	29.480	52.5	29.490	60.5	39.	31.			33.4	30.	35.2	32.	Cal.	0.	SE	0.5					4.											4		
5	29.410	60.	29.190	55.5	45.	34.			40.	35.8	39.8	36.	E	2	E	3.		0.14				4.										5		
6	28.816	53.	29.104	58.	46.5	34.			41.6	39.8	42.	39.2	NE	2	SW	2.		0.74				2.										6		
7	29.450	58.	29.836	60.5	54.	40.			46.	41.8	42.	39.8	SW	2	N	0.5		0.01				9.										7		
8	30.134	55.	30.316	59.	45.5	39.			42.2	40.	39.5	38.	NE	0.5	Cal.	0.					—										8			
9	30.344	55.5	30.430	59.	51.	37.			45.8	43.5	45.4	43.6	W	3	Cal.	0.					5.										9			
10	30.542	62.	30.608	62.	58.5	42.			53.8	49.2	45.2	44.2	SW	0.5	SE	0.5		0.01				11.										10		
11	30.544	59.	30.516	58.	46.	41.			44.	42.6	44.	43.	Cal.	0.	Cal.	0.		0.02				—										11		
12	30.500	59.	30.458	62.5	51.5	36.			48.5	43.8	39.6	37.	NE	0.5	Cal.	0.					12.										12			
13	30.304	57.	30.302	59.	49.	37.			45.4	42.8	45.	43.	SW	1.	Cal.	0.		0.03				—										13		
14	30.342	57.	30.388	65.	48.	42.			45.2	43.8	44.4	42.	Cal.	0.	Cal.	0.					—										14			
15	30.360	60.	30.330	62.5	51.	42.			45.6	43.4	45.5	43.2	W	1.	Cal.	0.					—										15			
16	30.300	58.	30.216	60.5	49.	43.			47.	44.	45.2	44.	Cal.	0.	SE	1.					4.										16			
17	30.030	60.	29.924	62.	52.	44.			50.	46.	48.	45.8	S	2	W	2.		0.17				1.										17		
18	30.028	62.5	30.064	62.	52.	44.			48.5	45.5	45.	43.4	SW	0.5	Cal.	0.					2.										18			
19	30.036	61.	30.030	63.	53.	41.			49.	47.	46.	44.4	SW	1.	—	—					9.										19			
20	29.994	62.5	30.186	61.5	49.	35.5			47.2	45.	37.	32.8	NW	2.	N	2.		0.01				—										20		
21	30.276	60.5	30.160	58.5	43.5	31.			37.8	31.6	38.2	33.	N	2	N	1.5					12.										21			
22	30.004	60.	30.014	56.	43.	30.			40.2	37.4	30.2	26.8	N	3	N	1.					12.										22			
23	30.042	51.	29.964	59.	43.5	28.5			37.2	31.8	42.4	40.	Cal.	0.	SW	2.					9.										23			
24	29.974	56.	30.156	61.	49.5	36.			46.	42.8	36.2	34.2	NW	2.	NE	0.5					8.										24			
25	30.142	60.5	30.140	60.5	50.	36.			46.6	43.6	45.	42.5	SW	1.	Cal.	0.		0.02				—										25		
26	30.026	63.	29.880	60.	53.5	42.5			50.5	46.	46.2	43.8	SW	2																				

# INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

One of the objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a coherency in the system of observation pursued at all the stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the returns from any two stations, so very considerable as to which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in the position or shelter of instruments, different hours of the day, or even from the use of differently constructed instruments. It is therefore hoped, that those who kindly send their reports to the Society will, by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and for the Tables published by the Society, an entire comparability among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

*Hour of Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railay Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the Schedule. It is hoped that the instrument, punctually in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

*Barometer.*—*Wandier glasses and Aerometers.*—Admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for Meteorological purposes. Nor can any Barometer be used for Meteorological observations that is not supplied with such means of adjustment or compensation as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

Two moderate-priced Barometers have been approved of by the Council; if properly tested and attested to, they are both well adapted to Meteorological purposes.

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring no adjustment of the cistern. Its scale-inches are not true inches but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee on the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the zero-point of the fixed scale, their coincidence being indicated by a little ivory float, whose item passes freely through the lid and case of the cistern. When the index-line on this little piston-end is brought by the adjusting screw to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this preliminary setting is alone noted.

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When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be suspended so as to form a tight plug to the cistern. Then screw up the tube, a *sharp top* is produced. If this is prevented by air passing it, the instrument so that the mercury strikes the top of the cistern, and so rid of, by inverting

it, the sun's direct rays not the heat of a fire. In *taking an Observation*, the attached Thermometer is first noted; the tube must then be gently tapped, and if this plan fails, the instrument must be repaired.

The Barometer should be suspended in a good light, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular, and exposed to the sun's direct rays not the heat of a fire.

In *taking an Observation*, the attached Thermometer is first noted; the tube must then be gently tapped, and if this plan fails, the instrument must be repaired.

*Protection of Thermometers.*—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the instruments used. It is, indeed, difficult to obtain an unexceptionable arrangement, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors may also be made to open to the south.

*Self Registering Thermometers.*—Professor Phillips, and Negretti and Zambra's Patent "Maximam," Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "Maximam" Thermometer of Rutherford is recommended and should be affixed to a frame separate from the "Maximam." It is recommended that these Thermometers be graduated on the glass stem. The Maximam Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer.

When the column of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils off the glass stem, the amount of cloud in the atmosphere ought to be estimated from

the greater or less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely, and thus, being unable to judge their amount, we ought not to take them into account in the observations.

The above remarks apply equally to the Thermometers of their amount, though their appearances and changes should be noted among the "Zeniths." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky overcast is free from clouds it is entered 0, when half covered by clouds, 5, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner;—In the column "Velocity and Direction,"  $\frac{2}{2}$ , (for example,) will indicate that the

upper strata of clouds travel with extreme velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud column, an entry of  $\frac{4}{4}$ , st. (e.g.) will indicate that the higher 2, cu. sh.

regions are covered to the "anomot" of 4-tenths with stratus clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

*Sunshine.*—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column. *Underground Thermometers.*—As the determination and health of crops and plants greatly depend on the temperature of the soil, its amount and constancy,—the Council recommend that observations in this interesting department be made by a thermometer placed in the earth, the bulb being sunk to depths of 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain water being conveyed to the bath by the stems or wooden frames. Mention should be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

*Temperature of the Sea.*—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology.—The Council therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from boats fully taken by a properly constructed apparatus, from boats influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

*Temperature of Wells.*—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

*Remarks.*—The ozone paper is tinted "3," on the scale, that the wind is from the N.W., and that its force 0—6 is "4"; i.e., that it is *blowing fresh*.

*Electrode.*—Too much importance cannot be attached to these indications registered in connection with the force and direction of the wind, at the time of observation; and continuing to observe for particular depths. Such a depression and elevation of the barometer, thunder storms, and remarkable falls of snow, hail, or rain in the hour maximum, as well as such notes on the vicinity of an Observatory, the height of clouds and in snowing in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or in two and off for the purpose, from that the use are given at the foot of the column. Besides special and in

extraordinary observations, great prominence ought to be given to the use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in this column to prevent disease, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, magnetic phenomena, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory.

*Remarks.*—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor assigned to this column, and the indications registered at 9 A.M. and 9 P.M. are affixed by a pin to a board in the thermometer box, and the indications registered at 9 A.M. and 9 P.M. used. The paper is affixed by a pin to a board in the thermometer box, and the indications registered at 9 A.M. and 9 P.M. are affixed by a pin to a board in the thermometer box.

*Observations in Connection with the Periodic Return of the Seasons.*—Passes not only great scientific value, but are of considerable interest to the Astronomer. The Council would direct the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or in two and off for the purpose, from that the use are given at the foot of the column. Besides special and in

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The Council recommend that *term and day* observations be taken; viz., on the 21st days of March, June, September, and December.

By Order A. B.

Edinburgh, November 1871.

Mr. ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK POST.

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FLORALS.

# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thorshavn, County of Faroë Islands, in Lat. 62° 3' N.; Long. 6° 43' E., Distance from Sea 50 feet miles.

Height of Cistern of the Barometer above Mean Sea-level 40 feet, above Ground 4 feet.

During the MONTH of May 1875.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	BAROMETER.		SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.		HYGROMETER, No. 822 & 829.		WIND.		RAIN.		CLOUDS.		THERMOMETERS under Ground.		SEA, No. 831	OZONE	GENERAL REMARKS.		Days of Month.											
	9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H.Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	P.M.		9 h. A.M.		9 h. P.M.									
	No. 91	Barometer.	Attached Thermometer.	No. 91	Barometer.	Attached Thermometer.	No. 7165	No. 3237	Max. in Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force	Direction.	Force	9 h. A.M.	No. 78	Velocity (0-6), and Direction.	Amount, (0-10), and Species.	Velocity (0-10), and Direction.	Amount, (0-10), and Species.	Hours.	No. 3 inches.	No. 12 inches.	No. 22 inches.		
1	30.068	53.	30.032	57.5	54.5	42.	46.4	44.	45.	42.8	SE	1.	SE	0.5	—	—	—	—	2.	—	—	—	—	—	—	—	—	—	44.8	1
2	29.964	59.	29.950	59.	47.5	43.	46.8	45.2	46.	44.8	SE	1.5	SE	1.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	45.2	2
3	29.856	53.	29.770	59.	49.	43.	45.	43.5	47.	46.	Calm	0.	Calm	0.	—	0.05	—	—	—	—	—	—	—	—	—	—	—	—	45.8	3
4	29.658	59.	29.830	62.	54.	45.5	50.	49.	48.8	46.4	S	1.	Calm	0.	—	0.09	—	—	—	—	—	—	—	—	—	—	—	—	46.	4
5	29.980	57.	29.986	62.	55.	46.	50.2	47.	47.6	46.	SW	1.	Calm	0.	—	—	—	—	8.	—	—	—	—	—	—	—	—	—	45.4	5
6	29.830	60.	29.678	62.	51.	45.	47.	46.	46.8	45.8	SE	1.	SE	0.5	—	0.01	—	—	—	—	—	—	—	—	—	—	—	45.6	6	
7	29.536	58.5	29.576	61.	52.5	45.	48.2	47.5	47.	46.2	Calm	0.	Calm	0.	—	0.02	—	—	—	—	—	—	—	—	—	—	—	47.	7	
8	29.568	56.	29.510	60.	48.	45.	46.8	45.8	46.8	45.8	SE	3.	SE	3.	—	0.07	—	—	—	—	—	—	—	—	—	—	—	47.	8	
9	29.432	58.5	29.402	61.	50.5	45.	47.2	46.5	47.6	46.6	Calm	0.	SE	1.	—	0.02	—	—	—	—	—	—	—	—	—	—	—	47.	9	
10	29.640	62.	29.886	59.	51.5	44.5	48.5	44.8	45.4	42.2	W	3.	SW	2.	—	0.09	—	—	—	2.	—	—	—	—	—	—	—	—	46.	10
11	29.702	55.	29.826	60.	56.	43.	46.5	44.	46.2	42.5	SE	2.	NW	1.	—	0.27	—	—	—	6.	—	—	—	—	—	—	—	—	46.	11
12	29.926	60.5	29.660	60.	51.5	37.5	49.5	43.8	49.8	48.2	SW	1.	SW	4.	—	0.38	—	—	—	5.	—	—	—	—	—	—	—	—	46.2	12
13	29.900	59.	29.970	61.	53.5	46.	50.	43.6	48.4	46.	SW	3.	S	3.	—	0.02	—	—	—	7.	—	—	—	—	—	—	—	—	46.	13
14	29.824	61.	29.774	60.5	53.5	44.	51.5	50.	45.	42.5	SW	3.	SW	2.	—	0.52	—	—	—	—	—	—	—	—	—	—	—	46.6	14	
15	29.652	57.	29.898	59.	49.	38.5	47.2	42.	40.2	36.	SW	4.	NW	3.	—	0.21	—	—	—	8.	—	—	—	—	—	—	—	46.6	15	
16	30.058	60.	30.004	60.	51	37.	46.	40.2	45.	42.4	NW	3.	S	1.	—	0.06	—	—	—	12.	—	—	—	—	—	—	—	—	46.6	16
17	29.702	58.5	29.590	59.	57.5	43.	49.	46.	45.3	42.7	SW	3.	SW	2.	—	0.95	—	—	—	—	—	—	—	—	—	—	—	46.6	17	
18	29.450	56.	29.308	60.5	54.5	41.5	47.	43.	42.	40.2	SW	1.	SW	0.5	—	0.09	—	—	—	11.	—	—	—	—	—	—	—	46.2	18	
19	29.160	58.	29.170	58.5	52.5	34.5	47.8	43.	42.4	40.	N	0.5	SW	0.5	—	0.01	—	—	6.	—	—	—	—	—	—	—	47.6	19		
20	29.170	59.	29.230	58.	49.	38.	47.5	42.5	47.	45.	SW	0.5	S	1.	—	0.06	—	—	8.	—	—	—	—	—	—	—	—	47.6	20	
21	29.308	57.	29.196	58.	53.	45.	49.	47.	49.	47.	S	3.	SE	5.	—	0.10	—	—	5.	—	—	—	—	—	—	—	—	47.6	21	
22	29.228	60.	29.360	56.	51.	46.	47.	45.	47.	44.5	SE	5.	SE	4.	—	0.18	—	—	—	—	—	—	—	—	—	—	—	47.6	22	
23	29.458	58.	29.730	61.5	54.5	45.	51.	47.	47.8	45.	SE	4.	SW	3.	—	0.09	—	—	9.	—	—	—	—	—	—	—	—	46.8	23	
24	29.716	56.	29.466	59.	50.	44.	47.8	45.4	49.2	47.	S	3.	NW	3.	—	0.80	—	—	—	—	—	—	—	—	—	—	—	46.8	24	
25	29.822	58.	30.052	60.	55.	44.5	50.8	45.5	45.	42.	NW	3.	NW	3.	—	0.05	—	—	6.	—	—	—	—	—	—	—	—	46.8	25	
26	30.248	55.5	30.312	60.	55.	43.	48.	43.2	46.	43.6	N	2.	Calm	0.	—	—	—	—	6.	—	—	—	—	—	—	—	—	47.		

# INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them ; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological

dislodged from thence by heating that part over a lamp ; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally. The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "Maximum" should be freely exposed to the sun, and the "Minimum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers ; nor the sun's heat to affect the Minimum Thermometer by distillation.

*Verification of Thermometers.*—No instrument ought to be used for Meteorological purposes, till it has been carefully tested by comparison with a *Standard Thermometer*. When such

*Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the Schedule. It is hoped that the almost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

*Barometer.*—*Weather glasses* and *Aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment* or *compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

Two moderate-priced Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

*Hour of Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the Schedule. It is hoped that the almost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

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Two moderate-priced Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean and moist*, and the water pure. In frosty weather

An excellent Barometer is constructed by Mr Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its scale-inches are not true inches but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee or the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this Little piston-rod is brought, by the adjusting screw, to form one *straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will adapt it to a different purpose.

observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

*Reading of the Thermometer.*—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read— $39^{\circ}9.40^{\circ}0$ , or  $40^{\circ}1.1$ ; or again,  $40^{\circ}4.40^{\circ}5$ , or  $40^{\circ}6$ , according as it indicates a little under, an exact coincidence with, or, a little over  $40^{\circ}$ , or  $40^{\circ}\frac{1}{2}$ , respectively. So also  $40^{\circ}\frac{1}{4}$ , and more or less must be registered  $40^{\circ}2$  or  $40^{\circ}3$  and  $40^{\circ}7$  or  $40^{\circ}8$  respectively. In reading Rutherford's "*Max.*" and "*Min.*" Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by the heat of the hand.

will vitiate the readings from the *vernier*. When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then screw up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument ; it should then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum ; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it ; and if this plan fails, the instrument must be repaired.

The Barometer should be suspended in a good *light*, which may be improved by putting a piece of white paper behind the

*Hour of observing Temperature.* — The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour ; and it is necessary to refer their occurrence to their proper meteorological *day*. In the Society's schedules, the indications registered on the 3rd are those of a series of phenomena commencing at 9 P.M. on the 2nd, and extending till 9 P.M. on the 3rd.

*Wind.*—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction should be taken ; and when it is stationary, and always when the wind is feeble, reference may be made to the direction of smoke, etc.

may be impeded by passing a piece of paper across the tube. It must be perfectly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire.

In taking an Observation, the attached Thermometer is first noted : the tube must then be gently tapped and the cistern-adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index,—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly ; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

*Protection of Thermometers.*—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors

Careful observations ought to be made on the changes in the direction of the wind ; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results.

The Council would recommend that every observatory be furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day ; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, Lind's Anemometer may also be recommended ; the method of Estimating Wind Force by such tables as that given in the *Rain-ganges*.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observation and partly from the defective nature of the

instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily at 9 A.M., and the readings entered in the returns of the day previous.

*Snow-falls* may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should be noted in the “Remarks,” and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

*Clouds.*—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The

To **SHIP LETTER**

*Mr ALEXANDER BUCHAN*

*Secretary of the Meteorological Society of Scotland,*

## EDINBURGH.

## BOOK POST.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

scuration of the sky *overhead* (*i. e.*, within sight). The strata of clouds that appear near obliquely; and thus, being unable to judge ought not to take them into account in the sum of their appearances and changes should be omitted. The amount of cloud is entered in the column “Velocity over head” to 10; thus, when the sky *overhead* is free from clouds, the column “Velocity over head” will indicate that the clouds are made at 9 A.M. and at sunset, condition and currents of the upper and lower atmosphere. The entries in the schedule are to be given in the following manner:—In the column “Velocity over head” will indicate that the clouds travel with extreme velocity from S.W., through regions from W., with one-third the velocity former. Again, in the second “Cloud”

—, (e.g.) will indicate that the higher cust.,  
so the “amount” of 4-tenths with *stratus* with *stratus* kind.  
the sky is further obscured to the extent of  
clouds of the *cumulo-stratus* kind.  
a number of hours in which objects in the  
news, should be entered in the proper column.  
*Thermometers.*—As the germination and health  
greatly depend on the temperature of the  
constancy,—the Council recommend that  
interesting department be made at 9 A.M., by  
in the earth, their bulbs being sunk to  
22 inches, and the stems above ground pro-  
tecting rays, and fitted with sloping tin collars,  
or being conveyed to the bulbs by the stems  
Mention should be made of the geological  
cultural condition of the soil in which these  
placed.  
*The Sea.*—A knowledge of the temperature of  
itself, but in its relations to that of our  
constant branch of Meteorology. The Council  
that the temperature of the sea be care-  
fully constructed apparatus, from boats, from  
and rocks round the coast, where it is not  
river water. At or near the time of high  
high, and 25th of each month, the thermo-

and each moment, inc. and inc., and 200 fms. and 200 fms. exactly six feet (one fathom), and after being hauled up, drawn up, and read. When convenient, observations might be taken for other and greater depths. The temperature of the air, and the hour continuing to observe for particular depths.

*Wells.*—The temperature of the water at the right, when practicable, to be taken, and the depth of the water noted.

It is not known whether Schönbein's or Moffat's papers are affixed by a pin to a board in the thermometer case; these indications registered at 9 A.M. and 9 P.M. in this manner:—thus  $\frac{35^{\circ}\text{N}}{4}$ , as an ozone entry in

"Remarks" column is too narrow, but un-  
derline the word "Remarks".

of the most valuable observations that can be made, which no rules can be given nor hours of contractions ought, therefore, to be taken and a list of such as are recognised and in the foot of the column. Besides special and observations, great prominence ought to be given

maximum, as well as such roads on which hills are limited at above. When lofty hills are in observatory, the height of clouds and of the should be recorded.

"in two ruled off for the purpose, from that it is intended that observations by the side-  
l be entered in this manner or on the side-  
l remarks may be made on the margin.  
In connection with the periodic return of the  
of only great scientific value, but are of con-

The Council would direct the Agricultural Observers to the registration of such Observers to the registration of such the published Summaries may fairly represent Scotland. Observation ought to be confined and shrubs; to particular species of birds;

crops, to specified sorts reared from year to piece of ground or farm. I recommend that *term day* observations be taken; days of March, June, September, and December, for the use of the instruments mentioned

commend observers, before purchasing new instruments, and may be had along with them from

A. B.  
(By Order)

To

**SHIP LETTER**

Mr ALEXANDER BUCHAN,

*Secretary of the Meteorological Society of Scotland,*

EDINBURGH.

BOOK POST.

15  
16  
HORN  
1904

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1904  
16



# INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

## WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labor and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully *tested* by comparison with a *Standard Thermometer*. When such upper strata of clouds travel with extreme velocity from S.W., and those in the lower regions from W., with one-third the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the clouds' column, though their appearances and changes should be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to .10; thus, when the sky *overhead* is free from clouds it is entered 0, when *half covered* by clouds, .5 and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction,"       , (for example,) will indicate that the

the greater or less obscuration of the sky *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed horizontally. These instruments should be hung vertically. The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "Maximum" should be freely exposed to the sun, and the "Minimum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

*6. S. W.*

*2. W.*

*upper strata of clouds travel with extreme velocity from S.W., and those in the lower regions from W., with one-third the*

*Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the Schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers, are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

*Hour of Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the Schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers, are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

*Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being *re-tested*.* The self-registering, and especially the "*Miram m.*" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice.

*The Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers, are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

*Barometer.—Weather glasses and Aneroids,* though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment* or *compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

Two moderate-priced Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

An excellent Barometer is constructed by Mr Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scales*—*inches* are not true inches but so much shorter as to *compensate* for the contraction of the glass tube when exposed to the heat of the sun's rays.

*Cloud*—*Cloudiness* speed of the former. Again, in the second "Cloud" column, an entry of 4, st., (e.g.) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

*Sunshine.*—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column.

*Underground Thermometers.*—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy,—the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to depths of 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain water being conveyed to the bulbs by the stems or wooden frames. Mention should be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

*Temperature of the Sea.*—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from boats, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high

the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, to form one *straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

*Reading of the Thermometer.*—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read— $39^{\circ}.9$ ,  $40^{\circ}.0$ , or  $40^{\circ}.1$ ; or again,  $40^{\circ}.4$ ,  $40^{\circ}.5$ , or  $40^{\circ}.6$ , according as it indicates a little under, an exact coincidence with, or, a little over  $40^{\circ}$ , or  $40\frac{1}{2}$ , respectively. So also  $40^{\circ}4$ , and  $40\frac{1}{2}\%$ , more or less must be registered  $40^{\circ}.2$  or  $40^{\circ}.3$  and  $40^{\circ}.7$  or  $40^{\circ}.8$  respectively. In reading Rutherford's "*Max.*" Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

*Temperature of Wells.*—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

*Ozone.*—Mention whether Schönbein's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus  $\frac{3\frac{1}{2}}{4}$ , as an *ozone* entry in the schedule will indicate that the ozone paper is tinted as  $\frac{3}{4}$ .

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then screw up the tube to within a quarter of an inch of the top of the tube, and take down the instrument; it should then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum: this is the case when an observer meteorological *dam* in the Societé's schedules the pressure "Baromètre" clearly indicates the same.

*Remarks.*—The “*remarks*” column is too narrow, but unavoidable so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given to prevalent diseases, differences in character, the direction of winds, &c.

colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms and wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the

*Projection of Thermometers.*—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be used in connection with the periodic return of the snow-line in winter should be recorded. By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner or on the margin. Additional remarks may be made on the margin. "*Observations* in connection with the periodic return of the

*Rain-gauges.*—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situations for observation and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily at 9 A.M., and the readings entered in the returns of year on a selected piece of ground or farm.

desirable, doors, may also be made to open to the south.

*Self Registering Thermometers.*—Professor Phillip's, and Negretti and Zambra's Patent "Maximum" Thermometers are recommended: printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Rutherford is recommended and should be affixed to a frame separate from the "Maximum." It is recommended that the day previous.

*Snow-falls* may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to and as a check noon viz., on the 21st days of March, June, September, and December.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

The Council recommend observers, before purchasing new instruments, to communicate with the Meteorological Secretary ; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

(By Order) A. B.

EDINBURGH, November 1872.

*Mr ALEXANDER BUCHAN*

*Secretary of the Meteorological Society of Scotland,*

EDINBURGH.

BOOK POST



FOREST TREES.						
Alder,	Beech,	Birch,	Elm,	Larch,	Lime,	Oak,
Ash,	Beech,	Birch,	Oats,	Wheat,	Pease,	Turfips,
Alder,	Beech,	Birch,	Barley,	Brewhouse,	Beans,	Rye Grass,
Fruit Buds,	In Leaf,	Driestened of	CROPS,	Sowing or	Appearing	In Bar,
In Flower,	Leaves,	Driestened of	mentaining variety,	Planting,	Above Ground,	or Flowers,
BOOK POST.	EDINBURGH.	POSTAGE PAID	29 JULY 1877	POSTAGE PAID	POSTAGE PAID	POSTAGE PAID
SHRUBS, ETC.	FRUITS.	First in Blossom.	Fruit Pipe,	MIGRATION BIRDS.	First Departure.	
Barberry,	Apple,	Quince,	Cherry,	House-Swallow,	Gean,	Hazel,
Boultree or Elder,	Black Currant,	Quince,	Cherry,	Lapwing,	Gooseberry,	Hawthorn,
Broom,	Bramble,	Quince,	Cherry,	House-Swallow,	Plower,	Holly,
Broom,	Barberry,	Quince,	Cherry,	Cherry,	Teach,	Lauburnum,
Broom,	Barberry,	Quince,	Cherry,	Cherry,	Dear,	Lilac,
Broom,	Barberry,	Quince,	Cherry,	Cherry,	Starling,	Plum,
Broom,	Barberry,	Quince,	Cherry,	Cherry,	Swan,	Rail or Corn Crake,
Broom,	Barberry,	Quince,	Cherry,	Cherry,	Strawberry,	Mountain Ash or Rowan,
Broom,	Barberry,	Quince,	Cherry,	Cherry,	Thorn,	Red Flowering Currant,
Broom,	Barberry,	Quince,	Cherry,	Cherry,	Thorn,	Rhubarb or Ponticum,
Broom,	Barberry,	Quince,	Cherry,	Cherry,	Thorn,	Whin,

FOREST TREES.						
Alder,	Beech,	Birch,	Elm,	Larch,	Lime,	Oak,
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Alder,	Beech,	Birch,	Barley,	Brewhouse,	Beans,	Rye Grass,
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Broom,	Barberry,	Quince,	Cherry,	Cherry,	Thorn,	Rhubarb or Ponticum,
Broom,	Barberry,	Quince,	Cherry,	Cherry,	Thorn,	Whin,

Have the goodness also to state any information you may be able to collect relative to the Crops of grain, Hay, Potatoes Turnips, Fruits, etc., whether plentiful, or in perfection; whether any have suffered from blight, disease, etc. Whether Epizootic disease prevails among cattle; and the Agricultural condition of the district generally.

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# INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS

## WITH REMARKS ON THE USE OF INSTRUMENTS.

*Hour of Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the Schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

*Barometer.*—*Weather glasses* and *Aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment* or *compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*. Two moderate-priced Barometers have been approved by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers, are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water *pure*. In frosty weather

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring no adjustment of the cistern. Its scale-inches are not true inches but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the zero-point of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the index-line on this little piston-rod is brought, by the adjusting screw, to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this preliminary setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the vernier.

When a Barometer having adjustable surfaces has to be

*Reading of the Thermometer.*—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read— $39^{\circ}9.40^{\circ}0$ , or  $40^{\circ}1.1$ ; or again,  $40^{\circ}4.40^{\circ}5$ , or  $40^{\circ}6$ , according as it indicates a little under, an exact coincidence with, or, a little over  $40^{\circ}$ , or  $40^{\circ}\frac{1}{2}$ , respectively. So also  $40^{\circ}\frac{1}{4}$ , and  $40^{\circ}\frac{3}{4}$ , more or less must be registered  $40^{\circ}.2$  or  $40^{\circ}.3$  and  $40^{\circ}.7$  or  $40^{\circ}.8$  respectively. In reading Rutherford's "Max." and "Min." Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

*Hour of Observing Temperature.*—The Hygrometer is read

removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then screw up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument ; it should then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum ; this is the case when, on inverting the instrument so that the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it ; and if this fails, the instrument must be repaired.

The Barometer should be suspended in a *good light*, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular, and exposed to either the sun's direct rays nor the heat of a fire.

In *taking an Observation*, the attached Thermometer is first noted : the tube must then be gently tapped and the cistern-adjustment carefully made. By raising and lowering the eye,

at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour ; and it is necessary to refer their occurrence to their proper meteorological *day*. In the Society's schedules, the indications registered on the 3rd are those of a series of phenomena commencing at 9 P.M. on the 2nd, and extending till 9 P.M. on the 3rd.

*Wind.*—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction should be taken ; and when it is stationary, and always when the wind is feeble, reference may be made to the direction of smoke, etc.

Careful observations ought to be made on the changes in the direction of the wind ; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important

The Council would recommend that every observatory be furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation

Lind's Anemometer may also be recommended; the method of *Estimating Wind Force* by such tables as that given in the schedule is, to say the least, unsatisfactory.

*Rain-ganges*.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observation and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily at 9 A.M., and the readings entered in the returns of the day previous.

*Snow-falls* may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to register observations, and to make arrangements for doing so.

*Protection of Thermometers*.—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors, may also be made to open to the south.

*Self Registering Thermometers*.—Professor Phillips's, and Negretti and Zambra's Patent "Maximum" Thermometers are recommended: printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Rutherford is recommended and should be affixed to a frame separate from the "Maximum." It is recommended that these Thermometers be graduated on the glass stem. The "Minimum" Thermometer is liable to two derangements, both of

Wanshaw  
July 1895.

7.

*Mr ALEXANDER BUCHAN*

**SHIP LETTER**

*Secretary of the Meteorological Society of Scotland,*

EDINBURGH

## BOOK POST.

have the goodness also to state all information you may be able to collect relative to the Crops of Grain, Hay, Potatoes, Turnips, Peas, etc., etc., whether Plentiful, or in Perfect condition; whether any have suffered from blight, disease, etc. Whether Epidzootic diseases prevail among cattle; and the Agricultural condition of the district generally.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

ONE of the objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all the stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological observation.

dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally. The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "Maximum," should be freely exposed to the sun, and the "Minimum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

*Verification of Thermometers.*—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers as are not graduated on the stem, but merely on

the greater or less obscuration of the *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata ds that appear near the horizon are viewed obliquely; and being unable to judge of their amount, we ought not to take into account in the *clouds' column*, though their appearance changes should be noted among the "*Remarks*." Theft of clouds is entered from a scale of 0 to 10; thus, when *overhead* is free from clouds it is entered 0, when *half* by clouds, 5 and so on.

Observations of the clouds are made A.M. and at sunset, as illustrating the condition and currie upper and lower regions of the atmosphere. The entire schedule are to be made in the following manner;—column "Velocity and Direction," 2, W.

upper strata of clouds travel with *velocity* from S.W., and those in the lower regions from with one-third the (*extreme*) speed of the former. A gate second "Cloud"

*Hour of Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following Schedule. It is hoped that the most punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "Hygrometrical Deductions", Observers, are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean and moist*, and the water pure. In frosty weather, the glass tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*. Two moderate-priced Barometers have been approved by the Council; if properly tested and attended to, they are both suitable for Meteorological purposes.

*Barometer.*—*Weather glasses* and *Aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological observations that is not supplied with such means of *adjustment* or *compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

*Thermometers.*—Amination and health of crops and plants greatly depend temperature of the soil,—its amount and constancy,—till recommend that observations in this interesting department at 9 A.M., by thermometers placed in the earth, lbs being sunk to depths of 3, 12, and 22 inches, and above ground protected from the sun's rays, and fit sloping tin collars, to prevent rain water being conveyed bulbs by the stems or wooden frames. Mention should be made of the geological formation and agricultural condition in which these Thermometers are placed.

*Temperature of the Sea.*—A knot' the temperature of the sea is not only in itself, but in ions to that of our very important branch of commerce. The Com-

well adapted to Meteorological purposes.

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its scale-inches are not true inches but so much shorter as to compensate the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the zero-point of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the index-line on this little piston-rod is brought, by the adjusting screw, to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this preliminary setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the vernier.

When a Barometer having adjustable surfaces has to be

always *clean and moist*, and the water pure.

The Council therefore recommend that the temp<sup>r</sup> of the sea be carefully taken by a properly constructed, from boats, from the ends of piers and rocks roundast, where it is not influenced by that of river water.

At the time of high water, on the 5th, 15th, and 25th month, the thermometer ought to be sunk exactly six fathom), and after ten minutes have elapsed, drawn up. When convenient, extra sea observations might be made at other and greater depths, noting always the temperate air, and the hour of observation; and continuing to particular depths.

*Temperature of Wells.*—The temp<sup>r</sup> of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water used.

*Ozone.*—Mention when being or Moffat's papers are used. The paper is affixed to a board in the thermometer box, and the registered at 9 A.M. and 9 P.M. It is desired that these be registered in connection with the force and direction of the wind at the time of observation, in the following manner  $\frac{3}{4}^{\text{N.W.}}$ , as an ozone entry in the schedule, will indicate ozone paper is tinted as "3" on the scale, that the wind the N.W., and that its force

at 9 A.M. and 9 P.M. The self-registering Thermometers are on the scale 0—6 is “4,” it is *blowing fresh*.  
*Electricity*.—Too muance cannot be attached to electric condition of the air in connection with terrestrial magnetism, and as a moral phenomenon. A proper Electrometer is necessary complete meteorological observatory.

*Remarks*.—The “Replum” is too narrow, but unavoidably so. Some of thirable observations that can be taken are those for whies can be given nor hours assigned. The use of co ought, therefore, to be taken every advantage of, and such as are recognised and in indications registered on the 3rd are those of a series of phenomena commencing at 9 P.M. on the 2nd, and extending till 9 P.M. on the 3rd.

*Wind*.—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction should be taken; and when it is stationary, and always when the wind is feeble, reference may be made to the direction of smoke, etc.

Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different stations, would be likely to give highly interesting and important information.

The Barometer should be suspended in a good *light*, which may be improved by putting a piece of white paper behind the tube. It must be perfectly perpendicular, and exposed to either the sun’s direct rays nor the heat of a fire.

In *taking an Observation*, the attached Thermometer is first noted: the tube must then be gently tapped and the cistern-adjustment carefully made. By raising and lowering the eye,

it must be brought into the plane of the back and front of the results.

The Council would recommend that every observatory be furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, Lind's Anemometer may also be recommended; the method of Estimating Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

*Rain-gauges.*—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observation and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily at 9 A.M., and the readings entered in the returns of the day previous.

*Snow-falls* may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should be noted in the “Remarks,” and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to observe the directions given in the section on *Observation*.

*Self Registering Thermometers.*—Professor Phillip's, and Negretti and Zambra's Patent “*Maximum*,” Thermometers are recommended: printed directions for their use may be obtained with each instrument. The “*Minimum*” Thermometer of Rutherford is recommended and should be affixed to a frame separate from the “*Maximum*.” It is recommended that these Thermometers be graduated on the glass stem. The Thermometer is liable to two derangements, both of which require immediate attention. The first is a sudden rise in temperature, which may be detected by the thermometer being

When lofty hills are in the vicinity of an Observatory, the snow-line in winter shored.

By the use of abbreviate state of the weather at 9 A.M. and 9 P.M. should be rather in two columns, otherwise unoccupied, or in ff for the purpose, from that headed “Remarks,” led that observations by the Electrometer should be this manner or on the side-margin. Additional re be made on the margin.

“Observations in edth the periodic return of the seasons,” possess not orientic value, but are of considerable interest to the st. The Council would direct the special attention of to the registration of such phenomena so that the Summaries may fairly represent the whole of Scoltivation ought to be confined to individual trees and particular species of birds; and, in the case of croed sorts reared from year to year on a selected piecor farm.

The Council recomim day observations be taken; —viz., on the 21st days June, September, and December.

Full directions for the instruments mentioned above have been printe had along with them from the makers.

The Council recomiv before purchasing new instruments, to commu Meteorological Secretary; and they consider it d he should have full power

# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thorshavn, County of Faroé Islands, in Lat.  $62^{\circ} 2' 8''$ , Long.  $6^{\circ} 43' 8''$ , Distance from Sea 50 feet miles.

Height of Cistern of the Barometer above Mean Sea-level 40 feet, above Ground 4 feet.

During the MONTH of August 1875

The Hours of Observation are of Greenwich Time.

ELECTRICITY. Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.		HYGROMETER. No. 832 & 839.		WIND.		RAIN.		CLOUDS.		THERMOMETERS under Ground.		SEA. No. 831	OZONE.	GENERAL REMARKS.		Days of Month.							
	9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H.Cup Anemometer, No. 78		9 h. A.M.		P.M.									
	Barometer No. 91	Attached Thermometer No. 91	Barometer No. 91	Attached Thermometer No. 91	Max.	Min.	Max. in Sun's rays	No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force	Direction.	Force	No. of hours in which it fell	Amount in inches, (0—6) and Direction.	Velocity (0—10), Amount (0—10), and Species.	Velocity (0—10), Amount (0—10), and Species.	9 h. A.M.	Hours.	SUNSHINE.	Temperature of Well at Depth of 1 fathom, at 1 Station, and Density,	0—10.	
1	30.174	62.5	30.176	61.5	58.5	50.		55.6	53.	51.8	50.4	SW	3	S.	0.5		0.10			10.	0.	0.	51.			1
2	30.312	60.	30.326	62.	57.	48.5		52.	51.	50.2	49.2	Calm	0.	N.E.	0.5		0.15			2.			51.			2
3	30.406	62.	30.416	62.5	58.5	49.5		55.2	52.2	49.8	47.5	NE	1.	E.	0.5					12.						3
4	30.356	59.	30.316	60.5	58.	46.5		53.	48.	49.8	47.	E.	0.5	Calm	0.					8.						4
5	30.342	57.5	30.380	59.5	60.	40.		53.3	50.	48.2	45.6	S.	1.	Calm	0.					10.						5
6	30.376	58.	30.362	61.	58.	47.		54.	48.8	50.8	49.6	S.	0.5	Calm	0.					2.						6
7	30.346	60.	30.336	59.5	60.	48.5		54.	50.5	50.6	48.4	Calm	0.	W.	0.5					10.						7
8	30.308	60.5	30.274	59	58.5	47.5		57.	51	49.8	47.5	Calm	0.	SE.	0.5		0.03			2.						8
9	30.184	59	30.096	59.5	56.	48.		53.8	52.2	49.8	48.6	NE	0.5	Calm	0.											9
10	30.018	62.	29.980	61.	58.5	48.		53.8	52.	50.	46.	N.E.	1.5	NE	2.		0.07									10
11	29.966	60	30.034	59.5	55.5	48.		54.2	49.	50.	45.8	NE	2.	NE	1.					8.						11
12	30.070	57.	30.066	59.	53.5	46.		49.5	46.2	47.	42.6	NE	2.	E.	2.					2.						12
13	30.036	55.5	30.052	61.	54.	44.		50.	44.6	47.2	45.	NE	2.	NE	1.					3.						13
14	29.974	55.5	30.004	60.	53.	45.5		52.8	48.2	51.4	50.6	SE	3.	SE	3.		0.13			2.						14
15	29.984	59.	29.930	63.	58.5	48.		53.2	52.3	55.	53.8	SE	1.	SW	2.		0.02								15	
16	29.752	60.	29.470	62.	56.	50.		53.	52.5	54.2	53.	S.	1.5	W.	2.		0.85								16	
17	29.588	60.	29.660	60.	58.	50.5		54.	53.5	52.4	51.4	SW	2.	SW	2.		0.10			4.						17
18	29.830	64.	29.970	61.5	58.	47		54.8	57.	50.	47.5	N	1.	SW	0.5					7.						18
19	29.982	59.	29.952	60.	59.	49.		55.	51.2	54.4	51.5	SW	3.	SW	4.		0.07			52.						19
20	29.740	58.	29.812	60.	56.5	49.		54.6	52.	50.2	46.8	S	5.	SW	3.		0.25			4.						20
21	29.984	59.5	30.090	59.	56.5	48.5		55.	49.	49.6	47.8	W	2.	W.	0.5		0.01			3.						21
22	29.928	61.	29.574	60.	56.5	48.		53.2	51.2	55.	54.	S.	3.	SW	3.		0.01			2.						22
23	29.576	59.5	29.556	60.5	56.	50.		53.4	50.8	50.8	48.	SW	3.	SW	2.		0.09								23	
24	29.572	58.	29.698	61.	61.	47		52.4	49.5	48.	47.	W	2.	NE	1.		0.05			3.						24
25	29.554	57.5	29.282	60	59.	45.		52.6	50.5	52.	51.5	SE	1.	E.	1.		0.52			50.8						25
26	29.212	59.	29.296	60	57.	50.5		55.3	51.2	53.	51.5	SW	2.	SW	2.		0.35			51.2						26
27	29.320	60.5	29.732	62.	59.	49.		54.	52.4	50.2	47.8	SW	3.	W	2.		0.31			5.						27
28	29.918	57.5	29.952	61.	56.	45.		49.6	46.8	48.8	46.5	W	1.5	Calm	0.				10.						28	
29	29.890	57.5	29.810	62.	53.	47.5		50.8	50.	51.	50.2	Calm	0.	SE.	3.		0.59			51.						29
30	29.812	57.	29.980	62.	53.	48.		50.3	49.	49.8	45.4	NE	3	NE	2		0.33			51.8						30
31	30.124	60	30.178	59.	56.	43.		51.2	45.6	44.3	41.8	NE	0.5	SW	1.				10.						31	
Sums.	928.534																									

# INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS, BY DR. JAMES G. FISHER, ASSISTANT SECRETARY OF THE NAVY.

WITH REMARKS ON THE USE OF INSTRUMENTS

ONE of the objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or sheller of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those who kindly furnish Reportis to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally. The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "Maxirum" should be freely exposed to the sun, and the "Minirum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

*Verification of Thermometers.*—No instrument ought to be used for Meteorological purposes till it has been carefully *tested* by comparison with a *Standard Thermometer*. When such Thermometers as are *not* graduated on the stem, but merely on

*Hour of Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the Schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

*Barometer.*—*Weather glasses* and *Aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment* or *compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*. Two moderate-priced Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

*Hygrometer.*—The Council recommend that Observers, in an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being *re-tested*. The self-registering, and especially the "*Minn m'*" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, insnow or melting ice. The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers, are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean and moist*, and the water pure. In frosty weather,

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scales* are not true inches but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the cistern are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, to form one *straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be used to observe temperature, it is necessary to take the observations at the same time every day, and to make the same observations at the same time every day.

The Hygrometer is used to observe the relative humidity of the air. It consists of two glass tubes, one containing a wet cloth, the other a dry cloth. The wet cloth is moistened with water, and the dry cloth is dried with a piece of cloth. The hygrometer is placed in a box, and the box is placed in a room where the temperature is constant. The hygrometer is then taken out of the box, and the wet cloth is moistened again. The hygrometer is then placed back in the box, and the box is placed back in the room. The hygrometer is then taken out of the box again, and the wet cloth is moistened again. This process is repeated until the hygrometer shows a constant reading.

The thermometer is used to observe the temperature of the air. It consists of a glass tube with a bulb at the top. The bulb is filled with mercury, and the tube is closed at the top. The tube is then immersed in a bath of water, and the temperature of the water is noted. The thermometer is then removed from the water, and the temperature of the air is noted. This process is repeated until the thermometer shows a constant reading.

The barometer is used to observe the pressure of the air. It consists of a glass tube with a bulb at the top. The bulb is filled with mercury, and the tube is closed at the top. The tube is then immersed in a bath of water, and the pressure of the water is noted. The barometer is then removed from the water, and the pressure of the air is noted. This process is repeated until the barometer shows a constant reading.

When a Barometer, having adjustable screws and  
removed from its fastenings, the ivory peg must be screwed so  
as to form a tight plug to the cistern. Then screw up the  
mercury to within a quarter of an inch of the top of the tube,  
and take down the instrument; it should then be carried with  
the cistern uppermost. Before suspending the Barometer for  
use, it must be ascertained whether the space above the mercury  
in the tube is a complete vacuum; this is the case when, on in-  
clining the instrument so that the mercury strikes the top of  
the tube, a sharp tap is produced. If this is prevented by air  
it may be removed to the cistern, and got rid of, by inverting  
the Barometer (care being taken to prevent the loss of mercury  
by tightening the ivory peg), and gently tapping it; and if this  
plan fails, the instrument must be repaired.

The Barometer should be suspended in a good light, which  
may be improved by putting a piece of white paper behind the  
tube. It must be perfectly perpendicular, and exposed to  
neither the sun's direct rays nor the heat of a fire.

In *taking an Observation*, the attached Thermometer is first  
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above surrounding objects. When it oscillates incessantly, the  
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Careful observations ought to be made on the changes in the  
direction of the wind; and during storms, extra observation  
ought to be made at every hour of Greenwich time. Such  
a system of simultaneous observation, pursued at different Sta-  
tions, would be liable to give highly important and import-  
ant information.

*adjustment carefully made.* By raising and lowering the eye, it must be brought into the plane of the back and front of the index,—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly ; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

*Protection of Thermometers.*—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to “protect” the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors, may also be made to open to the south.

*Self-Registering Thermometers.*—Professor Phillip's, and Mr. T. J. M. Poter's Patent “*Mercurian*” Thermometers

The Council would recommend that every observatory furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day ; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation Lind's Anemometer may also be recommended ; the method *Estimating Wind Force* by such tables as that given in the schedule is, to say the least, unsatisfactory.

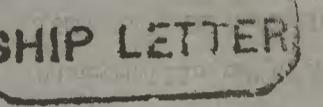
*Rain-gauges.*—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situations for observation and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge ; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily at 9 A.M., and the readings entered in the returns for the day previous.

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Negretti and Zamora's Patent "Maximum." Thermometers are recommended: printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Rutherford is recommended and should be affixed to a frame separate from the "Maximum." It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be observed, and registered in addition to, and as a check upon the indications of the rain-gauge. For wind, rain, and snow, indeed in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

*Clouds.*—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from

*Mr ALEXANDER BUCHAN,*



*Secretary of the Meteorological Society of Scotland,*

## EDINBURGH.

To

## BOOK POST.

Have the goodness also to state any information you may be able to collect relative to the Crops of Grain, Hay, Potatoes, Fruits, etc., whether plentiful, or in perfection; whether any have suffered from blight, disease, etc. Whether Fzoot

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

A. B  
By Order)

Memorandum 1089

the greater or less obscuration of the sky *overhead* (*i. e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the 'clouds' column, though their appearances and changes should be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky *overhead* is free from clouds it is entered 0, when *half covered* by clouds, 5 and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner;—In the column "Velocity 6, S. W. and Direction" (for example) will indicate that the

upper strata of clouds travel with extreme velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" 4, st. column, an entry of 2, cusi-, (e.g.) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

*sun's rays cast shadows, should be entered in the proper column.*  
*Underground Thermometers.*—As the germination and health  
of crops and plants greatly depend on the temperature of the  
soil,—its amount and constancy,—the Council recommend that  
observations in this interesting department be made at 9 A.M., by  
thermometers placed in the earth, their bulbs being sunk to  
depths of 3, 12, and 22 inches, and the stems above ground pro-  
tected from the sun's rays, and fitted with sloping tin collars,  
to prevent rain water being conveyed to the bulbs by the stems  
or wooden frames. Mention should be made of the geological  
formation and agricultural condition of the soil in which these  
Thermometers are placed.

*Temperature of the Sea.*—A knowledge of the temperature of  
the sea is not only in itself, but in its relations to that of our  
island, a very important branch of Meteorology. The Council

therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from boats, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

*Temperature of Wells.*—The emperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

*Ozone.*—Mention whether Söjöbein's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus  $\frac{3\frac{1}{2}}{4}$ , as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as “3” on the scale, that the wind is from the N.W., and that its force

on the scale 0—6 is “4”: *i.e.*, that it is *blowing fresh*.  
*Electricity*—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to very complete meteorological observatory.

*Remarks.*—The “*Remarks*” column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which notules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use are given at the foot of th column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of te sky, etc. Remarks ought to be made on the occurrence of pteors, aurora boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hil, or rain, the hour of storms of wind, attaining their maximum as well as such notes as

of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter should be recorded.

By the use of abbreviations, he state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or in two rull off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner or on the side-margin. Additional remarks ay be made on the margin.

"Observations" in connecti with the periodic return of the seasons," possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena so that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to sicified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *term day* observations be taken; —wiz., on the 21st days of May, June, September, and Decem-

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

The Council recommend observers, before purchasing new instruments, to communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.











# INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

## THE REMARKS ON THE USE OF INSTRUMENTS

THE objects of immediate importance that the "Scottish Meteorological Society" has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those who kindly furnish Report's to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several returns, without which the Society's Reports must inevitably fall in achieving one of the main objects of Meteorological observation.

dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally. The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "Maximum" should be freely exposed to the sun, and the "Minimum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

*Verification of Thermometers.*—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers as are not graduated on the stem, but merely on

The greater or less obscuration of the sky *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the "clouds" column, though their appearances and changes should be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky *overhead* is free from clouds it is entered 0, when *half covered* by clouds,  $\frac{1}{2}$ , and so on.

Observations of the clouds are made at 9 A.M. and ~~at sunset~~<sup>at 6 P.M.</sup> as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner;—In the column "Velocity and Direction,"  $\frac{\text{S.E.}}{\text{W.}}$ , (for example,) will indicate that the upper strata of clouds travel with *extreme velocity* from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud"

*Hour of Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following Schedule. It is hoped that the most punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not necessarily, mounted on one frame. As apparently slight deviations from the approved and well-tested form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers, are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended;—the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the mercury in the cistern. It is also necessary that every thermometer shall have been compared with a *Standard*. Two moderate-priced Barometers have been approved of by the Council, and are to be supplied by the Government, and the cost of the same will be defrayed by the Council. The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following Schedule. It is hoped that the most punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not necessarily, mounted on one frame. As apparently slight deviations from the approved and well-tested form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers, are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended;—the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the mercury in the cistern. It is also necessary that every thermometer shall have been compared with a *Standard*.

The Council; if properly tested and attended to, they are both water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

*Reading of the Thermometer.*—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°.9, 40°.0, or 40°.1 ; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or, a little over 40°, or 40½°, respectively. So also 40°.4, and 40°.5, more or less must be registered 40°.2 or 40°.3 and the *zero-point* of the fixed scale ; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, to form one and “*Min.*” Thermometers, the indication of that end of the mercury is then at the exact height from which the scale is graduated. In taking an observation this *vernier* setting is alone noted. Readings of the Thermometers officially of

temperature of the sea, — a knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. — The Council therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from boats, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation ; and continuing to observe for particular depths.

*Temperature of Wells.*—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

*Ozone.*—Mention whether Schönbein's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the *thermometer* setting.

with the force and direction of the wind at the time of observation, and a thermometer, especially of the wet and dry bulb, must be rapidly taken, being so readily affected by heat from the person of the observer.

*Hour of observing Temperature.*—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 3rd are those of a series of phenomena commencing at 9 P.M. on the 2nd, and extending till 9 P.M. on the 3rd.

*Wind.*—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction should be taken; and when it is stationary, and always when the wind is feeble, reference may be made to the direction of smoke, etc.

Careful observations ought to be made on the changes in the direction of the wind, during the day, and the change in the

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under the sun's direct rays nor the heat of a fire.

In *taking an Observation*, the attached Thermometer is first set up : the tube must then be gently tapped and the cistern-junction carefully made. By raising and lowering the eye, must be brought into the plane of the back and front of the flexy,—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex face of the mercury in the tube. Observations must be taken quickly ; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will easily facilitate an accurate adjustment and reading of the thermometer.

*Production of Thermometers.*—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from very local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge ; but in all cases the gauge must be sunk in the ground till its edges are on a level with the

direction of the wind ; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different stations, would be likely to give highly interesting and important results.

The Council would recommend that every observatory be furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day ; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, Lind's Anemometer may also be recommended ; the method of *Estimating Wind Force* by such tables as that given in the schedule is, to say the least, unsatisfactory.

*Rain-gauge.*—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observation and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge ; but in all cases the gauge must be sunk in the ground till its edges are on a level with the

occurrence of meteors, aurœ boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner or on the side-margin. Additional remarks may be made on the margin.

"Observations in connection with the periodic return of the seasons," possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena so that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs ; to particular species of birds ;

sure of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors, may also be made to open to the south.

*Self Registering Thermometers.*—Professor Philip's, and Agreit and Zambra's Patent “*Maximum*” Thermometers recommended: printed directions for their use may be obtained with each instrument. The “*Minimum*” Thermometer of Rutherford is recommended and should be affixed to the frame separate from the “*Maximum*.” It is recommended that these Thermometers be graduated on the glass stem. The “*Minimum*” Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by observer. When the column of spirit breaks, it may be united by striking the instrument repeatedly against the m of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be

Snow-falls may, *for convenience*, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should be noted in the “Remarks,” and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be to careful to register *observations only*; and nothing that partakes of the nature of deduction or inference.

*Clouds.*—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from

and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *term day* observations be taken; —viz., on the 21st days of March, June, September, and December.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

The Council recommend observers, before purchasing new instruments, to communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

BOOK POST

*Secretary of the Meteorological Society of Scotland,*

# *EDINBURGH.*

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS

A. B

IN BURGH, November 1873.

# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thorshavn, County of Faroe Islands, in Lat. 62° 2' N, Long. 6° 43' E, Distance from Sea 50 feet miles.

Height of Cistern of the Barometer above Mean Sea-level 40 feet; above Ground 4 feet.

During the MONTH of December 1875.

The Hours of Observation are of Greenwich Time.

ELECTRODIO.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER, No. 832 & 829.				WIND.				RAIN.	CLOUDS.				THERMOMETERS under Ground.				SEA. Jp 831	OZONE.	GENERAL REMARKS.				Days of Month.		
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H.Cup Anemometer.		9 h. A.M.		9 h. P.M.			No. of hours in which it fell.		9 A.M.		P.M.		SUNSHINE.		9 h. A.M.		Temperature of WELL at depth of feet, No.				
		Barometer, No. 91	Attached Thermometer, No. 91	Barometer, No. 7165	Attached Thermometer, No. 3037	Max. in Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	9 h. A.M.	No. 78	Velocity (0-6) and Direction.	Amount (0-6) and Species.	Velocity (0-6) and Direction.	Amount (0-6) and Species.	Hours.	No. 8 inches.	No. 12 inches.	No. 22 inches.	Temperature, in Sun and Darkness.	0-10.	9 A.M. 9 P.M.							
1	30.250	55.5	30.248	62.	36.5	30.	34.6	32.	35.8	32.	N.	1.5	N.	2.	0.02						2	0	0	0	45.4		Snow				1				
2	30.288	54.	30.216	62.5	37.	31.6	35.5	33.	35.2	32.8	N.E.	0.5	N.	3.	0.02						1	0	0	0	45.3		de				2				
3	30.184	57.	30.216	65.5	38.	31.	37	35.	31.8	N.E.	2.	N.E.	1.5	0.04							—	—	—	—	45.2		d°				3				
4	30.194	56.	30.256	59.5	35.	28.	31.2	30.	31.2	29.	Calm	0.	N.E.	1.5	0.05						1	0	0	0	45.		de				4				
5	30.304	53.	30.608	58.5	40.5	28	38.2	33.6	35.	34.	E.	3.	E.	2.	0.20						4	0	0	0	44.3		Snow, hail & rain				5				
6	30.668	54	30.678	58.	40.	33.5	39.	35.6	37.	33.	E.	2.	Calm	0.	0.04						—	—	—	—	44.5		hail & rain				6				
7	30.602	56.	30.514	61.5	40.	32.5	36.2	32.8	38.	36.	N.W.	0.5	N.W.	1.5	0.02						—	—	—	—	44.2						7				
8	30.440	56.5	30.422	63.5	40.	34.	37.	34.	38.	37.	N.W.	1.	Calm	0.	0.10						3	0	0	0	44.8						8				
9	30.312	54.	30.258	64.	46.	35.	44.	41.	41.8	40.	N.W.	2.	N.W.	1.5	0.09						—	—	—	—	44.8						9				
10	30.110	56.	30.118	60.5	44.5	36.	42.	41.	37.	36.	N.E.	1.5	Calm	0.	0.10						—	—	—	—	45.2						10				
11	29.896	56.	29.872	63.	48.5	35.	44.5	43.	48.	45.	N.W.	2.	N.W.	3.	0.14						—	—	—	—	45.2						11				
12	29.866	60.	29.814	60.5	48.	44.	46.2	43.4	45.	43.	N.W.	2.	N.W.	2.	0.01						2	0	0	0	44.2						12				
13	29.666	57.5	29.812	62.5	49.	42.	46.8	43.8	44.	40.	W.	3.	W.	2.	0.19						—	—	—	—	44.2						13				
14	29.732	56.5	29.618	61.5	50.	42.	48.	46.	49.	45.	S.W.	4.	S.W.	5.	0.59						—	—	—	—	45.3		fog				14				
15	29.732	56.	29.786	62.	50.	41.5	44.8	42.	47.	45.6	Calm	0.	W.	4.	0.87						—	—	—	—	45.3		de				15				
16	29.674	57.	29.620	64.	50.	45.	47.	46.	47.	46.	S.W.	3.	S.W.	3.	0.45						—	—	—	—	44.2						16				
17	29.470	59	29.388	65	51.	47.	50.	46.8	48.8	46.	S.W.	5.	S.W.	4.	0.02						—	—	—	—	44.2						17				
18	29.142	56.5	29.396	64.	49.	41.5	46.	43.4	45.	41.7	S.W.	4.	S.W.	4.	0.29						—	—	—	—	44.2						18				
19	29.424	57.	29.282	63.5	45.5	36.5	39.8	38.2	40.	38.8	S.	2.	Calm	0.	0.03						3	0	0	0	44.2						19				
20	28.940	55.	28.674	60.5	46.	41.	44.2	40.8	42.	39.7	S.E.	4.	S.W.	4.	0.27						—	—	—	—	44.2						20				
21	28.944	53.5	28.524	60.	47.	40.	43.	38.8	46.	44.5	S.W.	4.	S.E.	6.	0.49						—	—	—	—	44.2						21				
22	28.540	55.	28.636	61.5	50.	40.	42.5	37.2	43.7	38.5	S.W.	5.	S.W.	5.	0.25						—	—	—	—	44.2						22				
23	28.830	55.	29.076	60.5	45.5	37.5	41.1	37.8	44.	39.8	S.W.	4.	S.W.	5.	0.29						—	—	—	—	44.2						23				
24	28.650	55.5	28.970	59.	47.	33.	44.5	41.2	41.8	39.	S.W.	5.	N.W.	2.	0.79						—	—	—	—	44.2						24				
25	29.690	57.	29.824	61.	46.	37.	42.2	39.	45.	44.	N.W.	3.	S.W.	3.	0.29						—	—	—	—	44.2						25				
26	29.834	55																																	

# INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS WITH REMARKS ON THE USE OF INSTRUMENTS.

WITH REMARKS ON THE USE OF INSTRUMENTS

One of the objects of immediate importance that the Scottish Meteorological Society has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will, by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

*Hour of Observation.*—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, or at the top of the schedule. It is hoped that the utmost punctuality in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

*Barometer.*—*Weather glasses* and *Aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment* or *compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

Two moderate-priced Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

An excellent Barometer is constructed by Mr Adie of London, the use of which is attended with the great convenience of requiring no *adjustment* of the cistern. Its *scale-inches* are not true inches but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the *cistern* are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then screw up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this setting fails, the instrument must be repaired.

In *taking an Observation*, the attached Thermometer is first noted: the tube must then be gently tapped and the cistern adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index,—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

*Protection of Thermometers.*—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside and inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as at once to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had from the opticians, Negretti and Zambra's Patent "*Maxinum*" Thermometer of Rutherford is recommended: printed directions for their use may be obtained with each instrument. The "*Minum*" Thermometer of Negretti and Zambra's Patent "*Maxinum*" Thermometers are recommended: printed directions for their use may be obtained with each instrument. The "*Minum*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maxum*." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least

from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the sun's heat. The "*Maxum*" should be freely exposed to the sun, and the "*Minum*" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by distillation.

*Verification of Thermometers.*—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the "*Minum*" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

*The Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersing from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

One form of "*Mason's*" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which also supports the water cup underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the tin case, and hanging them side by side, so that the aforementioned requirements shall be complied with, as far as possible.

*Reading of the Thermometer.*—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read— $39^{\circ} . 9$ ,  $40^{\circ} . 0$ , or  $40^{\circ} . 1$ ; or again,  $40^{\circ} . 4$ ,  $40^{\circ} . 5$ , or  $40^{\circ} . 6$ , according as it indicates a little under, an exact coincidence with, or a little over  $40^{\circ}$ , or  $40^{\circ} . 5^{\circ}$  respectively. So also  $40^{\circ} . 1$ , and  $40^{\circ} . 2^{\circ}$ , more or less must be registered  $40^{\circ} . 2$  or  $40^{\circ} . 3$ , and  $40^{\circ} . 7$  or  $40^{\circ} . 8$  respectively. In reading Rutherford's "*Max.*" and "*Min.*" Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

*Hour of observing Temperature.*—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

*Wind.*—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, and always when the wind is feeble, reference must be made to Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

*Careful observations* ought to be made on the changes in the direction of the wind; and during storms, it is earnestly recommended that extra observations be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results.

The Council recommend that every observatory be furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended; the method of *Estimating Wind Force* by such tables as that given in the schedule is, to say the least, unsatisfactory.

*Snow-gauges.*—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situations for observation and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an uncontrollable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauge ought to be read daily, and the readings entered in the returns on the day on which the rain fell.

*Snowfalls* may, for convenience, be registered in the rain columns, under the following conditions:—when a Snow shower occurs it must be noted in the "*Remarks*," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

*Clouds.*—Convenient abbreviations for Luke Howard's

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds' column*, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky *overhead* is *half covered* by clouds, 5 is entered as the *observation*, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 6, S. W.

2, W. (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of —, (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

*Sunshine.*—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column.

*Underground Thermometers.*—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy,—the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

*Temperature of the Sea.*—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

*Temperature of Wells.*—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

*Ozone.*—Mention whether Schönbein's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3 NW., as an ozone paper in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4"; *i.e.*, that it is *blowing fresh*.

*Electricity.*—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory.

*Remarks.*—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, auroræ boreales, remarkable depressions and elevations of the barometer, thunderstorms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner or on the side-margin. Additional remarks may be made on the margin.

"Observations" in connection with the periodic return of the seasons," possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *term day* observations be taken; —viz., on the 21st days of March, June, September, and December.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

The Council recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

## OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.	CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Raised.
Alder, . . . . .					Barley, . . . .				
Ash, . . . . .					Bere or Bigg, . .				
Beech, . . . . .					Oats, . . . . .				
Birch, . . . . .					Wheat, . . . . .				
Elm, . . . . .					Beans, . . . . .				
Larch, . . . . .					Pease, . . . . .				
Lime, . . . . .					Potatoes, . . . . .				
Oak, . . . . .					Turnips, . . . . .				
Sycamore or Plane,					Rye Grass, . . . .				

General Post Office Buildings,

Secretary of the Meteorological Society of Scotland,

*Mr. ALEXANDER ROCHE*



SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry,		Apple, . . . . .			Cuckoo, . . . . .		
Bourtree or Elder,		Black Currant, . . . . .			Curlew, . . . . .		
Broom, . . . . .		Cherry, . . . . .			House-Swallow, . . . . .		
Hazel, . . . . .		Gean, . . . . .			Lapwing, . . . . .		
Hawthorn, . . . . .		Gooseberry, . . . . .			Plover, . . . . .		
Holly, . . . . .		Peach, . . . . .			Sand-Martin, . . . . .		
Laburnum, . . . . .		Pear, . . . . .			Starling, . . . . .		
Lilac, . . . . .		Plum, . . . . .			Swan, . . . . .		
Mezereon, . . . . .		Strawberry, . . . . .			Rail or Corn Crake, . . . . .		
Mountain Ash or Rowan, .							
Red Flowering Currant, .							
Rhododendron Ponticum, .							
Whin, . . . . .							

Have the goodness also to state any information you may be able to collect relative to the Crops of Grain, Hay, Potatoes, Turnips, Fruits, etc., whether plentiful, or in perfection; whether any have suffered from blight, disease, etc. Whether Epizootic disease prevails among cattle; and the Agricultural condition of the district generally.