

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Gorsham Town, County of Perthshire, in Lat. $6^{\circ}2'4''$, Long. $6^{\circ}43'8''$, Distance from Sea 100 miles.

Height of Cistern of the Barometer above Mean Sea-level 12 feet, above Ground 5 feet.

During the MONTH of January 1871

The Hours of Observation are of Greenwich Time (unwritten)

ELECTRICITY.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER, No. 31-32		WIND.		RAIN.		CLOUDS.		THERMOMETERS under Ground.			SEA.	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-Cap Anemometer No. 78		No. of in which it fell.	Amount in inches.	Velocity, (0-0), (0-10), (0-10) and Species.	Amount, (0-0), (0-10), (0-10) and Species.	Hours.	Temperature of Wet Bulb at Depth of feet, No. 0-10.								
		Barometer, * No. 91	Attached Thermometer No. 91	Barometer, No. 91	Attached Thermometer No. 91	Max. No. 7165	Min. No. 3234	Max. in Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Fog.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.	Temperature at Station and Dist.	0 A.M.	9 P.M.					
		inches.	°	inches.	°	inches.	°	inches.	°	inches.	°	inches.	°	inches.	°	inches.	°	inches.	°	inches.	°	inches.	°	inches.	°	inches.	°		
1	29,008	53	29,330	55	48.5	39.5	48.5	39.5	48	47	40	36.5	SW	3	SW	2	1.18						Johannesburg	0-10.		1			
2	29,530	50	29,636	53	41	35	40	37	35.5	34.5	35.5	34.5	NW	0.5	0.31													2	
3	29,864	43	29,744	51	42	29	30	28	41	40	39	38	S	3	0.08													3	
4	29,440	51	29,420	55	49	39	48.5	46	44.5	40.5	48.5	40.5	SW	2	SW	3	0.33											4	
5	29,116	49	29,294	50	45	35	38.5	38.5	38	35	38.5	35	SW	2	W	2	0.41											5	
6	29,198	45	29,050	49	39.5	34	38.5	36	36.5	32	38.5	32	SW	1	SW	1	0.32											6	
7	29,074	41	29,284	51	38.5	29.5	32	29.5	33	31	30.5	30.5	NW	0.5	SE	0.5	-	3.5										7	
8	29,132	42	29,076	52	37	33	35.5	34	36	34	35.5	34	SW	3	SW	3	0.31											8	
9	29,138	44	29,600	45	36	31	34	33	32	32	32	32	N	1	N	3	0.31											9	
10	29,622	40	29,800	43	33	29	32	30	31	30	30	31	N	1	N	3	-	1										10	
11	30,004	36	30,132	39	31	28	29	27	29	27.5	27.5	29	NW	3	NW	1.5	-	-										11	
12	30,000	37.5	29,520	50	44	23	34	32	44	43.5	44	44	S	1	S	4	1.28											12	
13	29,364	48	29,310	53	47.5	43.5	46.5	44.5	44.5	42	46.5	42	SW	2	W	1	1.04											13	
14	28,918	48.5	28,852	50.5	45	38	43.5	42	40.5	36	43.5	42	SW	1.5	SW	3	0.41											14	
15	28,800	46	28,696	51	41	35	39	37	35.5	34.5	39	37	SW	1	SE	1.5	0.28	2										15	
16	28,610	48	28,212	51	42.5	35	42	40.5	41.5	41	42	40.5	41	SE	1.5	SE	5	0.53										16	
17	28,548	47	28,388	51	44	36	42.5	40	37.5	37	42.5	40	SE	1	SE	0.5	0.19											17	
18	28,760	48	29,126	53	45	37.5	42	40	42	39.5	39.5	42	40	SE	1.5	SE	0.5	0.12	2										18
19	29,388	46	29,610	50	42.5	34.5	35.5	34.5	35.5	34.5	35.5	34.5	N	0.5	N	0.5	0.09	2										19	
20	29,696	44	29,722	51	37	33.5	34.5	33.5	33.5	35	34.5	34.5	N	1	N	1	0.15	2										20	
21	29,562	47	29,652	50	41.5	35	40	37.5	36.5	35.5	40	37.5	36.5	SE	1	SE	1	0.10	2										21
22	29,712	47	29,830	53	42	36.5	39	38	40.5	38	39	38	SE	1	E	1	0.27	-										22	
23	29,980	48	30,254	49	40.5	29.5	40	38.5	29.5	27.5	40	38.5	29.5	SE	1	SE	0.5	0.07	1									23	
24	30,532	42	30,244	52	41	27	28	26	40	37	38	36.5	SE	0.5	SW	1	0.07	-										24	
25	29,894	48	29,858	53	46	36	44	41.5	38	36	44	41.5	38	SW	1	SW	1	0.22	-										25
26	29,870	46	29,958	52	40.5	35	35.5	34.5	34.5	32	35.5	34.5	SW	0.5	SW	1	0.10	2										26	
27	29,960	50	30,050	54	45	38	42.5	40	40.5	39	42.5	40	SE	3	SE	3	0.19	-										27	
28	30,190	50	30,274	54	44.5	39.5	43.5	42	40.5	37	43.5	42	SE	3	SE	3	0.08	-										28	
29	30,232	45	30,360	55	40.5																								

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 observations 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, without which the Monthly Results from different Observations, 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) 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 *Barometers*, 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* that 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* are of leather, and thus, by inches but so much shorter than the *zero-point* of the fixed scale; 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 screwing, to form a *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 care; as a slight error here will vitiate the readings from the *vermer*.

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, a *slippery tap* is produced. If this is prevented by air it is removable by pulling a piece of white paper behind the tube, and may be removed to the cistern, and again, if by inverting the instrument, the tube must then be gently tapped and the cistern adjusted carefully made. By raising and lowering the eye adjustment tube is a complete vacuum; this is the case when on inclining the instrument so that the mercury strikes the top of the tube, usually the lower edge of the vermer, 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, and may be removed by putting a quarter of an inch of the tube, 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 adjusted carefully made. By raising and lowering the eye adjustment tube of the back and front of the plate, the instrument must be repaired.

The Barometer should be suspended in a good *Welt*, 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.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed 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 affixed to a frame separate from the opticians, open to the south. These Boxes may be had from the opticians, and must be guarded against, and may be easily remedied by an observer. When the *coldum* 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 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.

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.

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INSTRUMENTS AND DEMANDS ON THE USE OF INSTRUMENTS

W 3 1033 1871
Mr ALEXANDER BUCHAN,
Secretary of the Meteorological Society of Scotland

EDINBURGH.

BOOK-POST

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thorshavn Faroer, County of _____, in Lat. $62^{\circ} 2' \frac{1}{2}$, Long. $6^{\circ} 43' 8''$, Distance from Sea 120 feet miles.

The Hours of Observation are of Greenwich Time (^{not} uncertain)

Sums.	898 ¹³ ₂₈ , 416 ¹⁰ ₁₃	1332 ¹¹ ₁₃	899 ¹⁶ ₂₉ , 516 ⁸ ₁	1514 ¹³ ₁	1252 ¹² ₅ , 094 ⁴ ₄	136 ⁶ ₅	1155 ¹⁴ ₁₅ , 2105 ⁹ ₁₅	1066 ¹² ₁₆			
Means.	29,947	44.4	29,984	50.5	41.7	31.6	38.5	35.0			
† Total Corrections for Instrumental Errors.											
‡ Corrections for Diurnal Range.											
"Corrected Means."											
No. of Observations	1	2	3	4	5	6	7	8	9	10	11

BAROMETER , "corrected Mean" at 9 A.M., minus the Correction †† } =	<u>29, 905</u>
for Temp. (Col. 2), = <u>29, 947</u> - <u>0.042</u> } =	
"Corrected Mean" of Barometer at 9 P.M., minus the Correction †† } =	<u>29, 925</u>
for Temp. (Col. 4), = <u>29, 984</u> - <u>0.059</u> } =	
Mean at Station, corrected, and at 32° ,	<u>29, 915</u>
Correction for height, <u>12</u> feet, above Mean Sea-level,	<u>0, 013</u>
Mean, reduced to 32°, and Sea-level ,	<u>29, 928</u>
Highest Reading, corrected for Index error, on the <u>25</u> th,.....	<u>30, 282</u>
Lowest Do., Do., on the <u>16</u> th,.....	<u>29, 432</u>
Difference, or Monthly Range ,	<u>0, 850</u>

S.-R. THERMOMETER, (in shade, etc.), Highest in Month , (corrected for Index Errors), on the 10 th,	=	<u>49</u>
Lowest in Month , corrected for Index errors, on the 14 th,	=	<u>22.8</u>
Difference, or Monthly Range ,	=	<u>26.5</u>
" Corrected Mean " of all the Highest , (Col. 5),	=	<u>41.7</u>
" Corrected Mean " of all the Lowest , (Col. 6),	=	<u>31.6</u>
Difference, or Mean Daily Range ,	=	<u>10.1</u>
** Calculated Mean Temperature of Month,	=	<u>36.7</u>

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for
Index errors), on the - th, =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 39

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12) = 33.9

II Computed Temperature of Dew-Point, = 29

|| Do. Elastic Force of Vapour, = 0 /

†† Do. Weight of Vapour in a Cubic Foot of Air, = 1.9

Relative Humidity, (Saturation = 100), = 73.

RAIN fell on 16 Days; Amount in Inches, = 1.53

WIND.	SUMMARY.
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WIND.	SUMMARY.										
	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	7	10	7	1	-	1	1	-	3	1	
P.M.	6	11	7	1	-	-	2	1	2	0.9	
Mean	6.5	10	7	1	-	1	1	-	2.5	1.05	

*Observations made and
Return verified by*

(Signed)

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS, ON THE COAST OF CALIFORNIA.

WITH REMARKS ON THE USE OF INSTRUMENTS

or at the top of the schedule. It is hoped that the utmost may be secured by 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 of 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 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 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 top* 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 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 black within, 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 at the Society's Office.

Self Registering Thermometers.—Professor Phillips, and Negretti and Zambra's Patent "*Maxinium*" Thermometers are recommended: printed directions for their use may be obtained with each instrument. The "*Minimun*" Thermometer of Rutherford is recommended when graduated on the glass stem on and affixed to a frame separate from the "*Maxinium*". 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

Mr ALEXANDER BUCHAN, SHIP LETTER

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK-POST.

LEWIS
WICK

OBSEERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thornshaw, County of Cumberland, in Lat. $62^{\circ}14'$, Long. $6^{\circ}43'8''$, Distance from Sea 120 miles.

Height of Cistern of the Barometer above Mean Sea-level 12 feet, above Ground 5 feet.

During the MONTH of June 1871.

The Hours of Observation are of Greenwich Time (unwritten)

ELEVATION. Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER. No. 821-31				WIND.				RAIN.				CLOUDS.				THERMOMETERS, under Ground.				SEA.	OZONE.	GENERAL REMARKS.				Days of Month.
	9 h. A.M.		9 h. P.M.		Promoted in Shade, 4 feet above Ground.				Exposed Black Bulbs.				9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.		9 h. P.M.		SEA.	OZONE.	GENERAL REMARKS.				Days of Month.
	Barometer, No. 91	Attached Ther- mometer	Barometer, No. 91	Attached Ther- mometer	Max. No. 165	Min. No. 207	Max. in Sun's rays	Min. on Grass.	No. 165	No. 207	Direc- tion.	Force	Direc- tion.	Force	No. 78	No. 78	No. 78	No. 78	Velocity, (0-0), and Direction.	Amount (0-10), and Species.	Velocity, (0-0), and Direction.	Amount (0-10), and Species.	Hours,	9 h. A.M.	9 h. P.M.	9 A.M.	9 P.M.	9 A.M.	9 P.M.		As to occurrence of Thunder, Lightning, Storms, Hall, Motions, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.				
1	30.306	51.5	30.410	57.5	33.5	40			50	45	40.5	36	calm	0	calm	0	—	—	—	—	—	—	15	—	—	—	Johnsbury	0-10.	70 70	8-15 70	8-15 70	8-15 70	1		
2	30.406	57	30.418	59.5	32.5	39			49.9	49	48	45	S E	0.5	calm	0	—	—	—	—	—	—	17	—	—	—	Johnsbury	10-15	8-15 70	8-15 70	8-15 70	8-15 70	2		
3	30.274	55	30.160	60	34	47			52	50.5	49.5	48.5	S W	1	S W	0.5	0.22	—	—	—	—	—	—	—	—	—	—	Johnsbury	15-20	8-15 70	8-15 70	8-15 70	8-15 70	3	
4	30.134	57	30.230	60	57.5	47			54.5	50	49.5	47	W	0.5	W	0.5	—	—	—	—	—	—	12	—	—	—	Johnsbury	20-25	8-15 70	8-15 70	8-15 70	8-15 70	4		
5	30.160	57	30.286	59	57	47.5			51.5	50	48.5	45.5	W	1	W	0.5	0.10	—	—	—	—	—	—	10	—	—	—	Johnsbury	25-30	8-15 70	8-15 70	8-15 70	8-15 70	5	
6	30.300	56	30.304	58.5	50	37			49.5	44	48.5	44	calm	0	calm	0	—	—	—	—	—	—	6	—	—	—	Johnsbury	30-35	8-15 70	8-15 70	8-15 70	8-15 70	6		
7	30.290	59	30.280	60	54.5	46			52.5	48.5	47.5	46.5	S E	0.5	S E	0.5	—	—	—	—	—	—	9	—	—	—	Johnsbury	35-40	8-15 70	8-15 70	8-15 70	8-15 70	7		
8	30.208	55	30.214	60	50	42			48	47	42.5	40	calm	0	calm	0	—	—	—	—	—	—	—	—	—	—	Johnsbury	40-45	8-15 70	8-15 70	8-15 70	8-15 70	8		
9	30.142	56	30.208	58	52.5	38			49	45	45.5	41	S W	1	S W	0.5	—	—	—	—	—	—	12	—	—	—	Johnsbury	45-50	8-15 70	8-15 70	8-15 70	8-15 70	9		
10	30.190	55	30.208	59	54.5	40			51.5	48	48.5	46.5	calm	0	calm	0	—	—	—	—	—	—	11	—	—	—	Johnsbury	50-55	8-15 70	8-15 70	8-15 70	8-15 70	10		
11	30.190	56	30.170	57	53	48			51	49.5	49.5	48.5	calm	0	calm	0	—	—	—	—	—	—	—	—	—	—	Johnsbury	55-60	8-15 70	8-15 70	8-15 70	8-15 70	11		
12	30.206	56	30.302	58	50.5	47			50	47	48.5	47.5	S E	0.5	S E	0.5	0.05	—	—	—	—	—	—	—	—	—	Johnsbury	60-65	8-15 70	8-15 70	8-15 70	8-15 70	12		
13	30.308	54	30.218	57	50	46			48.5	47.5	47.5	45.5	N E	0.5	N E	1	—	—	—	—	—	—	—	—	—	—	Johnsbury	65-70	8-15 70	8-15 70	8-15 70	8-15 70	13		
14	30.144	54	30.170	58	50.5	47			49.5	47.5	48.5	47.5	N E	0.5	N E	0.5	0.02	—	—	—	—	—	—	—	—	Johnsbury	70-75	8-15 70	8-15 70	8-15 70	8-15 70	14			
15	30.112	54.5	30.100	57	51	47			50.5	49.5	49.5	48.5	calm	0	calm	0	0.02	—	—	—	—	—	—	—	—	Johnsbury	75-80	8-15 70	8-15 70	8-15 70	8-15 70	15			
16	30.060	55	29.942	60	51.5	47.5			50.2	49.4	49.4	48.8	calm	0	N E	0.5	0.05	—	—	—	—	—	—	—	—	Johnsbury	80-85	8-15 70	8-15 70	8-15 70	8-15 70	16			
17	29.624	56	29.890	60	51.5	48.5			50.4	49.8	50	48	N E	1	N E	0.5	0.18	—	—	—	—	—	—	—	—	Johnsbury	85-90	8-15 70	8-15 70	8-15 70	8-15 70	17			
18	29.470	57	29.402	60	52	49			51.2	50.8	50	48	N E	0.5	N E	0.5	0.37	—	—	—	—	—	—	—	—	Johnsbury	90-95	8-15 70	8-15 70	8-15 70	8-15 70	18			
19	29.540	57	29.804	58	51	47			50.3	49.7	47.5	46.5	S E	0.5	S E	1	0.12	—	—	—	—	—	—	—	—	Johnsbury	95-100	8-15 70	8-15 70	8-15 70	8-15 70	19			
20	29.938	52	30.082																																

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS

Mr ALEXANDER BUCHAN

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

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BOOK-POST

Have the goodness also to state any information you may be able to collect relative to the Groups of Gram, Hay, Potatoes

OBSEERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Glenham, County of Perthshire, in Lat. 62° 1' N., Long. 6° 43' E., Distance from Sea 120 miles.

Height of Cistern of the Barometer above Mean Sea-level 12 feet, above Ground 5 feet.

During the MONTH of July 1871.

The Hours of Observation are un of Greenwich Time (uncertain)

ELECTRICITY. Day of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.				HYGROMETER. No. 831-32				WIND.				RAIN.		CLOUDS.				THERMOMETERS, under Ground.				SEA. No. Schenck	OZONE. No. 0-10.	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.		Bending on the H-Cup Anemometer No. 16		9 h. A.M.		9 h. P.M.		0 A.M.		P.M.		9 h. A.M.		9 h. P.M.										
	Barometer, No. 91	Atmosph. Barometer, No. 3165	Atmosph. Barometer, No. 3129	Atmosph. Barometer, No. 91	Max. Min.	Max. Min.	Max. in Sun's rays	Min. on Grass.	Direc. tion,	Force	Direc. tion,	Force	No. 16	in which it fell.	No. 16	in which it fell.	No. 16	No. 16	Velocity, (0-6), Amount, (0-10), and Species.	Velocity, (0-6), Amount, (0-10), and Species.	Hours.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature at 1 ft. above Ground.										
1	29.840	56	29.466	60	54	49			51.8	51.2	51.8	50.7	N.E.	0.5	N.E.	0.5			0.10				—	○	○	○	○	○	○	○	○	○	○	○	1
2	29.802	57	29.720	61	55	50			52.4	51.9	51.8	50.5	Calm	0	Calm	0			0.03				2												2
3	29.682	58	29.688	61	59	51			52.6	52	52.8	51.6	Calm	0	N.E.	0.5			0.04				3												3
4	29.628	57	29.726	61	59	50.5			51.3	50.3	52.5	51	Calm	0	Calm	0			—				4												4
5	29.716	57	29.872	61	57	49.5			55.5	52.3	52.8	51	S.E.	0.5	Calm	0			—				7												5
6	29.892	58	29.896	60	54.5	49			52.9	51	52.4	51.2	Calm	0	Calm	0			—				1												6
7	29.864	57	29.760	59	57.5	50			53.3	52.4	51.2	50.5	Calm	0	S.E.	0.5			0.04				1											7	
8	29.550	56	29.582	60.5	53.5	51			52.3	51.7	52.4	51.7	Calm	0	S.E.	0.5			0.08				1											8	
9	29.530	58	29.568	59.5	56.5	51			53.8	51.2	52	51.4	S.E.	1.5	S.E.	0.5			0.12				1											9	
10	29.550	58	29.722	59.5	57	51			53.2	52.8	52	51.2	W	0.5	W	0.5			0.41				1											10	
11	29.850	57	29.890	60	59	49.5			54.2	52.7	51.5	49	W	1	Calm	0			—				12												11
12	29.794	59	29.790	61.5	56.5	49.5			54.5	52.8	53.8	52	Calm	0	Calm	0			0.09				5												12
13	29.754	60	29.678	61	57	51.5			53.3	51.7	52.8	51.3	S.E.	0.5	S.E.	0.5			0.04				1												13
14	29.508	59	29.658	62	63	51.5			56.8	55	54.5	52	S	1.5	S	1			0.28				4												14
15	29.630	59	29.644	61	62.5	52			55.5	53.8	53	51.5	S.W.	0.5	Calm	0			0.10				1												15
16	29.720	59	29.844	61	62.5	51			56.5	53	54.5	50	Calm	0	S.W.	1			—				6												16
17	29.742	58	29.708	60	57	50.5			54.4	53	50.5	49	Calm	0	S.W.	0.5			0.11				1												17
18	29.708	58	29.776	60	58.5	49.5			53.3	51	51.8	49	W	1	W	1			—				6												18
19	29.744	57	29.824	60	53	50			51.3	50.2	50	49.5	Calm	0	Calm	0			0.96				1												19
20	29.926	58	29.910	59	57.5	49			55.7	51.5	50.5	49	N	0.5	E	0.5			—				7												20
21	29.600	58	29.502	59	56	50			55.4	53	51.8	51	S.E.	1	S.E.	2			0.44				1												21
22	29.462	57	29.544	58	53	49			51.8	50.8	49.5	48.5	S	2	N.E.	3			0.36				1												22
23	29.612	54	29.644	57	53.5	49			49.8	48	49.8	48.6	S	2	E	0.5			0.22				1												23
24	29.564	56	29.432	56	56	48.5			52.1	50	50.3	48.8	E	0.5	S.E.	0.5			—				1		</td										

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

Howard's Conventional Abbreviations for India

A. D.

Shondhawn
Aug 9 1891

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Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK-POST.

EX

Secretary of the Mete

EDINBURGH.

OBSErvATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

THE 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 Returns from different observations; and it is found that differences between the wind 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.

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 delivered and forwarded to their office, and

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* 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 *sever* 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 incriming the instrument so that the mercury strikes the top of the

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 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 black within, 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 accom-

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 at the Society's Office.

Self Registering Thermometers.—Professor Phillips's, and Negretti and Zambra's Patent “*Maximus*” Thermometers are recommended : printed directions for their use may be obtained with each instrument. The “*Minimus*” Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the “*Maximus*.” 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 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 should be hung horizontally.

Woodhouse
August 1891

Tc

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK-POST.

OBSEERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

The above remarks apply equally to the Thermometers for

A. B.

EDINBURGH, 5th December, 1857.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thurso, County of _____, in Lat. $6^{\circ} 43' 4''$, Long. $6^{\circ} 43' 8''$, Distance from Sea 120 fms.

Height of Cistern of the Barometer above Mean Sea-level 12 feet, above Ground 5 feet.

During the MONTH of September 1871

The Hours of Observation are of Greenwich Time (unadjusted)

ELECTRICITY.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.		HYGROMETER, No. 84-92		WIND.		RAIN.	CLOUDS.		THERMOMETERS under Ground.		SEA.	OZONE.	GENERAL REMARKS.		Days of Month.		
		Barometer, No. 91	9 h. A.M.	Barometer, No. 91	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	No. of hours in which it fell.	Velocity (0-10), Amount, and Direction, No. 78	P.R.	9 h. A.M.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of WELL at depth of feet, No. 10.	Temperature of WELL at depth of feet, No. 9 A.M. 9 P.M.	
1	29, 806	59	29, 800	61	57	53	53, 5	53, 5	54, 4	52, 8	SW	0, 5	SW	1	0, 15	—	—	—	9, 15	9, 15	1
2	29, 778	58	29, 452	61	57, 5	53, 5	55, 5	51, 8	53, 2	54, 2	SW	1	S	2	0, 24	3	6	6	8, 15	9, 15	2
3	29, 350	58, 5	29, 420	60	57, 5	53	57	54, 4	53, 5	52	SW	1, 5	W	1	0, 25	8	7	7	8, 15	9, 15	3
4	29, 464	59	29, 570	60	59	52	54, 5	52, 5	53, 5	51, 5	SW	0, 5	SW	0, 5	0, 06	—	—	—	7, 15	8, 15	4
5	29, 684	57, 5	29, 632	58	58	52, 5	54, 5	52, 2	55	54, 2	SW	1	SW	2	0, 12	—	—	—	8, 15	9, 15	5
6	29, 666	58, 5	29, 780	60	59	53	57	53, 5	54, 5	51, 5	SW	1, 5	SW	1, 5	0, 34	5	11	11	7, 15	8, 15	6
7	29, 848	57	29, 814	59	56, 5	51, 5	53, 5	52, 5	51, 5	50, 5	SE	0, 5	S	0, 5	—	8	8	10, 15	9, 15	7	
8	29, 842	57	30, 038	61	57	51	53	52, 5	53, 5	52, 5	SE	0, 5	SE	0, 5	0, 09	—	6	6	8, 15	9, 15	8
9	30, 204	57	30, 244	60	59	51	53, 5	52, 5	53	S	E	0, 5	E	0, 5	—	8	8	9, 15	9, 15	9	
10	30, 100	58	30, 084	60	58	52, 5	54	53, 5	57	52	S	1	S	1	—	4	4	8, 15	8, 15	10	
11	30, 102	59	30, 230	60	59, 5	52	57	54, 5	52, 5	50	SW	0, 5	W	0, 5	—	6	6	8, 15	8, 15	11	
12	30, 282	58	30, 318	59	58, 5	51, 5	55, 5	52, 5	52, 5	48	W	1	W	0, 5	—	5	5	8, 15	8, 15	12	
13	30, 408	57	30, 322	58	58	50, 5	54	49, 5	51, 5	50	W	0, 5	W	0, 5	—	5	5	8, 15	8, 15	13	
14	30, 398	57	30, 300	57	57	50, 5	52, 5	51, 5	51, 5	51, 5	calm	0	calm	0	0, 25	—	—	8, 15	8, 15	14	
15	30, 102	56	30, 344	57	55, 5	45	54	53	45	42	W	1, 5	N	0, 5	0, 44	—	—	9, 15	9, 15	15	
16	30, 532	50	30, 592	56	50	32, 5	43	40	44	42	NW	0, 5	NW	0, 5	—	5	5	8, 15	8, 15	16	
17	30, 340	51	30, 502	55	50	33, 5	49, 5	42	43, 5	40, 5	calm	0	NW	0, 5	—	11	11	7, 15	8, 15	17	
18	30, 480	53	30, 326	57	53	44	48	45	43, 5	43, 5	calm	0	calm	0	0, 08	—	—	8, 15	8, 15	18	
19	30, 232	53	30, 174	58	51	42	48	45	43, 5	42, 5	SE	0, 5	SE	1	0, 35	—	—	7, 15	8, 15	19	
20	30, 206	51	30, 200	55	49	35, 5	43, 5	42	36, 5	34	NE	1	NE	0, 5	0, 20	2	2	7, 15	8, 15	20	
21	30, 110	50	30, 030	50	47, 5	35	41	36, 5	35	NE	0, 5	NE	1	0, 17	6	6	7, 15	8, 15	21		
22	30, 070	48	30, 118	50	46, 5	36, 5	45, 5	41	38, 5	36	NE	2	NE	3	0, 18	3	3	7, 15	8, 15	22	
23	30, 116	48	30, 132	51	45, 5	35	43	40, 5	37, 5	36	NE	1, 5	NE	0, 5	0, 11	—	—	7, 15	8, 15	23	
24	30, 010	50	29, 972	51	45	38	43	41, 5	40	36	NE	0, 5	NE	0, 5	—	—	—	7, 15	8, 15	24	
25	29, 896	48	29, 906	52	48, 5	34, 5	44	40, 5	36, 5	34	N	0, 5	N	0, 5	—	8	8	7, 15	8, 15	25	
26	29, 876	49	29, 882	52	50	33	44, 5	41, 5	33, 5	31, 5	NE	0, 5	NE	0, 5	—	9	9	7, 15	8, 15	26	
27	29, 824	47	29, 796	52	50	32	42, 5	40	33, 5	33	N	0, 5	NE	0, 5	0, 10	7	7	7, 15	8, 15	27	
28	29, 824	45	30, 018	52	47	34, 5	40, 5	37	37	34	NE	1	NE	0, 5	0, 15	4	4	7, 15	8, 15	28	
29	30, 072	45	30, 038	53	45	32, 5	38, 5	36	35, 5	32, 5	calm	0	SW	0, 5	0, 06	9	9	7, 15	8, 15	29	
30	29, 820	47	29, 608	53	46	30, 5	39, 5	38	46	42	calm	0	SE	1, 5	—	3	3	7, 15	8, 15	30	
31																				31	
Sums.		900, 320, 130	900, 722, 168	175, 9	158, 6, 130, 5	13, 11, 85	27, 19, 18	210	210	238	239	16	137	137	23	673	226				
Means.		30, 022, 53, 4	30, 024, 56, 5	52, 9	43, 4	49, 5	46, 5	46, 5	43, 9	0, 7	0, 8	—	—	—	50, 8	7, 8	7, 6				
Total Corrections for Instrumental Errors.																					
Corrections for Diminut. Range.																					
"Corrected Means."																					
No. of Column.	1	2	3	4	5																

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 kindly furnish Reports to the Society will be scrupulous to attend to the following Directions, secure for their Observations 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 instruments, 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 Aerometers*, 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 Atie 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, 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 the Barometer; the sides of the cistern are of leather, and thus, 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; otherwise the instrument being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the index-fine on this little piston-rod is brought, by the adjusting screw, to form one sharp 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 will vitiate the readings from the cistern.

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, and the sun's direct rays are then at the exact height from which the mercury is removed 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 is necessary to remove the cistern, and gout oil, by inverting the tube, and take down the instrument; the tube must then be gently tapped and the cistern righted, the iron 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 noted; the tube must then be gently tapped and the cistern adjusted, carefully made. By raising and lowering the eye, 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 is necessary to remove the cistern, and gout oil, by inverting the tube, and take down the instrument; the tube must then be gently tapped and the cistern righted, the iron peg, and gently tapping it; and if this plan fails, the instrument must be repaired.

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from radiation during night. Their bulbs have a black coating, which makes it difficult to be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in 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 observations; and the "Minutum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. 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 be scrupulous to attend to the following Directions, secure for their Observations 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.

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An excellent Barometer is constructed by Mr Atie 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, 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 the Barometer; the sides of the cistern are of leather, and thus, 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; otherwise the instrument being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the index-fine on this little piston-rod is brought, by the adjusting screw, to form one sharp 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 will vitiate the readings from the cistern.

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, and the sun's direct rays are then at the exact height from which the mercury is removed to within a quarter of an inch of the top of the tube and take down the instrument; the tube must then be gently tapped and the cistern righted, the iron 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 noted; the tube must then be gently tapped and the cistern adjusted, carefully made. By raising and lowering the eye, 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 is necessary to remove the cistern, and gout oil, by inverting the tube, and take down the instrument; the tube must then be gently tapped and the cistern righted, the iron peg, and gently tapping it; 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 open to the south. These Boxes may be had from the opticians, Thermometer is liable to two denunciations, both of which must be guarded against, and may be easily remedied by an observer. When the colour of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when affixed to the depth of water received in gauge, the depth of part of the spirit distils by high temperature, it will be found that the thermometer is observed, and registered in addition to, and as a check upon 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 makes it difficult to be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in 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 observations; and the "Minutum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. 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 be scrupulous to attend to the following Directions, secure for their Observations 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 instruments, 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 Aerometers*, 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.

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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, and the sun's direct rays are then at the exact height from which the mercury is removed to within a quarter of an inch of the top of the tube and take down the instrument; the tube must then be gently tapped and the cistern righted, the iron 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</*

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thursoham Green, County of Northumberland, in Lat. $62^{\circ} 2' N$, Long. $6^{\circ} 43' 8'' E$, Distance from Sea 100 miles.

Height of Cistern of the Barometer above Mean Sea-level 12 feet, above Ground 5 feet.

During the MONTH of November 1871.

The Hours of Observation are of Greenwich Time (unseen)

ELEPHANT. A.M.	BAROMETER.		SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M.		HYGROMETER, No. 831-32.		WIND.		RATN. No. 78	CLOUDS.		THERMOMETERS under Ground.		SEA.	OZONE.	GENERAL REMARKS.		Days of Month.													
	9 h. A.M.	9 h. P.M.	Shade, 4 feet above Ground.	Exposed Black Bulbs.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.		No. of hours in which it fell.	Amount in inches.	Velocity (0-6) and Direction.	Amount (0-10) and Direction.	9 h. A.M.	Temperature at 1 ft. above Ground.	9 h. A.M.	Temperature at 1 ft. above Ground.														
	Barometer, * No. 91	Barometer, Adjusted Thermometer No. 91	Max. No. 3161	Min. No. 3257	No.	No.	Direc- tion.	Force.		No. 9 h. A.M.	No. 9 P.M.	No. 5 inches.	No. 12 inches.	No. 22 inches.	No. 9 A.M.	No. 9 P.M.															
1	30.512	51	30.576	55	46	41	○	○	○	○	○	○	○	○	○	○	○	○	2 pm	1											
2	30.418	50	30.472	52	45	40	○	○	○	○	○	○	○	○	○	○	○	○	48	2											
3	30.498	46	30.550	52	40	37	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	3											
4	30.468	47	30.408	51	37	33	○	○	○	○	○	○	○	○	○	○	○	○	46.5	4											
5	30.354	46	30.250	50	38	30	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	5											
6	30.110	46	29.974	49	36	32	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	6											
7	29.722	43	29.800	48	38	30	○	○	○	○	○	○	○	○	○	○	○	○	2 pm	7											
8	29.402	40	29.390	43	37	32	○	○	○	○	○	○	○	○	○	○	○	○	45.7	8											
9	29.208	40	29.380	48	37	28	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	9											
10	29.696	40	29.848	43	38	31	○	○	○	○	○	○	○	○	○	○	○	○	3 pm	10											
11	29.770	40	29.828	43	34	29	○	○	○	○	○	○	○	○	○	○	○	○	45	11											
12	29.926	37	30.080	44	31	26	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	12											
13	30.120	43	30.010	47	35	25	○	○	○	○	○	○	○	○	○	○	○	○	44.5	13											
14	29.594	40	29.660	47	38	32	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	14											
15	29.882	40	30.100	47	36	23	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	15											
16	30.080	40	30.164	40	34	25	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	16											
17	30.184	36	30.084	45	36	24	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	17											
18	30.050	43	30.036	50	42	34	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	18											
19	29.900	50	29.560	53	48	40	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	19											
20	29.444	52	29.460	58	52	44	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	20											
21	29.484	55	29.564	57	52	45	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	21											
22	29.618	53	29.674	56	48	42	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	22											
23	29.626	50	29.832	51	45	35	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	23											
24	30.004	45	30.204	50	36	30	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	24											
25	30.256	45	30.148	47	36	27	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	25											
26	30.422	44	30.430	50	40	24	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	26											
27	30.392	45	30.444	46	40	30	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	27											
28	30.458	43	30.466	46	38	31	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	28											
29	30.442	43	30.480	47	35	30	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	29											
30	30.496	42	30.524	49	36	31	○	○	○	○	○	○	○	○	○	○	○	○	4 pm	30											
31																			4 pm	31											
Sums.	900.121	1936	901.146	1470	184.5	9160.5	1076.1	1023.1	1062.1	1018.1	363	360	8.92	41.5																	
Means.	30.015	44.5	30.039	49.0	39.5	32.1	35.9	34.2	35.6	34.0	1	1.2		45.5	7.9	9.6															
+ Total Corrections for Instrumental Errors.																															
‡ Corrections for Diurnal Range.																															
"Corrected Means."																															
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction $\dagger\dagger$, = 29.972
for Temp. (Col. 2), = .0015 — .0455, = 29.984

"Corrected Mean" of Barometer at 9 P.M., minus the Correction $\dagger\dagger$, = 29.984
for Temp. (Col. 4), = .0059 — .0523, = 29.978

Mean at Station, corrected, and at 32°, = 29.978

Correction for height, 12 feet above Mean Sea-level, = 0.017

Mean, reduced to 32°, and Sea-level, = 29.991

Highest Reading, corrected for Index error, on the 3 th, = 30.550</

WITH REMARKS ON THE USE OF INSTRUMENTS

The 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., (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 4, st., (*e.g.*) will indicate that the higher 2, cu-st., 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 bottom 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 N.W., 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 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, aurora 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 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, . . .				

EDWARD CH

General Post Office Buildings,

BOOK-POST

MR ALEXANDER BUCHAN,

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.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thorsham ^{Farm}, County of in Lat. $62^{\circ} 2' N$, Long. $6^{\circ} 43' E$, Distance from Sea 120 miles.

Height of Cistern of the Barometer above Mean Sea-level 12 feet, above Ground 5 feet.

During the MONTH of December 1871.

The Hours of Observation are Greenwich Time (¹²₁₂ hours)

ELECTRICITY. Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS, Read Daily at 9 P.M.				HYGROMETER, No. 831-32		WIND.		RAIN.		CLOUDS.		THERMOMETERS under Ground.		SEA.		OZONE.		GENERAL REMARKS.		Days of Month.						
	9 h. A.M.		9 h. P.M.		Protected in Shade, & etc., above Ground.		Exposed Block Bulbs.		9 h. A.M.		9 h. P.M.		Readings of the H.Cup Anerometer, No. 78		No. of hours in which it fell.		Amount in inches No. 78		Velocity (0-6), and Direction.		Velocity (0-6), and Direction.		Velocity (0-6), and Direction.		Temperature of W.T.L. at Depth of feet, No.		Temperature at Depth of feet, No.		
	No. 91	Barometer.	Attached Thermometer.	No. 91	Barometer.	Attached Thermometer.	Max.	Min.	No. 163	No. 5137	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.	9 h. A.M.	9 h. P.M.	
1	30.524	43	30.340	47	40	25	27.8	26.1	40	38	N	0.5	NW	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
2	30.228	42	30.354	45	40	31	33.8	31.7	31	29	N	1.5	N	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
3	30.346	39	30.438	44	34	28	30.2	28.5	30	29	N	0.5	N	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
4	30.360	41	30.266	47	39	24	35.6	34	34	33	W	0.5	N	0.5	Q.2	0.25	-	-	-	-	-	-	-	-	-	-	-	4	
5	30.222	42.5	30.324	47	35.5	31	34.3	33	31	30	N	0.5	N	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	5	
6	30.352	44	30.318	49	38	25	30.7	29.5	37	34	N	0.5	N	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	6	
7	30.272	45	30.332	47	37	27.5	35.7	33.8	31	29.7	NW	0.5	W	0.5	-	-	-	-	-	-	-	-	-	-	-	-	7		
8	30.330	42	30.276	47	37	27	34.7	32.8	29.5	28.5	W	0.5	W	0.5	-	-	-	-	-	-	-	-	-	-	-	-	8		
9	30.200	43	30.186	47	39	28.5	36.4	34.6	35.5	34	W	0.5	W	0.5	-	-	-	-	-	-	-	-	-	-	-	-	9		
10	29.950	47	29.946	50	44	32	43	40.2	43	41	SW	1.5	NW	1	-	0.40	-	-	-	-	-	-	-	-	-	-	10		
11	29.942	49	29.624	55	49	39	44	43	45	44	SW	1	SW	3	-	0.61	-	-	-	-	-	-	-	-	-	-	11		
12	29.676	51	29.786	50.5	45	37	41	38.5	42	37.8	SW	2	SW	2	-	0.49	-	-	-	-	-	-	-	-	-	-	12		
13	30.100	48	30.148	52	42.5	37.5	41.7	38.8	41	38.2	NW	1	NW	0.5	-	0.19	-	-	-	-	-	-	-	-	-	13			
14	30.018	50	29.870	55	48	39.5	43.8	42.9	47.3	46	SW	1	SW	2	-	0.24	-	-	-	-	-	-	-	-	-	14			
15	29.696	54	29.730	56	50	43.5	49	48	44	42	SW	3	W	1.5	-	0.35	-	-	-	-	-	-	-	-	-	15			
16	29.872	50	29.712	55	48	41	43.9	40.3	47	38	SW	1.5	S	5	-	0.18	-	-	-	-	-	-	-	-	-	16			
17	29.280	52	29.380	52	48	39	43	41.5	42.8	38.6	SW	1.5	W	2	-	0.61	-	-	-	-	-	-	-	-	-	17			
18	28.628	53.5	28.776	52.5	51	37	51	48.5	38	35	SW	5	NW	3	-	0.67	-	-	-	-	-	-	-	-	-	18			
19	29.120	44	29.120	48	40	32	37.6	34.8	35	33.8	SW	1	SW	3	-	0.25	-	-	-	-	-	-	-	-	-	19			
20	29.108	45	29.364	47	36.5	29.5	32	30.5	29.5	28	NW	0.5	N	0.5	-	-	-	-	-	-	-	-	-	-	-	20			
21	29.580	40	29.856	46	32	23	30	28.8	27	26	N	1	N	0.5	-	-	-	-	-	-	-	-	-	-	-	21			
22	30.064	41	29.480	43	40	25	29	27.6	39.6	38	NW	0.5	SW	1.5	-	-	-	-	-	-	-	-	-	-	-	22			
23	29.366	43	29.404	49	48	39.5	44.8	44	41.4	39	SW	5	W	3	-	1.44	-	-	-	-	-	-	-	-	-	23			
24	29.362	47	28.808	54	47.5	38	41.2	37.5	46	42.4	SW	1	SW	5	-	0.45	-	-	-	-	-	-	-	-	-	24			
25	29.016	47	29.248	54	47	39	42	38	35	34	SW	2	W	1	-	0.36	-	-	-	-	-	-	-	-	-	25			
26	29.272	51	29.080	56	45	35.5	40.5	39.8	43	42.2	S	0.5	S	2	-	0.18	-	-	-	-	-	-	-	-	-	26			
27	28.872	51	28.988	56	45	40	42.3	41	42.2	39.3	S	1.5	S	1.5	-	0.41	-	-	-	-	-	-	-	-	-	27			
28	29.052	53	29.150	55	45	33.5	44	42	33.5	32	S	1.5	S	0.5	-	0.20	-	-	-	-	-	-	-	-	-	28			
29	29.170	54	29.064	59	45	33	43.3	41.8	44	42.5	S	1.5	S	1.5															

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 *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 dissimilarities 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 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 Observation.

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railways 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 Observation 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 should 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 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, which stem passes freely through the lid and case of the cistern. Whether the *index-line* on this little piston-rod is brought, by the adjustment 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 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 stem 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 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 the scale 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 on 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 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 and Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "Maximum." 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.

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 direct 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 "Minimum" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch in 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 a 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 medium fineness, and fastened at the neck of the bulb by tight cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and that 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 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 forementioned 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 decimal. Thus the Thermometer will be read— $39^{\circ}.9$, $40^{\circ}.0$, or $40^{\circ}.1$; 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° , or $40^{\circ}3$ respectively. So also $40^{\circ}.1$, and $40^{\circ}.4$, more or less must be registered $40^{\circ}.2$ or $40^{\circ}.3$, and $40^{\circ}.7$ or $40^{\circ}.8$ respectively. 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 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, an instant direction of the lower strata of clouds overhead, and to the direction of smoke, etc.

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 or 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 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, Linné'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.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situations, 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 by 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." will indicate that the higher, 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 4, st.

"2, cu-st." will indicate that the highest 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 consistancy,—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 N.W., 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 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,				

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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 goodress 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.