

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *March Hall Park*, County of *Midlothian*, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.

Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet.

During the MONTH of *January* 186*4*.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	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.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.												
	Barometer.	Attached Ther- mometer	Barometer.	Attach- ed Ther- mometer	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	No.	No.	No.										
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.									
	* No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.									
1	30.00	43	30.13	44	37	30.5			34.3	31.8	33	32																			1		
2	30.30	42	30.36	41	31.7	25			32	30	27.8	27						0													2		
3	30.39	40	30.41	41	35	24			28.6	28.4	29	24.6																			3		
4	30.43	38	30.38	40	28	20																										4	
5	30.27	37	30.12	38	30.8	19.5																										5	
6	30.06	37	30.00	40	32	22					31.8	31.8																				6	
7	29.99	38	29.91	40	31	20.5					30.8	30.8																				7	
8	29.87	39	29.71	38	32	24.5			30	29.5	32	31.8																				8	
9	29.64	40	29.68	38	32	22.5			32	31.6	29	27.5						2														9	
10	29.66	40	29.70	41	42	26.5			37.8	36	42	40.8																				10	
11	29.78	42	29.60	43	45	32			36	35	43	41																				11	
12	29.66	43	29.74	44	43	34			42.4	41.8	42.2	40	J		S.W																	12	
13	30.08	44	30.09	47	42	30			34.8	34.4	39	38	Caln		Caln																	13	
14	30.08	45	29.99	46	41	31			38	37.2	32.8	32	E		E																	14	
15	29.89	45	29.90	46	41	30.5			37	36	40.8	40	J.		E																	15	
16	29.96	46	29.86	46	42.4	35			39	38.8	37.5	37	N.E		E			3														16	
17	29.53	44	29.74	45	43.5	31			34.5	33.2	38.8	37	E		C																	17	
18	29.80	44	29.78	47	40.7	29.5			34.4	33.4	36	35.7	J		C																	18	
19	29.70	45	29.76	47	41	34.5			42.5	41	43	42	J.W		W																	19	
20	29.87	46	29.70	47	44	35			41	39.6	37	36	W		C																	20	
21	29.65	45	29.20	49	48	31			36.5	35.5	48	46	J.W		W																		21
22	29.12	47	29.13	48	48	32.5			45.8	43.8	47	45.5	J		W																		22
23	29.18	47	29.47	47	47	33			39.8	37.8	39	34.2	J.		W			4															23
24	29.59	44	29.82	46	45	35.5			41	39	44	41.6	W		W																		24
25	29.98	45	29.95	48	45	38.5			41	39	43.8	41	J.W		W																		25
26	29.70	47	29.61	48	48.5	40.5			44.5	41.8	46.8	45	J		C																		26
27	29.46	48	29.40	50	48.2	44.5			46.4	44.8	47.4	44.5	J.		W																		27
28	29.47	48	29.95	49	47	35			42.8	41.4	37.4	36.4	J.W		C																		28
29	30.09	49	29.76	47	44.8	29			36	34.5	44.8	41.8	W		W																		29
30	29.83	47	29.82	48	48	32.5			47	45	45	43	J.W		W			7															30
31	29.58	49	29.35	47	50	35.5			50	47.4	47	46.5	J		W																		31
Sums.	117	476	111	474	124	128			127	1410	158	113						1.00															
Means.	29.826	43.7	29.826	44.7	41.1	30.9			37.4	37.4	39.2	37.8																					
+ 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++ for Temp. (Col. 2), = *29.785*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ for Temp. (Col. 4), = *29.782*  
Mean at Station, corrected, and at 32°, = *29.784*  
Correction for Height, feet, above Mean Sea-level, = *29.6*  
Mean, reduced to 32°, and Sea-level, = *30.080*  
Highest Reading, corrected for Index error, on the 4 th, = *30.430*  
Lowest Do., Do., on the 22 th, = *29.120*  
Difference, or Monthly Range, = *1.310*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 31 th, = *50.0*  
Lowest in Month, corrected for Index errors, on the 5 th, = *19.5*  
Difference, or Monthly Range, = *30.5*  
"Corrected Mean" of all the Highest, (Col. 5), = *41.1*  
"Corrected Mean" of all the Lowest, (Col. 6), = *30.9*  
Difference, or Mean Daily Range, = *10.2*  
\*\* Calculated Mean Temperature of Month, = *36.0*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the th, =  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =  
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =  
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, =  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *39.0*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *37.6*  
Computed Temperature of Dew-point, = *35.8*  
Do. Elastic Force of Vapour, = *2.10*  
Do. Weight of Vapour in a Cubic Foot of Air, = *2.42*  
Relative Humidity, (Saturation = 100), = *89*  
RAIN fell on Days; Amount in Inches, = *1.00*

WIND.		SUMMARY.							
Direction.		N	NE	E	SE	S	SW	W	NW
A.M.									
P.M.									
Mean.									

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 8th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by *Alexander Johnston*  
*A. Keith Johnstone Jun.*

(Signed)

Greatest daily range = *17.0* on the 21<sup>st</sup>



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Black Hill, Edin.*, County of \_\_\_\_\_, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.

Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet.

During the MONTH of *February* 186 \_\_\_\_\_.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER.						SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No. _____				WIND.				RAIN.		CLOUDS.				SUNSHINE. Hours.	THERMOMETERS. under Ground.			Temperature of WELL at Depth of feet. No. _____	SEA. Temperature at surface and Density.	OZONE. 0-10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.	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.		9 h. A.M.		9 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.	Amount in inches. No. _____	9 A.M.		P.M.			9 h. A.M.																																		
	Barometer. * No.	Attached Ther- mometer	Barometer. No. _____	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. in Sun's rays No. _____	Min. on Grass. No. _____	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc- tion.	Force	Direc- tion.	Force	No. _____	No. _____			No. _____	No. _____	No. _____	No. _____		No. _____	No. _____	No. _____						No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____																				
																																									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.		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	29.59	48	29.42	50	49	39.5			44.5	41	42	42	N.W.	W.																			1																											
2	29.57	46	29.43	48	45	34.5			40	37	39	37	N.W.	W.																			2																											
3	29.47	44	29.63	44	37.8	21.5			36	35	34.8	31.8	W.	W.																			3																											
4	29.73	42	30.16	44	37	30			34.3	31.5	32.3	30	N.W.	N.W.																			4																											
5	30.18	40	30.24	40	35	29			32.4	30.8	32	31	W.	N.W.																			5																											
6	30.12	38	29.96	39	36	25			30	29	34.8	33	N.W.	N.W.																			6																											
7	29.87	40	29.78	41	35	24			28.8	28.8	29	28.5	N.W.	E																			7																											
8	29.59	40	29.63	40	32	22							E	N.E.																			8																											
9	29.43	38	29.34	40	32.8	20.5					32	31.5	S.	C.																			9																											
10	29.33	39	29.52	43	37	29.5			32.5	31.8	33	32.8	S.	N.W.																			10																											
11	29.53	40	29.29	43	36	28.5			32	31.5	35	33	E	E																			11																											
12	28.87	41	29.13	43	44.8	32.5			36.8	35.8	40	37	S.	W.																			12																											
13	28.81	45	29.48	44	42	35.5			48.5	47.5	40.4	38	W.	N.W.																				13																										
14	29.59	46	29.48	47	47	39.5			46.8	43.4	47	43.5	N.W.	W.																				14																										
15	29.30	48	29.21	48	48	42			47.5	45	45.2	42	N.W.	N.W.																				15																										
16	29.29	46	29.48	43	43	32.5			37	35	33	32	N.W.	W.																				16																										
17	29.86	43	30.08	43	38.5	32.1			36.5	34	35.5	32	E	C.																			17																											
18	30.11	43	30.23	44	37	29.5			33	31	33.5	33	N.E.	E																				18																										
19	30.32	43	30.19	44	35	26.5			30	29.5	29	28	E	S.E.																				19																										
20	29.99	42	29.85	41	33	24			29.5	29			N.E.	S.E.																				20																										
21	29.75	42	29.61	41	33	21.5			29	28.4	22.8	29	N.E.	C.																				21																										
22	29.78	42	29.68	41	32.6	21.5					29	28.8	N.W.	W.																				22																										
23	29.77	41	29.84	40	32.5	24			29.8	29	29.8	29	N.W.	S.																				23																										
24	29.88	41	29.86	40	24	20					30	29.5	N.W.	C.																				24																										
25	29.87	38	29.83	40	37	21.5					32.6	32	S.	E																				25																										
26	29.84	40	29.78	42	37	22.5					34.4	32	S.E.	E																				26																										
27	29.68	40	29.56	42	38	27.5			31	30	35.6	35	E	E																				27																										
28	29.52	43	29.35	43	38.5	33.5			37.8	37.4	37.6	36.5	E	E																				28																										
29	29.33	44	29.57	45	40	36			38.6	37	38.8	38	E	S.E.																				29																										
30																																			30																									
31																																			31																									
Sums.	1716	410	1714	408	3154	135			223.5	791.4	943.6	903.9																																																
Means.	29.664	42.2	29.680	42.8	37.6	29.0			35.8	34.4	34.9	33.5																																																
+ 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++ for Temp. (Col. 2), = *29.627*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ for Temp. (Col. 4), = *29.642*  
Mean at Station, corrected, and at 32°, = *29.634*  
Correction for Height, feet, above Mean Sea-level, = *29.6*  
Mean, reduced to 32°, and Sea-level, = *29.930*  
Highest Reading, corrected for Index error, on the *19* th, = *30.320*  
Lowest Do., Do., on the *13* th, = *28.870*  
Difference, or Monthly Range, = *1.510*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the *1* th, = *49.0*  
Lowest in Month, corrected for Index errors, on the *24* th, = *20.0*  
Difference, or Monthly Range, = *29.0*  
"Corrected Mean" of all the Highest, (Col. 5), = *37.6*  
"Corrected Mean" of all the Lowest, (Col. 6), = *29.0*  
Difference, or Mean Daily Range, = *8.6*  
\*\* Calculated Mean Temperature of Month, = *33.3*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the \_\_\_\_\_ th, = \_\_\_\_\_  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = \_\_\_\_\_  
Lowest at Night, Black Bulb, (corrected for Index errors), on the \_\_\_\_\_ th, = \_\_\_\_\_  
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, = \_\_\_\_\_  
Difference of above Means or Range ("exposed"), = \_\_\_\_\_

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *35.4*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *34.0*  
Computed Temperature of Dew-point, = *31.8*  
Do. Elastic Force of Vapour, = *1.80*  
Do. Weight of Vapour in a Cubic Foot of Air, = *2.06*  
Relative Humidity, (Saturation = 100), = *87*  
RAIN fell on *11* Days; Amount in Inches, = *2.40*

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	0	3	7	1	4	5	3	6	0		
P.M.	0	4	7	3	1	3	7	2	4		
Mean.	0	2	7	2	2	4	5	5	2		

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by *Alexander Johnston, Gardiner*  
*Arthur Johnston, Jr.*

(Signed)

Greatest daily range = *15.5°* on the *25* th

# 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, 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-tubes* 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 the 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 screw, to form one straight line with those on its ivory frame, 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 *venier*.

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 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 *venier*, 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 lids 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 open 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 "*Maximum*" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximum*." This Thermometer is liable to two disadvantages, both of which must be guarded against, and may be easily remedied by striking 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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 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 alcohol by distillation.

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes, that has not been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers 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 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 *calibrated* 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 *parallel* to an inch, from any board on which it may be supported; 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 cotton fineness, and fastened at the neck of the bulb by the medium, 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.

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 decimals. Thus the Thermometer will be read—39°·3, 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 40°·5, respectively. So also 40°·3, and 40°·7 or 40°·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 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 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, &c.

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 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 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.

**Rain-gauges.**—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavorable 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 rim is 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.

**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 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

non-structure 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 appearance and changes ought to be noted among the "*Remarks*." The amount of cloud is entered on 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*,"  $\frac{1}{2}$  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 (*average*) speed of the former. Again, in the second "*Cloud*" column, an entry of  $\frac{2}{3}$  east, (*etc.*) 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.

**Sketches.**—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 the tide 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 Schönbain's or Moffat's papers are used.—Moffat's are preferred. 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°·5, 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, &c. Remarks on 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 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. For these hourly observations separate schedules will be furnished to observers.

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 have agreed to 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.

(By Order,) A. B.

Eninburgh, 9th December 1863.

BOOK-POST.

EDINBURGH.

10, St Andrew Square,

Secretary of the Meteorological Society of Scotland,

Mr ALEXANDER BUCHAN,

To

Edinburgh  
February 1864

FOREST TREES.	FRUITS.	MIGRATORY BIRDS.
Alder, .....	Apple, .....	Cuckoo, .....
Ash, .....	Black Currant, .....	Cutew, .....
Beech, .....	Cherry, .....	House-Swallow, .....
Birch, .....	Gooseberry, .....	Plover, .....
Elm, .....	Holly, .....	Sand-Martin, .....
Larch, .....	Hawthorn, .....	Starling, .....
Lim, .....	Hazel, .....	Swan, .....
Oak, .....	Laburnum, .....	Other Birds, naming them—
Sycamore or Plane, .....	Mountain Ash or Rowan, .....	
	Rhododendron Ponticum, .....	
	Red Flowering Currant, .....	
	Strawberry, .....	
	Plum, .....	
	Pear, .....	
	Peach, .....	
	Gooseberry, .....	
	Cherry, .....	
	Black Currant, .....	
	Apple, .....	
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## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at March Hall Park, County of Midlothian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.

Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet.

During the MONTH of March 1864.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.				CLOUDS.				THERMOMETERS. under Ground.				SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.	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.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.		9 h. P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
		Barometer.	Attach- ed Ther- mometer	Barometer.	Attach- ed Ther- mometer	No.	No.	No.	No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force	Direction.	Force	Velocity, (0-6), and Direc- tion.	Amount, (0-10), and Species.	Velocity, (0-6), and Direc- tion.	Amount, (0-10), and Species.	No.	No.	No.	No.	No.	No.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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BAROMETER, “corrected Mean” at 9 A.M., minus the Correction†† = 29.379  
for Temp. (Col. 2), = 29.420..... - .041.....  
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† = 29.367  
for Temp. (Col. 4), = 29.411..... - .044.....  
Mean at Station, corrected, and at 32°, ..... = 29.373  
Correction for Height, feet, above Mean Sea-level, ..... = 29.6  
Mean, reduced to 32°, and Sea-level, ..... = 29.669  
Highest Reading, corrected for Index error, on the 16 th, ..... = 29.890  
Lowest Do., Do., on the 7 th, ..... = 28.890  
Difference, or Monthly Range, ..... = 1.000  
1.000

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 31 th, ..... = 57.0  
Lowest in Month, corrected for Index errors, on the 10 th, ..... = 18.0  
Difference, or Monthly Range, ..... = 39.0  
“Corrected Mean” of all the Highest, (Col. 5), ..... = 42.5  
“Corrected Mean” of all the Lowest, (Col. 6), ..... = 31.9  
Difference, or Mean Daily Range, ..... = 10.6  
\*\* Calculated Mean Temperature of Month, ..... = 37.2

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected for Index Errors), on the \_\_\_\_\_ th, ..... = \_\_\_\_\_  
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, ..... = \_\_\_\_\_  
Lowest at Night, Black Bulb, (corrected for Index errors), on the \_\_\_\_\_ th, ..... = \_\_\_\_\_  
“Corrected Mean,” (Col. 8), of Black Bulb Min. on grass, ..... = \_\_\_\_\_  
Difference of above Means or Range (“exposed”), ..... = \_\_\_\_\_

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, ..... = 37.6  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, ..... = 36.3  
†† Computed Temperature of Dew-point, ..... = 34.5  
†† Do. Elastic Force of Vapour, ..... = 2.00  
†† Do. Weight of Vapour in a Cubic Foot of Air, ..... = 2.33  
†† Relative Humidity, (Saturation = 100), ..... = 89  
RAIN fell on \_\_\_\_\_ Days; Amount in Inches, ..... = 2.50

WIND.	SUMMARY.										Mean Force.	Mean Velocity in miles per day.
	Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.		
A.M.		0	4	9	1	0	7	8	1	1		
P.M.		5	2	6	2	2	0	10	3	1		
Mean.		2	3	8	2	1	3	9	2	1		

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the “Principal Towns” should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and  
Return verified by

(Signed)

Greatest daily range 21.0 on the 10 th

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 sameness* in the system of observatory 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 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 comprehensiveness among the several Returns, without which the Society's Reports must inevitably fall 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, at or close to the time, and at the place, and at the hour, 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 make up the loss by 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* as *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 small enough for Meteorological purposes.

well adapted to Meteorological purposes, by Mr Adie of London. An excellent Barometer is constructed by the great convenience of re-  
the use of which is attended with the great convenience of requir-  
ing *no adjustment* of the instrument. *Its scale* is graduated in inches, but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury by the  
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 leaden, 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, whose  
their coincidence being indicated by a little ivory tooth, 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 is first be made with scrupulous accuracy; as a slight error  
in setting, will vitiate the readings from the *zenith*.

here will vitiate the readings from the *zenner*.

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 *scrup* 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 upmost. 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 *lylja*, 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.

[illegible]

*Protection of Thermometers.*—The Council of the Society for an accurate admission and reading of the records of the Society recommended 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 any 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 doors may be

doors are also fitted to open to the south. And the  
had at the Society's Office.

*Self-Registering Thermometers.*—Professor Phillips, and  
Negretti and Zambra's Patent "*Maximum*" Thermometers are  
recommended; pivoted directions for their use may be obtained  
with each instrument. The "*Minimum*" Thermometer  
Rutherford is recommended when graduated on the glass stem  
and affixed to a frame separate from the "*Maximum*" Ther-  
mometer 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 smiting  
the instrument repeatedly against the palm of the hand; when  
the instrument disjoins by high temperature, it will be found if  
part of the spirit distils by high temperature, it will be found if  
the upper tube, and must be disjoined from thence by heating  
that part over a lamp; the alcohol will evaporate and again con-  
dense in contact with the body of the liquid. This instrument  
must be hung perfectly horizontal: the bulb end should incline  
slightly downwards, rather than the other.

The above remarks apply equally to the Thermometers *few* 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 mercuried, 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 "*Mercurium*" should be freely exposed to the Sun, and the "*Amburum*" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Show must not be allowed to cover either of these Thermometers; nor the Sun's heat to affect the alcohol by dissipation.

*Verification of Thermometers.*—No instrument is quite so good as the Sun's heat to detect any inaccuracy, and is commonly used for Meteorological purposes, that has not been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are *well* graduated on the stem, but merely *poorly* attached to the scale, and the scale is very liable to be moved from their position on the *Scale*, and ought never afterwards to be used, without being *re-tested*. The self-indicating, 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 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 *optimal and well-known form* of this apparatus seriously violate the "Hygrometric Deductions," Observers are specially requested to attend to the following conditions:—

The bulbs must *hang loosely*, at least an inch free from the seats and frame to which they are attached—the frame must be such as will bring the tubes for at least 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 bulb;—in *warmer* climates the bulb is to be surrounded by a 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 mistlin 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 clod 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 tin case and supports shall be compelled with, as far as possible.

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 readings should be taken to tenths of a degree, and noted in decimals. Thus the thermometer will be read  $-39^{\circ}\cdot9$ ,  $40^{\circ}\cdot0$ , or  $40^{\circ}\cdot1$ , or again,  $40^{\circ}\cdot4$ ,  $40^{\circ}\cdot5$ , or  $40^{\circ}\cdot6$ , according as it indicates a little under, an exact coincidence with, or a little over  $40^{\circ}$ , or  $40\frac{1}{2}^{\circ}$ , respectively. So also  $40^{\circ}\cdot0$  and  $40^{\circ}\cdot5$ , more or less, must be noted as  $40\cdot0$ ,  $40\cdot5$ ,  $40\cdot1$ ,  $40\cdot6$ , etc. The thermometers registered  $40^{\circ}\cdot2$  or  $40^{\circ}\cdot3$ , and  $40^{\circ}\cdot7$  or  $40^{\circ}\cdot8$  respectively, in the 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 Hygrometers are read at 9 a.m. and 9 p.m. The self-registering Thermometers are read at 9 a.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 readings to their proper meteorological day. In the Society's schedules, the indications registered on p.m. on the 3rd, 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 must be taken; and when it is stationary, any 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.

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 strongly recommend that every Observator be furnished with a Hemispherical-Cup Anemometer, a self-registering instrument, which shows the amount of Wind at that times it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indication at the Force of the Wind, at any particular hour of observation, Linch's Anemometer is also recommended; the method of *Using* making Wind Force by such tables as that given in the section is, to say the least, unsatisfactory.

*Rank-grasses*. 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 dense cut grass around its mouth. The rain-gauge ought to be read daily, and the readings entered in the returns on the third day, when the rain fell.

on *Snow-falls* may, for convenience, be registered in the columns under the following conditions:—When a snow shower occurs it must be noted in the "Remarks," and the letter "S" must be written in the column headed "Snow." As regards the depth of water received in gauge, the depth of snow must be measured in some open place where no drift has accumulated; if there is no such place, the snow must be measured in the run-gauge. For wind, rain, and snow, the indications of the run-gauge. For wind, rain, and snow, indeed in every column, the observer cannot be too careful in his observations only; and nothing that partakes of the nature of deduction or inference.

*Clouds*... Convenient abbreviations for Luke Howard

# OBSERVATIONS,

non-occurrence 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  $20^{\circ}$  to  $30^{\circ}$  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 *overcast* is half-covered by clouds, 5 is entered as the *observation*, and so on.

covered by clouds,  $\beta$  is clouds in the observation, and so on.

Observations of the clouds are made at 9 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,"  $\frac{0.5W}{2}$ , (for example), will indicate that the upper strain of clouds travel with extreme velocity from S.W., and these in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of  $\frac{4}{21} \frac{40}{100}$ , ( $\frac{4}{21}$  or  $\frac{40}{100}$ ) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus*, 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 rays cast shadows, should be entered in the proper column.

*Underground Thermometers.* As the temperature and health of crops and plants greatly depend on the temperature of the soil, its amount, and consistency, the Council recommended observations in this interesting department be made at 9 a.m. by thermometers placed in the earth; they bulbs being sunk to 3, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fixed with sloping iron collars, to prevent rain water being conveyed to the bulbs by the stems of 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.*—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 the heat of river water. *At least* near the mouth 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 Solkibolts or Moffitt's papers are used.—Moffitt's are preferred. 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° S. S.W. an *ozone* array in the schedule, will indicate that the *ozone* pressure is at 3° on the scale, that the *ozone* wind is from the N.W., and that its force on the scale 0—6 is “4.” viz., that it is blowing *fresh*.

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

*Remarks.*—The “*Remarks*” column is too narrow, but can be availed so. Some of the most valuable observations that can be taken are those for which no rates 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, &c. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunderstorms, and remarkable falls of snow, hail, or rain, the hour of storms, and remarkable falling of the maximum, as well as such notes as storms of wind attaining their maximum, as well as such notes as on storms as have been limited 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 and 9 P.M. ought to be registered, either in two columns either wise uncoupled, or in two ruled off for the purpose, from the headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or the side margin. Additional remarks may be made on the margin.

Observations in connection with the periodic return of seasons, possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would therefore recommend the Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observations 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 *year-day* observations be taken—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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

(By Order,) A. B.

EDINBURGH, 9th December 1863.

*Clouds.* --- Convenient abbreviations for Luke Howards

## BOOK-POST.

Mr ALEXANDER BUCHAN,

*Secretary of the Meteorological Society of Scotland,*

10, *St Andrew Square,*

EDINBURGH.

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

FOREST TREES.	In flower.	In leaf buds first appear.	In leaf.	Directed of leaves.	CROPS, mentioning variety.	Sowing or planting.	Apportioning or above ground.	In ear.	First Cut
Alder,					Barley,				
Asp,					Bere or Bize,				
Beech,					Oats,				
Birch,					Wheat,				
Elm,					Beans,				
Larch,					Pears,				
Lime,					Potatoes,				
Oak,					Turnips,				
Sycamore or Plane,					Rye Grass,				

SHRUBS, ETC.		FRUITS.	MIGRATORY BIRDS.	
First in Blossom.		Apple.	Cuckoo.	Departure.
Raspberry,				
Banquette or Elder.				
Broom,		Cherry,	House-Swallow,	
Hazel,		Gean,	Lapwing,	
Hawthorn,		Gooseberry,	Plover,	
Holly,		Peach,	Sand-Martin,	
Laburnum,		Pear,	Starling,	
Lilac,		Plum,	Swain,	
Mazeton,		Strawberry,	Tail or Corn Crane,	
Red Flowering Currant,			Other Birds, naming them—	
Rhododendron Ponticum,				
Viburnum,				

Have the goodness also to state any information you may be able to collect relative to the crops of Gram, Ray, Fench, Turpiss, Truits, 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.

Edinburgh  
March 1864

## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at March Hall park, County of Midlothian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet. During the MONTH of April 186 \_\_\_\_\_.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No. _____				WIND.				RAIN.		CLOUDS.		THERMOMETERS. under Ground.			SEA.	OZONE. 0—10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.	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.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.										
		Barometer. * No. _____	Attach- ed Ther- mometer	Barometer. No. _____	Attach- ed Ther- mometer	Max. No. _____	Min. No. _____	Max. in Sun's rays No. _____	Min. on Grass. No. _____	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force	Direction.	Force	No. of hours in which it fell.	Amount in inches.	Velocity, (0—6), and Direction.	Amount, (0—10), and Species.	Velocity, (0—6), and Direction.	Amount, (0—10), and Species.	No. _____ 3 inches.					No. _____ 12 inches.	No. _____ 22 inches.		
		inches.	"	inches.	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					"	"	"	
		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.	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.	9 h. A.M.	9 h. P.M.	
1	29.12	45	29.25	45	44	32			38	35.5	37	36	W	W													1					
2	29.49	44	29.62	48	46	32			41	38	44.5	38	W	W				to									2					
3	29.54	47	29.45	48	47	38			42.5	40.2	45	44	E	E													3					
4	29.69	48	29.93	47	45	37.5			41.3	41	40	38.8	E	E													4					
5	30.01	47	30.02	47	41	35			40.2	37	38	37	E	E													5					
6	29.97	46	29.98	47	46	34.8			40.8	39	42.5	41.8	E	C													6					
7	29.96	49	29.97	48	51	40			49	47	50	49	E	E													7					
8	30.00	52	30.07	53	56	47			52	50.5	52	51	W	W				to									8					
9	30.06	54	30.02	56	60	48.7			54	51	57.2	49	W	C													9					
10	29.92	58	29.85	56	62	45			55	51.2	50	48	W	W													10					
11	29.78	54	29.86	54	51	40			47	42	40	39	W	W													11					
12	29.80	54	29.88	53	51	37.5			45	51.8	44	40	W	W													12					
13	29.85	54	29.76	55	56	30			48.8	45	45	42	W	W													13					
14	29.68	55	29.53	56	59	40			53	51	59	45	W	W													14					
15	29.48	55	29.55	55	50	38.5			43	41.8	45	43.8	W	W													15					
16	29.60	55	29.68	56	54	39			47	48.5	45	41.8	W	W				to									16					
17	29.70	53	29.69	53	51	38.8			48	44.4	44.4	39.8	W	W													17					
18	29.66	55	29.63	54	54	36.5			45	42.8	48	45	W	W													18					
19	29.50	55	29.53	53	57	44.5			48	45.8	53	49	W	C													19					
20	29.62	56	29.71	58	62	49			56	51	55	51	E	E													20					
21	29.85	60	29.96	62	69	48.5			61	56	54	47	E	C													21					
22	30.06	59	30.07	62	63	40.5			51	47.2	44.5	43	E	E				to									22					
23	30.08	59	30.10	61	57	38.8			50	47	46	44.5	E	E													23					
24	30.24	58	30.12	54	49	39			48	44.5	45	43	E	E													24					
25	30.01	56	30.04	52	49	39.5			45	43.3	43.2	42	E	E													25					
26	30.07	54	30.12	56	50	40			46	44.8	48	43.2	E	E													26					
27	30.13	53	30.09	56	49	38.5			45.5	43	44	43.5	E	E													27					
28	30.12	53	30.08	55	51	40			44.6	42.8	44	42.7	E	E													28					
29	29.87	56	29.89	60	61	39			50	46.5	50	45	E	E													29					
30	29.96	56	29.97	58	57	38.5			50	44	43.5	40	W	W				to									30					
31																											31					
Sums.		14.13	5.16	15.15	5.15	12	14.8			12.3	12.8	12.2	14.5					5	1.20													
Means.		29.827	53.4	29.847	54.1	53.1	39.5			47.5	45.0	46.4	43.4																			
† 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†† = 29.761  
for Temp. (Col. 2), = 29.827 - 0.066  
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† = 29.779  
for Temp. (Col. 4), = 29.847 - 0.068  
Mean at Station, corrected, and at 32°, = 29.770  
Correction for Height, feet, above Mean Sea-level, = 29.6  
Mean, reduced to 32°, and Sea-level, = 30.066  
Highest Reading, corrected for Index error, on the 24 th, = 30.240  
Lowest Do., Do., on the 1 th, = 29.120  
Difference, or Monthly Range, = 1.120

\* Each instrument tested at the Office in Edinburgh bears the stamp “S.M.S.” and a number to be entered in the Heading; or the Number and Initials of the Maker may be here given.  
† Enhancing corrections for both capillarity and Index Errors.  
‡ The Diurnal Range for Scotland is as yet unknown.  
†† Practically, though not absolutely, a minus correction.  
‡‡ These “Hygrometrical Deductions” are calculated from Glaisher’s Hygrometrical Tables, Second Edition only.  
\*\*\* While the Diurnal Range is unknown, the Arithmetical Mean of Cols. 5 and 6 will be entered as the “Calculated Mean Temperature.” Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the Observer, in each Schedule. See Order.

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 21 th, = 69.0  
Lowest in Month, corrected for Index errors, on the 13 th, = 50.0  
Difference, or Monthly Range, = 39.0  
“Corrected Mean” of all the Highest, (Col. 5), = 53.1  
“Corrected Mean” of all the Lowest, (Col. 6), = 39.5  
Difference, or Mean Daily Range, = 13.6  
\*\* Calculated Mean Temperature of Month, = 46.3

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected for Index Errors), on the th, = \_\_\_\_\_  
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = \_\_\_\_\_  
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, = \_\_\_\_\_  
“Corrected Mean,” (Col. 8), of Black Bulb Min. on grass, = \_\_\_\_\_  
Difference of above Means or Range (“exposed”), = \_\_\_\_\_

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 47.0  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 44.2  
‡‡ Computed Temperature of Dew-point, = 41.0  
‡‡ Do. Elastic Force of Vapour, = 2.57  
‡‡ Do. Weight of Vapour in a Cubic Foot of Air, = 2.96  
‡‡ Relative Humidity, (Saturation = 100), = 80  
RAIN fell on Days; Amount in Inches, = 1.20

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Variable.
A.M.		0	0	11	3	1	2	12	1	
P.M.		0	1	8	4	0	1	10	2	4
Mean.		0	0	10	3	0	2	11	2	2

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the “Principal Towns” should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and  
Return verified by

(Signed)

Greatest daily range 26.0 on the 13<sup>th</sup>

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 incompable, may arise from dissimilarity in the position or shelter of instrument, and 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-sized Barometers have been approved of by the Council; if properly reset 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 *zenith*.

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 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 lids forming the sides and doors of the Boxes are arranged so as to open to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-sticks, 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'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 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 dries by high temperature, it will be found in the upper lobe, and must be displaced from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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 tubes 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 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 alcohol by distillation.

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes, that has not been carefully tested by comparison with a Standard Thermometer. When such Thermometers 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 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 regulated form of this apparatus seriously require 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 delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 20 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 framed 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°·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 40°·3, respectively. So also 40°·1, and 40°·2, more or less, must be registered 40°·2 or 40°·3, and 40°·7 or 40°·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 A.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 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, &c.

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 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 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.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from the 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, and the readings entered in the returns on the day 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 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 observation 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 account and changes ought to be noted among the "Remarks." The amount of cloud 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," 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 2, c-s-t, (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 8, 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 Schönbach's or Moffat's papers are used. Moffat's are preferred. 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 38°·5, as an ozone entry in the schedule, will indicate that the ozone paper is fitted 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, &c. 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 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. For these hourly observations separate schedules will be furnished to observers.

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 have agreed to 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.

(By Order,) A. B.

Edinburgh, 9th December 1861.

FOREST TREES.		FRUITS.		MIGRATORY BIRDS.	
In Flower.	In Last buds.	Divested of Leaves.	CROPS, mentioning variety.	Sowing or above ground.	In Ear or Harvest.
Alder,.....			Barley,.....		
Beech,.....			Wheat,.....		
Birch,.....			Oats,.....		
Elm,.....			Beans,.....		
Larch,.....			Peas,.....		
Timber,.....			Potatoes,.....		
Turnip,.....			Rye Grass,.....		
Sycamore or Plane,.....					
SHRUBS, ETC.		First in Blossom.		First in Blossom.	
Apple,.....			Cherry,.....		
Berry,.....			Black Currant,.....		
Broom,.....			Gooseberry,.....		
Hazel,.....			Plum,.....		
Hawthorn,.....			Strawberry,.....		
Holly,.....					
Laburnum,.....					
Lilac,.....					
Mountain Ash or Rowan,.....					
Rhododendron,.....					
Red Flowering Currant,.....					
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.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

EDINBURGH.

10, St Andrew Square,

Secretary of the Meteorological Society of Scotland,

Mr ALEXANDER BUCHAN,

BOOK-POST.

Collected by Mr. Buchanan April 1864

## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at March Hall, County of Midlothian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.

Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet.

During the MONTH of May 1864.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No. _____				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.	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.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
	Barometer. * No. _____	Attach- ed Ther- mometer	Barometer. No. _____	Attach- ed Ther- mometer	Max. No. _____	Min. No. _____	Max. in Sun's rays No. _____	Min. on Grass. No. _____	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the H-Cup Anemometer. No. _____	No. of hours in which it fell.	Amount in inches.	Velocity (0-6), and Direction.	Amount, (0-10), and Species.	Velocity (0-6), and Direction.	Amount, (0-10), and Species.	No. _____ 3 inches.	No. _____ 12 inches.					No. _____ 22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction++  
for Temp. (Col. 2), =  $29.825 - 0.81 = 29.744$   
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++  
for Temp. (Col. 4), =  $29.811 - 0.84 = 29.727$   
Mean at Station, corrected, and at 32°, =  $29.736$   
Correction for Height, feet, above Mean Sea-level, =  $29.6$   
Mean, reduced to 32°, and Sea-level, =  $30.032$   
Highest Reading, corrected for Index error, on the 24 th, =  $30.120$   
Lowest Do., Do., on the 2 th, =  $29.470$   
Difference, or Monthly Range, =  $0.650$

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 17 th, =  $79.0$   
Lowest in Month, corrected for Index errors, on the 31 th, =  $32.0$   
Difference, or Monthly Range, =  $47.0$   
"Corrected Mean" of all the Highest, (Col. 5), =  $60.0$   
"Corrected Mean" of all the Lowest, (Col. 6), =  $42.0$   
Difference, or Mean Daily Range, =  $18.0$   
\*\* Calculated Mean Temperature of Month, =  $51.0$

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected for Index Errors), on the th, =  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =  
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =  
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, =  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, =  $50.7$   
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, =  $47.8$   
Computed Temperature of Dew-point, =  $44.8$   
Do. Elastic Force of Vapour, =  $2.97$   
Do. Weight of Vapour in a Cubic Foot of Air, =  $3.39$   
Relative Humidity, (Saturation = 100), =  $87$   
RAIN fell on Days; Amount in Inches, =  $1.30$

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.
A.M.		0	2	9	5	0	7	7	1	
P.M.		0	1	10	1	1	8	8	1	
Mean.		0	2	10	3	0	8	7	1	0

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and  
Return verified by

(Signed)

Greatest daily range =  $32.5$  on the 20

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, 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 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-tubes* 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 *zenith*.

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 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 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 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'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 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 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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 alcohol by distillation.

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes, that has not 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 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 are specially vitiated the "*Hygrometrical Deductions*," Observers are 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 that 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.

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 decimals. 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 over, an exact coincidence with, or a little over  $40^{\circ}$ , or  $40^{\circ}.1$ , respectively. So also  $40^{\circ}.1$  and  $40^{\circ}.2$ , 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.*" 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 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 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, &c.

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 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 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 *Evén's* *making* 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, and the readings entered in the returns on the day 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 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, 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  $20^{\circ}$  or  $30^{\circ}$  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 appearance 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*," 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  $\frac{2}{4}$ , *sc.*, (*cp.*) 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 bottom of wells ought, when practicable, to be taken, and the depth of the well and of the water noted.

**Ozone.**—Mention whether Schönben's or Moffat's papers are used.—Moffat's are preferred. 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  $3^{\circ}$ , 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, &c. 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 of wind attaining their maximum, as well as such notes on storms as have been limited 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-marginal. 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 *year-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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 have agreed to 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.

(By Order.) A. B.

Edinburgh, 30th December 1863.

FOREST TREES.		FRUITS.		MIGRATORY BIRDS.	
In flower.	In leaf.	First in blossom.	First ripe blossom.	First arrival.	First departure.
Alder, .....	Barberry, .....	Apple, .....	Cuckoo, .....	House-Swallow, .....	Lapwing, .....
Beech, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....
Birch, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....
Elm, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....
Larch, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....
Oak, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....
Sycamore or Plane, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....

Almond, .....	Barberry, .....	Apple, .....	Cuckoo, .....	House-Swallow, .....	Lapwing, .....
Beech, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....
Birch, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....
Elm, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....
Larch, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....
Oak, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....
Sycamore or Plane, .....	Black Currant, .....	Gooseberry, .....	House-Swallow, .....	House-Swallow, .....	House-Swallow, .....

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

BOOK-POST.

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

To

Edinburgh  
May 1864.

## SCOTTISH METEOROLOGICAL SOCIETY.

113

Observations taken at March Hall, County of Midlothian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.

Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet.

During the MONTH of June 1864.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No. _____				WIND.				RAIN.		CLOUDS.				SUNSHINE. Hours.	THERMOMETERS. under Ground.			SEA. Temperature at 1 fathom, and Density.	OZONE. 0—10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.	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.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.											
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. No.	Min. No.	Max. in Sun's rays.	Min. on Grass.	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.		No. 9 inches.	No. 12 inches.	No. 22 inches.						
		No. _____	_____	No. _____	_____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____		No. _____	No. _____	No. _____					No. _____	No. _____
		inches.	"	inches.	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"		"	"	"					"	"
	1	29.58	58	29.74	59	58	39.5			50.5	45	46	44.8	W	SW															1			
29.40	2	29.68	56	29.80	60	57	38			50	46.8	47	44	SW	W															2			
6.8	3	29.77	56	29.73	59	57	32.5			49	46	47.8	44	E	E															3			
	4	29.74	61	29.74	63	58	42.3			53	47	51.8	46	W	W																4		
	5	29.63	61	29.57	62	58.5	45.3			53.5	49.3	53	50	S	S																5		
	6	29.68	62	29.75	62	61	46			54	51	57	54	S	S																6		
	7	29.78	63	29.74	64	62	56			66	57	57	54	S	SW																	7	
	8	29.72	66	29.68	63	62	47			61	57	58	54	W	SW																	8	
	9	29.78	62	29.70	62	57	48			55	53	57	50	SW	W																	9	
	10	29.72	61	29.64	63	59	48			51.5	50	53	50	E	S-E																	10	
	11	29.68	65	29.54	63	60	49			57	54.5	55	51.8	S-E	E																	11	
	12	29.62	65	29.58	65	61	45			57	54.5	55	53	W	S																	12	
	13	29.56	62	29.42	62	58	48			56	55	54.5	52.4	E	S-E																	13	
	14	29.48	62	29.44	63	59	48			57	54	55	53.8	S-W	S-E																	14	
	15	29.74	63	29.52	64	56.8	50			54	53	55	53.5	W	W																	15	
	16	29.72	63	29.78	66	66	51			51	46	58.5	58	W	W																	16	
	17	29.70	66	29.74	67	63	52.5			61	58	56.8	55	W	W																	17	
	18	29.74	63	29.78	66	62	49			57	54	54	51.8	W	W																	18	
	19	29.88	65	29.88	65	64	49			56.8	51.5	58	55	W	W																	19	
X	20	29.85	66	29.62	67	66	47			63.5	57.5	57	56.8	W	W																	20	
	21	29.68	64	29.78	64	60	49			57	52	51	49	W	W																	21	
	22	29.74	64	29.74	65	63	46			55	51	55	50	W	W																	22	
	23	29.72	63	29.78	63	60	47			56	52	54	51	E	E																	23	
	24	29.76	62	29.72	65	62	46			54	51	56	54	W	W																	24	
	25	29.76	63	29.72	63	61	51			56	51	55	51	W	W																	25	
	26	29.67	64	29.86	61	66	47.5			56	49.5	54	48	SW	SW																	26	
	27	29.94	64	29.99	62	63	43			57	52	55	51	SW	SE																	27	
	28	29.88	65	29.78	66	65	50			55	53.5	57	55	W	W																	28	
	29	29.76	63	29.62	64	68	47			55	51	53	49	W	W																		

## NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	us.	" meteors.
ci-cu.	" cirro-cumulus.	u.	" nimbus.
ci-s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" scud.
fr.	" frost.	sl.	" sleet.
h.-fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
hl.	" hail.	sqa.	" squalls.
l.	" lightning.	t.	" thunder.
l. cl.	" light clouds.	t.-s.	" thunder-storm.
l. sh.	" light showers.	w.	" wind.
lu. co.	" lunar corona.	g.	" gale of wind.
lu. ha.	" lunar halo.		

## TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-4.	Common Designation.	Estimated Force, 5-6.	Common Designation.	Estimated Force, 7-8.	Common Designation.
0	Calm	1-5	Light breeze	4	Blowing hard
0.5	Very light air	2	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction for Temp. (Col. 2), = 29.718 - 0.05 = 29.668"Corrected Mean" of Barometer at 9 P.M., minus the Correction for Temp. (Col. 4), = 29.602 - 0.02 = 29.582Mean at Station, corrected, and at 32°, = 29.614Correction for Height, feet, above Mean Sea-level, = 0.296Mean, reduced to 32°, and Sea-level, = 29.910Highest Reading, corrected for Index error, on the 27th, = 29.990Lowest Do., Do., on the 13th, = 29.420Difference, or Monthly Range, = 0.570S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 30th, = 68.0Lowest in Month, corrected for Index errors, on the 3th, = 37.5Difference, or Monthly Range, = 30.5"Corrected Mean" of all the Highest, (Col. 5), = 61.2"Corrected Mean" of all the Lowest, (Col. 6), = 44.0Difference, or Mean Daily Range, = 17.2\*\* Calculated Mean Temperature of Month, = 54.1S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the 11th, = 68.0"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 61.2Lowest at Night, Black Bulb, (corrected for Index errors), on the 13th, = 44.0"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, = 44.0Difference of above Means or Range ("exposed"), = 17.2

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry

Bulb, = 55.0Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 51.4†† Computed Temperature of Dew-point, = 48.0†† Do. Elastic Force of Vapour, = 0.335†† Do. Weight of Vapour in a Cubic Foot of Air, = 3.78†† Relative Humidity, (Saturation = 100), = 77RAIN fell on Days; Amount in Inches, = 1.70

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Mean Velocity in miles per day.
A.M.		1	0	4	1	3	6	13	2	0
P.M.		1	1	3	3	3	2	14	2	0
Mean.		1	1	3	2	3	4	14	2	0

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and  
Return verified by

(Signed)

Present daily range = 22.0 on the 30th

Standing  
June 18th

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  $30^{\circ}$  or  $30^{\circ}$  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 *observation*. The appearance and changes ought to be noted among the *5 Remains*. 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,"  $\frac{6}{10}$  S.W., (for example), will indicate that the upper strata of clouds travel with *westerly* 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 column, an entry of  $\frac{2}{10}$  cu-st. (*cu*., for clouds) 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.

*Staveline*—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 2, 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, 13th, 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 Schülein's or Moffat's papers are used—Moffat's are preferred. 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  $\frac{3}{4}$  S, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as  $\frac{3}{4}$  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 can be made so, so that the most valuable observations that can be made may be put in it. The *Remarks* column is taken up by 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 is recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides such 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, &c. 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 of wind attaining their maximum, as well as such notes on storms as have been limited 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, a 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 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. For these hourly observations separate schedules will be furnished to observers.

The Council have agreed to 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.

(By Order,) A. B.

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. What Mosaic disease prevails among Cattle; and the Agricultural condition of the district generally.

[illegible]

Mr ALEXANDER BUCHAN.

10, *St Andrew Square.*

EDINBURGH

## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at March Hall Park County of Middlesex, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet. During the MONTH of July 1864.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE. ..... 0-10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.	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.	Velocity, (0-6), and Direc- tion.	Amount, (0-10), and Species.	Velocity, (0-6), and Direc- tion.	Amount, (0-10), and Species.	SUNSHINE.  Hours.	9 h. A.M.			Temperature of WELL at Depth of feet. No.					Temperature at 1 fathom, and Density.	9 A.M. 9 P.M.						
		Barometer. No.	Attach- ed Ther- mometer	Barometer. No.	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc- tion.	Force								Direc- tion.	Force	No.								No. 3 inches.	No. 12 inches.	No. 22 inches.			
																									9 h. A.M.											9 h. P.M.	No.	No.
1	29.68	61	29.68	65	60	48			56	49	52	50	W		W															1								
2	29.47	64	29.32	65	65	48			60	57.5	55	53.5	W		W															2								
3	29.47	64	29.64	63	56	48			51	50	54	52	W		8. W															3								
4	29.66	61	29.69	62	61	44			54	51	52	48.5	W		W															4								
5	29.76	62	29.92	63	61	46			55	52	54	53	W		W															5								
6	29.96	63	29.77	62	64	46			55	51	54	51	NE		E															6								
7	30.02	63	30.03	60	62	57			57	53	55	52	W		W															7								
8	29.96	64	30.06	67	66	49			59	55	52	50	E		E															8								
9	30.05	66	29.98	63	61	48			54	52	56	54	E		E															9								
10	30.06	62	30.08	60	58	48			51.5	51	51	49	E		E															10								
11	30.12	61	30.12	59	55	47			50.5	48.5	51	48.5	E		E															11								
12	30.03	62	30.04	63	58	48			51	48.5	51	48	E		E															12								
13	29.94	61	29.94	63	60	46			50.5	49	52	51	SE		E															13								
14	29.97	64	29.97	64	62	52			52	51	54	53	E		E															14								
15	29.92	63	29.95	65	63	47			53	50	56	44	E		SE															15								
16	29.94	65	29.94	68	71	47			61	59	62	58	SE		W															16								
17	29.98	67	29.98	68	73	47			59	55	65	61	W		W															17								
18	29.94	71	29.94	72	79	57			65	61	65	61	W		W															18								
19	29.96	72	29.93	75	74	55			64.5	58	64	60	W		W															19								
20	29.92	72	29.88	70	66	52			64.5	60	63	59	W		W															20								
21	29.64	70	29.59	66	66	55			61	59	59	56	W		W															21								
22	29.58	67	29.68	66	64	51			57	54	55	51	W		W															22								
23	29.73	66	29.68	66	61	50			57	52	59	53	W		SW															23								
24	29.62	65	29.54	67	61	51			57	54.5	54	51	SW		W															24								
25	29.58	62	29.55	66	62	49			56.5	52	56	54	W		SW															25								
26	29.59	64	29.76	64	65	45			58	53	56	51	W		W															26								
27	29.77	65	29.67	67	64	51			61	66	59	55	W		SW															27								
28	29.56	65	29.62	67	67	54			52.5	51	56	54	E		S															28								
29	29.74	66	29.78	66	66	52			58	56	59	56	SW		W															29								
30	29.76	67	29.83	69	68	56			65	63	59	57	W		W															30								
31	29.82	68	29.46	66	66	55			61	55	62	59	SW		S															31								
Sums.	2016	511	4017	1616	1214	17			723		2014	121																										
	2520	203	252	4202	1985	1551			17674	1666	1752	1654	8																									
Means.	29.813	65.0	29.814	65.7	64.0	50.0			57.0	53.7	56.5	53.4																										
Total rections Instru- mental errors.																																						
Correc- tions for urnal ange.																																						
Cor- ected eans."																																						
No. of olumn.	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							

## NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	cirrus.	ms.	meteors.
ci-cu.	cirro-cumulus.	n.	nimbus.
ci-s.	cirro-stratus.	r.	rain.
cu.	cumulus.	h. r.	heavy rain.
cu-s.	cumulo-stratus.	c. h. r.	continued heavy rain.
d.	dew.	s.	stratus.
f.	fog.	sc.	scud.
fr.	frost.	sl.	sleet.
h. fr.	hoar-frost.	sn.	snow.
h.	haze.	so. ha.	solar halo.
h. d.	heavy dew.	sq.	squall.
hl.	hail.	sq.	squalls.
l.	lightning.	t.	thunder.
li. cl.	light clouds.	t-s.	thunder-storm.
li. sh.	light showers.	w.	wind.
lu. co.	lunar corona.	g.	gale of wind.
lu. ha.	lunar halo.		

## TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.
0	Calm	1.5	Light breeze	4	Blowing hard
0.5	Very light air	2	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction++ = 29.716  
for Temp. (Col. 2), = 29.813 - 0.097.....  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ = 29.716  
for Temp. (Col. 4), = 29.814 - 0.098.....  
Mean at Station, corrected, and at 32°, = 29.716  
Correction for Height, feet, above Mean Sea-level, = 29.6  
Mean, reduced to 32°, and Sea-level, = 30.012  
Highest Reading, corrected for Index error, on the 11 th, = 30.120  
Lowest Do., Do., on the 2 th, = 29.320  
Difference, or Monthly Range, = 0.800

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 18 th, = 79.0  
Lowest in Month, corrected for Index errors, on the 4 th, = 44.0  
Difference, or Monthly Range, = 35.0  
"Corrected Mean" of all the Highest, (Col. 5), = 64.0  
"Corrected Mean" of all the Lowest, (Col. 6), = 50.0  
Difference, or Mean Daily Range, = 14.0  
\*\* Calculated Mean Temperature of Month, = 57.0

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the th, =  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =  
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =  
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, =  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 56.8  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 53.6  
Computed Temperature of Dew-point, = 50.6  
Do. Elastic Force of Vapour, = 3.69  
Do. Weight of Vapour in a Cubic Foot of Air, = 4.12  
Relative Humidity, (Saturation = 100), = 80  
RAIN fell on 7 Days; Amount in Inches, = 1.60

WIND.		SUMMARY.										
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.	
A.M.	1	1	8	2	0	4	14	1	0			
P.M.	2	0	8	1	2	3	14	1	0			
Mean.	2	0	8	1	1	4	14	1	0			

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and  
Return verified by

(Signed)

Greatest daily Range = 24.0 on 17th

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, 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. It is hoped that the utmost care will be taken at the top of the observatory. 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-sized Barometers have been approved of by the Council; if properly tested and attended to, they are both well adapted for 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-tubes* 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 the 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-tube* 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 *center*.

When a Barometer, having adjustable surfaces has to be removed from its fastenings, the ivory p-*g* must be screwed so as to form a tight plug to the cistern. Then *raise* 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 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 bars forming the sides and doors of the Boxes are arranged so as to open to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-sticks 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's, and Negretti and Zambra's Patent "Aneroid" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "Maximum." This Thermometer is liable to two demerits, 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 the spirit splits by high temperature, it will be found in part of the spirit globe, 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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 alcohol by distillation.

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes, that has not been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are not graduated on these, 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 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 Society.

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 are specially vitiate the "Hygrometrical Deductions," Observers are requested to attend to the following conditions:—The bulbs must *hang down*, by at least an inch 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 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 frame mentioned 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°·9, 40°·0, or 40°·1; or again, 40°·4, 40°·3, or 40°·6, according as it indicates a little under, an exact coincidence with, or a little over 40°; or 40°·3, respectively. So also 40°·1, and 40°·7 or 40°·6 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 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 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.

Current 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 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 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.

**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, and the readings entered in the returns on the day 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 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 Lake Howard's

OBSERVATIONS.

structure 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 appearance 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," 2, W., 3 (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 2,  $\alpha\alpha\pi\pi$  (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 Schönbain's or Moffat's papers are used—Moffat's are preferred. 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, as the time of observation, in the following manner:—thus 3,  $\alpha$ , 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 borealis, 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 limited 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 observations, 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 purposes, 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. For these hourly observations separate schedules will be furnished to observers. 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 have agreed to 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.

(By Order,) A. B.

Enacted, 4th December 1863.

BOOK-POST.

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

Mr ALEXANDER BUCHAN,

FOREST TREES.		FRUIT.		MIGRATORY BIRDS.		First Arrival.		First Departure.	
In flower.	First in bloom.	In leaf.	First in bloom.	First in bloom.	First in bloom.	First in bloom.	First in bloom.	First in bloom.	First in bloom.
Alder, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aspen, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Beech, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Birch, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Elm, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Larch, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lincoln, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oak, .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
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## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *March Hall park* County of *Midlothian*, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.

Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet.

During the MONTH of *August* 186*4*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.				Temperature of Water at depth of feet. No.	SEA. Temperature at 1 fathom, and Density.	OZONE. ..... 0-10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.	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.		No. of hours in which it fell.	Amount in inches. No.	9 A.M.		P.M.		9 h. A.M.			Temperature at 1 fathom, and Density.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		Barometer. No.	Attach- ed Ther- mometer	Barometer. No.	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc- tion.	Force			Direc- tion.	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.	No.						3 inches.	No.	12 inches.	No.	24 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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## NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	"	ms.	"
ci-cu.	"	n.	"
ci-s.	"	r.	"
cu.	"	h. r.	"
cu-s.	"	o. h. r.	"
d.	"	s.	"
f.	"	sc.	"
fr.	"	st.	"
h. fr.	"	sn.	"
h.	"	so. ha.	"
h. d.	"	sq.	"
h. l.	"	sq.	"
l.	"	sq.	"
li. cl.	"	t.	"
li. sh.	"	t-s.	"
lu. co.	"	w.	"
lu. ha.	"	g.	"

## TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.
0	Calm	1.5	Light breeze	4	Blowing hard
0.5	Very light air	2	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction  $^{+}$  = *29.89815*  
for Temp. (Col. 2), = *29.89815* - *0.023* = *29.87515*  
"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction  $^{+}$  = *29.792*  
for Temp. (Col. 4), = *29.792* - *0.027* = *29.765*  
Mean at Station, corrected, and at 32°, = *29.843*  
Correction for Height, feet, above Mean Sea-level, = *29.6*  
Mean, reduced to 32°, and Sea-level, = *30.138*  
Highest Reading, corrected for Index error, on the *15* th, = *30.390*  
Lowest Do., Do., on the *29* th, = *29.290*  
Difference, or Monthly Range, = *1.100*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the *13* th, = *74.0*  
Lowest in Month, corrected for Index errors, on the *27* th, = *40.0*  
Difference, or Monthly Range, = *34.0*  
"Corrected Mean" of all the Highest, (Col. 5), = *62.6*  
"Corrected Mean" of all the Lowest, (Col. 6), = *47.1*  
Difference, or Mean Daily Range, = *15.5*  
\*\* Calculated Mean Temperature of Month, = *54.8*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the \_\_\_\_\_ th, = \_\_\_\_\_  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = \_\_\_\_\_  
Lowest at Night, Black Bulb, (corrected for Index errors), on the \_\_\_\_\_ th, = \_\_\_\_\_  
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, = \_\_\_\_\_  
Difference of above Means or Range ("exposed"), = \_\_\_\_\_

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *55.4*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *57.8*  
Computed Temperature of Dew-point, = *48.4*  
Do. Elastic Force of Vapour, = *339.341*  
Do. Weight of Vapour in a Cubic Foot of Air, = *3.82*  
Relative Humidity, (Saturation = 100), = *78*

RAIN fell on		Days; Amount in Inches,		..... = 1:10							
WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	0	0	9	2	1	8	11	0	0		
P.M.	0	2	6	6	2	2	10	1	2		
Mean.	0	1	8	4	2	3	10	0	1		

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, 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 to 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-sized 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 great 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 *zenith*.

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 *scrape* 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 upright. 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 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 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's, and Negretti and Zamboni's Patent "*Maximum*" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of 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 *columns* of spirit breaks, it may be re-secured 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards rather than the other.

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 alcohol by distillation.

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes, that has not 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 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 "*Hygrometric* 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 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 decimals. 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  $40^{\circ}.1$ , respectively. So also  $40^{\circ}.1$  and  $40^{\circ}.2$  or  $40^{\circ}.7$  or  $40^{\circ}.8$  respectively, in reading Rutherford's "*Max.*" and "*Min.*" Thermometers. In the case of the "*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 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, 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.

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 important Stations, would be likely to give highly interesting and important results.

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 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.

**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, and the readings entered in the returns on the day 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*," 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, 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  $20^{\circ}$  or  $30^{\circ}$  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*," 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  $\frac{2}{4}$ , S.E., (*cap*) 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 time 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 Schönbien's or Moffat's papers are used—Moffat's are preferred. 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  $3^{\circ}$ , as an ozone entry in the schedule, will indicate that the ozone paper is tinted as " $\beta$ " on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is " $\beta$ ," 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 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 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 *year-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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 have agreed to 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.

(By Order,) A. B.

EDINBURGH, 30th December 1863.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.		In Flower.	In Leaf Buds first appear.	In Leaf.	Dressed of Leaves.	CROPS.	Sowing or Planting.	Appearance or above Ground.	In Kar.	First Cut.
Alder, .....						Barley, .....				
Asb., .....						Bare or Higgs, .....				
Beech, .....						Oats, .....				
Birch, .....						Wheat, .....				
Elm, .....						Beans, .....				
Larch, .....						Pease, .....				
Trinity, .....						Potatoes, .....				
Oak, .....						Turnips, .....				
Sycamore or Plane, .....						Rye Grass, .....				

SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit ripe generally.	MIGRATORY BIRDS.	First Arrival.	Departure.								
Barberry, .....	Apple, .....	Black Currant, .....	Cuckoo, .....	House-Swallow, .....	Lapwing, .....	Plover, .....	Sand-Martin, .....	Starling, .....	Swan, .....	Rail or Corn Crake, .....	Other Birds, naming them, .....	Mountain Ash or Rowan, .....	Red Flowering Currant, .....	Rhododendron Ponticum, .....	Viburnum, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Broom, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....	Hawthorn, .....	Boureaux or Elder, .....
Boureaux or Elder, .....	Black Currant, .....	Cherry, .....	Hazel, .....	Gean, .....	Gooseberry, .....	Pear, .....	Plum, .....	Strawberry, .....	Alsearoon, .....	Ilac, .....	Laburnum, .....	Holly, .....	Broom, .....		

## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *March Hall*, County of *Midlothian*, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet. During the MONTH of *September* 186*4*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.	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.		9 h. A.M.		9 h. P.M.		No. of hours in which it fell.	Amount in inches.  No.	9 A.M.		P.M.		9 h. A.M.								
		Barometer. * No.	Attach- ed Ther- mometer.	Barometer. No.	Attach- ed Ther- mometer.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc- tion.	Force	Direc- tion.	Force			Velocity, (0-5), and Direc- tion.	Amount, (0-10), and Species.	Velocity, (0-10), and Direc- tion.	Amount, (0-10), and Species.	No.	No.	No.						
																															Readings of the H-Cup Anemometer. No.	
		inches.	"	inches.	"	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.					No.	No.
1	29-38	60	29-38	62	63	48			55	50	58	55	W		SW												1					
2	29-58	64	29-61	65	66	50			55	51	54	51	W		W			4									2					
3	29-56	63	29-54	66	67	50			55	52	56	54	SW		W			7									3					
4	29-66	62	29-46	64	61	46			54	51	54	52	E		SW												4					
5	29-44	60	29-72	63	60	48			55	50	52	49	SW		W												5					
6	29-66	58	29-54	62	59	47			51	51	54	50	SW		W												6					
7	29-73	59	29-58	65	65	46			55	49	61	58	W		SW												7					
8	29-56	61	29-66	64	63	51			57	53	55	51	W		W												8					
9	29-32	65	29-58	62	65	50			65	62	53	50	W		SW			7									9					
10	29-68	60	29-58	61	59	46			57	53	49	47	W		E												10					
11	29-56	59	29-68	62	57	49			50	47	51	48	E		SW												11					
12	29-76	58	29-72	60	58	43			50	46	50	47	W		W												12					
13	29-44	59	29-58	63	58	44			54	51	54	52	W		E												13					
14	29-51	59	29-34	62	58	47			56	54	50	48	W		W												14					
15	29-41	58	29-37	61	59	41			55	52	54	50	W		SE												15					
16	29-27	59	29-24	60	56	49			53	51	50	49	E		S			4									16					
17	29-26	58	29-33	60	58	42			55	54	51	47	S		SW			7									17					
18	29-33	59	29-34	62	58	49			54	51	53	52	SW		SW												18					
19	29-44	60	29-64	62	60	48			53	51	52	50	W		W												19					
20	29-66	60	29-55	64	56	43			51	49	53	50	SW		E												20					
21	29-47	60	29-48	63	59	46			52	50	54	51	SW		W												21					
22	29-47	61	29-55	62	60	46			55	53	56	51	SW		W												22					
23	29-68	60	29-62	64	59	47			55	51	53	52	W		W												23					
24	29-88	62	30-04	65	58	48			54	51	53	50	SW		W			1-0									24					
25	30-08	62	30-12	65	59	42			52	50	55	54	E		SW												25					
26	30-12	64	30-12	66	63	51			59	57	54	52	SW		W												26					
27	30-08	63	30-08	65	60	45			51	50	54	52	E		E												27					
28	30-12	62	30-07	64	60	48			55	53	51	48	W		W												28					
29	29-97	62	29-98	66	61	47			56	54	52	50	W		W												29					
30	30-05	65	30-06	63	58	40			49	47	43	42	E		E												30					
31																											31					
Sums.		1416	12	1316	9	15	14			12	8	9	10					2.40														
Means.		29.650	57.4	29.661	63.1	59.646	4			54.351	55.305	50.4																				
† Total corrections for Instru- mental Errors.																																
Correc- tions for Diurnal Range.																																
"Cor- rected 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

## NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	ms.	" meteor.
ci-cu.	" cirro-cumulus.	n.	" nimbus.
ci-s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" squall.
fr.	" frost.	sl.	" sleet.
h. fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
hl.	" hail.	sq.	" squall.
l.	" lightning.	t.	" thunder.
l. cl.	" light clouds.	t-s.	" thunder-storm.
l. sh.	" light showers.	w.	" wind.
lu. co.	" lunar corona.	g.	" gale of wind.
lu. ha.	" lunar halo.		

## TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-10.	Common Designation.	Estimated Force, 0-10.	Common Designation.	Estimated Force, 0-10.	Common Designation.
0	Calm	1.5	Light breeze	4	Blowing hard
0.5	Very light air	2	Fresh breeze	5	Blowing a gale
1	Light air	3	Fresh breeze	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the correction for Temp. (Col. 2), = *29.650* - *0.068* = *29.582* 574  
"Corrected Mean" of Barometer at 9 P.M., minus the correction for Temp. (Col. 4), = *29.581* - *0.065* = *29.516* 570  
Mean at Station, corrected, and at 32°, = *29.585* 572  
Correction for Height, feet, above Mean Sea-level, = *29.6* 296  
Mean, reduced to 32°, and Sea-level, = *29.885* 868  
Highest Reading, corrected for Index error, on the 25th, = *30.120*  
Lowest Do., Do., on the 16th, = *29.240*  
Difference, or Monthly Range, = *0.880*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 7th, = *65.0*  
Lowest in Month, corrected for Index errors, on the 30th, = *40.0*  
Difference, or Monthly Range, = *25.0*  
"Corrected Mean" of all the Highest, (Col. 5), = *59.6*  
"Corrected Mean" of all the Lowest, (Col. 6), = *46.4*  
Difference, or Mean Daily Range, = *13.2*  
\*\* Calculated Mean Temperature of Month, = *53.0*

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected for Index Errors), on the 7th, = \_\_\_\_\_  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = \_\_\_\_\_  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 16th, = \_\_\_\_\_  
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = \_\_\_\_\_  
Difference of above Means or Range ("exposed"), = \_\_\_\_\_

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *53.6*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *51.0*  
†† Computed Temperature of Dew-point, = *48.5*  
†† Do. Elastic Force of Vapour, = *1.339*  
†† Do. Weight of Vapour in a Cubic Foot of Air, = *3.824*  
†† Relative Humidity, (Saturation = 100), = *82*

RAIN fell on \_\_\_\_\_ Days; Amount in Inches, = *2.40*

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.
A.M.		0	0	6	0	1	9	14	0	0
P.M.		0	0	2	1	1	7	15	1	3
Mean.		0	0	4	1	1	8	14	0	2

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by \_\_\_\_\_

(Signed) \_\_\_\_\_

*Greatest daily Range = 19.0 on 7th*



SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at March Hall, County of Midlothian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.

Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet. During the MONTH of October 1864.  
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				SUNSHINE.	THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.	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.		9 h. A.M.		9 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.			P.M.		9 h. A.M.					Temperature of WELL at Depth of feet. No.	Temperature at 1 fathom and Density.	0-10.  0 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
		Barometer. * No.	Attach- ed Ther- mometer.	Barometer. No.	Attach- ed Ther- mometer.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc- tion.	Force	Direc- tion.	Force	No.				Velocity (0-6), and Direc- tion.	Amount, (0-10), and Species.		Velocity (0-6), and Direc- tion.	Amount, (0-10), and Species.	No.								No.	No.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
																		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.	3 inches.	12 inches.	23 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	ms.	" meteors.
ci-cu.	" cirro-cumulus.	n.	" nimbus.
cl-s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" scud.
fr.	" frost.	sl.	" sleet.
h-fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
hl.	" hail.	sq.s.	" squalls.
l.	" lightning.	t.	" thunder.
li. cl.	" light clouds.	t-s.	" thunder-storm.
li. sh.	" light showers.	w.	" wind.
lu. co.	" lunar corona.	g.	" gale of wind.
lu. ha.	" lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-5	Common Designation.	Estimated Force, 6-9	Common Designation.	Estimated Force, 10-15	Common Designation.
0	Calm	1-5	Light breeze	4	Blowing hard
0.5	Very light air	2	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M. 29.777 the Correction ++ = 29.777  
for Temp. (Col. 2), = 29.777 - 0.068 = 29.709  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ = 29.714  
for Temp. (Col. 4), = 29.790 - 0.076 = 29.714  
Mean at Station, corrected, and at 32°, = 29.706  
Correction for Height, feet, above Mean Sea-level, = 29.6  
Mean, reduced to 32°, and Sea-level, = 30.002  
Highest Reading, corrected for Index error, on the 2 th, = 30.260  
Lowest Do., Do., on the 20 th, = 28.240  
Difference, or Monthly Range, = 1.770

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 7 th, = 57.0  
Lowest in Month, corrected for Index errors, on the 21 th, = 31.0  
Difference, or Monthly Range, = 26.0  
"Corrected Mean" of all the Highest, (Col. 5), = 57.0  
"Corrected Mean" of all the Lowest, (Col. 6), = 39.7  
Difference, or Mean Daily Range, = 11.3  
\*\* Calculated Mean Temperature of Month, = 46.4  
S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the th, =  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =  
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =  
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, =  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 46.1  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 44.4  
†† Computed Temperature of Dew-point, = 42.5  
†† Do. Elastic Force of Vapour, = 27.3  
†† Do. Weight of Vapour in a Cubic Foot of Air, = 3.16  
†† Relative Humidity, (Saturation = 100), = 88  
RAIN fell on 16 Days; Amount in Inches, = 6.10

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	0	0	1	4	0	2	7	0	0		
P.M.	1	0	3	0	2	9	0	3			
Mean.	0	0	1.5	4	0	2	8	0	2		

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by \_\_\_\_\_

(Signed)

Greatest daily range = 20° on the 7th



SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Arch Hall, County of Midlothian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.

Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet. During the MONTH of November 1864.  
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				SUNSHINE. Hours.	THERMOMETERS. under Ground.			SEA. Temperature and Density.	OZONE. 0-10. 9 A.M. 9 P.M.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.	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.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.											
		Barometer. * No.	Attached Thermometer	Barometer. No.	Attached Thermometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force	Direction.	Force	No. of hours in which it fell.	Amount in inches. No.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.		No. 3 inches.	No. 12 inches.	No. 22 inches.						
		inches.	inches.	inches.	inches.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.		No.	No.	No.					No.	No.
		No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.		No.	No.	No.					No.	No.
	1	30.12.53	30.13.55	55	45	38			41	40	43	41	E	SE																1			
	2	30.07.52	30.05.56	56	46	38			41	39	42	42	E	W																2			
	3	30.06.53	30.14.57	57	50	38			44	42	48	46	W	W																3			
	4	30.02.53	30.04.58	58	56	41			47	44	52	51	W	W																4			
	5	30.22.55	30.41.58	51	40				46	44	45	40	W	E			R 0.1													5			
	6	30.48.51	30.42.54	42	32				36	34	39	37	W	SW																6			
	7	30.13.50	29.98.55	47	36				44	41	46	45	W	W			R													7			
	8	30.02.51	30.11.54	45	37				41	38	41	40	W	E																8			
	9	30.05.49	29.98.53	42	32				34	32	38	37	W	SW																9			
	10	29.92.47	29.86.50	46	29				34	33	37	36	W	E																10			
	11	29.82.49	29.76.53	40	31				36	35	38	37	SW	W																11			
	12	29.64.47	29.57.50	41	31				36	35	34	32	W	E			R 0.1													12			
	13	29.28.48	29.03.52	46	29				38	37	45	44	SE	E			R 0.4													13			
	14	28.86.51	28.85.54	47	40				45	44	44	43	E	NE			R													14			
	15	28.94.52	29.12.54	45	39				45	44	44	43	NE	E			R													15			
	16	29.29.51	29.34.53	43	32				35	34	34	33	E	E																16			
	17	29.12.48	28.93.53	46	31				29	28	46	45	SE	E			R													17			
	18	28.92.52	29.18.54	47	42				47	45	47	46	E	S			R													18			
	19	29.32.51	29.43.55	49	38				40	39	44	43	S	E			R 0.4													19			
	20	29.42.50	29.51.51	46	40				45	43	44	43	E	SW																20			
	21	29.54.53	29.46.56	49	40				46	44	47	45	S	SE			R													21			
	22	29.33.53	29.28.53	49	39				42	41	42	42	E	SW			R													22			
	23	29.34.51	29.42.54	48	38				41	39	36	35	W	W																23			
	24	29.38.50	29.16.53	48	31				36	35	42	41	SW	W			R													24			
	25	29.09.50	28.34.51	42	34				40	38	39	38	SW	SW			R													25			
	26	28.86.51	29.98.51	41	35				38	37	38	37	W	SW			R 0.4													26			
	27	29.32.48	29.42.52	45	36				41	39	42	41	SW	E			R													27			
	28	29.29.52	29.51.53	52	39				50	49	42	40	W	SW			R													28			
	29	29.83.49	29.94.54	54	36				40	38	47	45	W	W			R													29			
	30	29.46.52	29.54.52	54	40				48	47	43	41	W	W			R													30			
	31																													31			
	Sums.	1213	510	1312	510	414	312		412	315	414	410					140																
	Means.	29.572	50.829	53.546	735.9				41.239	642.241	0																						
	Total Corrections for Instrumental Errors.																																
	Corrections for Diurnal Range.																																
	"Cor- rected 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	

NOTATION USED IN GENERAL REMARKS.			
a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	ms.	" meteors.
ci-cu.	" cirro-cumulus.	n.	" nimbus.
ci-s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" squall.
fr.	" frost.	sl.	" sleet.
h. fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
hl.	" hail.	sqs.	" squalls.
l.	" lightning.	t.	" thunder.
l. cl.	" light clouds.	t-s.	" thunder-storm.
l. sh.	" light showers.	w.	" wind.
lu. co.	" lunar corona.	g.	" gale of wind.
lu. ha.	" lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.							
Estimated Force, 0-6.		Common Designation.		Estimated Force, 0-6.		Common Designation.	
0	Calm	1.5	Light breeze	4	Blowing hard		
0.5	Very light air	2	Fresh breeze	5	Blowing a gale		
1	Light air	3	Very fresh	6	Violent gale		

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction++ = 29.515  
for Temp. (Col. 2), = 29.572 - 0.057  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ = 29.524  
for Temp. (Col. 4), = 29.589 - 0.065  
Mean at Station, corrected, and at 32°, = 29.520  
Correction for Height, feet, above Mean Sea-level, = 29.6  
Mean, reduced to 32°, and Sea-level, = 29.816  
Highest Reading, corrected for Index error, on the 6 th, = 30.480  
Lowest Do., Do., on the 28 th, = 28.340  
Difference, or Monthly Range, = 2.140

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 4 th, = 56.0  
Lowest in Month, corrected for Index errors, on the 10 th, = 29.0  
Difference, or Monthly Range, = 27.0  
"Corrected Mean" of all the Highest, (Col. 5), = 46.7  
"Corrected Mean" of all the Lowest, (Col. 6), = 35.9  
Difference, or Mean Daily Range, = 10.8  
\*\* Calculated Mean Temperature of Month, = 41.3

S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected for Index Errors), on the th, = \_\_\_\_\_  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = \_\_\_\_\_  
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, = \_\_\_\_\_  
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, = \_\_\_\_\_  
Difference of above Means or Range ("exposed"), = \_\_\_\_\_

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 41.7  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 40.3  
Computed Temperature of Dew-point, = 38.6  
Do. Elastic Force of Vapour, = 2.35  
Do. Weight of Vapour in a Cubic Foot of Air, = 2.72  
Relative Humidity, (Saturation = 100), = 90  
RAIN fell on 15 Days; Amount in Inches, = 1.00

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		4	1	7	2	2	2	14	8	A	
P.M.		2	1	7	2	1	4	7	3	3	
Mean.		3	1	7	2	2	3	8	2	2	

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by \_\_\_\_\_

(Signed) \_\_\_\_\_

Greatest daily range = 18.8 on the 29th

P

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 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 incommensurable, 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 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. 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* may 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 *scrape* 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 *slight 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 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 to 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'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 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-unioned 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 globe, and must be discoloured from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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 alcohol by distillation.

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes that has not been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers 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 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 Society.

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 seats 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.

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 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 40½, and 40¾, more or less, must be registered 40°·2 and 40°·3, and 40°·7 and 40°·8 respectively. In reading Rutherford's "*Max.*" and "*Min.*" Thermometers, the indication of that end of the *tube* 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 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 must be taken; and when it is stationary, and always when the wind is feeble, references must be made to the direction of the lower strata of clouds overhead, and to the direction of smoke, &c.

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 important Stations, would be likely to give highly interesting and important results.

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 at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, the 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.

**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, and the readings entered in the returns on the day 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 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 detection or inference.

**Clouds.**—Convenient abbreviations for Lake Howarth'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," 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 2, ca-se., (*ca*) will indicate that the higher regions are covered to the "anent" 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 Schönbien's or Moffat's papers are used—Moffat's are preferred. 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 3½, 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, &c. 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 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 *year-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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 have agreed to 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.

(By Order.) A. B.

Edinburgh, 9th December 1864.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	Alder,	Ash,	Beech,	Elm,	Larch,	Lim,	Oak,	Sycamore or Plane,
In Flower.								
First Buds.								
In Leaf.								
Dissected of Leaves.								
CROPS.	Barley,	Bere or Bidge,	Oats,	Wheat,	Beans,	Peas,	Potatoes,	Rye Grass,
Planting.								
Sowing or Above Ground.								
Aperting or In Ear.								
First Cut or Harvest.								

SHRUBS, ETC.	Barberry,	Bourtree or Elder,	Broom,	Hazel,	Hawthorn,	Holly,	Laburnum,	Lilac,	Mazeron,	Mountain Ash or Rowan,	Red Flowering Currant,	Rhododendron Ponticum,	Whin,
First in Blossom.													
In Blossom.													
First in Fruit.													
First in Blossom.													
MIGRATORY BIRDS.	Chukco,	Curlew,	House-Swallow,	Lapwing,	Plover,	Sand-Martin,	Starling,	Swan,	Tail or Corn Crake,	Other Birds, naming them.	First Departure.	First Arrival.	First Departure.
First in Blossom.													
In Blossom.													
First in Fruit.													
First in Blossom.													

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; or whether any have suffered from blight, disease, etc. Whether Epizootic disease prevails among Cattle; and the Agricultural condition of the district generally.

BOOK-POST.

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

Mr ALEXANDER BUCHAN,

To

Edinburgh  
Nov. 1864

# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at March Hall, County of Middlethian, in Lat. \_\_\_\_\_, Long. \_\_\_\_\_, Distance from Sea \_\_\_\_\_ miles.

Height of Cistern of the Barometer above Mean Sea-level \_\_\_\_\_ feet, above Ground \_\_\_\_\_ feet. During the MONTH of December 1864.  
The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read daily, at 9 P.M.				HYGROMETER. No.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms began and ended.		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.		9 h. A.M.		9 h. P.M.		Readings of the H-Cup Anemometer.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
		Barometer. * No.	Attach- ed Ther- mometer	Barometer. No.	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direc- tion.	Force	Direc- tion.	Force	No.	9 h. A.M.			9 h. P.M.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-5), and Direction.	Amount, (0-10), and Species.						Hours.	No. 3 Inches.	No. 12 Inches.	No. 22 Inches.	Temperature of WELL at Depth of feet No.	Temperature at 1 fathom, and Density.	0-10. 9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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NOTATION USED IN GENERAL REMARKS.									
a.	denotes aurora.	m.	denotes meteor.						
ci.	cirrus.	ms.	meteo.						
ci-cu.	cirro-cumulus.	n.	nimbus.						
cu.	cumulus.	r.	rain.						
cu-s.	cumulo-stratus.	h. r.	heavy rain.						
d.	drizzle.	c. h. r.	continued heavy rain.						
f.	fog.	s.	stratus.						
fr.	frost.	sc.	scud.						
h.-fr.	hoar-frost.	sl.	sleet.						
h.	haze.	sn.	snow.						
h. d.	heavy dew.	so. ha.	solar halo.						
hl.	hail.	sq.	squall.						
l.	lightning.	squ.	squalls.						
li. cl.	light clouds.	t.	thunder.						
li. sh.	light showers.	t.-s.	thunder-storm.						
lu. cu.	lunar corona.	w.	wind.						
lu. ha.	lunar halo.	g.	gale of wind.						

TABLE FOR ESTIMATING FORCE OF WIND.					
Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.	Estimated Force, 0-6.	Common Designation.
0	Calm	1-5	Light breeze	4	Blowing hard
0.5	Very light air	2	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction++ for Temp. (Col. 2), = 29.702  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ for Temp. (Col. 4), = 29.699  
Mean at Station, corrected, and at 32°, = 29.700  
Correction for Height, feet, above Mean Sea-level, = 29.6  
Mean, reduced to 32°, and Sea-level, = 29.996  
Highest Reading, corrected for Index error, on the 23 th, = 30.380  
Lowest Do., Do., on the 18 th, = 29.250  
Difference, or Monthly Range, = 1.130

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 5 th, = 58.0  
Lowest in Month, corrected for Index errors, on the 31 th, = 25.0  
Difference, or Monthly Range, = 33.0  
"Corrected Mean" of all the Highest, (Col. 5), = 43.9  
"Corrected Mean" of all the Lowest, (Col. 6), = 34.8  
Difference, or Mean Daily Range, = 9.1  
\*\* Calculated Mean Temperature of Month, = 39.4  
S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index Errors), on the th, = \_\_\_\_\_  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = \_\_\_\_\_  
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, = \_\_\_\_\_  
"Corrected Mean," (Col. 8), of Black Bulb Min. on grass, = \_\_\_\_\_  
Difference of above Means or Range ("exposed"), = \_\_\_\_\_

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 40.4  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 38.7  
Computed Temperature of Dew-point, = 36.5  
Do. Elastic Force of Vapour, = 216  
Do. Weight of Vapour in a Cubic Foot of Air, = 2.50  
Relative Humidity, (Saturation = 100), = 87  
RAIN fell on 20 Days; Amount in Inches, = 1.80

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		0	0	13	1	2	4	11	0	0	
P.M.		0	2	6	5	1	5	12	0	0	
Mean.		0	1	10	3	2	4	11	0	0	

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by \_\_\_\_\_

(Signed) \_\_\_\_\_

Greatest daily range = 14.0° on the 9th

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 fall 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 the action 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 *venier*.

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 stop 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 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 *venier*, 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 to 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'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 Rudolph 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 *columns* of spirit breaks, it may be repaired 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. This instrument must be hung perfectly horizontal; the bulb and should incline slightly downwards, rather than the other.

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 "*Minimum*" should be freely exposed to the Sun, and the "*Maximum*" 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 alcohol by distillation.

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes, that has not 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 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 Society.

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *calibrated* 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 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 "*Wason'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 decimals. Thus the Thermometer will be read—39°·0, 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 40°·5, respectively. So also 40°·2, and 40°·3, more or less, must be registered 40°·2 or 40°·3, and 40°·4 or 40°·8 respectively. In reading Rudolph'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 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 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, &c.

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 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 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.

**Rain-gauges.**—Many causes conspire to produce anomalies in rain returns. They arise, 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, and the readings entered in the returns on the day 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 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

nonenclature 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 appearance 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," 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  $\frac{2}{4}$ , sc., (*sc.*) 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 Schönbien's or Moffat's papers are used—Moffat's are preferred. 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°, as an ozone entry in the schedule, will indicate that the ozone paper is fixed 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, &c. 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 of wind attaining their maximum, as well as such notes on storms as have been limited 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 on a scale of crops, to specified sorts reared from year to year in the 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. For these hourly observations separate schedules will be furnished to observers. 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 have agreed to 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.

(By Order.) A. B.

Edinburgh, 24th December 1861.

FOREST TREES.		FRUITS.		MIGRATORY BIRDS.	
In flower.	In leaf.	First in blossom.	First in fruit.	First in flight.	First in flight.
Alder.	Barley.	Apple.	Cuckoo.	Cuckoo.	Cuckoo.
Aspen.	Black Currant.	Black Currant.	House-Swallow.	House-Swallow.	House-Swallow.
Beech.	Gooseberry.	Gooseberry.	Lavender.	Lavender.	Lavender.
Birch.	Holly.	Holly.	Sand-Martin.	Sand-Martin.	Sand-Martin.
Elm.	Laburnum.	Laburnum.	Swallow.	Swallow.	Swallow.
Larch.	Mountain Ash or Rowan.	Mountain Ash or Rowan.	Other Birds, naming them.	Other Birds, naming them.	Other Birds, naming them.
Oak.	Rhododendron Ponticum.	Rhododendron Ponticum.	Whin.	Whin.	Whin.
Sycamore or Plane.	Strawberry.	Strawberry.			

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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, etc., whether Epizootic disease prevails among Cattle; and the Agricultural condition of the district generally.

BOOK-POST.

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

Mr ALEXANDER BUCHAN,

To

March Hall,  
Edinburgh  
Dec 1861