

79

Height of Cistern of the Barometer above Mean Sea-level 270 feet, above Ground 20 feet.

During the MONTH of January 1863

The Hours of Observation are of Greenwich Time.

[illegible]

N.B.—The Sums to be correctly added, and the Means deducted. 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 = $20^{\circ}4$ on the 22nd

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the objects of immediate importance, that the Scotch 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 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 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 means for adjustment of compensation, as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer should have been compared with a Standard.

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

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

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

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

In taking an observation, the attached Thermometer is first noted; the tube must then be gently tapped and the cistern adjusted carefully made. By raising and lowering the eye, it must be 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 be at once "protected" 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 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 marked 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 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. A lens such as 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 well-tested form of this apparatus seriously vitiate the Hygrometrical Detentions, 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. Thus the Thermometer will be read 38°·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°·5, respectively. So also 40½, and 40¾, more or less, must be registered 40·2 or 40·3, and 40·4 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 importance 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.

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 Horizontal 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 are 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 depth of 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 indicated 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 nomen-

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	IN FLOWERS.	LEAFY BIRDS.	CROPS.	PLANTING.	SOILING OR ABOVE GROUND.	APPEARING.	IN FLOWERS.	IN FRUIT.	PLANTING.	SOILING OR ABOVE GROUND.	APPEARING.
Alder,.....			Barley,.....								
Aspen,.....			Bare or High,.....								
Beech,.....			Oats,.....								
Birch,.....			Wheat,.....								
Elm,.....			Beans,.....								
Larch,.....			Peas,.....								
Oak,.....			Potatoes,.....								
Sycamore or Plane,.....			Rye Grass,.....								

SHRUBS, ETC.	IN BLOSSOM.	IN FRUIT.	FRUITS.	IN BLOSSOM.	IN FRUIT.	IN BLOSSOM.	IN FRUIT.	IN BLOSSOM.	IN FRUIT.	IN BLOSSOM.	IN FRUIT.
Barberry,.....			Apple,.....			Black Currant,.....			Cuckoo,.....		
Bouquet or Elder,.....			Cherry,.....			House-Swallow,.....			Culver,.....		
Broom,.....											
Hazel,.....			Gooseberry,.....			Lapwing,.....					
Hawthorn,.....											
Holly,.....			Peach,.....			Sand-Martin,.....					
Laburnum,.....			Pear,.....			Starling,.....					
Lilac,.....			Plum,.....			Swan,.....					
Mountain Ash or Rowan,.....			Strawberry,.....			Hall or Corn Crake,.....					
Red Flowering Currant,.....											
Rhododendron Tomicum,.....											
Whin,.....											

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

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

BOOK-POST.

Edinburgh
Melrose Hall
January 1863

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at March Hall Park, County of Midlothian, in Lat. 55° 56' 12" Long. 3° 10' 5" W, Distance from Sea 2 1/2 miles.Height of Cistern of the Barometer above Mean Sea-level 270 feet, above Ground 20 feet.During the MONTH of February 1863

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	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, (0-5), and Direction.	Amount, (0-10), and Species.	No. _____ 3 inches.	No. _____ 12 inches.					No. _____ 22 inches.																																																																																																																																																																																		
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	1	29.10	45	29.33	45	42.8	32			41	40.4	37	36																																																																																																																																																																																																				
	2	29.14	46	29.28	48	48	35			47	44.5	43.5	40																																																																																																																																																																																																				
	3	29.18	46	29.37	45	43.2	32.3			39.3	37.5	36	34.8																																																																																																																																																																																																				
	4	29.45	43	29.15	49	48.5	32			41.5	39.8	40	38.4																																																																																																																																																																																																				
	5	29.62	44	29.60	49	51	33			39	36.3	51	48																																																																																																																																																																																																				
	6	29.70	50	29.70	48	59	36			50.5	48	51	48																																																																																																																																																																																																				
	7	29.68	50	29.68	48	50	37			41	39.5	39.5	37																																																																																																																																																																																																				
	8	29.57	45	29.73	46	39.5	33			38	36.2	35.4	33																																																																																																																																																																																																				
	9	29.80	44	29.54	45	47	31			37	34.8	43	42																																																																																																																																																																																																				
	10	29.61	45	29.73	46	47	38.5			42	39.2	46.5	44.2																																																																																																																																																																																																				
	11	29.66	47	29.65	49	48.5	39.5			43	41	42.5	40																																																																																																																																																																																																				
	12	29.85	46	30.20	46	46	36			41	39.8	41.4	39																																																																																																																																																																																																				
	13	30.42	45	30.46	48	44	31			34.5	33.5	35.8	35																																																																																																																																																																																																				
	14	30.42	46	30.32	48	44	29.2			37	34.8	35	33.6																																																																																																																																																																																																				
	15	30.32	45	30.32	46	41	26.5			30	29.8	36	34.5																																																																																																																																																																																																				
	16	29.30	44	30.24	47	43	28.5			36	32	41	35.5																																																																																																																																																																																																				
	17	30.16	45	30.08	50	47.6	33.5			42	39.5	47	45.5																																																																																																																																																																																																				
	18	30.09	48	30.22	52	48	45.5			41	39	45	44																																																																																																																																																																																																				
	19	30.27	49	30.22	50	46	36.5			42	40.5	39.5	38.5																																																																																																																																																																																																				
	20	30.16	47	30.04	50	46	33.5			41	39.5	42.5	41																																																																																																																																																																																																				
	21	29.91	49	29.78	49	47.8	39			43	40	41.5	40																																																																																																																																																																																																				
	22	29.90	47	30.08	48	45	35			42	39.6	44.6	41																																																																																																																																																																																																				
	23	29.92	48	30.05	52	49.5	40.5			47	45	46.4	44.8																																																																																																																																																																																																				
	24	30.00	49	29.99	49	46	41.5			45	43.4	45	43.5																																																																																																																																																																																																				
	25	29.95	49	30.03	51	47	40			46	44.4	47	48.5																																																																																																																																																																																																				
	26	29.69	47	29.76	51	50	40			47	44.3	50	48																																																																																																																																																																																																				
	27			29.80	54	52.4	42			50	48	45	43																																																																																																																																																																																																				
	28	29.96	47	29.76	51	48.5	32			39.5	38.3	42	40.8																																																																																																																																																																																																				
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Means.		29.809	46.7	29.860	48.7	47.0	35.3			41.6	39.5	42.5	40.5																																																																																																																																																																																																				
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a. denotes aurora. m. denotes meteor. cl. " cirrus. ms. " meteors. cl.-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. so. " scud. fr. " frost. sl. " sleet. h.-fr. " hoar-frost. sn. " snow. h. " haze. so. ha. " solar halo. h. d. " heavy dew. sq. " squall. li. " hail. sqs. " 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.																																																																																																																																																																																																																	
Esti- mated Force, 0-6.																																			Common Designation.																																			Esti- mated Force, 0-6.																																			Common Designation.																																			Esti- mated 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), = 29.760
"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ for Temp. (Col. 4), = 29.805
Mean at Station, corrected, and at 32°, = 29.782⁸⁰⁰
Correction for Height, feet, above Mean Sea-level, = 29.6
Mean, reduced to 32°, and Sea-level, = 30.078
Highest Reading, corrected for Index error, on the 13 th, = 30.460
Lowest Do., Do., on the 1 th, = 29.100
Difference, or Monthly Range, = 1.360

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 6 th, = 59.0
Lowest in Month, corrected for Index errors, on the 15 th, = 26.5
Difference, or Monthly Range, = 32.5
"Corrected Mean" of all the Highest, (Col. 5), = 47.0
"Corrected Mean" of all the Lowest, (Col. 6), = 35.3
Difference, or Mean Daily Range, = 11.7
** Calculated Mean Temperature of Month, = 41.2

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, = 42.0
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 40.0
** Computed Temperature of Dew-point, = 37.5
** Do. Elastic Force of Vapour, = 2.225
** Do. Weight of Vapour in a Cubic Foot of Air, = 2.60
** Relative Humidity, (Saturation = 100), = 85
RAIN fell on Days; Amount in Inches, = 1.80

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.
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 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by

Alexander Johnston W. Keith Johnston Jun.

(Signed)

Greatest daily range = 23.0 on the 6th

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at March Hall, Perth, County of Midlothian, in Lat. 55° 52' 12" N Long. 3° 10' 5" W, Distance from Sea 2 1/2 miles.

Height of Cistern of the Barometer above Mean Sea-level 240 feet, above Ground 20 feet.

During the MONTH of March 1863.

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 Direction.	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.	Attached Ther- mometer No.	Barometer. No.	Attach- ed Ther- mometer No.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb. No.	Wet bulb. No.	Dry bulb. No.	Wet bulb. No.	Direction. No.	Force No.	Direction. No.	Force No.	Readings of the H-Cup Anemometer. No.		No. of hours in which it fell.	Amount in inches. No.	Velocity, (0-6), and Direction. No.	Amount, (0-10), and Species. No.		Velocity, (0-6), and Direction. No.	Amount, (0-10), and Species. No.	No. 3 inches.					No. 12 inches.	No. 22 inches.	9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction ++ for Temp. (Col. 2), = 29.479
"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ for Temp. (Col. 4), = 29.501
Mean at Station, corrected, and at 32°, = 29.490
Correction for Height, feet, above Mean Sea-level, = 29.6
Mean, reduced to 32°, and Sea-level, = 29.786
Highest Reading, corrected for Index error, on the 25th, = 30.190
Lowest Do., Do., on the 6th, = 28.920
Difference, or Monthly Range, = 1.270

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 3th, = 58.5
Lowest in Month, corrected for Index errors, on the 12th, = 25.0
Difference, or Monthly Range, = 33.5
"Corrected Mean" of all the Highest, (Col. 5), = 48.5
"Corrected Mean" of all the Lowest, (Col. 6), = 37.4
Difference, or Mean Daily Range, = 11.1
** Calculated Mean Temperature of Month, = 43.0
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, = 43.6
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 41.0
Computed Temperature of Dew-point, = 37.9
Do. Elastic Force of Vapour, = 2.28
Do. Weight of Vapour in a Cubic Foot of Air, = 2.64
Relative Humidity, (Saturation = 100), = 80
RAIN fell on Days; Amount in Inches, = 0.50

WIND.		SUMMARY.					
Direction.		N	NE	E	SE	S	SW
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 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by Alexander Johnston
Midlothian

(Signed) _____

Greatest daily range = 19.8 on the 29th

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Marble Hall Park* County of *Midlothian*, in Lat. *55° 12' N.*, Long. *3° 10' W.*, Distance from Sea *2 1/2* miles.

Height of Cistern of the Barometer above Mean Sea-level *270* feet, above Ground *20* feet.

During the MONTH of *May* 186*3*

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. <i>Mention the hour at which Storms began and ended.</i>	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.		No. of hours in which it fell.	Amount in inches.	9-A.M.		P.M.		SUNSHINE. Hours.	9 h. A.M.						Temperature of WELL at Depth of feet No.	Temperature at 1 fathom, and Density.	9 A.M. 3 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.	Direction.	Force	Direction.	Force	9 h. A.M.	9 h. P.M.			Velocity, (0-6), and Direc- tion.	Amount, (0-10), and Species.	Velocity, (0-10), and Direc- tion.	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), = *29.696*
"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ for Temp. (Col. 4), = *29.693*
Mean at Station, corrected, and at 32°, = *29.694*
Correction for Height, feet, above Mean Sea-level, = *29.6*
Mean, reduced to 32°, and Sea-level, = *29.990*
Highest Reading, corrected for Index error, on the *21* th, = *30.200*
Lowest Do., Do., on the *13* th, = *29.100*
Difference, or **Monthly Range**, = *1.100*

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the *1* th, = *64.5*
Lowest in Month, corrected for Index errors, on the *18* th, = *36.5*
Difference, or **Monthly Range**, = *28.0*
"Corrected Mean" of all the **Highest**, (Col. 5), = *56.0*
"Corrected Mean" of all the **Lowest**, (Col. 6), = *42.9*
Difference, or **Mean Daily Range**, = *13.1*
** Calculated **Mean Temperature** of Month, = *49.4*

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**, = *49.8*
Mean (corrected) A.M. and P.M. Reading of **Wet Bulb**, = *46.7*
Computed **Temperature of Dew-point**, = *43.4*
Do. **Elastic Force of Vapour**, = *283*
Do. **Weight of Vapour in a Cubic Foot of Air**, = *3.23*
Relative **Humidity**, (Saturation = 100), = *79*
RAIN fell on **Days**; **Amount in Inches**, = *1.20*

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.
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 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by *Alexander Johnston*
Michael Johnston

(Signed)

Greatest daily range = 28.0 on the 8th

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 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 *approximate* every reading at what time it was taken, if not at 9 o'clock.

Barometer.—Weather-glasses and Aneroids, though originally 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. Ait 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; its co-incidence 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 *préliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

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

Ventilation 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 self-registering indications, Observers are specially requested to attend to the following cautions:—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 placed 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. 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°·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 difference in the 24 hours preceding. It is not a matter of importance 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 and 4th 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.

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 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-gauges. 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.

EDINBURGH, 17th July 1861.

(By Order.) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Last Buds first appear.	In Leaf.	Dissected of Leaves.	Growing or about Ground.	First Cut or Raised.
Alder.						
Ash.						
Beech.						
Birch.						
Elm.						
Larch.						
Line.						
Oak.						
Sycamore or Plane.						

FRUIT.	First in Blossom.	First in Fruit.	First in Generally.	Departure.
Apple.				
Black Currant.				
Cherry.				
Broom.				
Hawthorn.				
Holly.				
Laburnum.				
Lilac.				
Mezereum.				
Mountain Ash or Rowan.				
Red Flowering Currant.				
Rhododendron Ponticum.				
Whin.				

MIGRATORY BIRDS.	First in Blossom.	First in Fruit.	First in Generally.	Departure.
Cuckoo.				
Curlew.				
House-Swallow.				
Plover.				
Sand-Martin.				
Starling.				
Swallow.				
Kill or Corn Crake.				
Other Birds, naming them.				

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; and the Agricultural condition of the district generally. Whether

EDINBURGH.

10, St Andrew Square,

Secretary of the Meteorological Society of Scotland,

Mr ALEXANDER BUCHAN.

To

BOOK-POST.

SCOTTISH METEOROLOGICAL SOCIETY.

89

Observations taken at March Hall Park County of Midlothian, in Lat. 55° 56' 12" N Long. 3° 10' 5" W Distance from Sea 2 1/2 miles.

Height of Cistern of the Barometer above Mean Sea-level 270 feet, above Ground 20 feet.

During the MONTH of June 1863

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. 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. * 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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NOTATION USED IN GENERAL REMARKS.	
a. denotes aurora.	m. denotes meteor.
ci. cirrus.	ms. meteors.
ci-cu. cirro-cumulus.	n. nimbus.
cu-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.
li. cl. light clouds.	t.-s. thunder-storm.
li. sh. light showers.	w. wind.
lu. op. lunar corona.	g. gale of wind.
lu. ha. lunar halo.	

TABLE FOR ESTIMATING FORCE OF WIND.					
Estimated Force, 0-5.	Common Designation.	Estimated Force, 0-5.	Common Designation.	Estimated Force, 0-5.	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), = 29.513
 "Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ for Temp. (Col. 4), = 29.515
 Mean at Station, corrected, and at 32°, = 29.574
 Correction for Height, feet, above Mean Sea-level, = 29.6
 Mean, reduced to 32°, and Sea-level, = 29.810
 Highest Reading, corrected for Index error, on the 30th, = 30.020
 Lowest Do., Do., on the 11th, = 29.170
 Difference, or Monthly Range, = 0.850

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 24th, = 68.0
 Lowest in Month, corrected for Index errors, on the 12th, = 42.0
 Difference, or Monthly Range, = 26.0
 "Corrected Mean" of all the Highest, (Col. 5), = 63.8
 "Corrected Mean" of all the Lowest, (Col. 6), = 47.5
 Difference, or Mean Daily Range, = 16.3
 ** Calculated Mean Temperature of Month, = 55.6

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, = 54.8
 Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 51.8
 ** Computed Temperature of Dew-point, = 48.9
 ** Do. Elastic Force of Vapour, = 346
 ** Do. Weight of Vapour in a Cubic Foot of Air, = 3.96
 ** Relative Humidity, (Saturation = 100), = 80
 RAIN fell on Days; Amount in Inches, = 2.90

WIND. SUMMARY.											
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.											
P.M.											
Mean.											

A

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
A. Johnston Jr.

(Signed) _____

Greatest daily range = 19.0 on the 22nd

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 recommends 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 atmosphere, 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 column. Its *scale-marks* are not true inches, but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of the mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of 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 co-incidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, to *form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed up so as to form a tight plug to the cistern. Then *serve 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 *slerry 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.

Noted, the tube must then be gently tapped and the asterism adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the body, until the lower edges of the vernier, which must be carefully adjusted to form a straight 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 Brometer.

Preparation of the thermometer.—The Councils of the Society recommend that Self-galvanizing Thermometers and Hygrometers be enclosed in a Box, painted white outside, and black within, and fixed 4 feet above ground in an exposed position, free from any local influences. The laths forming the sides and doors of the Boxes are arranged so as to open to the north, 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.

Self-Registering Thermometers.—Professor Phillips's, and Negretti and Zambra's Patent "Maximeter" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "Minimeter" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "Maximeter." This Thermometer is liable to two disadvantages, both of which must be guarded against and may be easily remedied by an observer. When the column of spirit breaks, it may be reunited by striking the thermometer repeatedly against the palm of the hand; when put in the spirit distils by high temperature, it will be found in the upper loop, and must be dislodged from thence by testing 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 upwards, 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 incised, 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 "*Macrumum*" should be freely exposed to the Sun, and the "*Minumum*" 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 in 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 have an attached scale, undergo repairs, they are very liable to be moved from their position on the scale, and self-moving alterations to be made, without being *re-tested*. The self-moving alterations, 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 "Hygrometrical Deductions," Observers are justly 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 so straitened that the tubes favored 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 a 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 bromonected requirements shall be complied with, as far as possible.

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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 the falling barometer prevents the recording of temperature in the 24 hours preceding. This is not matter of indifference with respect to safety, as the thermometers are read, since, in winter, at least, the extremes may occur at any hour; and it is in vain 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 a.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 the surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, and always in the same direction, the direction must be taken. 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.

Credul 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 Observation 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, Laland's Anemometer is also recommended: the method of *Estimating* Wind Force by such tables as that given in the schedule above, 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 prefixed to the amount of snow. The depth of the snow must be measured in some open place where no drift has accumulated, and registered in addition to, as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as recorded 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 nomen-

clature of clouds will be found on the other side of the mountain. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (*see*, 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" (S.W.) (for example), will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{1}{2}$, or $\frac{1}{4}$, 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.

Susling.—The number of hours in which objects in the sun's rays cast shadows, and the temperature of the air, the ground, and the water, were observed. 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 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 very important 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 details.

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—Moffats 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 3rd, 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 invariably 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 sun above in various directions, to be recorded.

snow-line in winter ought to be recorded by the use of abbreviations, the state of the weather at 9 A.M. and 5 P.M. ought to be registered, either in two columns offset-ward or in one column, as may be found most convenient; and if y.e.m. ought to be written off for the purpose, from that time onwards it will be better to write "y.e.m." than "y.m.", which is headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or by the side of them, so that they may be referred to without loss of margin. Additional remarks may be made on the margin.

(*a*) 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.

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, 17th July 1861.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.		In Flower.	Leaves first appear.	In Leaf.	Divided of Leaves.	CHOPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear.	First Cut
Alder,						Barley,				
Asch,						Bere or Bize,				
Beech,						Oats,				
Birch,						Wheat,				
Blm,						Beans,				
Larch,						Pease,				
Lime,						Potatoes,				
Oak,						Turnips,				
Sycamore or Plane,						Rye Grass,				

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. Write the district generally.

SHRUBS, ETC.	Barberry,	Apple,	FRUITS.	Strawberry,	Other Birds, naming them—	Whin,	
	Bourtree or Elder,	Black Currant,		Gooseberry,		Rhododendron Ponticum,	Red Flowering Currant,
	Broom,	Cherry,		Gean,		Mountain Ash or Rowan,	Red Flowering Currant,
	Hazel,	Cherry,		Pear,		Mezerion,	Red Flowering Currant,
	Hawthorn,	Cherry,		Gooseberry,		Mezerion,	Red Flowering Currant,
	Holly,	Cherry,		Pear,		Mezerion,	Red Flowering Currant,
	Laburnum,	Cherry,		Gooseberry,		Mezerion,	Red Flowering Currant,
	Lilac,	Cherry,		Pear,		Mezerion,	Red Flowering Currant,
	Mezerion,	Cherry,		Gooseberry,		Mezerion,	Red Flowering Currant,
	Mountain Ash or Rowan,	Cherry,		Pear,		Mezerion,	Red Flowering Currant,
MIGRATORY BIRDS.	Cuckoo,	House-Swallow,	First in Blossom.	Swan,	Rail or Corn Cuck,	Whin,	
	Curtew,	Plover,		Starling,		Rhododendron Ponticum,	Red Flowering Currant,
	House-Swallow,	Swan,		Mezerion,		Mountain Ash or Rowan,	Red Flowering Currant,
	Curtew,	Starling,		Pear,		Mezerion,	Red Flowering Currant,
	House-Swallow,	Swan,		Gooseberry,		Mezerion,	Red Flowering Currant,
	Curtew,	Starling,		Pear,		Mezerion,	Red Flowering Currant,
	House-Swallow,	Swan,		Gooseberry,		Mezerion,	Red Flowering Currant,
	Curtew,	Starling,		Pear,		Mezerion,	Red Flowering Currant,
	House-Swallow,	Swan,		Gooseberry,		Mezerion,	Red Flowering Currant,
	Curtew,	Starling,		Pear,		Mezerion,	Red Flowering Currant,
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BOOK-POST.

EDINBURGH.

10, St Andrew Square,

Secretary of the Meteorological Society of Scotland,

Mr ALEXANDER BUCHAN.

 T_0

June 1863.

Calcutta

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Marchmont* 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 *July* 186*3*.
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.		P.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	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.	SUNSHINE. Hours.	No. 3 Inches.	No. 12 Inches.					No. 22 Inches.	Temperature of WELL, at Depth of feet. No.	Transparence at 1000 ft. and Densify.	9 A.M. 9 P.M.			
		* No.		No.		No.	No.	No.	No.																													
		inches.		inches.																																		
	1					63	45			62	57	59	56																				1					
	2			29.79	64	64	54			60	57.5	60	57																				2					
	3	29.92	63	30.03	62	61	52.5			57	55	58.8	54.8																				3					
	4	30.04	62	30.08	60	52.3	47			56	53.8	59	53							10													4					
	5	30.13	62	30.14	64	63	50			57	53.6	58	55																				5					
	6	30.09	63	29.92	67	72	56			60	57	61	58																				6					
	7	29.81	66	29.79	65	63.3	55			66	60.4	60.8	57																				7					
	8	29.86	66	20.08	67	73	54.3			63	59.4	60	53.8																				8					
	9	30.08	66	30.09	70	75	55			65	60	63	59																				9					
	10	30.16	69	30.26	70	75	58			67	63	63.4	62																				10					
	11	30.25	69	30.24	68	75.2	56			67	65	63.8	59							10													11					
	12	30.30	68	30.32	67	75.2	55			59	56.4	56.8	55																				12					
	13	30.21	66	30.27	67	75	53.4			67.4	62.8	58	53																				13					
	14	30.20	63	30.10	69	73	49			61	55	58.4	55																				14					
	15	30.03	65	30.10	67	70	48.8			62	55.8	51.8	47																				15					
	16	30.10	62	29.94	62	68	39.5			52	48.8	54	48																				16					
	17	29.80	61	29.59	63	74.6	44.5			54.8	48	54.8	47																				17					
	18	29.58	61	29.54	62	74.8	44			51	48	51.5	49							10													18					
	19	29.70	59	29.66	61	66	42			48.6	45.5	51	47.8																				19					
	20	29.60	58	29.52	61	65	42			47.5	45	52	48																				20					
	21	29.60	66	29.51	62	56	44.5			50	45.5	49.5	46																				21					
	22	29.42	61	29.42	61	53	48			52.5	47	52.3	51.8																				22					
	23	29.54	60	29.23	61	58.3	44			50	45.3	50	48.8																				23					
	24	29.74	59	29.66	61	58	44			55.2	48.6	55	53																				24					
	25	29.72	61	29.88	62	61	43			50	45.5	53	51							10													25					
	26	29.82	62	29.98	66	61	57			54.5	52	62	58																				26					
	27	29.88	64	29.96	66	67	43			58.4	54	61	58																				27					
	28	29.86	64	29.83	66	64.8	55.7			62	57.8	57	54																				28					
	29	29.97	64	30.00	66	62.9	55			60.8	57.2	53.8	49.8																				29					
	30	30.03	63	30.07	65	60	50.4			56	53	59	56																				30					
16	31	29.86	62	30.16	64	68	46			54.4	52	58.6	55.2																				31					
		25.70	1830	2788	1936	15271				17899	16609	17653	1656																									
		29.918	63.1	29.872	64.5	66.6	49.3			57.7	53.6	56.9	53.4																									
4 Total Corrections for Instru- mental 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.	scud.
fr.	frost.	sl.	sleet.
h.-fr.	hoar-frost.	sn.	snow.
h.	haze.	so. ha.	solar halo.
h. d.	heavy dew.	sq.	squall.
hl.	hall.	sqs.	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.

Esti- mated Force, 0-6.	Common Designation.	Esti- mated Force, 0-6.	Common Designation.	Esti- mated 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 \ddagger for Temp. (Col. 2), = 29.821
 "Corrected Mean" of Barometer at 9 P.M., minus the Correction \ddagger for Temp. (Col. 4), = 29.833
 Mean at Station, corrected, and at 32°, = 29.810827
 Correction for Height, feet, above Mean Sea-level, = 338.296
 Mean, reduced to 32°, and Sea-level, = 30.748123
 Highest Reading, corrected for Index error, on the 12 th, = 30.320
 Lowest Do., Do., on the 31 th, = 29.420
 Difference, or Monthly Range, = 1.1600900

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 11 th, = 75.2
 Lowest in Month, corrected for Index errors, on the 16 th, = 39.5
 Difference, or Monthly Range, = 35.7
 "Corrected Mean" of all the Highest, (Col. 5), = 66.6
 "Corrected Mean" of all the Lowest, (Col. 6), = 49.3
 Difference, or Mean Daily Range, = 17.3
 ** Calculated Mean Temperature of Month, = 58.0

S.-R. THERMOMETER, Bulb, in Sun, Highest, (corrected, for Index errors), on the 11 th, = 75.2
 "Corrected Mean" of all the Highest, (Col. 5), = 66.6
 "Corrected Mean" of all the Lowest, (Col. 6), = 49.3
 Difference, or Mean Daily Range, = 17.3
 ** Calculated Mean Temperature of Month, = 58.0

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = 57.3
 Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 53.5
 Computed Temperature of Dew-point, = 50.0
 Do. Elastic Force of Vapour, = 36.1
 Do. Weight of Vapour in a Cubic Foot of Air, = 4.02
 Relative Humidity, (Saturation = 100), = 76
 RAIN fell on 4 Days; Amount in Inches, = 0.50

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.
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 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

(Signed)

Robert Lomaxton
Gardener

Printed daily range = 30.3 on the 18th

WITH REMARKS ON THE USE OF INSTRUMENTS.

Hour of Observation.—The council recommend that Observations be made precisely at 9 o'clock, (Greenwich or Railway Time only), twice a-day for sons, 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; but in such instances they are specially requested to mark opposite every reading at what time it was taken, if not at 9 o'clock.

Barometres.—*Wadell's* classes and *Averells*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometre 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 Barometre shall have been compared with a *Standard*.

An excellent Barometer is constructed by Mr. Adie of London,

inches, but so much shorter as to *compensate* the error that would

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed up so as to form a tight plug to the cistern. Then *care* up the ivory peg, and take down an inch of the top of 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. And if this plan fails, the instrument must be reitred.

In taking an *Observation*, the attached Thermometer is first

Protection of Thermometers.—The Council 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 possible 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 the duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had at the Secretary's Office.

Self-Registering Thermometers—Professor Phillips's, and Negretti and Zambra's Patent "*Maximian*," Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Maximian*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximian*." This Thermometer is preferable to two detriments, both of which must be guarded against, and may be easily remedied by an observer. When the "*Maximian*" spirit breaks, it may be re-mitted by striking the "*Maximian*" column of spirit breaks, it may be re-mitted 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 upwards, rather than the other.

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

The *Hygrometer* consists of two Thermometers usually, but

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the centre of the index or column of mercury. The reading

Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

Wind.—A wind-vane ought to be elevated 12 feet at least, above the *Znd*, and extending $\sin 9^{\circ}$ m. on the *Grnd*. When it oscillates incessantly, the mean surrounding objects.

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

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

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

Snow-falls may, for convenience, be regarded as occurring in columns, under the following conditions:—When a snow shower occurs it must be noted in the “Remarks,” and the letter S

Clouds.—Convenient abbreviations for Luke Howard's nomen-

column, an entry of $\frac{4}{2}$, $\frac{\text{st.}}{\text{cu-st.}}$, (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus*.

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

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.

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

Electricity.—Too much importance cannot be attached to fresh electric condition of the atmosphere in connection with terrestrial

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.

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

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

Electrometer should be entered in this manner, or on the side-margin. Additional remarks may be made on the margin.

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,

Full directions for the use of the instruments mentioned above furnished to observers.

rological 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.

1

[illegible]

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 Epizootic disease prevails among Cattle; and the agricultural condition of the district generally.

 T_0

Secretary of the Meteorological Society of Scotland.

10, St Andrew Square,

EDINBURGH.

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *March Hall, Perth* 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 *August* 186*3*.

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.	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	No.	Amount in inches.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-6), and Direction.	Amount, (0-10), and Species.		No.	No.	No.					
		inches.		inches.						Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.					9 h. A.M.	9 h. P.M.	No.							inches.					inches.
	1	29.95	62	29.89	62	68	47			54	52	57	53.8						6/10											1		
	2	29.57	60.4	29.75	62	67.8	48			57	54	61.8	59.5																	2		
	3	29.65	62	29.65	62.2	69	55			61	59	60	57																	3		
	4	29.59	62.8	29.52	64	69	54.5			62.8	56	57	56																	4		
	5	29.58	65	29.49	63	64	50			62.2	56.5	58	55																	5		
	6	29.48	62.4	29.69	63	63.6	53			65	58	59	54.4																	6		
	7	29.63	63.3	29.52	65	69	52.5			64	61	64	64																	7		
	8	29.44	65	29.58	64	65	59			68.5	64.5	59.5	55.4						6/10											8		
	9	29.69	62	29.72	62.4	67	55			60	55.5	57.8	54.3																	9		
	10	29.62	62.4	29.68	62	64	53.5			64.5	57	57	51.2																	10		
	11	29.62	61	29.77	60	61	51.5			66	50.4	54	48																		11	
	12	29.83	58.2	29.87	58.7	62.5	44			57	51	52	48.5																		12	
	13	29.72	57	29.74	58	60	44			54.5	54.3	51	48.8																		13	
	14	29.86	58.4	29.69	59	61	44.5			57	55	58.4	55																		14	
	15	29.35	60	29.36	62	67	55			63	61	63.4	58.8						4/10												15	
	16	29.32	62	29.34	60	64.5	53			61	57.6	55	53																		16	
	17	29.34	58.8	29.34	59	60	50.5			57.4	53.5	54	51.4																		17	
	18	29.42	57.4	29.62	59	61	50			57	52.4	58.4	54																		18	
	19	29.52	57	29.62	57	59	49			55.5	51.4	54	52																		19	
	20	29.63	57	29.92	57	61.5	44.7			54.5	48.7	52	49.5																		20	
	21	29.86	55.4	29.82	56.5	55	39			49.5	47	54.5	51																		21	
	22	29.76	58	29.63	57	65	51			60	58.5	56	53.8						3/10												22	
	23	29.63	57	29.57	57.5	61	49.5			58	54	59	55.4																		23	
	24	29.47	57	29.42	57	63	49			58.3	54.5	53	49.8																		24	
	25	29.28	56.8	29.16	57.8	63	48			58	53.8	57	54																		25	
	26	29.17	57	29.32	57	58	49			63.4	51.2	53	50																		26	
	27	29.79	56	29.37	56.5	53	48.5			51	50.5	51	48.5																		27	
	28	29.42	57	29.44	45	68	45			50	49	50	49.8																		28	
	29	29.36	55	29.54	56	59	48			54.4	52	51	48						1/10												29	
	30	29.66	54.5	29.67	56	60	43			53.4	50	54	53																		30	
	31	29.66	55.4	29.64	55	55	49			52.4	51	54	53																		31	
Sums.		17.15	15.6	18.14	15.3	14.2	14.4			5.15	5.17	5.15	5.16						5	3.30												
Means.		29.558	57.1	29.595	59.0	62.5	49.5			57.7	54.0	56.2	53.1																			
+ 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), = *29.478*
"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ for Temp. (Col. 4), = *29.515*
Mean at Station, corrected, and at 32°, = *29.496*
Correction for Height, feet, above Mean Sea-level, = *29.6*
Mean, reduced to 32°, and Sea-level, = *29.792*
Highest Reading, corrected for Index error, on the 1st th, = *29.950*
Lowest Do., Do., on the 25th, = *29.160*
Difference, or Monthly Range, = *0.790*

* 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.
† Instrument 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. 9 and 10 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 Over.

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 3rd th, = *69.0*
Lowest in Month, corrected for Index errors, on the 21st th, = *39.0*
Difference, or Monthly Range, = *30.0*
"Corrected Mean" of all the Highest, (Col. 5), = *62.5*
"Corrected Mean" of all the Lowest, (Col. 6), = *49.5*
Difference, or Mean Daily Range, = *13.0*
** Calculated Mean Temperature of Month, = *56.0*

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, = *57.0*
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *53.6*
Computed Temperature of Dew-point, = *50.4*
Do. Elastic Force of Vapour, = *3.67*
Do. Weight of Vapour in a Cubic Foot of Air, = *4.08*
Relative Humidity, (Saturation = 100), = *79*
RAIN fell on 5 Days; Amount in Inches, = *3.30*

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
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 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 1st

46

August 1863.

 T_G

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, *St Andrew Square,*

EDINBURGH.

BOOK-POST.

SHRUBS, &c.		FRUITS.		MIGRATORY BIRDS.	
First in Blossom.		First in Blossom.	First in Fruit ripe generally.	First Arrival.	Departure.
Barberry,	Apple,	Chokeberry,	Gooseberry,	Holly,	Plover,
Bourtree or Elder,	Black Currant,	Cherry,	House-Swallow,	Impwing,	Cartlew,
Broom,	Hazel,	Gean,	House-Swallow,	Impwing,	House-Swallow,
Hawthorn,	Gooseberry,	Gooseberry,	House-Swallow,	Impwing,	House-Swallow,
Holly,	Pear,	Pear,	House-Swallow,	Impwing,	House-Swallow,
Laburnum,	Plum,	Plum,	House-Swallow,	Impwing,	House-Swallow,
Mountain Ash or Rowan,	Strawberry,	Strawberry,	House-Swallow,	Impwing,	House-Swallow,
Red Flowering Currant,			House-Swallow,	Impwing,	House-Swallow,
Rhododendron Ponticum,			House-Swallow,	Impwing,	House-Swallow,
Whin,			House-Swallow,	Impwing,	House-Swallow,

FOREST TREES.	In flower.	In leaf buds first appear.	In leaf.	Divided of leaves.	CROPS.	Sowing or planting.	Appearing or above ground.	In ear or flower.	First cut.
Alder,					Barley,				
Ash,					Bare or Bigg,				
Beech,					Oats,				
Birch,					Wheat,				
Blin,					Beans,				
Larch,					Pears,				
Lime,					Potatoes,				
Oak,					Turnips,				
Sycamore or Plane,					Rye Grass,				

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

EDINBURGH, 17th July 1861.

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 September 1863.

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.				CLOUDS.				RAIN.				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.		P.M.									
		Barometer. No.	Attached Ther- mometer	Barometer. No.	Attached Ther- mometer	Max. No.	Min. No.	Max. No.	Min. 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. 1.	No. 2.	No. 3.							
		inches.		inches.																													
	1	29.66	54	29.42	50	56	45			54.5	51	54	52															1					
	2	29.57	55	29.42	55	60	50			55.6	53	52	49.5															2					
	3	29.46	55	29.36	56	57	46			56	52.8	55	53.8															3					
	4	29.52	54	29.54	56	56.4	44			52.2	51.8	52.8	52															4					
	5	29.36	56.5	29.52	55	56.5	44			58	54	52	47															5					
	6	29.45	56	29.38	54	55.6	41			51.2	46.8	50	48															6					
	7	28.86	52	29.26	52	52.5	46.5			56.3	48	50	46															7					
	8	29.46	53	29.22	51	53	43			53.5	48	53	52															8					
	9	29.44	55	29.35	53	57	47			53	48.5	49	47															9					
	10	29.36	56	29.52	53	56	43			52	48.4	51	47.3															10					
	11	29.88	51	29.78	53	56.7	42			50	47	51	48.2															11					
	12	29.78	53	29.84	53.5	56.5	48			55	51	55	51.4															12					
	13	29.78	52.8	29.75	54	56	47			50.8	47.8	54	51.2															13					
	14	29.94	54	29.92	53.8	57	50			54.8	52	54.8	51															14					
	15	29.68	55.2	29.84	55	58	47			55.8	54	50	46															15					
	16	29.86	52.3	29.63	54	54	45			51	48	51	47															16					
	17	29.69	53	29.58	53	57.5	46.5			52	48.6	57	55															17					
	18	29.59	56	29.62	55	59.5	54			58	54.8	58	55															18					
	19	29.7	53	29.59	57	52	46			52	46	48	45															19					
	20	28.96	52	28.85	52	54	44			52	48	48	45.8															20					
	21	28.72	51	28.44	53	53	44.5			48.5	47	48	45.5															21					
	22	28.54	50	28.56	51	48	42			46	45	48	45.5															22					
	23	28.86	50.5	29.07	50.3	51	43			48	48	47	46															23					
	24	29.12	50	29.24	50	50	43			47.8	46	47	45.8															24					
	25	29.34	50	29.46	52	53	43			49	47	50.5	45.5															25					
	26	29.62	50	29.72	50	53	48			48.5	45	48.3	47															26					
	27	29.48	52	29.26	52	56	44			54	50	52	48															27					
	28	29.33	50	29.38	50	50.5	41			48	44.5	46	44.2															28					
	29	29.45	50	29.42	52	53	42			49	46	52	49															29					
	30	29.45	51	29.22	51	52	47			52	48	50.5	48.5															30					
	31																											31					
Sums.		1616 82	833	1415 81	5144 4122			5136 4164 5122 4146		585 2672 319 2552								3.30															
Means.		29.408	52.8	29.400	52.9	54.7	45.2			51.9	48.4	51.1	48.5																				
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++ = 29.347
for Temp. (Col. 2), = 29.408 - 0.061
"Corrected Mean" of Barometer at 9 P.M., minus the Correction++ = 29.339
for Temp. (Col. 4), = 29.400 - 0.061
Mean at Station, corrected, and at 32°, = 29.343
Correction for Height, feet, above Mean Sea-level, = 29.6
Mean, reduced to 32°, and Sea-level, = 29.639
Highest Reading, corrected for Index error, on the 14 th, = 29.940
Lowest Do., Do., on the 21 th, = 28.440
Difference, or Monthly Range, = 1.500

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 2 th, = 60.0
Lowest in Month, corrected for Index errors, on the 6 th, = 41.0
Difference, or Monthly Range, = 19.0
"Corrected Mean" of all the Highest, (Col. 5), = 54.7
"Corrected Mean" of all the Lowest, (Col. 6), = 45.2
Difference, or Mean Daily Range, = 9.5
** Calculated Mean Temperature of Month, = 50.0

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, = 51.5
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 48.7
Computed Temperature of Dew-point, = 45.8
Do. Elastic Force of Vapour, = 3.10
Do. Weight of Vapour in a Cubic Foot of Air, = 3.49
Relative Humidity, (Saturation = 100), = 87
RAIN fell on Days; Amount in Inches, = 3.30

WIND.		SUMMARY.					
Direction.		N	NE	E	SE	S	SW
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 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 = 14.7 on the 11th

WITH REMARKS ON THE USE OF INSTRUMENTS.

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 October 1863.

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. 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		Velocity, (0-6), and Direction.	Amount, (0-10), and Species.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	No.	No.	No.											
		inches.		inches.																				3 inches.	12 inches.					22 inches.						
	1	28.98	56	29.16	59	58	47			52	48	55	53.5																	1						
	2	29.24	53	29.35	57	55	44			51	48.6	51	48																	2						
	3	29.40	53	29.45	55	51	45.5			50	48	50	48																	3						
	4	29.48	51	29.53	55	51	46.5			46.8	44.6	45	43																	4						
	5	29.57	52	29.64	53	49	38			45	42.8	41	39																	5						
	6	29.65	52	29.77	52	46	31.5			42	38	44.5	39.8																	6						
	7	29.82	51	29.83	54	49	38			46	44	47	45																	7						
	8	29.77	53	29.59	54	52	46			49	48	51	50																	8						
	9	29.50	54	29.31	55	53	48			50	49.4	50	49.8																	9						
	10	29.34	55	29.47	55	56	48			53	52	54	52																	10						
	11	29.33	56	29.40	57	55	47.5			54.6	52.5	54.2	47.2																	11						
	12	29.27	55	29.18	57	56	44			51.2	49	51	49																	12						
	13	29.12	56	29.11	57	55	46			53	50	52	48.8																	13						
	14	29.20	57	29.37	57	55	44			52	51	50	48.4																	14						
	15	29.43	57	29.30	57	58	45			50.4	49	52.2	51																	15						
	16	29.37	57	29.47	57	54	44			51	49.4	47	45.3																	16						
	17	29.57	57	29.67	57	57.5	46.5			50	48.5	52	49																	17						
	18	29.44	56	29.47	56	51	43.5			56	53	49	48																	18						
	19	29.60	54	29.66	56	52	44			48.5	47	47.8	46																	19						
	20	29.74	54	29.91	56	50	42			48	47	46.4	44.8																	20						
	21	29.94	53	29.85	53	53	39			48	46.5	45	42.3																	21						
	22	29.90	51	29.93	54	53	42			48	45	48.8	47																	22						
	23	30.00	52	30.06	56	53	37.5			48	46.2	43.6	42																	23						
	24	29.98	53	29.86	53	49	40			49	47.3	44	43																	24						
	25	29.81	53	29.79	52	49	43			45	44	48	45.8																	25						
	26	29.87	57	29.77	55	51	42			47	46	45	44																	26						
	27	29.72	53	29.58	55	46	38.5			48	47	46	45																	27						
	28	29.26	53	29.32	50	49	33			46	45.5	44	38.4																	28						
	29	29.00	49	28.46	48	44	34.5			38.3	38	42	40																	29						
	30	28.75	46	28.58	48	47	36.5			38	37.5	41	37.5																	30						
	31	28.59	45	28.95	47	48	36.4			42	38.8	42	39.4																	31						
	Sums.	1612.5	13	1615.5	16	5	54.5			44.3	41.9	44	113.4																							
	Means.	29.439	53.3	29.477	54.3	51.8	41.8			48.3	46.5	47.4	45.5																							
	† 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				
																																TABLE FOR ESTIMATING FORCE OF WIND.				
		Estimated Force, 0-5.	Common Designation.	Estimated Force, 0-5.	Common Designation.	Estimated Force, 0-5.	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																													

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.	scud.
fr.	frost.	sl.	sleet.
h-fr.	hoar-frost.	sn.	snow.
h.	haze.	so. ha.	solar halo.
h. d.	heavy dew.	sq.	squall.
h.	hall.	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.

Esti- mated Force, 0-6.	Common Designation.	Esti- mated Force, 0-6.	Common Designation.	Esti- mated 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†† = 29.374
for Temp. (Col. 2), = 29.413..... - 0.039.....
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† = 29.409
for Temp. (Col. 4), = 29.477..... - 0.068.....
Mean at Station, corrected, and at 32°, = 29.392
Correction for Height, feet, above Mean Sea-level, = 29.6
Mean, reduced to 32°, and Sea-level, = 29.688
Highest Reading, corrected for Index error, on the 23 th, = 30.060
Lowest Do., Do., on the 29 th, = 28.460
Difference, or Monthly Range, = 1.600

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the / th, = 58.0
Lowest in Month, corrected for Index errors, on the 6 th, = 31.5
Difference, or Monthly Range, = 26.5
“Corrected Mean” of all the Highest, (Col. 5), = 57.8
“Corrected Mean” of all the Lowest, (Col. 6), = 41.8
Difference, or Mean Daily Range, = 10.0
** Calculated Mean Temperature of Month, = 46.8

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, = 47.8
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = 46.0
†† Computed Temperature of Dew-point, = 45.8 44.0
†† Do. Elastic Force of Vapour, = 3.08 2.88
†† Do. Weight of Vapour in a Cubic Foot of Air, = 3.16
†† Relative Humidity, (Saturation = 100), = 87
RAIN fell on 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.					
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 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

Alexander Johnston &
A. Keith Johnston

(Signed)

Greatest daily range = 16.0 on the 28th.

Collected by
October 1863.

70

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

BOOK-POST.

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 soon dissimilarity 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-marks* 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 this scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *screw up* the 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 adjusted 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 ground in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as to form 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; primed 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 the derangements, both of which must be guarded against, and may be easily remedied by an observer. When the columns of spirit peaks, it may be resorted to 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.

clature 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 1 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, *ci-st.*, (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

State.—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, nothing always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

Temperature of Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted. **Ozone.**—Mention whether Schönbein's or Moffat's papers are used—Moffat's are preferred. These papers are affixed by a pin to a board in the thermometer box, and a 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^{W.}, as an ozone entry in the schedule, will indicate that the ozone paper is timed as 3^{W.} 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 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 periodical return of the seasons.—*Observations* in connection with the periodical 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 writers.

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, 17th July 1861.

Clouds.—Convenient abbreviations for Luke Howard's nomen-

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 *November* 1863.
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 of WELL, at Depth of feet, No.	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.	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 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.							
		* No.		No.		Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.									No. of hours in which it fell.	Amount in inches.													
		inches.		inches.																												
	1	29.10	46	29.03	48	45.5	34			42	40	37	36																	1		
	2	28.90	46	29.16	48	42	29.5			40	39	37	34																	2		
	3	29.33	44	29.08	48	52	33.8			39.4	38	52	50																	3		
	4	29.27	50	29.58	57	53.5	41			51	48	45	42																	4		
	5	29.83	47	29.02	45	54	36			41	39	39	37																	5		
	6	30.27	45	30.13	46	39	26.3			32	30	37	35																	6		
	7	29.78	44	29.80	46	41	29.5			37.3	36.3	38	37.8					3 10												7		
	8	29.70	46	30.02	47	41	36.5			40	39.6	40.8	38.5																	8		
	9	30.17	45	29.74	47	41	34			38	35.5	41	38.6																	9		
	10	29.41	47	29.24	47	45	37			42	39.5	39.5	38																	10		
	11	29.08	45	29.23	47	43	35			39	37	38	36.4																	11		
	12	29.67	44	29.77	44	41	31.5			36	36.5	41	39																	12		
	13	29.69	47	29.77	52	53	37			52	50.4	53	51																	13		
	14	29.77	53	29.84	58	55	48.5			52	50	54	52.5					8 10												14		
	15	29.83	63	29.70	64	53.5	48.5			54.8	49	53	52																	15		
	16	29.65	53	29.72	56	55	44.5			51.5	50	47	46																	16		
	17	29.69	54	29.68	54	54	44			50	49	54	52.5																	17		
	18	29.77	53	29.70	56	53.5	47.5			50	48	53	50																	18		
	19	29.74	55	29.78	55	55	47			51	49.8	49.5	47																	19		
	20	29.72	53	29.60	56	53	48			51.5	49.5	51	49.5																	20		
	21	29.36	55	28.84	55	53	47			51	49.5	48	47					5 10												21		
	22	29.06	54	29.32	52	48	44.5			45	43	46	43.8																	22		
	23	29.44	50	29.46	53	48	40			43	41	47	45																	23		
	24	29.52	52	29.56	53	51	37			47	45.8	49.5	39																	24		
	25	29.57	53	29.80	56	56	37.5			54.5	51.5	57	48.5																	25		
	26	29.87	53	29.78	56	57	45			52	50.8	53	50																	26		
	27	29.76	54	29.78	56	53	48			50.8	49	50	48																	27		
	28	29.77	53	30.07	56	51	40			45.2	41	45.8	41					7 10												28		
	29	30.10	57	30.07	54	45	34			36.8	35.5	38	35																	29		
	30	29.75	48	29.80	50	38	34.5			35.5	34.2	37.5	36																	30		
	31																													31		
	Sums.	1714	412	1512	515	412	316	6		49	54	157	415	3					1 96													
	Means.	29.644	49.9	29.650	51.4	49.1	39.1			44.9	43.2	46.2	43.2																			
	+ 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 ++ = *29.587*
for Temp. (Col. 2), = *29.587* - *0.57* = *29.017*
"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ = *29.590*
for Temp. (Col. 4), = *29.590* - *0.60* = *28.990*
Mean at Station, corrected, and at 32°, = *29.588*
Correction for Height, feet, above Mean Sea-level, = *29.6*
Mean, reduced to 32°, and Sea-level, = *29.884*
Highest Reading, corrected for Index error, on the 6th, = *30.270*
Lowest Do., Do., on the 21st, = *28.840*
Difference, or Monthly Range, = *1.430*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the 26th, = *57.0*
Lowest in Month, corrected for Index errors, on the 6th, = *36.5*
Difference, or Monthly Range, = *20.5*
"Corrected Mean" of all the Highest, (Col. 5), = *49.4*
"Corrected Mean" of all the Lowest, (Col. 6), = *39.1*
Difference, or Mean Daily Range, = *10.0*
** Calculated Mean Temperature of Month, = *44.1*
S.-R. THERMOMETER, Black Bulb, in Sun, Highest, (corrected, for Index errors), on the 26th, = *67.0*
"Corrected Mean" of all the Highest, (Col. 5), = *49.4*
"Corrected Mean" of all the Lowest, (Col. 6), = *39.1*
Difference, or Mean Daily Range, = *10.0*
** Calculated Mean Temperature of Month, = *44.1*
S.-R. THERMOMETER, Black Bulb, Max. in Sun, = *67.0*
Lowest in Month, corrected for Index errors, on the 6th, = *36.5*
"Corrected Mean" of all the Highest, (Col. 5), = *49.4*
"Corrected Mean" of all the Lowest, (Col. 6), = *39.1*
Difference, or Mean Daily Range, = *10.0*
** Calculated Mean Temperature of Month, = *44.1*

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, = *46.0*
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *43.2*
Computed Temperature of Dew-point, = *41.1*
Do. Elastic Force of Vapour, = *2.57*
Do. Weight of Vapour in a Cubic Foot of Air, = *2.94*
Relative Humidity, (Saturation = 100), = *86*
RAIN fell on Days; Amount in Inches, = *1.90*

WIND.		SUMMARY.									
Direction.	N	NE	E	SE	S	SW	W	NW	Variable.	Mean Force.	Mean Velocity in miles per day.
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 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by *Alexander Johnston & Co.*

(Signed) _____

Greatest daily range 18.5 on the 25th

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 *December* 186*3*.

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.			Temperature of WELL 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.		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, (0-9), 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.																												
	1	29.40	47	29.06	48	44	32			37	35.3	44	42																	1		
	2	29.08	47	28.79	47	44	33			39.4	38.5	37.8	36																	2		
	3	28.63	44	29.46	46	28	31			34	33	35.2	33																	3		
	4	29.78	43	29.60	46	48.5	31.5			42	40.2	48	46.5																	4		
	5	29.30	49	29.63	48	51	38			52	49.5	41	38.3						1.6											5		
	6	27.70	45	29.59	48	47	36			41	39	47	45																	6		
	7	29.60	46	29.52	50	51	43.5			51	48.8	51	47.5																	7		
	8	29.28	51	29.60	48	51	38			45	42.8	41	38.3																	8		
	9	29.63	45	29.55	47	44.5	36			39.8	37.2	44.5	43																	9		
38	10	29.60	49	29.61	58	47	38			42	40.7	45.6	43																	10		
	11	29.66	47	29.58	52	50.3	40.5			45	44.7	51	49						4											11		
	12	29.56	57	29.71	50	56	40			52	49.2	42	40																	12		
	13	30.02	47	30.00	52	50	39.5			45	42	50	47.4																	13		
	14	30.05	48	30.08	53	51	45.5			50	48.7	50	47																	14		
	15	29.80	47	29.64	51	51	44			52	47.5	47.5	44.7																	15		
	16	27.27	45	29.17	48	47	35			40	37	45	42																	16		
	17	29.86	45	30.16	45	44	32.5			40.7	37	36	33																	17		
	18	30.08	45	30.15	48	48	32			42	42	48	46.5																	18		
	19	30.16	45	30.08	57	48	43			47	46.7	47	44.5						2											19		
	20	29.85	48	29.86	50	48	41.5			46.5	44	44.5	42																	20		
	21	29.79	44	29.84	50	45	34.5			40	38	45	43																	21		
	22	29.74	42	29.84	43	47	28.5			32	27.3	35	33																	22		
	23	29.42	48	29.64	52	52	31.5			47	47	47.8	48.8																	23		
	24	29.76	47	29.77	50	49	44			48	45.5	48	45																	24		
	25	29.63	49	29.49	52	51	40			45	44	48.8	46.3																	25		
	26	29.52	48	29.35	50	48.3	40			43.5	41.8	44	42						1											26		
	27	29.68	45	30.04	43	42	27			33.5	34.5	29	28																	27		
	28	30.03	42	29.66	43	35	24.5			30	28.2	35	34.5																	28		
38	29	29.56	42	29.75	42	43	34			32.5	28.5	41	39.4																	29		
	30	29.85	42	29.83	42	41	32			38.4	37	38.8	33																	30		
	31	29.70	41	29.58	41	37.5	30.4			33.8	33	35.8	35																	31		
Sums.		1512 4 12		1515 4 11		141	115			125	110	154	116						1													
		19.49	18.6	20.53	25.4	44.5	11.8	4		131.6	128.7	134.1	127.9						2.4													
Means.		29.645	48.0	29.662	48.2	46.8	36.1			42.5	40.6	43.3	41.2																			
+ 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

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.	" squalls.						
l.	" lightning.	t.	" thunder.						
ll. cl.	" light clouds.	t-s.	" thunder-storm.						
ll. sh.	" light showers.	w.	" wind.						
lu. co.	" lunar corona.	g.	" gale of wind.						
lu. ha.	" lunar halo.								

TABLE FOR ESTIMATING FORCE OF WIND.					
Esti- mated Force, 0-1.	Common Designation.	Esti- mated Force, 0-5.	Common Designation.	Esti- mated Force, 6-12.	Common Designation.
0	Calm	1.5	Light breeze	4	Blowing hard
0.5	Very light air	2.5	Fresh breeze	5	Blowing a gale
1	Light air	3	Very fresh	6	Violent gale

NOTATION USED IN GENERAL REMARKS.			
a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	ms.	" meteora.
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.					
Esti- mated Force, 0-6.	Common Designation.	Esti- mated Force, 0-6.	Common Designation.	Esti- mated Force, 0-6.	Common Designation.
0	Calm	1.5	Light breeze	4	Blowing hard
0.5	Very light air	2.5	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†† = *29.593*
for Temp. (Col. 2), = *29.645* - *0.52* = *29.593*
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = *29.610*
for Temp. (Col. 4), = *29.662* - *0.52* = *29.610*
Mean at Station, corrected, and at 32°, = *29.602*
Correction for Height, feet, above Mean Sea-level, = *296*
Mean, reduced to 32°, and Sea-level, = *29.898*
Highest Reading, corrected for Index error, on the *19* th, = *30.160*
Lowest Do., Do., on the *3* th, = *28.630*
Difference, or Monthly Range, = *1.530*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month (corrected for Index errors), on the *12* th, = *56.0*
Lowest in Month, corrected for Index errors, on the *28* th, = *24.5*
Difference, or Monthly Range, = *31.5*
"Corrected Mean" of all the Highest, (Col. 5), = *46.8*
"Corrected Mean" of all the Lowest, (Col. 6), = *36.1*
Difference, or Mean Daily Range, = *10.7*
** Calculated Mean Temperature of Month, = *41.4*

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, = *42.9*
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, = *40.9*
†† Computed Temperature of Dew-point, = *38.6*
†† Do. Elastic Force of Vapour, = *2.34*
†† Do. Weight of Vapour in a Cubic Foot of Air, = *2.69*
†† Relative Humidity, (Saturation = 100), = *85*
RAIN fell on 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.											
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 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by

Alexander Johnston

(Signed)

Greatest daily range = 20.5 on the 23rd

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 *Anemoids*, 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 co-incidence 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 *piston-rod* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *screw up* the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum: this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *dry 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 meniscus in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and face 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 also 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 hole, 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 ball 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 bulb 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 Staff, 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 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 fast in the moist cloth in ordinary circumstances.

One form of Mr 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 40°·3, 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 *days*. In the Society's schedules, the indications registered on the 3rd of each month, and extending till 9 P.M. on the 3rd, 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 gauges. 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 indicated 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 nomen-

clature 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. 1 (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 $\frac{2}{3}$ *cu-st.*, (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

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

Underground Thermometers.—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy; the Council recommend that observations in this interesting department be made at 9 A.M., by thermometers placed in the earth, their bulbs being sunk to 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. Attention 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 Schimbeni's or Moffat's pyres 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 $\frac{3}{4}$, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4," i.e. that it is *blowing fresh*.

Electricity.—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to 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 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, aurore boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns either 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 *ten-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, 17th July 1861.

BOOK-POST.

EDINBURGH.

10, St Andrew Square.

Secretary of the Meteorological Society of Scotland,

Mr ALEXANDER BUCHAN,

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SHRUBS, ETC.		FRUITS.		MIGRATORY BIRDS.		Other Birds, naming them.	
First in Blossom.	First in Leaf.	First in Blossom.	First in Leaf.	First in Blossom.	First in Leaf.	First in Blossom.	First in Leaf.
Barberry,	Black Currant,	Cherry,	Cornus,	Laburnum,	Plum,	Strawberry,	Swamp,
Broom,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Bourtree or Elder,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Black Currant,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Apple,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Cuckoo,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Cutew,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
House-Swallow,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Labwing,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Plover,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Sand-Martin,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Stalling,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Swamp,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Rail or Corn Crake,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Other Birds, naming them,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Whin,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Rhododendron Ponticum,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Mountain Ash or Rowan,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Red Flowering Currant,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Mezerion,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,
Thorn,	Gooseberry,	Hawthorn,	Holly,	Laburnum,	Plum,	Strawberry,	Swamp,

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

Orange
December 1862