

## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Bogside, Lochet-Bushnie*, County of *Arberdeen*, in Lat.  $57^{\circ}10'50''$ , Long.  $2^{\circ}45'0''$ , Distance from Sea *28* miles.Height of Cistern of the Barometer above Mean Sea-level *885* feet, above Ground *3* feet.During the MONTH of *January* 18*72*.

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. 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 B.C.P. Anemometer No.	No. of hours in which it fell.	Amount in inches.	Velocity, (0—10), and Direction.	Amount, (0—10), and Species.	Velocity, (0—10), and Direction.		Amount, (0—10), and Species.	No. 3 inches.	No. 13 inches.					No. 22 inches.	Temperature of WELL at Depth of feet. No.	Temperature at 1 fathom, and Density.	9 A.M. 9 P.M.
		inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.	inches.		inches.	inches.	inches.					inches.	inches.	inches.	inches.
	1	28.570	44	28.600	44	44.0	37.0	44.0	34.0	44.0	41.0	39.5	36.0	9	3	9	1	90160	0.30	0.02	10st	10st	0								g. l.	1			
	2	28.570	42	28.580	43	40.0	35.0	52.0	30.0	39.0	36.0	37.0	34.0	9	2	9	1	66070	—	—	3st	8st	4								g. l. co.	2			
	3	28.740	42	28.580	42	37.0	34.0	42.0	30.0	36.0	33.0	36.5	35.0	9	1	5	1	45020	1.30	1.7	10st	3st	2								r.	3			
	4	28.040	42	28.990	42	38.0	32.0	48.0	28.0	35.0	33.5	33.0	32.0	9	1.5	9	5	39412	—	—	5st	10st	3								r.	4			
	5	27.770	42	28.000	40	34.0	30.0	38.0	24.0	32.0	30.5	33.0	32.0	9	5	9	5	33800	—	—	10st	3st	2								an.	5			
	6	28.190	40	28.320	41	38.0	31.0	54.0	26.0	35.0	32.0	34.0	32.0	9	1.5	9	1.5	62471	—	—	3st	3st	5								r.	6			
	7	28.370	40	28.300	40	35.0	30.0	50.0	23.0	33.0	31.0	32.0	32.0	9	5	9	1	28682	2.0	1.0	6ci	10st	3								r.	7			
	8	28.330	40	28.420	41	34.0	27.0	57.0	21.0	28.0	27.0	32.0	30.5	9	5	9	5	61002	1.0	0.3	2ci	0	5								r.	8			
	9	28.730	40	29.050	42	37.0	32.0	61.0	23.0	34.0	34.0	32.0	31.0	9	5	9	5	94710	—	—	10st	6st	1								r.	9			
	10	29.080	40	28.880	40	36.0	29.0	45.0	22.0	34.0	32.0	35.0	35.0	9	5	9	1.5	33170	4.0	2.7	6ci	10st	3								r.	10			
	11	28.700	40	28.920	42	43.0	39.0	72.0	28.0	36.0	35.0	40.0	39.0	9	5	9	5	66050	1.0	—	10st	6st	4								r.	11			
	12	29.100	42	28.900	42	41.0	32.0	40.0	23.0	33.5	33.0	37.5	37.0	9	5	9	5	95680	1.0	0.2	10st	10st	2								r.	12			
	13	28.800	43	28.310	45	44.0	37.0	45.0	36.0	42.0	41.0	39.0	38.5	9	5	9	5	30385	2.0	3.2	10st	10st	0								r.	13			
	14	28.660	43	28.980	44	44.0	34.0	62.0	27.0	37.0	35.0	35.0	32.0	9	1.5	9	5	25190	2.0	—	3st	0	6								r.	14			
	15	28.910	40	28.900	42	38.5	32.0	42.0	26.0	37.0	35.0	38.5	37.0	9	5	9	5	91235	—	—	10st	10st	0								r.	15			
	16	28.970	42	28.750	43	40.0	33.0	64.0	28.0	36.0	35.0	36.0	34.5	9	5	9	1	12653	1.0	0.3	10st	7st	5								r. f.	16			
	17	28.300	41	27.700	44	44.0	33.0	44.0	32.0	39.0	38.0	44.0	33.0	9	5	9	1	88650	1.0	0.4	10st	10st	0								r. f.	17			
	18	27.400	44	27.800	45	46.0	37.0	46.0	36.0	41.0	41.0	37.0	35.0	9	5	9	2	31258	—	—	10st	10st	0								g. l. co.	18			
	19	28.120	42	28.400	42	40.0	34.0	44.0	31.0	38.0	34.5	39.0	36.0	9	2	9	2.5	54340	—	—	5st	2st	2								g. l. co.	19			
	20	28.780	41	28.660	43	40.0	30.0	70.0	23.0	32.0	31.0	32.0	30.0	9	5	9	5	94340	—	—	4st	3st	5								lu co.	20			
	21	28.700	39	28.920	42	37.0	30.0	68.0	22.0	33.0	31.0	30.0	29.0	9	1	9	5	49350	—	—	0	7st	6								lu co.	21			
	22	28.800	40	28.620	42	34.0	25.0	57.0	19.0	32.0	31.0	34.0	34.0	9	5	9	5	60050	3.0	3.2	10st	10st	1								r. st. g.	22			
	23	28.270	41	28.000	42	39.0	33.0	39.0	30.0	36.0	35.5	39.0	39.0	9	1.5	9	2.5	39820	19.30	7.0	10st	10st	0								r. st. g.	23			
	24	27.930	42	27.780	44	39.0	35.0	38.0	34.0	38.0	37.5	36.0	35.0	9	5	9	5	98380	7.30	3.8	10st	10st	0								r.	24			
	25	28.100	42	28.380	44	39.0	32.0	41.0	28.0	35.0	34.0	40.0	39.5	9	5	9	5	525082	7.30	2.6	10st	10st	0								r.	25			
	26	28.640	44	28.955	44	40.0	38.0	40.0	39.0	39.0	40.0	40.0	40.0	9	5	9	5	66030	15.0	5.5	10st	10st	0								r. f.	26			
	27	29.050	45	29.100	45	40.0	32.0	51.0	25.0	37.0	36.0	31.5	31.0	9	5	9	5	02475	4.0	—	8st	6st	3								r.	27			
	28	29.130	44	29.040	44	36.0	26.0	53.0	18.0	29.0	29.0	35.0	35.0	9	5	9	5	29622	2.0	1.0	10st	10st	2								r.	28			
	29	28.870	42	28.580	44	39.0	34.0	40.0	32.0	38.0	38.0	40.0	40.0	9	5	9	5	39910	9.0	2.8	10st	10st	0								r.	29			
	30	28.560	45	28.570	48	37.0	38.0	38.0	37.0	47.0	45.0	45.0	42.0	9	2	9	1.5	23610	—	—	3st	6st	2								g.	30			
	31	28.660	46	28.400	48	48.5	40.0	51.0	38.0	43.0	41.0	48.0	45.0	9	5	9	3	76585	1.15	0.2	10st	10st	0								g.	31			
Sums.		1511	7	1710	9	141	12	141	14	16	122	142	132	275	12	300		369																	
Means.		28.534	41.9	28.553	43.0	39.9	32.9	49.5	28.2	36.4	35.0	36.8	35.2	0.9	0.9																				
† Total Corrections for Instrumental Errors.		-100		-100																															
† 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				

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction  $\pm$  for Temp. (Col. 2), =  $28.434 - 0.34$  = **28.400**  
“Corrected Mean” of Barometer at 9 P.M., minus the Correction  $\pm$  for Temp. (Col. 4), =  $28.453 - 0.37$  = **28.416**  
Mean at Station, corrected, and at 32°, = **28.408**  
Correction for height, feet, above Mean Sea-level, = **966**  
Mean, reduced to 32°, and Sea-level, = **28.374**  
Highest Reading, corrected for Index error, on the 28th, = **29.130**  
Lowest Do., Do., on the 18th, = **27.400**  
Difference, or Monthly Range, = **1.730**

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 30th, = **50.0**  
Lowest in Month, corrected for Index errors, on the 28th, = **26.0**  
Difference, or Monthly Range, = **24.0**  
“Corrected Mean” of all the Highest, (Col. 5), = **39.9**  
“Corrected Mean” of all the Lowest, (Col. 6), = **32.9**  
Difference, or Mean Daily Range, = **7.0**  
\*\* Calculated Mean Temperature of Month, = **36.4**

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for Index errors), on the 11th, = **72.0**  
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = **49.5**  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 28th, = **18.0**  
“Corrected Mean,” (Col. 8), of Black Bulb Min. on grass, = **20.2**  
Difference of above Means or Range (“exposed”), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = **36.6**  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = **35.1**  
† Computed Temperature of Dew-Point, = **33.0**  
† Do. Elastic Force of Vapour, = **1.87**  
† Do. Weight of Vapour in a Cubic Foot of Air, = **87**  
† Relative Humidity, (Saturation = 100), = **87**  
RAIN fell on 17 Days; Amount in Inches, = **3.6**

WIND.										SUMMARY.		
Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.	
A.M.	2		2	1	12	9	4	1		.90		
P.M.	1	1	1	1	6	15	6			.90		
Mean.	1.5	1.5	1.5	1.5	9	12.5	4	0		.90		

0.81

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 3rd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gunned or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by *William Bruce*  
*Bogside, Lochet-Bushnie.*(Signed) *William Bruce.*

A very fine open winter month. snow only fell on one day. Turnips and fodder are both plentiful. Field labour well forward. Some cold very prevalent, several cases of inflammation of the lungs, one of which proved fatal, no other disease in the district. Cattle healthy.



# 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 Reports from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incompatible, may arise from dissimilarity in the position or siting 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 *correction* 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. By Mr. Adie of London, the use of which is attended with the great convenience of requiring no *adjustment* of the cistern. Its *scale* is 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 tubes, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, to form *one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary setting* must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then, *seize 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 by 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 nearly local influences. The lids 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 Rutlandford 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. It may be easily remedied by striking the instrument against the palm of the hand; when the part of the spirit distils by high temperature, it will be found in the upper globe, and must be discoloured from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

The above remarks apply equally to the Thermometers for

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

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

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *calibrated form* of self-registering instruments vitiate the "Hygrometric" Deductions, Observers are specially requested to attend to the following conditions:—The bulbs must *hang down*, by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer, that the muslin is always *clean and moist*, and the water pure. In frosty weather observations are a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 20 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

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

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

**Hour of observing Temperature.**—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 2nd 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 Hemispherical-Cup Anemometer, a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended; the method of *Estimating* Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

**Rain-gauges.**—Many causes conspire to produce anomalies in rain returns. They arise partly from defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the gauge, and 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 latter 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.

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

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

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

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

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

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

**Wings.**—Mention whether Schöbein's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation in the following manner:—Thus  $3^{\circ}$ , as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as  $3^{\circ}$  on the scale, that the wind is from the N.W., and that its force on the scale 0—10 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.**—This "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 on the side-margin. Additional remarks may be made on the margin.

**Observations in connection with the periodic return of the seasons.**—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. Observations ought to be confined to individual trees and shrubs in 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 *vern day* observations be taken;—viz., on the 21st days of March, June, September, and December. Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers.

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

(By Order) A. B.

Enacted, December 1852.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In flower.	In bud.	In leaf.	Dressed of leaves.	GROES.	Sowing or planting.	In flower.	In bud.	First Cut
Alder.					Barley.				
Beech.					Oats.				
Birch.					Wheat.				
Blm.					Beans.				
Larch.					Potatoes.				
Lime.					Rye Grass.				
Oak.									
Sycamore or Plane.									

SHRUBS, ETC.	First in flower.	First in bud.	Fruit in blossom.	Fruit in blossom.	Fruit in blossom.	Fruit in blossom.	Fruit in blossom.	Fruit in blossom.	Fruit in blossom.
Barberry.					Apple.				
Bourne or Elder.					Black Currant.				
Broom.					Cherry.				
Hazel.					Gooseberry.				
Hawthorn.					Peach.				
Holly.					Laburnum.				
Lilac.					Mountain Ash or Rowan.				
Mezereum.					Red Flowering Currant.				
Rhododendron Ponticum.					Whin.				

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

M<sup>r</sup> ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK-POST.

Received Jan. 1852



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Bogside, Lochesh-bushnie*, County of *Aberdeen*, in Lat.  $57^{\circ}10'50''$ , Long.  $2^{\circ}45'0''$ , Distance from Sea *28* miles.  
Height of Cistern of the Barometer above Mean Sea-level *825* feet, above Ground *3* feet. During the MONTH of *February*, 18*72*.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. —				WIND.				RAIN.				CLOUDS.				THERMOMETERS. under Ground.				SEA.	OZONE. 0—10.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevailing Diseases, etc.  Mention the hour at which Storms began and ended.		Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	0 h. A.M.		0 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		0 h. A.M.		0 h. P.M.		0 h. A.M.		0 h. P.M.		Readings of the H. Cup Anemometer No. —		No. of hours in which it fell.		0 h. A.M.		P.M.		0 h. A.M.		P.M.							Sunshine. Hours.	0 h. A.M.			Temperature of Water, in Fahrenheit, No. —	Temperature and Direction of Wind, No. —																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
	Baromet. No. —	Attach- ed Ther- mometer	Baromet. 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.	0 h. A.M.	Velocity, (0—10), and Direction.	Amount (0—10), and Species.	Velocity, (0—10), and Direction.	Amount (0—10), and Species.	No. 3 Inches.	No. 19 Inches.	No. 22 Inches.	9 A.M.	9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction  $\pm$  for Temp. (Col. 2), =  $28.673$   
for Temp. (Col. 4), =  $28.680$   
"Corrected Mean" of Barometer at 9 P.M., minus the Correction  $\pm$  for Temp. (Col. 4), =  $28.670$   
Mean at Station, corrected, and at 32°, =  $28.676$   
Correction for height, feet, above Mean Sea-level, =  $982$   
Mean, reduced to 32°, and Sea-level, =  $29.638$   
Highest Reading, corrected for Index error, on the 27 th, =  $29.270$   
Lowest Do., Do., on the 1 th, =  $28.300$   
Difference, or Monthly Range, =  $0.970$

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 29 th, =  $52.0$   
Lowest in Month, corrected for Index errors, on the 8 th, =  $28.0$   
Difference, or Monthly Range, =  $24.0$   
"Corrected Mean" of all the Highest, (Col. 5), =  $41.7$   
"Corrected Mean" of all the Lowest, (Col. 6), =  $34.0$   
Difference, or Mean Daily Range, =  $7.7$   
\*\* Calculated Mean Temperature of Month, =  $37.8$

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index errors), on the 29 th, =  $87.0$   
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =  $53.0$   
Lowest at Night, Black Bulb, (corrected for Index errors), on the 8 th, =  $18.0$   
"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, =  $34.0$   
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), =  $37.0$   
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), =  $36.3$   
# Computed Temperature of Dew-Point, =  $35.2$   
# Do. Elastic Force of Vapour, =  $205$   
# Do. Weight of Vapour in a Cubic Foot of Air, =  $93$   
# Relative Humidity, (Saturation = 100), =  $93$   
RAIN fell on 7 Days; Amount in Inches, =  $5.89$

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 3rd; 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 *William Bruce*  
*Bogside, Lochesh-bushnie.*

(Signed) *William Bruce*

A very wet month, vegetation has made great progress during the month, the fields are quite green, in the garden the early flowers are out and the bushes budding. Straw plentiful but turnips rather scarce. Some cold very prevalent, small pox in one family, one case of small pox proved fatal. Little healthy.



# 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 incompatible, 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 consistency and uniformity. Several Remarks, without which the Society's Reports must inevitably fall in achieving one of the main objects of Meteorological Observation.

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

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

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

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-tubes* are not more than six inches long, and its *scale* is so constructed as to be 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 coincidences being indicated by a little ivory float, whose stem passes freely through the lid and over of the cistern. When the *index-line* on this little piston and is brought, by the adjusting screw, to *from one straight line* with those on its two sides, the surface of the mercury is then at the exact height from which the *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 *sozen* up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern upmost. Before suspending the Barometer for use, it must be ascertained whether the space above the mercury in the tube is a complete vacuum; this is the case when, on inclining the instrument so that the mercury strikes the top of the tube, a *sharp tap* is produced. If this is prevented by air it may be removed to the cistern, and got rid of, by inverting the Barometer (care being taken to prevent the loss of mercury by tightening the ivory peg), and gently tapping it; and if this plan fails, the instrument must be repaired.

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

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

**Protection of Thermometers.**—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box painted white outside, and black within, and fixed 4 feet above grass in an exposed position free from merely local influences. The lids for closing the sides and doors of the Boxes are angled so as to "project" the Thermometers, and to allow a complete ventilation of the interior. The instrument is suspended on cross-baths, in the centre of the Box, and the door opening to the south. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had at the Society's Office.

**Self-registering Thermometers.**—Professor Phillips's, and Negretti and Zambra's Patent "Maximum" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "Minimum" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "Maximum." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

The above remarks apply equally to the Thermometers for

registering the greatest heat from the sun's rays, and the least amount of radiation during night. Their bulbs have a black coating, the greater or less obscuration of the sky *overhead* (*i. e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds' column*, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky *overhead* is half covered by clouds, 5 is entered as the *observation*, and so on.

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

upper strata of clouds travel with *extreme* velocity from S.W., and these in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of  $\frac{2}{4}$  east, (*ex*) will indicate that the higher clouds; and that the sky is further obscured to the extent of 2 tenths by low clouds of the *cumulostratus* kind.

**Schedule.**—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 6, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

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

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

**Observations.**—Mention whether Selkirk's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box; and the indication registered at 9 a.m. and 9 p.m. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus  $\frac{3}{4}$  S.W., as an *exact* entry in the schedule will indicate that the *upper* paper is tilted as  $\frac{4}{3}$  on the scale, that the wind is from the N.W., and that its force on the scale 0 is "4"; *i. e.*, that it is *blowing fresh*.

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

**Remarks.**—The "Remarks" column is too narrow, but unavoidable so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides such and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, 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 hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 a.m. and 9 p.m. ought to be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner or on the side-margin. Additional remarks may be made on the margin. **Observations in connection with the periodic return of the seasons.** possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena, that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Council recommend that *yearly* day observations be taken;—viz., on the 21st days of March, June, September, and December.

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

FURNISHED, 24th December 1852.

FOREST TREES.		CROPS.		MIGRATORY BIRDS.		FRUITS.		SHRUBS, ETC.	
In flower.	First buds.	In leaf.	Discoloured.	First in blossom.	First in leaf.	First in blossom.	First in leaf.	First in blossom.	First in leaf.
Alb.	Barley.	Barley.	Barley.	Cuckoo.	Cuckoo.	Apple.	Apple.	Barberry.	Barberry.
Asp.	Beach.	Beach.	Beach.	Curtley.	Curtley.	Black Currant.	Black Currant.	Banberry.	Banberry.
Birch.	Birch.	Birch.	Birch.	House-Swallow.	House-Swallow.	Cherry.	Cherry.	Broom.	Broom.
Blm.	Blm.	Blm.	Blm.	Lapwing.	Lapwing.	Gem.	Gem.	Hazel.	Hazel.
Larch.	Larch.	Larch.	Larch.	Plover.	Plover.	Gooseberry.	Gooseberry.	Hawthorn.	Hawthorn.
Line.	Line.	Line.	Line.	Sand-Martin.	Sand-Martin.	Teal.	Teal.	Holly.	Holly.
Oak.	Oak.	Oak.	Oak.	Starling.	Starling.	Plum.	Plum.	Laburnum.	Laburnum.
Plane.	Plane.	Plane.	Plane.	Swain.	Swain.	Strawberry.	Strawberry.	Mountain Ash or Rowan.	Mountain Ash or Rowan.
Rowan.	Rowan.	Rowan.	Rowan.	Rail or Corn Crake.	Rail or Corn Crake.	18	18	Red Flowering Currant.	Red Flowering Currant.
Thorn.	Thorn.	Thorn.	Thorn.					Rhododendron Ponticum.	Rhododendron Ponticum.
Whin.	Whin.	Whin.	Whin.					Whin.	Whin.

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

FOREST TREES.		CROPS.		MIGRATORY BIRDS.		FRUITS.		SHRUBS, ETC.	
In flower.	First buds.	In leaf.	Discoloured.	First in blossom.	First in leaf.	First in blossom.	First in leaf.	First in blossom.	First in leaf.
Alb.	Barley.	Barley.	Barley.	Cuckoo.	Cuckoo.	Apple.	Apple.	Barberry.	Barberry.
Asp.	Beach.	Beach.	Beach.	Curtley.	Curtley.	Black Currant.	Black Currant.	Banberry.	Banberry.
Birch.	Birch.	Birch.	Birch.	House-Swallow.	House-Swallow.	Cherry.	Cherry.	Broom.	Broom.
Blm.	Blm.	Blm.	Blm.	Lapwing.	Lapwing.	Gem.	Gem.	Hazel.	Hazel.
Larch.	Larch.	Larch.	Larch.	Plover.	Plover.	Gooseberry.	Gooseberry.	Hawthorn.	Hawthorn.
Line.	Line.	Line.	Line.	Sand-Martin.	Sand-Martin.	Teal.	Teal.	Holly.	Holly.
Oak.	Oak.	Oak.	Oak.	Starling.	Starling.	Plum.	Plum.	Laburnum.	Laburnum.
Plane.	Plane.	Plane.	Plane.	Swain.	Swain.	Strawberry.	Strawberry.	Mountain Ash or Rowan.	Mountain Ash or Rowan.
Rowan.	Rowan.	Rowan.	Rowan.	Rail or Corn Crake.	Rail or Corn Crake.	18	18	Red Flowering Currant.	Red Flowering Currant.
Thorn.	Thorn.	Thorn.	Thorn.					Rhododendron Ponticum.	Rhododendron Ponticum.
Whin.	Whin.	Whin.	Whin.					Whin.	Whin.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

BOOK-POST.

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

Mr. ALEXANDER BUCHAN,

To

Book-Post  
Feb. 1872



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Bosside, Lochet-Bushnie*, County of *Aberdeen*, in Lat.  $57^{\circ}10'52''$ , Long.  $2^{\circ}45'N$ , Distance from Sea *28* miles.Height of Cistern of the Barometer above Mean Sea-level *885* feet, above Ground *3* feet.During the MONTH of *March* 18*72*.

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, Frequent Diseases, &c.  <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.		9 A.M.		P.M.		9 h. A.M.												
		Barometer.	Attach- ment of Ther- mometer	Barometer.	Attach- ment of Ther- mometer	Max.	Min.	Max. in Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the Cup Anemometer No. _____	No. of hours in which it fell.	Amount in inches.	Velocity (0-10), and Direction.	Amount, (0-10), and Species.	Velocity (0-10), and Direction.						Amount, (0-10), and Species.	No. _____ 3 inches.	No. _____ 12 inches.	No. _____ 22 inches.		
		* No.		No.		No.	No.	No.	No.									No.		No.		No.							No.		No.		No.	
		inches.		inches.															0 h. A.M.															
	1	28.800	42	29.000	46	41.0	36.0	46.0	34.0	37.0	36.0	36.5	35.0	N	5	E	5	24	26	30	22	10	10	0				1						
	2	29.065	43	28.900	46	45.0	32.0	48.0	26.0	39.0	38.0	44.0	43.5	S	5	S	1	52	30	—	—	10	10	0				2						
	3	29.070	46	29.120	49	50.0	42.0	52.0	37.0	47.0	44.0	48.0	45.0	S	5	N	5	42	35	—	—	10	10	0				3						
	4	29.170	48	29.070	53	51.0	44.0	76.0	36.0	49.0	45.0	47.5	45.0	N	1.5	S	1.5	04	20	—	—	10	10	0				4						
	5	28.950	50	29.040	52	52.0	43.0	72.0	38.0	47.0	44.0	45.0	43.0	S	5	E	—	64	50	—	—	10	10	0				5						
	6	29.000	50	28.900	53	58.0	41.0	64.0	34.0	50.0	47.0	41.5	40.0	S	5	S	1	92	25	—	—	6	10	10	0				6					
	7	28.700	47	28.520	51	53.0	34.0	68.0	23.0	48.0	47.0	34.0	34.0	S	5	E	—	94	50	—	—	10	10	0				7						
	8	28.485	48	28.560	50	49.0	32.0	59.0	23.0	41.0	41.0	42.0	41.0	S	5	S	5	10	66	2	30	10	10	0				8						
	9	28.500	47	29.170	44	43.0	32.0	63.0	30.0	36.0	34.0	34.0	32.0	N	1	N	5	68	110	1	30	10	10	0				9						
	10	29.335	42	29.300	44	36.0	26.0	38.0	18.0	30.0	29.0	36.0	35.0	S	5	S	5	99	90	—	—	10	10	0				10						
	11	29.210	44	29.080	47	47.0	34.0	53.0	32.0	43.0	42.0	44.0	43.0	S	5	S	5	27	66	5	30	10	10	0				11						
	12	28.940	46	28.920	47	47.0	41.0	54.0	37.0	43.0	42.0	42.0	39.0	S	5	N	5	76	220	1	30	10	10	0				12						
	13	28.890	46	28.650	47	47.0	34.0	73.0	27.0	42.0	38.0	42.0	40.0	N	5	S	1.5	23	020	—	—	5	10	10	0				13					
	14	28.560	46	28.620	47	42.0	39.0	42.0	38.0	41.0	40.0	40.0	39.0	S	1.5	S	5	63	390	2	30	10	10	0				14						
	15	28.770	46	28.755	46	44.5	38.0	45.0	38.0	40.0	40.0	42.0	45.0	S	5	S	5	01	152	1	15	10	10	1				15						
	16	28.800	46	28.980	50	55.0	47.0	92.0	32.0	43.0	42.0	43.0	41.0	S	5	N	5	51	845	—	06	10	10	0				16						
	17	28.940	48	28.700	50	50.0	40.0	52.0	33.0	43.0	42.0	44.0	40.0	S	5	N	2	04	735	2	02	10	10	0				17						
	18	28.550	47	28.920	48	47.0	37.0	57.0	30.0	43.0	40.0	40.0	39.0	S	1.5	N	1.5	23	580	3	25	10	10	0				18						
	19	29.130	45	29.180	45	40.0	31.0	57.0	29.0	34.0	31.5	35.0	32.0	N	1	N	5	08	923	3	20	10	10	0				19						
	20	29.100	43	29.000	45	34.0	26.0	56.0	22.0	32.0	31.5	27.0	27.0	N	5	N	5	36	353	4	50	10	10	0				20						
	21	29.060	41	29.150	41	29.0	22.0	53.0	16.0	25.0	25.0	28.0	28.0	N	5	N	5	09	250	7	30	10	10	0				21						
	22	29.160	40	29.230	41	32.0	27.0	39.0	23.0	30.0	29.0	30.0	30.0	N	5	N	5	47	582	2	30	10	10	0				22						
	23	29.250	41	29.200	41	34.5	28.0	42.0	24.0	30.0	30.0	30.0	30.0	N	5	N	5	76	110	7	30	10	10	0				23						
	24	29.100	40	29.030	42	32.0	28.0	40.0	29.0	31.0	30.0	31.0	31.0	N	5	N	5	40	860	9	25	10	10	0				24						
	25	28.900	41	28.760	42	35.0	27.0	73.0	23.0	29.0	27.0	27.0	26.5	N	5	N	5	68	850	2	10	10	10	0				25						
	26	28.550	40	28.490	42	32.0	26.0	45.0	24.0	30.0	29.0	31.0	31.0	N	5	N	1	34	262	14	37	10	10	0				26						
	27	28.530	38	28.570	42	44.0	29.0	78.0	26.0	34.0	30.0	33.0	31.0	N	5	S	5	39	270	—	—	0	10	10	0				27					
	28	28.360	40	28.325	45	44.0	24.0	96.0	19.0	32.0	30.0	35.0	34.0	N	5	E	—	47	485	—	—	0	10	10	0				28					
	29	28.400	44	28.450	45	36.0	32.0	43.0	30.0	36.0	34.0	34.0	33.5	N	5	N	5	57	900	3	30	10	10	0				29						
	30	28.440	43	28.600	45	35.0	32.0	40.0	32.0	33.0	32.0	34.0	34.0	N	5	N	5	03	660	12	30	10	10	0				30						
	31	28.700	43	28.800	45	38.0	32.0	53.0	30.0	34.5	32.0	33.5	32.0	N	5	N	5	56	520	1	15	8	10	10	0				31					
Sums.		1411	12	1310	12	131	13	13	13	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11					
Means.		28.715	13.1	28.950	12.1	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5					
Total Corrections for Instrumental Errors.		-100		-100																														
Total 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					

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction  $\pm$  = *28.721*  
for Temp. (Col. 2) = *28.721* - *0.41* = *28.311*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction  $\pm$  = *28.723*  
for Temp. (Col. 4) = *28.723* - *0.41* = *28.313*  
Mean at Station, corrected, and at 32°, = *28.312*  
Correction for height, feet, above Mean Sea-level, = *961*  
Mean, reduced to 32°, and Sea-level, = *29.273*  
Highest Reading, corrected for Index error, on the 10 th, = *29.335*  
Lowest Do., Do., on the 28 th, = *28.325*  
Difference, or Monthly Range, = *1.010*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 6 th, = *58.0*  
Lowest in Month, corrected for Index errors, on the 24 th, = *22.0*  
Difference, or Monthly Range, = *36.0*  
"Corrected Mean" of all the Highest, (Col. 5), = *42.5*  
"Corrected Mean" of all the Lowest, (Col. 6), = *33.4*  
Difference, or Mean Daily Range, = *9.1*  
\*\* Calculated Mean Temperature of Month, = *38.0*  
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for Index errors), on the 28 th, = *96.0*  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = *56.7*  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 21 th, = *16.0*  
"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, = *28.8*  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = *37.5*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = *36.1*  
Computed Temperature of Dew-Point, = *34.2*  
Do. Elastic Force of Vapour, = *197*  
Do. Weight of Vapour in a Cubic Foot of Air, = *88*  
Relative Humidity, (Saturation = 100), = *88*  
RAIN fell on 21 Days; Amount in Inches, = *3.28*

WIND.		SUMMARY.									
Direction	No.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.	82										
P.M.	92										
Mean.	92										

036

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 3rd; 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 *William Bruce*, *Bosside, Lochet-Bushnie*.(Signed) *William Bruce*.

During this month we have had more snow than in any month during the winter. Straw very plentiful, but turnips in many cases rather scarce. Much dishealth in the district, such as colds of a very severe nature, inflammation on the lungs, gastric fever, small pox in one family, erysipelas, bronchitis, one case of which proved fatal, one case of cholera which proved fatal. Cattle in general healthy, a few cases of diarrhoea. Two horses have died of natural causes.



WITH REMARKS ON THE USE OF INSTRUMENTS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

FOREST TREES.	Flower.	In Leaf.	Dressed of Leaves.	Barley.	Oats.	Wheat.	Beans.	Potatoes.	Turnips.	Nye Grass.
Alder.	✓			✓	✓	✓	✓	✓	✓	✓
Ash.	✓			✓	✓	✓	✓	✓	✓	✓
Beech.	✓			✓	✓	✓	✓	✓	✓	✓
Birch.	✓			✓	✓	✓	✓	✓	✓	✓
Elm.	✓			✓	✓	✓	✓	✓	✓	✓
Larch.	✓			✓	✓	✓	✓	✓	✓	✓
Lin.	✓			✓	✓	✓	✓	✓	✓	✓
Oak.	✓			✓	✓	✓	✓	✓	✓	✓
Sycamore or Plane.	✓			✓	✓	✓	✓	✓	✓	✓

SHRUBS, &c.	Barberry, . . . . . Bouvier or Elder, . . . . . Broom, . . . . . Hazel, . . . . . Hawthorn, . . . . . Holly, . . . . . Laburnum, . . . . . Pear, . . . . . Plum, . . . . . Strawberry, . . . . .	First in Blossom.	FRUITS.	First in Blossom.	Early Rep. Generally.	MIGRATORY BIRDS.	Cuckoo, Chimney, House-Swallow, Lapwing, Plover, . . . . . Sand-Martin, Starling, . . . . . Swan, . . . . . Hail or Corn Crake, . . . . .	First Arrival.	Departure.
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...diseases prevalent among cattle; and the Agricultural condition of the district generally.

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*Secretary of the Meteorological Society of Scotland*

EDINBURGH.

(By Order) A. B.

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



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Bogside, Lochiel-Bushnie*, County of *Aberdeen*, in Lat.  $57^{\circ}10'50''$ , Long.  $2^{\circ}45'W$ , Distance from Sea *28* miles.Height of Cistern of the Barometer above Mean Sea-level *885* feet, above Ground *3* feet.During the MONTH of *April**1872*

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. ..... 0—10.	GENERAL REMARKS.		Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		P.M.			9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
		Baromet. No.	Attach- ed Ther- mometer	Baromet. No.	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. in Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity, (0—10), and Direction.	Amount, (0—10), and Species.	Velocity, (0—10), and Direction.	Amount, (0—10), and Species.		No. 3 inches.	No. 12 inches.	No. 22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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## NOTATION USED IN GENERAL REMARKS.

a.	drizzle aurora.	m.	drizzle meteor.
ci.	cirrus.	ms.	micros.
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. h.	solar halo.
h. d.	heavy dew.	sq.	squall.
h.	hail.	sq.	squalls.
l.	lightning.	t.	thunder.
li. cl.	light clouds.	t. s.	thunder storm.
li. sh.	light showers.	w.	wind.
lu. co.	lunar corona.	s.	gale of wind.
lu. h.	lunar halo.		

## TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction  $\pm$  for Temp. (Col. 2), = *28.850*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction  $\pm$  for Temp. (Col. 4), = *28.869*  
Mean at Station, corrected, and at 32°, = *28.860*  
Correction for height, feet, above Mean Sea-level, = *960*  
Mean, reduced to 32°, and Sea-level, = *29.820*  
Highest Reading, corrected for Index error, on the 5<sup>th</sup>, = *29.480*  
Lowest Do., Do., on the 24<sup>th</sup>, = *28.550*  
Difference, or Monthly Range, = *0.930*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 10<sup>th</sup>, = *59.0*  
Lowest in Month, corrected for Index errors, on the 1<sup>st</sup>, = *32.0*  
Difference, or Monthly Range, = *27.0*  
"Corrected Mean" of all the Highest, (Col. 5), = *48.1*  
"Corrected Mean" of all the Lowest, (Col. 6), = *36.1*  
Difference, or Mean Daily Range, = *12.0*  
\*\* Calculated Mean Temperature of Month, = *42.1*

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index errors), on the 28<sup>th</sup>, = *90.0*  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = *64.3*  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 5<sup>th</sup>, = *24.0*  
"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, = *32.4*  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = *42.0*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = *39.7*  
Computed Temperature of Dew-Point, = *36.6*  
Do. Elastic Force of Vapour, = *0.218*  
Do. Weight of Vapour in a Cubic Foot of Air, =  
Relative Humidity, (Saturation = 100), = *82*  
RAIN fell on 20 Days; Amount in Inches, = *4.04*

WIND.		SUMMARY.							
Direction		N	NE	E	SE	S	SW	W	NW
A.M.		2		2	9	3	2		
P.M.		2	1		12	2	7		
Mean.		8	0	2	0	10	2	6	2

0.46

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 3rd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gunned or Fastened, and Forwarded by Book Post, prepaid.

Observations made and  
Return verified by*William Bruce*  
*Bogside, Lochiel-Bushnie*

(Signed) *William Bruce*  
The weather has been very changeable during the month, fine and dry during the second week, then followed two weeks of very bad weather, rain, sleet, snow and hail, which put a stop to sowing, which was only commenced on the 24<sup>th</sup>. Much sickness in the district. Three died in brood mares, two cases of gastric fever, one of inflammation from tartar inflammation on the lungs, a good number of cases of measles, and whooping cough, one of small pox. Bogside is very severe nature more than usually prevalent. Several cattle have died during the month in quarters, and a few cases of red water among cows, cattle otherwise healthy.



# 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 inapplicable, 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 relieving one of the main objects of Meteorological Observation.

**Hours 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. *Is-salt-scales* are not true inches but so much shorter as to *compensate* the error that would otherwise arise from the fluctuations of the surface of mercury in the cistern. This form of instrument has been adopted by the Board of Trade, and has received the approval of the Meteorological Committee of the British Association. In another form of the Barometer, the sides of the *cistern* are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale; their coincidence being indicated by a little ivory float, whose stem passes freely through the lid and cistern. When the 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 *seize* 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, the tube is to 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 disengagement carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index,—usually the lower edge of the vernier, which must be carefully adjusted to form exactly a tangent to the convex surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

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

**Self-registering Thermometers.**—Professor Phillips'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. These instruments should be hung horizontally.

The above remarks apply equally to the Thermometers for

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

**Validation of Thermometers.**—No instrument ought to be used for Meteorological purposes till it has been carefully compared by comparison with a *Standard Thermometer*. When such Thermometers are *not* graduated on the stem, but merely on an attached scale, undue repairs, they are very liable to be vitiated by being 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 Meteorological may be had, on loan, by any observer, from the Meteorological Secretary.

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by 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 "*Maxim*," Hygrometer is highly objectionable. The frame of the Thermometer 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 cottonened 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  $40^{\circ}$ , or  $40.5$ , respectively. So also  $40.8$ , and  $40.9$ , more or less must be registered  $40.2$  or  $40.3$  and  $40.7$  or  $40.8$  respectively. In reading Rutherford's "*Max*," and "*Min*," Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

**Wind.**—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, and always when the wind is feeble, references must be made to the direction of the lower strain 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 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, Linet'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 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

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *en-mass* (i. e., within  $20^{\circ}$  or  $30^{\circ}$  of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the cloud column, though in 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.

and Direction," 2. W. (for example), will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of  $\frac{2}{4}$ , (i. e.,  $\frac{1}{2}$ ) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

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

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

**Temperature of Wells.**—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted. *Ozone.*—Mention whether Schönbain's or Moffat's papers are used. 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  $3\frac{1}{2}$ , as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4"; i. e., that it is *blowing fresh*.

**Electricity.**—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory. *Remarks.*—The "*Remarks*" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, may be 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 hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns, otherwise unoccupied, or in two ruled off for the purpose, from that headed "*Remarks*." It is intended that observations by the Electrometer should be entered in this manner or on the side-margin. Additional remarks may be made on the margin. *Observations* in connection with the periodic return of the seasons, possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *term day* observations be taken;—viz., on the 21st days of March, June, September, and December. Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers. The Council 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, 6th December 1855.

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

FOREST TREES.	In flower.	Leaf buds first appear.	In leaf.	Digested or in liquid.	CROPS.	Sowing or above ground.	Appearing or above ground.	In ear or above ground.	First cut or threshed.
Alley.					Barley.				
Ash.					Bere or Biege.				
Beech.					Wheat.				
Birch.									
Blin.									
Larch.					Pears.				
Time.					Potatoes.				
Val.					Rye Grass.				
Sycamore or Plane.									

SHRUBS, ETC.	First in blossom.	First in leaf.	First in blossom generally.	First in leaf generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry.					Cuckoo.	28	
Broom.					Chaffinch.		
Black Currant.					House-Swallow.	29	
Apple.					Lapwing.		
Hawthorn.					Moor.		
Holly.					Sand-Martin.	28	
Laburnum.					Starling.		
Lilac.					Swan.		
Meacock.					Rail or Corn Crane.		
Mountain Ash or Rowan.							
Red Flowering Currant.	15						
Myrtle.	5						

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

BOOK-POST.

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

Mr ALEXANDER BUCHAN,

To

15A  
EDINBURGH  
JAN 4  
1872

RECD  
H  
JAN 27  
1872

RECD  
H  
JAN 27  
1872

Boyd  
April 1872



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Bogside, Lochet-Bushnie*, County of *Aberdeenshire*, in Lat.  $57^{\circ}10'30''$ , Long.  $2^{\circ}45'0''$ , Distance from Sea *28* miles.Height of Cistern of the Barometer above Mean Sea-level *885* feet, above Ground *3* feet.During the MONTH of *May*, 18*72*.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS.			SEA.	OZONE.	GENERAL REMARKS.		Days of Month.					
	0 h. A.M.		0 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		0 h. A.M.		0 h. P.M.		0 h. A.M.		0 h. P.M.		0 h. A.M.		P.M.		0 h. A.M.														
	Barometer.	Atmospheric Thermometer.	Barometer.	Atmospheric Thermometer.	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity.	Amount.	Velocity.	Amount.	No.	3 inches.	No.	13 inches.	No.						22 inches.				
	* No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.						No.	No.			
1	29.350	55	29.300	55	58.0	50.0	62.0	45.0	53.0	51.0	52.0	51.0	S	5	S	5	6.1620	—	—	10st	10st	1	—	—	—	—	—	—	—	—	—	—	1		
2	29.220	54	29.300	55	62.0	45.0	62.0	39.0	56.0	50.0	45.0	42.0	SW	5	W	5	2.1830	—	—	4st	5st	9	—	—	—	—	—	—	—	—	—	—	2		
3	29.030	51	29.600	53	51.0	36.0	67.0	28.0	45.0	42.0	47.0	44.0	SE	5	SW	1	4.6683	1/2	0.3	10st	7st	2	—	—	—	—	—	—	—	—	—	—	3		
4	29.730	47	29.720	49	46.0	37.0	51.0	31.0	49.5	47.5	40.0	39.0	SE	5	W	1.5	0.4657	7	22	10st	10st	0	—	—	—	—	—	—	—	—	—	—	4		
5	29.430	47	29.500	51	51.0	37.0	58.0	33.0	44.5	41.5	44.0	42.0	W	1	6	—	7.9920	1	42	4st	6st	8	—	—	—	—	—	—	—	—	—	—	5		
6	29.520	50	29.500	50	44.0	41.0	52.0	39.0	41.5	41.0	41.0	41.0	NE	5	NE	5	9.9730	19	61	10st	10st	0	—	—	—	—	—	—	—	—	—	—	—	6	
7	29.415	49	29.400	50	45.0	38.0	58.0	35.0	43.0	42.0	42.0	41.0	NE	5	NE	5	0.0000	5	97	5st	10st	0	—	—	—	—	—	—	—	—	—	—	—	7	
8	29.470	49	29.700	50	46.0	38.0	58.0	33.0	44.0	41.0	40.0	38.0	NE	5	NE	5	4.4335	1/2	10	3st	10st	4	—	—	—	—	—	—	—	—	—	—	—	8	
9	29.885	47	29.170	50	49.0	36.0	51.0	32.0	40.0	43.0	44.0	43.0	SW	5	NE	5	5.95865	2	06	3st	10st	6	—	—	—	—	—	—	—	—	—	—	—	9	
10	29.400	47	29.450	49	46.0	34.0	80.0	29.0	42.0	40.0	36.0	36.0	NE	1	NE	5	4.7892	—	04	5st	10st	5	—	—	—	—	—	—	—	—	—	—	—	10	
11	29.400	46	29.350	47	43.0	38.0	63.0	29.0	40.0	37.0	38.0	37.0	NE	1	NE	1	9.7860	1/2	08	5st	10st	3	—	—	—	—	—	—	—	—	—	—	—	11	
12	29.190	45	29.280	48	44.0	37.0	48.0	36.0	40.0	39.0	44.0	44.0	NE	1	6	5	4.3230	4	14	10st	10st	0	—	—	—	—	—	—	—	—	—	—	—	—	12
13	29.420	48	29.360	50	52.0	42.0	54.0	39.0	45.0	43.0	42.5	41.0	6	5	NE	5	2.2842	—	—	4st	10st	2	—	—	—	—	—	—	—	—	—	—	—	13	
14	29.300	48	29.200	53	55.0	41.0	68.0	40.0	47.0	46.0	47.0	47.0	NE	5	NE	5	9.8662	2	9.0	10st	10st	0	—	—	—	—	—	—	—	—	—	—	—	—	14
15	29.100	48	29.115	52	54.0	44.0	89.0	40.0	45.5	45.0	45.0	44.0	6	5	W	5	3.6630	9	1.3	10st	10st	5	—	—	—	—	—	—	—	—	—	—	—	—	15
16	29.970	50	29.955	50	45.0	39.0	45.0	39.0	43.0	42.0	40.5	40.0	NE	5	NE	5	9.7930	9	5.8	10st	10st	0	—	—	—	—	—	—	—	—	—	—	—	—	16
17	29.950	47	29.980	47	43.0	35.0	60.0	34.0	38.0	36.0	36.0	35.0	NE	5	SW	5	8.0482	2	1.3	3st	10st	5	—	—	—	—	—	—	—	—	—	—	—	—	17
18	29.900	45	29.860	47	43.0	32.0	58.0	29.0	39.0	37.0	34.0	33.0	NE	5	SW	5	3.8340	4	1.8	3st	5st	6	—	—	—	—	—	—	—	—	—	—	—	—	18
19	29.800	44	29.780	47	49.0	30.0	93.0	26.0	42.0	38.0	36.0	34.0	SW	5	S	5	8.6410	1	0.8	7st	4st	8	—	—	—	—	—	—	—	—	—	—	—	—	19
20	29.725	45	29.860	49	51.0	33.0	90.0	28.0	44.0	40.0	42.0	40.0	SW	1.5	SW	5	4.0400	2 1/2	1.6	8st	5st	6	—	—	—	—	—	—	—	—	—	—	—	—	20
21	29.880	47	29.900	50	53.0	32.0	105.0	26.0	48.0	43.0	42.0	40.0	NE	5	6	—	5.8250	1 1/2	1.4	4st	2st	8	—	—	—	—	—	—	—	—	—	—	—	—	21
22	29.930	48	29.950	48	45.0	34.0	72.0	28.0	45.0	44.0	41.0	40.0	W	5	6	—	4.7330	6	3.2	10st	10st	1	—	—	—	—	—	—	—	—	—	—	—	—	22
23	29.960	48	29.000	50	46.0	38.0	68.0	35.0	43.5	41.0	39.0	38.0	SW	5	W	5	8.7970	3	2.0	6st	10st	2	—	—	—	—	—	—	—	—	—	—	—	—	23
24	29.065	48	29.150	51	50.0	34.0	95.0	30.0	45.0	42.0	47.0	45.0	W	5	6	—	0.2690	1	0.3	3st	10st	6	—	—	—	—	—	—	—	—	—	—	—	—	24
25	29.160	51	29.300	55	54.0	41.0	75.0	36.0	51.5	48.5	52.0	50.0	SW	5	W	5	3.8210	1/2	0.3	10st	10st	0	—	—	—	—	—	—	—	—	—	—	—	—	25
26	29.365	55	29.330	58	67.0	47.0	115.0	41.0	60.0	54.0	53.0	49.0	SW	5	SW	1.5	0.7100	—	—	2st	10st	8	—	—	—	—	—	—	—	—	—	—	—	—	26
27	29.400	55	29.370	56	60.0	45.0	105.0	42.0	51.0	47.0	47.0	45.0	W	5	W	5	4.8120	—	—	10st	6st	6	—	—	—	—	—	—	—	—	—	—	—	—	27
28	29.300	55	29.190	55	56.0	41.0	85.0	35.0	49.0	45.0	51.0	47.0	S	5	SW	1.5	8.7490	—	—	10st	10st	7	—	—	—	—	—	—	—	—	—	—	—	—	28
29	29.985	55	29.965	56	60.0	50.0	92.0	45.0	54.0	50.0	52.0	48.0	SW	5	SW	1	5.9010	—	—	3st	10st	3	—	—	—	—	—	—	—	—	—	—	—	—	29
30	29.020	55	29.900	56	55.0	41.0	75.0	35.0	51.5	45.0	42.0	39.0	SW	5	SW	1	2.4000	—	—	6st	3st	4	—	—	—	—	—	—	—	—	—	—	—	—	30
31	29.000	48	29.050	56	57.0	36.0	96.0	35.0	50.0	44.0	46.0	42.0	S	5	W	5	6.9390	—	—	5st	3st	8	—	—	—	—	—	—	—	—	—	—	—	—	31
Sums.	15103	17	15111	13	13	13	13	13	123	111	111	112	13	11	11	11	5.53	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Means.	29.010	47.20	29.018	51.45	138.8	78.33	46.4	43.2	43.5	41.0	43.6	41.0	4	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Total Corrections for Instrumental Errors.	-100	—	-100	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
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	32	33		

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction  $\pm$  for Temp. (Col. 2), = *28.857*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction  $\pm$  for Temp. (Col. 4), = *28.859*  
Mean at Station, corrected, and at 32°, = *28.858*  
Correction for height, feet, above Mean Sea-level, = *951*  
Mean, reduced to 32°, and Sea-level, = *29.809*  
Highest Reading, corrected for Index error, on the *10*th, = *29.450*  
Lowest Do., Do., on the *7*th, = *28.400*  
Difference, or Monthly Range, = *1.050*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the *26*th, = *46.70*  
Lowest in Month, corrected for Index errors, on the *19*th, = *30.0*  
Difference, or Monthly Range, = *16.70*  
"Corrected Mean" of all the Highest, (Col. 5), = *51.1*  
"Corrected Mean" of all the Lowest, (Col. 6), = *38.8*  
Difference, or Mean Daily Range, = *12.3*  
\* Calculated Mean Temperature of Month, = *45.0*  
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for Index errors), on the *26*th, = *115.0*  
"Corrected Mean" (Col. 7), of Black Bulb, Max. in Sun, = *78.3*  
Lowest at Night, Black Bulb, (corrected for Index errors), on the *19*th, = *26.0*  
"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, = *34.6*  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = *44.8*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = *42.6*  
† Computed Temperature of Dew-Point, = *40.0*  
† Do. Elastic Force of Vapour, = *2.48*  
† Do. Weight of Vapour in a Cubic Foot of Air, =  
† Relative Humidity, (Saturation = 100), = *84*  
RAIN fell on *22* Days; Amount in Inches, = *5.53*



INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

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

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

**Barometer.**—Weather glasses and aneroids, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of adjustment or compensation as will secure the height of the mercury in the tube, being accurately measured from the fluctuating surfaces 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-bubbles* 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 this 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 screws, 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 *bell*, 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 "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 Mr. 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-erected by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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 thickened boxes, these sites protect the bulbs from the wind. The "Maximum" should be freely exposed to the sun, and the "Minimum" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the sun's heat to affect the Minimum Thermometer by dissipation.

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers 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 Scales, 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, properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and well-tested form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must hang down by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the mudin 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 by the observer that the mudin 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°.5, and 40°.6, more or less must be registered 40°.2 or 40°.3 and 40°.7 or 40°.8 respectively. In reading Rutherford's "Max." and "Min." Thermometers, the indication of that end of the index which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

**Hour of observing Temperature.**—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered at 9 P.M. on the 2nd and extending till 9 P.M. on the 3rd, at least 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, at least above surrounding objects. When it settles incessantly, the mean direction must be taken; and when it is stationary, 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 that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended; the method of *Estimating* Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

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

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

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

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from 0 or less obscuration of the sky *at-peak* (i. e., within 30° or 36° 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 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 condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity

6, S. W.

and Direction,"—(for example,) will indicate that the

upper strata of clouds travel with *extreme* velocity from S.W.,

and those in the lower regions from W., with one-third the

(*extreme*) speed of the former. Again, in the second "Cloud"

column, an entry of— $\frac{2}{4}$  (eg.) 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 and 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 fixed with sloping tin soldiers, 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.

**Apperature 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 care-

fully 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 obser-

vations might be taken for other and greater depths, noting always

the temperature of the air, and the hour of observation; and con-

tinuing 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 Schœnbein's or Moffat's papers are

used. The paper is affixed by a pin to a board in the ther-

monometer 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 obser-

vation, in the following manner:—thus 3<sup>rd</sup>, 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—8 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 un-

avoidably 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 advan-

tage of, and a list of such as are recognized in use at Green-

wich 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, other-

wise unoccupied, or in two ruled off for the purpose, from that

headed "Remarks." It is intended that observations by the

Electrometer should be entered in this manner or on the side-

margin. Additional remarks may be made on the margin.

**Observations in connection with the periodic return of the**

seasons," possess not only great scientific value, but are of con-

siderable 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 *form day* observations be taken;

—viz., on the 21st days of March, June, September, and Decem-

ber.

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, be-

fore 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.

Secretary, 26, December 1865.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	In Leaf.	Divested of Leaves.	CROPS.	Growing or Ripe.	Planting or Above Ground.	In Ear or Blossom.	First Cut or Blasted.
Alder.	26			Barley.	1			
Ash.				Bare or Bigg.	2			
Beech.	20			Wheat.				
Birch.	20			Beans.				
Larch.	21			Potatoes.	11			
Oak.	20			Turnips.	18			
Sycamore or Plane.	20			Rye Grass.	21			

SHRUBS, ETC.	First in Blossom.	First in Fruit.	First in generally.	MICHAELMAS BIRDS.	First Arrival.	Departure.
Barberry.				Cuckoo.		
Bourtree or Elder.				Curlew.		
Broom.				House-mallow.		
Black Currant.	23			Lapwing.		
Apple.	30			Plover.		
				Sand-Martin.		
				Starling.		
				Swan.		
				Rail or Corn Crake.		
						27

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.

BOOK-POST.

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

To

EDINBURGH  
JUN 3 1872



Boyd  
May 1872



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Bosside, Loch-bushnie, County of Aberdeen, in Lat.  $57^{\circ}10'50''$ , Long.  $2^{\circ}45'0''W$ , Distance from Sea 28 miles.  
Height of Cistern of the Barometer above Mean Sea-level 885 feet, above Ground 3 feet. During the MONTH of June 1872.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS, under Ground.			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 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.									
		Barometer.	Attach- ed Ther- mometer	Barometer.	Attach- ed Ther- mometer	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity (0-6), and Direction.	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.	Inches.					No.	Inches.	
		No.	Inches.	No.	Inches.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.					No.	No.	No.
		* No.	°	* No.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°					°	°	°
1	29.185	48	29.050	52	60.0	39.0	107.0	30.0	45.0	43.0	44.0	41.0	W	5	W	5	94945	—	09	5	cu	6	cu	5				2					
2	28.840	57	28.880	57	62.0	42.0	92.0	41.0	46.5	46.0	52.0	50.0	W	5	W	5	22465	1/2	—	10	st	5	st	4				3					
3	28.845	55	28.900	55	63.0	42.0	103.0	35.0	59.0	52.5	57.0	47.0	W	5	W	5	36402	1/2	20	10	st	5	st	6				4					
4	29.135	54	29.200	55	61.0	40.0	108.0	34.0	56.0	50.0	57.0	48.0	W	5	W	5	54492	1/2	10	3	cu	6	cu	9				5					
5	29.130	54	29.040	55	56.0	45.0	64.0	40.0	50.0	49.0	50.0	49.0	W	5	W	5	67140	6	24	10	st	10	st	0				6					
6	29.020	53	29.000	58	60.0	41.0	103.0	36.0	52.0	50.0	50.0	50.0	W	5	W	5	94235	1	10	10	st	10	st	7				7					
7	28.880	56	28.650	57	57.0	47.0	63.0	38.0	51.0	49.0	49.0	49.0	W	5	W	5	27590	1/2	66	10	st	10	st	1				8					
8	28.700	57	28.690	54	56.0	38.0	85.0	35.0	50.0	47.0	47.0	46.0	W	5	W	5	68665	1/2	26	5	cu	10	st	6				9					
9	28.570	53	28.550	56	57.5	46.0	89.0	45.0	49.0	46.0	49.0	49.0	W	1	W	5	17405	6	24	10	st	10	st	8				10					
10	28.550	55	28.600	55	53.0	46.0	73.0	44.0	49.0	48.0	47.5	47.0	W	5	W	5	76470	4	09	10	st	10	st	0				11					
11	28.610	55	28.700	55	58.0	44.0	95.0	44.0	51.0	48.0	49.0	47.0	W	5	W	5	85520	1/2	09	7	cu	10	st	5				12					
12	28.830	54	28.900	56	57.0	44.0	94.0	44.0	52.0	52.0	51.5	49.0	W	5	W	5	11660	—	—	10	st	10	st	6				13					
13	28.960	55	29.100	58	63.0	47.0	95.0	46.0	52.0	49.0	54.0	52.0	W	5	W	5	24890	—	—	10	st	10	st	5				14					
14	29.150	58	29.180	62	62.0	50.0	97.0	49.0	59.0	57.0	59.0	56.0	W	5	W	5	38820	—	—	10	st	10	st	8				15					
15	29.185	58	29.285	58	63.4	50.0	85.0	46.0	54.0	52.0	57.0	55.0	W	5	W	5	68025	3	17	10	st	10	st	4				16					
16	29.400	61	29.410	65	70.0	54.0	85.0	50.0	60.0	58.5	59.0	58.0	W	5	W	5	92975	1/2	—	10	st	10	st	3				17					
17	29.365	63	29.300	63	68.0	50.0	100.0	47.0	63.0	60.0	64.0	60.0	W	5	W	5	03270	2	09	10	st	10	st	6				18					
18	29.200	64	29.110	68	74.0	57.0	107.0	48.0	67.0	63.0	63.5	61.5	W	5	W	5	29302	—	—	10	st	10	st	7				19					
19	29.100	65	29.060	61	66.0	53.0	103.0	52.0	60.0	58.0	59.0	58.0	W	5	W	5	80030	2 1/2	16	10	st	10	st	8				20					
20	29.180	62	29.240	62	63.0	54.0	90.0	53.0	60.0	55.0	53.0	52.0	W	5	W	5	11273	—	08	10	st	10	st	4				21					
21	29.200	61	28.900	60	64.0	49.0	101.0	49.0	61.0	56.0	52.0	52.0	W	5	W	5	42063	5 1/2	29	10	st	10	st	3				22					
22	28.700	57	28.900	60	58.0	46.0	87.0	44.0	61.0	56.0	51.0	47.5	W	5	W	1	05120	1 1/2	09	10	st	5	st	5				23					
23	29.060	58	29.135	61	64.0	46.0	95.0	45.0	54.0	51.0	56.5	52.0	W	5	W	5	50004	—	07	10	st	5	st	6				24					
24	29.100	59	28.975	59	64.0	49.0	90.0	47.0	53.0	54.0	53.0	52.0	W	5	W	5	90430	1	12	10	st	5	st	7				25					
25	28.770	59	28.680	61	61.0	51.0	80.0	50.0	54.0	54.0	56.0	55.0	W	5	W	5	24435	4	42	10	st	10	st	0				26					
26	28.745	59	28.900	58	56.5	49.0	74.0	48.0	57.0	50.0	50.0	49.0	W	5	W	5	58195	7	06	10	st	10	st	0				27					
27	28.985	55	28.900	58	58.0	42.0	90.0	35.0	53.0	54.0	50.0	49.0	W	5	W	5	88120	3 1/2	45	3	cu	10	st	8				28					
28	28.660	57	28.620	58	59.0	42.0	85.0	41.0	52.0	52.0	51.0	47.0	W	5	W	2	20220	9	22	10	st	8	st	3				29					
29	29.964	56	29.100	57	59.0	45.0	80.0	40.0	48.0	46.0	49.0	46.0	W	1	W	5	47010	3	—	10	st	0	9				30						
30	29.100	56	28.960	57	62.0	41.0	104.0	33.0	59.0	54.0	57.0	49.0	W	5	W	5	79125	—	—	5	cu	10	st	14				31					
31																																	
Sums.	1513	15	1491	15	121	12	11	12	12	131	124	161					150	168															
Means.	28.968	567	28.964	584	61.0	46.1	90.8	43.5	54.7	51.9	52.5	50.8	5				155	165															
Total Corrections for Instrumental Errors.	-100		-100																														
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			

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

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

## NOTATION USED IN GENERAL REMARKS.

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

## TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, (0-1).	Common Designation.	Estimated Force, (0-1).	Common Designation.	Estimated Force, (0-1).	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), = 28.795  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction  $++$  for Temp. (Col. 4), = 28.786  
Mean at Station, corrected, and at 32°, = 28.790  
Correction for height, feet, above Mean Sea-level, = 931  
Mean, reduced to 32°, and Sea-level, = 29.721  
Highest Reading, corrected for Index error, on the 16th, = 29.410  
Lowest Do., Do., on the 10th, = 28.550  
Difference, or Monthly Range, = 0.860

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 18th, = 74.0  
Lowest in Month, corrected for Index errors, on the 8th, = 38.0  
Difference, or Monthly Range, = 36.0  
"Corrected Mean" of all the Highest, (Col. 5), = 61.0  
"Corrected Mean" of all the Lowest, (Col. 6), = 46.1  
Difference, or Mean Daily Range, = 14.9  
\*\* Calculated Mean Temperature of Month, = 53.6

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for Index errors), on the 4th, = 108.0  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 90.8  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 1th, = 30.0  
"Corrected Mean" (Col. 8), of Black Bulb Min. on grass, = 43.0  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 53.7

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 51.4

Computed Temperature of Dew-Point, = 49.2

Do. Elastic Force of Vapour, = 34.9

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

Relative Humidity, (Saturation = 100), = 84

RAIN fell on 27 Days; Amount in Inches, = 4.29

WIND.	SUMMARY.											
	Direction	N	NE	E	SE	S	SW	W	NW	Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.		2	1		5	13	1	4	2	2		
P.M.		2	4	4	9	1	5	1	3			
Mean.		2	1	2	4	11	1	5	2	2	52	

0.27

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 3rd; 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  
Returned by

William Bruce  
Bosside, Loch-bushnie

(Signed) William Bruce.  
The weather has been very wet during the month, very backward for turnip sowing, so that the ground has been very ill cleaned. Broods of all kinds are looking very well. Pasture very plentiful. Grass staggers very prevalent among cattle and horses. People healthy.



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

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

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

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

**Protection of Thermometers.**—The Council of the Society recommend that Self-registering Thermometers and Hygrometers be enclosed in a Box, painted white outside, and black within, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the Boxes are arranged so as to "protect" the Thermometers, and to allow a complete ventilation of the interior. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, the 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 Rathford 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 replaced by sucking the instrument repeatedly against the palm of this hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

The above remarks apply equally to the Thermometers for

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

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers 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 Scales, 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 properly tested Thermometers 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 adhere to the following conditions:—The bulbs must hang down by at least an inch and a half 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 mullin 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 by the observer that the mullin 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 aforementioned requirements shall be complied with, as far as possible.

**Reading of the Thermometer.**—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read  $-39.9$ ,  $40.0$ , or  $40.1$ ; or again,  $40.2$ ,  $40.5$ , or  $40.6$ , according as it indicates a little under, an exact coincidence with, or a little over  $40^{\circ}$ , or  $40\frac{1}{2}$ , respectively. So also  $40\frac{1}{2}$ , and  $40\frac{3}{4}$ , more or less must be registered  $40.2$  or  $40.3$  and  $40.7$  or  $40.8$  respectively. In reading Rathford's "Max." and "Min." Thermometers, the indication of that end of the tube which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

**Wind.**—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, and always when the wind is feeble, reference must be made to the direction of the lower surface 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 observer be furnished with a Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, Lind's Anemometer is also recommended; the method of *Estimating* Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

**Rain-gauges.**—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable situation for observation, and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unequivocal 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

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner;—In the column "Velocity and Direction," (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of  $\frac{2}{4}$  st., 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 temperature 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 soil, their bulbs being sunk to 3, 12, and 22 inches, and the stems above ground projected from the sun's rays, and fitted with sloping tin collars, to prevent water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

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

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

**Ozone.**—Mention whether Schönbain's or Moffat's papers are used. 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  $3\frac{3}{4}$  w., as an ozone entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is  $4\frac{1}{2}$ ; i. e., that it is blowing fresh.

**Electricity.**—Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper 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 recognized and in use at Greenwich and Southampton, are given at the foot of the column.

Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, &c. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

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

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

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.

ENDEBUSH, 9th December 1855.

OSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf buds first appear.	In Leaf.	Divested of Leaves.	CROPS, mentioning variety.	Sowing or above ground.	Appearance in Bar.	First Cut.
Alder.					Barley.			
Asp.					Bere or Blyss.			
Beech.					Oats.			
Birch.					Wheat.			
Blin.					Beans.			
Larch.					Pease.			
Linne.					Potatoes.			
Oak.					Turnips.			
Sycamore or Plane.					Ivy Grass.			

SHRUBS, ETC.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.	First in Blossom.
Barberry.					Apple.			
Bornet or Elder.					Black Currant.			
Broom.					Cherry.			
Hazel.					Cean.			
Hawthorn.					Gooseberry.			
Holly.					Teach.			
Laburnum.					Pear.			
Lilac.					Plum.			
Mockern.					Strawberry.			
Mountain Ash or Rowan.								
Red Flowering Currant.								
Rhododendron Ponticum.								
Whin.								

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

EDINBURGH.

Secretary of the Meteorological Society of Scotland,

Mr ALEXANDER BUCHAN,

BOOK-POST.

Boyside

June 1872.

To



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Bogside, Lochet-Buslinis*, County of *Aburdeen*, in Lat.  $57^{\circ}10'50''$ , Long.  $2^{\circ}45'0''$ , Distance from Sea *28* miles.  
Height of Cistern of the Barometer above Mean Sea-level *88.5* feet, above Ground *3* feet. During the MONTH of *July* 187*2*.  
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.  9 A.M. 9 P.M.	GENERAL REMARKS.  As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.				
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.		9 h. P.M.											
		Barometer. * No. _____	Attached Thermometer	Barometer. No. _____	Attached Thermometer	Max. No.	Min. No.	Max. in Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Readings of the H. Cup Anemometer. No. _____	No. of hours in which it fell.	Amount in inches.	Velocity (0—10), and Direction.	Amount (0—10), and Species.	Velocity (0—10), and Direction.	Amount (0—10), and Species.	No. _____ 8 inches.	No. _____ 12 inches.	No. _____ 22 inches.					Temperature of Well at 4 feet, No. _____	Temperature at 10 feet, No. _____	Temperature at 10 feet, and Density.	
		inches.	°	inches.	°	°	°	°	°	°	°	°	°					9 h. A.M.																	
	1	29.830	58	29.900	60	60.0	49.0	75.0	46.0	56.0	55.0	56.0	54.0	9	5	9	5	0.225	—	—	10 st	8 st	3	—	—	—	—	—	—	—	1				
	2	29.000	56	29.200	60	64.0	49.0	103.0	46.0	54.0	53.0	55.0	53.0	9	5	9	5	1.7340	1	0.8	10 st	8 st	5	—	—	—	—	—	—	—	2				
	3	29.270	59	29.270	65	72.0	44.0	85.0	39.0	59.0	54.0	59.0	56.0	9	5	9	5	5.7440	1	0.6	8 st	10 st	10	—	—	—	—	—	—	—	3				
	4	29.300	65	29.340	69	74.0	57.0	90.0	53.0	68.0	64.0	65.0	62.0	9	1	9	5	7.9766	1 1/2	0.2	8 st	10 st	12	—	—	—	—	—	—	—	4				
	5	29.300	67	29.060	69	77.0	58.0	121.0	54.0	71.0	69.0	64.0	60.0	9	1	9	5	0.4132	—	—	2 st	4 st	14	—	—	—	—	—	—	—	5				
	6	29.070	65	29.230	63	61.0	52.0	97.0	49.0	63.0	57.0	53.0	51.0	9	1	6	—	5.7250	1	0.4	7 st	10 st	4	—	—	—	—	—	—	—	6				
	7	29.270	67	29.180	62	55.0	49.0	70.0	44.0	53.0	57.0	53.0	50.0	9	5	9	5	7.2220	11	5.1	10 st	10 st	0	—	—	—	—	—	—	—	7				
	8	29.800	61	29.040	63	61.0	49.0	74.0	47.0	55.0	55.0	57.0	56.5	6	—	9	—	5.92240	6	3.7	10 st	10 st	0	—	—	—	—	—	—	—	8				
	9	28.835	59	29.000	60	64.0	47.0	102.0	43.0	59.0	54.0	52.0	50.0	9	5	6	—	3.1890	—	—	3 st	8 st	8	—	—	—	—	—	—	—	9				
	10	29.055	58	29.040	58	64.0	48.0	112.0	45.0	57.0	53.0	51.0	48.0	9	5	9	5	6.9910	—	—	7 st	5 st	12	—	—	—	—	—	—	—	10				
	11	29.085	59	29.160	59	64.0	48.0	80.0	41.0	55.0	54.0	54.0	54.0	6	5	9	5	8.6522	3	2.6	10 st	10 st	0	—	—	—	—	—	—	—	11				
	12	29.265	60	29.300	61	57.0	53.0	65.0	53.0	56.0	56.0	57.0	56.5	9	5	6	—	5.2910	2 1/2	1.4	10 st	10 st	0	—	—	—	—	—	—	—	12				
	13	29.210	60	29.260	61	50.0	51.0	73.0	47.0	54.0	53.0	53.0	53.0	9	1	9	5	7.7445	1 1/2	1.2	10 st	10 st	0	—	—	—	—	—	—	—	13				
	14	29.290	59	29.260	58	53.0	49.0	62.0	47.0	57.0	50.0	50.0	47.0	9	5	9	5	5.36610	1/2	0.8	10 st	10 st	0	—	—	—	—	—	—	—	14				
	15	29.200	59	29.120	60	64.0	45.0	87.0	39.0	56.0	57.0	56.0	50.0	9	1.5	9	5	0.6695	—	—	4 st	5 st	12	—	—	—	—	—	—	—	15				
	16	29.020	59	29.150	60	64.0	45.0	89.0	40.0	56.0	57.0	56.0	47.0	9	1	9	1	5.6695	—	—	10 st	4 st	6	—	—	—	—	—	—	—	16				
	17	29.100	57	29.100	58	61.0	40.0	100.0	30.0	67.0	52.0	48.0	44.0	9	5	6	—	7.4520	—	—	5 st	0	14	—	—	—	—	—	—	—	17				
	18	29.100	57	29.150	59	63.0	50.0	110.0	41.0	64.0	47.0	50.0	48.0	9	5	6	—	9.7640	—	—	3 st	4 st	10	—	—	—	—	—	—	—	18				
	19	29.200	58	29.240	60	64.0	42.0	112.0	34.0	63.0	58.0	54.0	51.0	6	—	9	1	2.2745	—	1.1	5 st	10 st	12	—	—	—	—	—	—	—	19				
	20	29.180	59	29.150	61	61.0	50.0	63.0	45.0	54.5	52.0	61.0	59.0	9	5	9	1	4.0990	6	1.0	10 st	5 st	0	—	—	—	—	—	—	—	20				
	21	29.110	63	29.110	66	70.0	58.0	90.0	53.0	64.0	62.0	64.0	61.0	9	5	9	5	1.6100	—	—	4 st	5 st	6	—	—	—	—	—	—	—	21				
	22	29.030	63	29.800	66	70.0	53.0	100.0	45.0	64.0	60.0	58.0	54.0	9	5	9	5	4.4200	12	0.4	7 st	5 st	10	—	—	—	—	—	—	—	22				
	23	29.060	63	29.100	64	70.0	50.0	100.0	40.0	65.0	61.0	53.0	50.0	9	5	9	5	7.5370	—	—	7 st	5 st	5	—	—	—	—	—	—	—	23				
	24	29.160	63	29.230	66	78.0	52.0	117.0	40.0	65.0	63.0	59.0	57.0	9	5	9	5	8.5780	—	—	10 st	10 st	11	—	—	—	—	—	—	—	24				
	25	29.320	63	29.360	65	61.0	53.0	74.0	53.0	60.0	57.0	55.0	55.0	9	5	6	—	0.6685	1 1/2	1.9	10 st	10 st	0	—	—	—	—	—	—	—	25				
	26	29.345	63	29.300	63	66.0	53.0	62.0	52.0	53.0	53.0	54.0	54.0	6	5	9	5	5.4310	1	—	10 st	10 st	0	—	—	—	—	—	—	—	26				
	27	29.240	61	29.200	64	64.0	57.0	87.0	48.0	57.0	53.0	61.0	61.0	6	5	6	—	6.4585	1	0.4	10 st	10 st	1	—	—	—	—	—	—	—	27				
	28	29.170	63	29.120	67	72.0	54.0	120.0	43.0	65.0	62.0	63.0	61.0	6	—	6	—	8.9380	1/2	0.2	7 st	8 st	12	—	—	—	—	—	—	—	28				
	29	29.100	63	29.100	65	70.0	53.0	118.0	46.0	60.0	58.0	53.0	53.0	6	—	9	5	8.7330	1 1/2	0.7	10 st	10 st	5	—	—	—	—	—	—	—	29				
	30	29.115	61	29.120	58	63.0	47.0	80.0	39.0	49.0	46.5	47.5	45.0	9	1.5	9	1.5	7.4735	2	0.7	8 st	6 st	4	—	—	—	—	—	—	—	30				
	31	29.110	57	29.100	57	54.0	46.0	75.0	37.0	56.0	54.0	48.0	46.0	9	5	9	5	5.2920	—	—	10 st	10 st	0	—	—	—	—	—	—	—	31				
Sums.		6105	18	67	13	9	15	157	14	13	12	14	11	11	11	11	7	258																	
Means.		29.140	60.8	29.164	62.2	63.5	50.1	90.2	44.8	58.4	55.6	55.3	53.1	6	6	6	6	6																	
+ Total Corrections for Instrumental Errors.		-100		-100																															
+ 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				

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction ++ = *29.955*  
for Temp. (Col. 2), = *29.040* - *0.85* = *28.190*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ = *29.955*  
for Temp. (Col. 4), = *29.064* - *0.89* = *28.171*  
Mean at Station, corrected, and at 32°, = *28.965*  
Correction for height, feet above Mean Sea-level, = *926*  
Mean, reduced to 32°, and Sea-level, = *29.891*  
Highest Reading, corrected for Index error, on the 25th, = *29.360*  
Lowest Do. Do. on the 1st, = *28.830*  
Difference, or Monthly Range, = *0.530*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 5th, = *77.0*  
Lowest in Month, corrected for Index errors, on the 17th, = *40.0*  
Difference, or Monthly Range, = *37.0*  
"Corrected Mean" of all the Highest, (Col. 5), = *63.5*  
"Corrected Mean" of all the Lowest, (Col. 6), = *50.1*  
Difference, or Mean Daily Range, = *13.4*  
\*\* Calculated Mean Temperature of Month, = *56.8*  
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 5th, = *121.0*  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = *90.2*  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 17th, = *30.0*  
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = *46.8*  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = *56.9*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = *54.4*  
# Computed Temperature of Dew-Point, = *52.1*  
# Do. Elastic Force of Vapour, = *389*  
# Do. Weight of Vapour in a Cubic Foot of Air, = *84*  
# Relative Humidity, (Saturation = 100), = *84*  
RAIN fell on 13 Days; Amount in Inches, = *2.58*

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



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

One of the objects of immediate importance that the Scottish Meteorological Society has proposed to itself is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will 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 scale. 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 *oppositely* 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 independent 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 recommended by Mr. Ald of London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-sticks* are not two 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 ball, 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 foot 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 *vernier*, which must be carefully adjusted to form exactly a tangent to the lower surface of the mercury in the tube. Observations must be taken quickly; so as to prevent heat from the observer's hands and person from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

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

**Self-registering Thermometers.**—Professor Phillips, 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 striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be dislodged from there by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

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

The Hygrometer consists of two Thermometers usually, but not necessarily mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometric Deductions" Observers are specially requested to attend to the following conditions:—The bulbs must hang down by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulb;—the mesh 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 mesh 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 "Masori'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 nailing 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 Thermometers.**—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 rounded in decimals. Thus the Thermometer will be read—59.9, 40.0, or 40.1, or again, 40.45, 40.35, or 40.46, according as it indicates a little under, an exact coincidence with, or a little over 40, or 40.5, respectively. So also 49.4, and 40.1, or 40.8 respectively. In reading Rutherford's "Max." and "Min." Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

The Council recommend that every observer 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 as the time of observation may be ascertained. For indicating the Force of the Wind, at any particular hour of observation, *Wind's* Anemometer is also recommended; the method of *Estimating* Wind Force by such tables as that given in the schedule is, to say the least, unsatisfactory.

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

**Snowfalls may, for convenience, be registered in the rain columns, under the following conditions:**—When a Snow shower occurs it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as 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

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity 6, S. W." (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of 4, str. (49) 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 transpiration being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

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

**Temperature of Wells.**—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and of the water noted. **Ques.**—Mention whether Schönbach's or Meiffert's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3xx, as an entry in the schedule, will indicate that the zero paper is fixed as 4.3° on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4, i.e., that it is blowing fresh.

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

**Remarks.**—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms 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 on the side-margins. Additional remarks may be made on the margin, *Observations* in connection with the periodic return of the seasons' press 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; Observations ought to be confined to individual trees and shrubs; to particular species of birds, and in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

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

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

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

(By Order) A. B. Edinburgh, 10th November 1870.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.	CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Raked.
Alder . . . . .					Barley . . . . .			12	
Ash . . . . .					Bere or Bigg . . . . .			11	
Beech . . . . .					Oats . . . . .			23	
Birch . . . . .					Wheat . . . . .				
Elm . . . . .					Beans . . . . .				
Larch . . . . .					Pease . . . . .				
Lime . . . . .					Potatoes . . . . .			30	
Oak . . . . .					Turnips . . . . .				
Sycamore or Plane . . . . .					Rye Grass . . . . .				

SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry . . . . .		Apple . . . . .			Cuckoo . . . . .		
Bountree or Elder . . . . .		Black Currant . . . . .		28	Curlew . . . . .		
Broom . . . . .		Cherry . . . . .			House-Swallow . . . . .		
Hazel . . . . .		Gean . . . . .			Lapwing . . . . .		
Hawthorn . . . . .		Gooseberry . . . . .			Plover . . . . .		
Holly . . . . .		Peach . . . . .			Sand-Martin . . . . .		
Laburnum . . . . .		Pear . . . . .			Starling . . . . .		
Lilac . . . . .		Plum . . . . .			Swan . . . . .		
Mezereon . . . . .		Strawberry . . . . .		20	Rail or Corn Crane . . . . .		
Mountain Ash or Rowan . . . . .							
Red Flowering Currant . . . . .							
Rhododendron Ponticum . . . . .							
Whin . . . . .							

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

MR ALEXANDER BUCHAN,  
General Post Office Buildings,  
Edinburgh.  
Secretary of the Meteorological Society of Scotland.  
Approved  
July 1872  
BOOK-POST.  
70  
72  
72



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Begsich Loch-bus-hine*, County of *Aberdeen*, in Lat.  $57^{\circ}10'50''$ , Long.  $2^{\circ}45'0''$ , Distance from Sea *28* miles.Height of Cistern of the Barometer above Mean Sea-level *885* feet, above Ground *3* feet.During the MONTH of *August* 1872.

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. No. of hours in which it fell.	Amount in inches.	CLOUDS.				SUNSHINE. Hours.	THERMOMETERS under Ground.			SEA. Temperature at 1 fathom, and Density.	OZONE. 0-10. 9 A.M. 9 P.M.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc.  Mention the hour at which Storms, including Thunder and Lightning, began and ended.	Days of Month.		
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.				9 A.M.		P.M.			9 h. A.M.								
		Barometer.	Attached Ther- mometer	Barometer.	Attached Ther- mometer	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.			Readings of the H- Cup Anemometer.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	Velocity (0-10), and Direction.		Amount (0-10), and Species.	No. 3 inches.	No. 12 inches.					No. 22 inches.	
		* No.	°	No.	°	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.			No.	No.	No.	No.		No.	No.	No.					No.	No.
	1	29.080	55	29.090	56	60.0	50.0	80.0	44.0	48.0	45.0	52.0	49.0.	N	5	N	5	34750	-	-	10 st	10 st	0								1		
	2	29.000	54	28.985	58	54.0	46.0	54.0	36.0	48.0	45.0	48.0	48.0	N	5	N	5	57310	1 1/2	14	10 st	10 st	2								2		
	3	29.000	55	29.085	56	56.0	44.0	80.0	32.0	50.0	49.0	46.0	46.0	N	5	E	-	09110	1	-	10 st	0	2								3		
	4	29.080	56	29.050	57	56.5	44.0	84.0	38.0	50.0	46.0	47.0	45.0	NW	5	E	-	29210	-	-	10 st	10 st	6								4		
	5	28.450	56	28.870	56	61.0	41.0	90.0	33.0	57.0	49.0	52.0	48.0	NW	5	E	-	30085	-	-	10 st	2 st	8								5		
	6	28.857	55	28.860	56	58.0	38.0	105.0	29.0	56.0	51.0	49.0	48.0	E	5	E	-	36610	3	20	3 in	10 st	6								6		
	7	28.840	57	28.750	54	61.0	47.0	100.0	44.0	58.0	53.0	57.0	51.0	S	5	N	5	45330	3	32	10 st	10 st	4								7		
	8	28.990	56	29.160	56	56.0	46.0	86.0	37.0	56.0	53.0	47.0	43.0	N	5	E	-	75000	-	-	10 st	8 st	2									8	
	9	29.180	56	29.090	57	62.0	36.0	90.0	27.0	58.0	54.0	50.0	47.0	N	5	E	5	99140	-	36	5 in	10 st	7									9	
	10	29.800	59	28.700	59	62.0	48.5	88.0	43.0	52.0	52.0	55.0	53.5	E	5	E	-	23200	6 1/2	09	10 in	10 st	3									10	
	11	28.700	59	28.770	59	60.0	49.0	80.0	48.0	50.0	47.0	54.0	53.0	NW	5	NW	1	54890	2	46	10 st	10 st	2									11	
	12	29.000	59	29.200	57	55.0	48.0	58.0	44.0	53.0	53.0	50.0	49.0	NW	5	N	5	92410	6	18	10 in	10 st	0									12	
	13	29.340	59	29.220	57	56.0	46.0	80.0	38.0	57.0	47.0	52.0	57.0	N	5	E	-	00310	-	-	10 st	10 st	5									13	
	14	29.435	57	29.420	59	64.0	43.0	90.0	33.0	61.0	58.0	51.0	50.0	NW	5	E	-	11522	-	-	5 in	0	15									14	
	15	29.400	57	29.360	59	63.0	43.0	89.0	34.0	53.0	52.0	54.0	53.0	S	5	N	5	25930	-	-	10 in st	10 st	12									15	
	16	29.230	57	29.120	59	57.0	51.0	62.0	46.0	54.0	54.0	53.0	54.0	S	5	N	1	57792	7	21	10 st	10 in	0									16	
	17	29.110	57	29.200	59	63.0	54.0	76.0	57.0	59.0	58.0	57.0	55.0	S	5	S	5	83610	-	-	10 st	10 st	0									17	
	18	29.450	61	29.500	64	69.0	50.0	103.0	45.0	63.0	59.0	59.0	57.0	E	5	E	-	01510	-	-	7 in st	8 st	10									18	
	19	29.490	61	29.480	64	72.0	50.0	104.0	48.0	62.0	58.0	56.0	53.0	S	5	S	5	29025	-	-	0	5 in	13									19	
	20	29.480	61	29.480	62	70.0	45.0	106.0	40.0	61.0	57.0	51.0	50	E	5	E	5	53320	-	-	0	0	15									20	
	21	29.380	60	29.470	64	69.0	48.0	112.0	46.0	58.0	55.0	56.0	55.0	E	-	E	-	61565	-	-	3 st	4 in	12									21	
	22	29.390	62	29.400	61	64.0	48.0	104.0	40.0	62.0	58.0	50.0	49.0	E	5	N	5	72475	-	-	0	0	15									22	
	23	29.400	56	29.425	62	65.0	45.0	110.0	40.0	49.0	48.0	56.0	54.0	N	5	E	-	89320	-	-	10 st	8 st	5									23	
	24	29.400	59	29.420	63	66.0	48.0	94.0	44.0	58.0	54.0	53.0	53.0	S	5	N	5	99520	4 1/2	38	3 in st	10 st	3									24	
	25	29.350	60	29.160	60	57.0	47.0	77.0	45.0	52.0	53.0	51.0	50.0	E	5	NW	5	07120	4 1/2	41	10 st	10 in	0									25	
	26	29.350	60	29.370	60	57.0	48.0	74.0	39.0	51.0	57.0	49.0	47.0	E	5	N	5	69692	4	-	10 in	10 st	6									26	
	27	29.330	60	29.440	59	58.0	47.0	82.0	45.0	57.0	48.0	57.0	49.0	N	5	N	5	03944	-	16	10 st	10 in st	5									27	
	28	29.285	57	29.120	60	61.0	45.0	60.0	38.0	49.0	48.0	59.0	55.0	S	5	N	5	42690	5 1/2	24	10 in	10 in	0									28	
	29	29.055	58	28.900	62	65.0	53.0	88.0	47.0	57.0	57.0	56.0	55.0	S	5	N	5	66175	2	12	10 in	10 st	2									29	
	30	28.800	58	28.750	60	60.0	48.0	85.0	38.0	52.0	57.0	50.5	49.5	NW	5	NW	5	81422	2	14	10 st	10 st	3									30	
	31	28.840	56	29.000	57	54.0	44.0	80.0	49.0	52.0	51.0	47.0	46.0	NW	5	NW	5	08065	1	03	10 st	10 st	0									31	
Sums.		12122	16	12111	16	13	15	1810	16	12	16	13	151					150		110													
Means.		29.159	57.8	29.158	59.3	61.0	46.4	88.2	40.7	54.3	52.0	52.1	50.5	48		3.6																	
+ Total Corrections for Instrumental Errors.		-100		-100																													
+ 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		

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

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

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction ++ = *29.983*  
for Temp. (Col. 2), = *29.054* - *0.76*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction ++ = *28.978*  
for Temp. (Col. 4), = *29.054* - *0.80*  
Mean at Station, corrected, and at 32°, = *28.980*  
Correction for height, feet above Mean Sea-level, = *932*  
Mean, reduced to 32°, and Sea-level, = *29.912*  
Highest Reading, corrected for Index error, on the 18th, = *29.500*  
Lowest Do. Do. on the 16th, = *28.700*  
Difference, or Monthly Range, = *0.800*

S.R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 19th, = *72.0*  
Lowest in Month, corrected for Index errors, on the 9th, = *36.0*  
Difference, or Monthly Range, = *36.0*  
"Corrected Mean" of all the Highest, (Col. 5), = *61.0*  
"Corrected Mean" of all the Lowest, (Col. 6), = *48.4*  
Difference, or Mean Daily Range, = *12.6*  
\*\* Calculated Mean Temperature of Month, = *53.7*  
S.R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 21st, = *112.0*  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = *86.2*  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 9th, = *27.0*  
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = *40.7*  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = *53.2*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = *51.2*  
# Computed Temperature of Dew-Point, = *49.2*  
# Do. Elastic Force of Vapour, = *350*  
# Do. Weight of Vapour in a Cubic Foot of Air, = *86*  
# Relative Humidity, (Saturation = 100), = *86*  
RAIN fell on *15* Days; Amount in Inches, = *3.47*

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		6	1	7	8	2	6	1	4	4	49
P.M.		2	1	2	2	3	2	1	1	1	136
Mean.		7	1	4	5	1	2	4	6	4	42

0.18

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 3d; those from Other Places, not later if possible than the 6th. This Schedule not to be Gunned or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by *William Bruce*  
*Begsich Loch-bus-hine*

(Signed) *William Bruce*

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Met and backward for out door labour. Hay crop much damaged by the wet, much of that crop still standing out. Grain crop after late appearance to be above an average, after turnips below an average. Beans and Peas will be an average crop. Potatoes much damaged by disease, the tops in general are quite black. Turnips on dry land appear to be in excellent state, on wet land fewer and less good. Potatoes, and cattle healthy.



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 difference between the Returns from any two Stations, so very considerable as to render them quite incomparable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fall in achieving one of the main objects of Meteorological Observation.

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

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

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

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

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 so of an inch of the top of the tube, and take down the instrument, if any then be carried with the cistern upstern. 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 inserting 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 venery, 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.

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

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

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

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

**The Hygrometer** consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the 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;—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 cold in ordinary circumstances.

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

**Reading of the Thermometer.**—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°·9, 40°·0, or 40°·1; or again, 40°·4, 40°·5, or 40°·6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½, respectively. So also 40½, and 40½, more or less must be read, 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 so 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 logical day. In the Society's schedules, the indications registered on the 8d. are those of a series of phenomena commencing at 8 P.M. on the 2d, and extending till 9 P.M. on the 3d, 5 P.M. on the 2d, and extending till 9 P.M. on the 3d, 7 P.M. on the 2d, and extending till 9 P.M. on the 3d, 9 P.M. on the 2d, and extending till 9 P.M. on the 3d, 11 P.M. on the 2d, and extending till 9 P.M. on the 3d, 1 P.M. on the 3d, and extending till 9 P.M. on the 3d, 3 P.M. on the 3d, and extending till 9 P.M. on the 3d, 5 P.M. on the 3d, and extending till 9 P.M. on the 3d, 7 P.M. on the 3d, and extending till 9 P.M. on the 3d, 9 P.M. on the 3d, and extending till 9 P.M. on the 3d, 11 P.M. on the 3d, and extending till 9 P.M. on the 3d, 1 P.M. on the 4d, and extending till 9 P.M. on the 4d, 3 P.M. on the 4d, and extending till 9 P.M. on the 4d, 5 P.M. on the 4d, and extending till 9 P.M. on the 4d, 7 P.M. on the 4d, and extending till 9 P.M. on the 4d, 9 P.M. on the 4d, and extending till 9 P.M. on the 4d, 11 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and extending till 9 P.M. on the 28th, 11 P.M. on the 28th, and extending till 9 P.M. on the 28th, 1 P.M. on the 29th, and extending till 9 P.M. on the 29th, 3 P.M. on the 29th, and extending till 9 P.M. on the 29th, 5 P.M. on



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Bogside, Loch-busluin, County of Arberdeen, in Lat. 57°10'50", Long. 2°45'00", Distance from Sea 28 miles.Height of Cistern of the Barometer above Mean Sea-level 3 feet, above Ground 85.5 feet.During the MONTH of September 1872.

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, including Thunder and Lightning, began and ended.	Days of Month.	
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.									
		Barometer. * No. _____	Attached Thermometer	Barometer. No. _____	Attached Thermometer	Max. No. _____	Min. No. _____	Max. in Sun's rays No. _____	Min. on Grass. No. _____	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	No. _____	Amount in inches.	Velocity (0-10), and Direction.	Amount (0-10), and Direction.	Velocity (0-10), and Direction.	Amount (0-10), and Direction.	No. _____	No. _____					No. _____
		inches.	°	inches.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°					°
	1	29.070	54	29.100	55	57.0	44.0	70.0	37.0	47.5	44.0	44.0	41.0	NW	5	6	—	38770	—	3	9	13							1		
	2	29.170	50	29.100	53	48.0	31.5	58.0	25.0	44.0	42.0	47.0	46.0	6	—	6	—	537282	1 1/2	95	9	10	4							2	
	3	28.970	53	28.930	57	57.0	50.5	70.0	45.0	53.0	52.5	50.0	49.0	6	—	6	—	542370	3	24	10	10	2							3	
	4	28.840	56	28.880	60	67.0	53.0	90.0	50.0	53.0	53.0	57.0	55.0	6	5	5	—	597412	1 1/2	03	10	10	1							4	
	5	28.880	60	28.900	62	67.0	50.0	100.0	46.0	59.0	58.0	59.0	56.0	6	—	5	—	513395	—	—	3	10	5							5	
	6	28.910	59	28.900	62	67.0	47.0	99.0	42.0	54.0	52.0	60.0	57.0	6	—	5	—	529770	—	—	10	10	6							6	
	7	28.930	60	29.000	60	61.0	50.0	63.0	50.0	52.0	53.0	50.0	50.0	N	5	NW	—	538896	3	27	10	10	2							7	
	8	29.100	55	29.000	59	58.0	47.0	79.0	44.0	52.0	50.0	53.0	52.0	N	5	N	—	547810	1 1/2	04	8	10	3							8	
	9	29.070	56	28.760	58	57.0	44.0	70.0	40.0	58.0	57.0	53.0	52.0	N	5	N	—	554550	2	05	10	10	0							9	
	10	28.790	56	28.840	58	61.0	42.0	83.0	35.0	58.0	52.0	53.0	50.0	N	1	N	—	597290	2 1/2	20	3	10	6							10	
	11	29.780	57	28.820	57	61.0	49.0	65.0	43.0	56.0	52.0	57.0	55.0	N	5	N	—	32140	5 1/2	14	10	10	0							11	
	12	29.070	58	29.220	60	65.0	50.0	90.0	45.0	52.0	51.0	53.0	51.0	N	1.5	N	—	590595	—	20	6	10	5							12	
	13	29.230	59	29.170	60	65.0	49.0	67.0	44.0	55.0	53.0	52.0	51.0	6	—	N	—	598020	7	24	10	10	0							13	
	14	29.300	56	29.200	58	58.0	46.0	90.0	42.0	52.0	49.0	52.0	49.0	NW	5	N	—	543515	—	—	3	10	12							14	
	15	29.070	56	29.090	58	58.0	48.0	86.0	47.0	53.0	49.0	53.0	52.0	N	1.5	N	—	534510	—	—	6	10	7							15	
	16	29.015	58	28.745	60	64.0	50.0	87.0	48.0	52.0	50.0	58.0	55.0	N	5	N	—	575965	—	04	10	10	6							16	
	17	28.820	57	28.630	54	58.0	42.0	75.0	35.0	52.0	49.0	46.0	45.0	N	5	N	—	529866	3 1/2	02	10	10	3							17	
	18	28.370	57	28.400	55	52.0	39.0	76.0	30.0	44.0	42.0	45.0	44.0	N	5	N	—	66790	5	27	10	10	2							18	
	19	28.600	57	28.800	51	52.0	38.0	65.0	35.0	46.0	44.0	42.0	40.0	NW	2	N	—	40610	3	24	3	10	1							19	
	20	28.890	48	28.780	50	56.0	35.0	70.0	32.0	40.0	39.0	38.0	36.0	NW	1	N	—	518380	3 1/2	20	3	10	6							20	
	21	28.930	47	28.950	49	46.0	35.0	60.0	32.0	38.0	36.5	40.0	38.0	NW	1.5	N	—	91512	7	40	5	10	7							21	
	22	29.915	46	29.940	47	45.0	34.0	72.0	29.0	40.0	37.0	37.0	35.0	N	1.5	N	—	565400	2 1/4	65	5	10	8							22	
	23	29.830	46	29.745	48	43.0	32.0	47.0	28.0	34.0	33.5	38.0	37.0	N	5	N	—	593800	9	06	10	10	0							23	
	24	26.740	47	28.500	48	45.0	32.0	50.0	31.0	40.0	39.0	41.0	40.0	N	1.5	N	—	37112	1	80	10	10	0							24	
	25	26.375	48	28.500	50	46.0	34.0	48.0	30.0	44.0	43.0	45.0	44.0	N	2.5	N	—	73682	14	56	10	10	0							25	
	26	28.720	49	28.600	49	48.0	36.0	53.0	28.0	43.0	41.0	38.0	36.0	N	1.5	N	—	43132	1	04	8	10	5							26	
	27	28.700	48	28.230	50	45.0	35.0	48.0	26.0	41.0	40.0	42.0	40.0	N	5	N	—	65340	3	19	10	10	0							27	
	28	28.150	48	28.320	50	49.0	38.0	60.0	34.0	44.5	42.3	45.0	43.0	N	5	N	—	74620	1 1/2	06	4	10	3							28	
	29	28.580	49	28.740	50	50.0	39.0	60.0	31.0	45.0	43.0	44.0	42.0	N	5	N	—	529020	1	05	3	10	6							29	
	30	28.830	48	28.770	50	50.0	34.0	70.0	27.0	44.5	42.0	43.0	43.0	N	5	6	—	39450	1 1/2	28	8	10	4							30	
	31																													31	
Sums.		17122	18	1681	11	15	131	10	12	121	111	121	111	130	225	649															
Means.		28.844	550	28.819	546	55.1	42.0	70.4	37.0	48.4	46.3	47.9	46.1	77	75																
† Total Corrections for Instrumental Errors.		-100		-100																											
† 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

NOTATION USED IN GENERAL REMARKS.					
a.	denotes aurora.	m.	denotes meteor.		
ci.	" cirrus.	ma.	" meteors.		
ci-cu.	" cirro-cumulus.	ni.	" 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. h.	" solar halo.		
h.d.	" heavy dew.	sq.	" squall.		
hl.	" hail.	sq.	" squalls.		
li. cl.	" lightning.	t.	" thunder.		
li. sh.	" light clouds.	t. s.	" thunder storm.		
lu. co.	" lunar corona.	v.	" wind.		
lu. ha.	" lunar halo.	g.	" gale of wind.		

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

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 28.680  
for Temp. (Col. 2), = 28.744 - .064  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 28.651  
for Temp. (Col. 4), = 28.719 - .068  
Mean at Station, corrected, and at 32°, = 28.666  
Correction for height, feet above Mean Sea-level, = 9.42  
Mean, reduced to 32°, and Sea-level, = 29.608  
Highest Reading, corrected for Index error, on the 14th, = 29.300  
Lowest Do. Do., on the 28th, = 28.150  
Difference, or Monthly Range, = 1.150

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 6th, = 67.0  
Lowest in Month, corrected for Index errors, on the 2th, = 37.1  
Difference, or Monthly Range, = 30.5  
"Corrected Mean" of all the Highest, (Col. 5), = 55.1  
"Corrected Mean" of all the Lowest, (Col. 6), = 42.0  
Difference, or Mean Daily Range, = 13.1  
\*\* Calculated Mean Temperature of Month, = 48.6  
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 5th, = 100.0  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 70.4  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 2th, = 25.0  
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 37.0  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 48.2  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 46.2  
†† Computed Temperature of Dew-Point, = 44.0  
†† Do. Elastic Force of Vapour, = 288  
†† Do. Weight of Vapour in a Cubic Foot of Air, = 86  
†† Relative Humidity, (Saturation = 100), = 86  
RAIN fell on 15 Days; Amount in Inches, = 6.49

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Mean Force.
A.M.	5		1			2	2	9	6	5
P.M.	4		2			2	3	10	5	2
Mean.	4.0	2.0	2.4	9	6	3	7.6			

0.58

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 3d; those from Other Places, not later if possible than the 6th. This Schedule not to be Gunned or Fastened, and Forwarded by Book Post, prepaid.

Observations made and  
Return verified by William Brown  
Bogside, Loch-busluin

(Signed) William Brown

This has been the wettest September during the last 16 years.  
On the 23rd snow lay about 4 inch deep on the low ground and on  
the hills about 8 inch deep. The crops are as flat as the ground as if  
they had been cut. Very little cut, and what is cut is sprouting in  
the stacks, and much of the crop is sprouting on the ground. Turnips have  
improved during the month. Potatoes much decayed, they will soon be  
useless. Beets and cabbages healthy.



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 it impossible, every reading at what time it was taken, if read at 9 o'clock, *propter*—*weather glasses and aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Nor can any Barometer be used for Meteorological Observations that is not supplied with such means of *adjustment or compensation* as will secure the height of the mercury in the tube being accurately measured from the fluctuating surface of the mercury in the cistern. It is also necessary that every Barometer shall have been compared with a *Standard*.

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

An excellent Barometer constructed by Mr. 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; their coincidence being indicated by a little ivory float, whose sign 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 *primary* 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 *seize up* the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern upright. Before suspending the Barometer for use, it must be ascertained whether the spot 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, 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.

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

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

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

**Position of Thermometers.**—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers as are *not graduated on the stem*, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, *without being re-tested*. The self-registering, and especially the "*Minimum*" Thermometers ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch 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. 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-spig must be covered, and placed to the side, and a little below the level of the wet bulb.—In no case under the bulbs—the muslin must be of medium fineness, and stretched at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean and moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be insulated by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances. The frame of the Thermometers is highly objectionable. One form of "Mason's" Hygrometer is highly objectionable. Also supports the water cup underneath. This arrangement must be immediately altered by putting 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—39.5, 40.0, or 40.1; or again, 40° 4, 40° 5, or 40° 6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 41½°, and 40° 7, or 40° 8 Thermometers, registering 40° 2 or 40° 3, and 40° 7 or 40° 8 respectively. In reading Rutherford's "*Max*" and "*Min*" Thermometers, 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, it is earnestly recommended that extra observations be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results.

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

**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 instrument used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauges; but in all cases the gauges must be sunk in the ground till its edges are on a level with the close cut grass around its mouth. The rain-gauges ought to be read daily, and the readings entered in the returns on the day on which the rain fell.

**Snow-fall** may, *conveniently*, be registered in the rain column, under the following conditions:—When a Snow-shower occurs it must be noted in the "Remarks," and the latter 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

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

Observations of the clouds are made at 9 a.m. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity 6, S.W." (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of "— 4, st." 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, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, noting always the temperature of the air, and the hour of observation; and continuing to observe for particular depths.

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

**Ozone.**—Mention whether Schloffen's or Meissner's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 a.m. and 9 p.m. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3<sup>xx</sup>, as an ozone entry in the schedule will indicate that the ozone paper is tinged 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 it is unavoidably so. Some of the most valuable observations that can be taken at these few rules can be given not longer than the space of one line 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, green promissory ought to be given in this column to prevent diseases, diseases 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 height of storms as well as having 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, either headed "Remarks," or in two third off for the purpose, from that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner 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. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *ten days* observations be taken on a selected piece of ground or farm.

*viz.*, on the 21st days of March, June, September, and December.

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

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

DUNDEE, 20th November 1892.

(By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Diseased of Leaves.	CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Out or Raised.
Alder, . . . . .					Barley, . . . . .				12
Ash, . . . . .					Bere or Bigg, . . . . .				10
Beech, . . . . .					Oats, . . . . .				14
Birch, . . . . .					Wheat, . . . . .				
Elm, . . . . .					Beans, . . . . .				
Larch, . . . . .					Pease, . . . . .				
Lime, . . . . .					Potatoes, . . . . .				
Oak, . . . . .					Turnips, . . . . .				
Sycamore or Plane, . . . . .					Rye Grass, . . . . .				

SHRUBS, ETC.	First in Blossom.	FRUITS.	First in Blossom.	Fruit Ripe, generally.	MIGRATORY BIRDS.	First Arrival.	Departure.
Barberry, . . . . .		Apple, . . . . .		24	Cuckoo, . . . . .		
Bourtree or Elder, . . . . .		Black Currant, . . . . .			Curlew, . . . . .		
Broom, . . . . .		Cherry, . . . . .			House-Swallow, . . . . .		
Hazel, . . . . .		Gean, . . . . .			Lapwing, . . . . .		
Hawthorn, . . . . .		Gooseberry, . . . . .			Plover, . . . . .		
Holly, . . . . .		Peach, . . . . .			Sand-Martin, . . . . .		
Laurum, . . . . .		Pear, . . . . .			Starling, . . . . .		
Lilac, . . . . .		Plum, . . . . .			Swan, . . . . .		
Mezereon, . . . . .		Strawberry, . . . . .			Rail or Corn Crane, . . . . .		
Mountain Ash or Rowan, . . . . .							
Red Flowering Currant, . . . . .							
Rhododendron Ponticum, . . . . .							
Whin, . . . . .							

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

EDINBURGH.  
General Post Office Buildings,  
Secretary of the Meteorological Society of Scotland,  
MR ALEXANDER BUCHAN,  
20  
Rogers  
Sept. 1. 1892



# SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Bogside, Loch-busluine, County of Abertain, in Lat. 57°10'50", Long. 2°45'00", Distance from Sea 28 miles.  
Height of Cistern of the Barometer above Mean Sea-level 885 feet, above Ground 3 feet.

During the MONTH of October, 1872.

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, including Thunder and Lightning, began and ended.	Days of Month.		
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.										
		Barometer. * No.	Attached Thermometer	Barometer. No.	Attached Thermometer	Max. No.	Min. No.	Max. in Sunrays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	No. 8 inches.	No. 12 inches.	No. 22 inches.								
		inches.	inches.																													
	1	28.570	50	28.470	55	57.0	42.0	68.0	41.0	47.0	47.0	53.0	50.0	9	5	9	1.5	70410	5	10	10	10	10	10								
	2	28.365	53	28.310	53	56.0	47.0	64.0	44.0	51.0	49.0	49.0	45.5	9	5	9	1.5	29055	2	10	10	10	10	10								1
	3	28.330	50	28.580	49	50.0	34.0	60.0	29.0	45.0	42.0	35.0	32.0	11	11	11	1.5	99415	1	10	10	10	10	10								2
	4	28.860	45	29.235	46	41.0	33.0	50.0	29.0	35.0	32.0	35.0	34.0	11	2.5	11	1	72000	2	10	10	10	10	10								3
	5	29.430	43	29.400	46	45.0	29.0	50.0	23.0	36.0	34.0	34.0	32.0	6	1	11	5	09000	1	0	5	5	5	5								4
	6	29.250	45	29.130	50	54.0	32.0	64.0	27.0	43.0	39.0	46.5	42.0	11	5	11	1.5	60090	1	10	10	10	10	10								5
	7	28.950	50	29.070	52	50.0	49.5	63.0	37.0	50.0	49.5	41.5	40.0	11	5	6	1	04565	3	10	10	10	10	10								6
	8	28.970	50	28.820	51	52.0	40.0	75.0	35.0	45.0	43.0	45.0	43.0	11	5	11	1.5	63285	1	10	10	10	10	10								7
	9	28.700	49	28.690	50	54.0	35.0	78.0	28.0	45.0	42.0	36.0	34.0	11	5	11	1.5	19746	1	0	0	0	0	0								8
	10	28.665	47	28.530	50	54.0	33.0	90.0	25.0	42.0	39.0	41.0	39.0	11	5	11	1.5	29890	1	10	10	10	10	10								9
	11	28.500	47	28.530	49	41.0	36.0	40.0	34.0	41.0	39.0	39.0	39.0	11	1.5	11	1.5	97640	13	10	10	10	10	10								10
	12	28.670	47	28.500	48	48.0	36.0	53.0	37.0	42.0	40.0	42.0	40.0	11	1.5	11	1.5	97200	8	10	10	10	10	10								11
	13	28.830	46	29.050	47	42.0	37.0	46.0	36.0	40.0	39.0	40.0	40.0	11	1.5	11	1.5	73210	11	10	10	10	10	10								12
	14	29.160	45	29.110	50	50.0	33.0	75.0	26.0	43.0	42.0	40.0	39.0	11	5	11	1.5	94866	1	0	0	0	0	0								13
	15	28.950	46	28.720	50	48.0	31.0	70.0	24.0	40.0	39.0	41.0	40.0	6	1	6	1	19733	1	0	6	6	6	6								14
	16	28.600	48	28.860	50	45.0	38.0	65.0	32.0	41.0	39.0	40.0	40.0	11	5	11	1.5	30940	1	10	10	10	10	10								15
	17	29.020	47	29.135	50	50.5	33.0	72.0	27.0	41.5	41.0	41.0	41.0	6	1	6	1	34620	1	0	0	0	0	0								16
	18	29.130	48	29.020	50	46.0	37.0	52.0	30.0	41.5	41.0	46.0	46.0	11	5	6	1	38093	1	10	10	10	10	10								17
	19	28.830	50	28.820	50	49.0	44.0	70.0	42.0	46.0	44.0	46.0	45.0	11	5	11	1.5	87190	5	10	10	10	10	10								18
	20	28.800	50	28.900	53	50.0	36.0	90.0	30.0	42.5	41.5	45.0	43.5	11	5	6	1	01305	1	2	10	10	10	10								19
	21	28.850	57	28.650	50	45.0	40.0	52.0	38.0	42.0	41.5	43.0	42.0	11	5	11	1.5	29600	14	10	10	10	10	10								20
	22	28.430	48	28.580	48	42.0	37.0	42.0	36.0	39.0	37.5	42.0	41.0	11	2	11	1.5	73460	9	10	10	10	10	10								21
	23	28.685	48	28.580	48	45.0	40.0	60.0	37.0	42.0	42.0	42.0	40.0	11	5	11	1.5	65520	1	10	10	10	10	10								22
	24	28.360	48	28.400	48	45.0	40.0	46.0	40.0	43.0	43.0	45.0	45.0	11	1.5	11	1.5	07430	3	10	10	10	10	10								23
	25	28.530	50	28.600	50	47.0	44.0	83.0	43.0	47.0	47.0	46.0	45.0	11	1.5	11	1.5	76312	9	10	10	10	10	10								24
	26	28.650	50	28.615	51	46.0	42.5	60.0	41.0	44.0	44.0	40.0	40.0	6	5	6	1	16680	2	10	10	10	10	10								25
	27	28.700	57	28.900	52	48.0	42.0	60.0	37.0	44.0	44.0	44.0	44.0	11	5	6	1	29830	5	10	10	10	10	10								26
	28	28.920	48	28.900	52	54.0	33.0	65.0	27.0	37.0	36.5	40.0	39.0	11	5	11	1.5	33255	1	3	3	3	3	3								27
	29	28.760	50	28.430	52	54.0	38.0	60.0	30.0	46.0	45.0	48.0	45.0	11	5	11	1.5	93290	1	10	10	10	10	10								28
	30	28.300	48	28.200	48	53.5	35.0	59.0	34.0	37.0	36.0	39.0	37.0	11	1.5	11	1.5	17720	3	2	2	2	2	2								29
	31	28.210	45	28.400	47	46.0	35.0	64.0	28.0	42.0	38.0	40.0	36.0	11	2.5	11	2	45400	1	3	3	3	3	3								30
	Sums.	1211	13	1591	10	121	131	9	14	11	162	111	101	13	10	13	10	169														
	Means.	28.740	48.2	28.753	46.6	48.6	37.5	63.0	33.1	42.4	41.0	42.1	40.6	84	84																	
	† Total Corrections for Instrumental Errors.	-100		-100																												
	† 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	

BAROMETER “corrected Mean” at 9 a.m. minus the Correction††)

16.8

16.8

NOTATION USED IN GENERAL REMARKS.

a. denotes aurora.

ci. cirrus.

ci-cu. cirro-cumulus.

cl-s. cirro-stratus.

cu. cumulus.

cu-s. cumulo-stratus.

f. fog.

fr. frost.

h-fr. hoar-frost.

h. haze.

h-d. heavy dew.

hl. hail.

l. lightning.

li-cl. light clouds.

li-sh. light showers.

lu. lunar corona.

lu-ha. lunar halo.

m. denotes meteor.

ms. meteors.

n. nimbus.

r. rain.

h.r. heavy rain.

c.h.r. continued heavy rain.

s. stratus.

sc. scud.

st. sleet.

ss. ha. solar halo.

sq. squall.

sqs. squalls.

t. thunder.

t.s. thunder storm.

w. wind.

g. gale of wind.

TABLE FOR ESTIMATING FORCE OF WIND.

Estimated Force, 0-6.

Common Designation.

Estimated Force, 0-6.

Common Designation.

Estimated Force, 0-6.

Common Designation.

0

0.5

1

Calm

Very light air

Light air

1.5

2

3

Light breeze

Fresh breeze

Very fresh

4

5

6

Blowing hard

Blowing strong

Violent gale

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction†† = 28.589  
for Temp. (Col. 2), = 28.640 - 0.051 = 28.589  
“Corrected Mean” of Barometer at 9 P.M., minus the Correction†† = 28.606  
for Temp. (Col. 4), = 28.653 - 0.047 = 28.606  
Mean at Station, corrected, and at 32°, = 28.598  
Correction for height, feet above Mean Sea-level, = 954  
Mean, reduced to 32°, and Sea-level, = 29.552  
Highest Reading, corrected for Index error, on the 5th, = 29.430  
Lowest Do. Do., on the 30th, = 28.200  
Difference, or Monthly Range, = 1.230

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 1th, = 57.0  
Lowest in Month, corrected for Index errors, on the 5th, = 29.0  
Difference, or Monthly Range, = 28.0  
“Corrected Mean” of all the Highest, (Col. 5), = 48.6  
“Corrected Mean” of all the Lowest, (Col. 6), = 37.5  
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 20th, = 90.0  
“Corrected Mean,” (Col. 7), of Black Bulb, Max. in Sun, = 63.0  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 5th, = 23.0  
“Corrected Mean,” (Col. 8), of Black Bulb, Min. on grass, = 33.1  
Difference of above Means or Range (“exposed”), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 42.3  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 40.8  
†† Computed Temperature of Dew-Point, = 39.0  
†† Do. Elastic Force of Vapour, = 238  
†† Do. Weight of Vapour in a Cubic Foot of Air, = 88  
†† Relative Humidity, (Saturation = 100), = 88  
RAIN fell on 18 Days; Amount in Inches, = 4.69

WIND.		SUMMARY.							
Direction.		N	NE	E	SE	S	SW	W	NW
A.M.	3		1	1	6	5	8	4	3
P.M.	4		1	2	3	3	4	4	5
Mean.	3	0	1	2	4	7	6	4	4

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 3d; those from Other Places, not later if possible than the 6th. This Schedule not to be Guessed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by William Brown  
Bogside, Loch-busluine

(Signed) William Brown  
The month has been very wet and backward for harvest operations, and the crops much damaged by the wet. There is much sprouting in the stock, and in some cases when it was put back to the ground it was sprouted before cut. There is yet a good deal to cut, and on some farms the half of crop is still standing out under the relentless pelting of the rain. The potato crop is a complete failure. Turnips are far below an average. Cattle and sheep are in a very poor state of health.



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 incommensurable, may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will, by 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 solistide. 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. A. de London, the use of which is attended with the great convenience of requiring *no adjustment* of the cistern. Its *scale-rod* is not more than 1/2 inch 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 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 convenience being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *water-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 *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 *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 *level*, 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 inside, and fixed 4 feet above grass in an exposed position, free from merely local influences. The laths forming the sides and doors of the boxes are arranged so as 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 open to the south. These boxes may be had from the opticians, *Self-registering Thermometers*.—Professors Phillips, 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 the Bathford 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 stirring the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers 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 Deductions," Observers are specially requested to attend to the following conditions:—

The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the mastin 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 mastin 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 framed-oned instruments shall be complied with as far as possible.

**Reading of the Thermometers.**—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 thus taken to tenths of a degree, as follows:—38.0, 39.0, 40.0, 40.1, or 40.2, 40.3, or 40.6, according as it indicates a little under, an exact coincidence with, or a little over 40, or 40.1, respectively. So also 44.3, and 44.6, or more or less must be registered 40.2 or 40.3, and 40.7 or 40.8 respectively. In reading Katherford's "Max." and "Min." Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

**Wind.**—A wind-vane ought to be elevated 12 feet at least above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, and always when the wind is feeble, reference must be made to 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 it is especially recommended that extra observations be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results.

The Council recommend that every observer 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 cases conspire to produce anomalies in rain returns. They arise partly from unfavorable situation for observation and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass round its mouth. The rain-gauge ought to be read daily, and the readings entered in the returns on the day on which the rain fell.

**Snowfalls may, for convenience, be registered in the rain columns, under the following conditions:**—When a Snow shower occurs it must be noted in the "Remarks," and the letter S affixed to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as 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

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky overhead (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds* column, though their appearances and changes ought to be noted among the "Remarks." The amount of cloud is *half covered* by clouds 5 is entered as the *observation*, and so on 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," S.W. (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of 4, st. (e.g.) will indicate that the higher 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.

**Sunshades.**—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, exposed observations might be taken for other and greater depths, nothing always the temperature of the site 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 noted, and the water kept.

**Remarks.**—Mention whether Subjects of Moffat's Papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 a.m. and 9 p.m. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—Thus 3.7, as an *arrows* entry in the schedule, will indicate that the *arrows* paper is used as 3.3 on the scale, that the wind is from the S.W., and that its force is on a scale of 0 to 10, 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 160 narrow, but unavailably 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, thunderstorms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, when such notes on storms as have been noticed 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 in one, as in the following manner:—It is intended, that observations by the

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

Observations in connection with the periodic return of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

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

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

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

By Order A. B.   
 Edinburgh, 10th November 1872.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.	CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Out or Raised.
Alder.					Barley.				
Ash.					Bere or Bigg.				
Beech.					Oats.				
Birch.					Wheat.				
Elm.					Beans.				
Larch.					Pease.				
Lime.					Potatoes.				02
Oak.					Turnips.				
Sycamore or Plane.					Rye Grass.				

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

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

EDINBURGH

General Post Office Buildings,  
Secretary of the Meteorological Society of Scotland.

MR ALEXANDER BUCHAN.



## SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Bosside, Leuch- buslinie*, County of *Aberdeen*, in Lat. *57° 10' 50"*, Long. *2° 45' 0" W*, Distance from Sea *28* miles.Height of Cistern of the Barometer above Mean Sea-level *885* feet, above Ground *3* feet.During the MONTH of *November*, 187*2*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.				CLOUDS.				THERMOMETERS under Ground.				SEA.	OZONE.	GENERAL REMARKS.				Days of Month.					
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.		9 h. P.M.													
		Barometer.		Barometer.		Max.		Min.		Dry bulb.		Wet bulb.		Direction.		Force.		Direction.		Force.		Velocity (0-10), and Direction.		Amount (0-10), and Direction.		No. 3 inches.		No. 12 inches.		No. 22 inches.											
		No.	inches.	No.	inches.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.						
	1	28.520	45	28.300	47	42.0	35.0	65.0	32.0	42.0	37.0	44.0	43.0	S	5	16	1.5	09480	4/2	1.52	4	4	10	10	0	0	0	0	0	0	0	0	0	0	1						
	2	28.150	46	28.400	47	44.0	35.0	45.0	33.0	37.0	36.5	40.0	39.0	W	1.0	2	5	58230	17	35	10	10	10	10	0	0	0	0	0	0	0	0	0	2							
	3	28.760	45	29.500	45	42.0	32.0	62.0	23.0	39.0	37.0	33.0	32.0	W	1.5	11	5	20360	-	-	3	10	10	0	0	0	0	0	0	0	0	0	0	0	3						
	4	28.955	43	28.500	46	46.0	27.0	46.0	20.0	32.0	31.5	45.0	45.0	S	5	1	51805	12	42	10	10	10	10	0	0	0	0	0	0	0	0	0	0	4							
	5	28.500	48	28.630	51	58.0	42.0	84.0	38.0	54.0	51.0	47.0	42.0	W	2	4	2.5	42630	-	02	8	10	10	6	10	5	0	0	0	0	0	0	0	5							
	6	28.440	51	28.100	55	59.0	44.0	85.0	43.0	50.0	48.0	50.0	46.5	W	1.5	4	2.5	36420	2/4	06	5	10	10	7	10	3	0	0	0	0	0	0	0	6							
	7	28.700	49	29.000	49	50.0	48.5	60.0	34.0	41.0	37.5	41.0	38.0	W	2	4	1.5	49791	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	7							
	8	29.020	47	29.040	48	46.0	37.0	68.0	32.0	39.0	37.0	39.0	37.0	S	5	4	1	13990	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8						
	9	29.000	46	28.740	44	32.0	32.0	65.0	24.0	39.0	37.0	33.0	32.0	W	5	4	5	66760	4	30	10	10	10	0	0	0	0	0	0	0	0	0	0	0	9						
	10	29.000	42	29.135	42	36.0	30.0	50.0	22.0	34.0	32.0	34.0	33.0	W	2.5	2	2	66475	6	62	10	10	10	2	0	0	0	0	0	0	0	0	0	0	10						
	11	29.170	42	29.320	48	36.0	32.0	58.0	30.0	35.0	34.0	36.0	34.0	W	2	2	5	35320	18	40	10	10	10	0	0	0	0	0	0	0	0	0	0	0	11						
	12	29.440	42	29.500	44	38.0	31.0	60.0	28.0	36.0	35.0	34.0	33.0	W	5	2	5	75730	4	18	10	10	10	2	0	0	0	0	0	0	0	0	0	0	12						
	13	29.540	42	29.440	42	35.0	29.0	42.0	26.0	32.0	31.0	30.0	29.0	W	5	2	5	87840	1/4	03	10	10	10	0	0	0	0	0	0	0	0	0	0	0	13						
	14	29.340	42	29.340	41	38.0	28.0	40.0	25.0	31.0	30.0	34.0	33.0	W	5	2	5	19400	1/4	06	10	10	10	0	0	0	0	0	0	0	0	0	0	0	14						
	15	29.400	41	29.300	42	35.0	32.0	38.0	30.0	33.5	32.0	34.0	33.0	W	5	2	5	30710	4	12	10	10	10	0	0	0	0	0	0	0	0	0	0	0	15						
	16	29.000	42	29.000	43	40.0	31.0	40.0	28.0	37.0	36.0	36.0	35.0	W	1.5	6	5	91512	11	64	10	10	10	0	0	0	0	0	0	0	0	0	0	0	16						
	17	29.000	43	28.900	44	39.0	33.0	42.0	31.0	39.0	38.0	37.0	37.0	W	1	6	5	24836	5	10	10	10	10	0	0	0	0	0	0	0	0	0	0	0	17						
	18	28.645	43	28.620	45	39.5	32.0	40.0	28.0	36.0	35.5	36.0	35.0	W	5	2	5	35262	3	09	10	10	10	0	0	0	0	0	0	0	0	0	0	0	18						
	19	28.600	43	28.340	45	36.0	31.0	53.0	25.0	34.0	34.0	37.0	36.5	W	5	2	5	37952	3	24	10	10	10	0	0	0	0	0	0	0	0	0	0	0	19						
	20	28.230	43	28.350	45	41.0	32.0	52.0	28.0	36.0	35.0	41.0	40.0	W	5	2	5	01320	2	-	10	10	10	2	0	0	0	0	0	0	0	0	0	0	20						
	21	28.500	42	28.500	44	41.0	36.0	48.0	34.0	39.0	37.0	41.0	41.0	S	5	2	5	47810	-	15	10	10	10	3	0	0	0	0	0	0	0	0	0	0	21						
	22	28.500	42	28.360	45	42.0	35.0	43.0	30.0	40.0	37.0	36.0	35.0	W	1.5	2	5	03310	2	14	6	10	10	1	0	0	0	0	0	0	0	0	0	0	22						
	23	28.080	44	27.960	46	45.0	34.0	45.0	33.0	38.0	38.0	43.0	42.0	W	5	2	1.5	47370	13	31	10	10	10	0	0	0	0	0	0	0	0	0	0	0	23						
	24	27.970	45	28.300	46	46.0	41.0	58.0	38.0	45.0	45.0	41.0	38.5	S	1.5	2	1.5	36662	1	15	10	10	10	4	0	0	0	0	0	0	0	0	0	0	24						
	25	28.340	45	28.070	45	42.0	33.5	42.0	26.0	38.0	38.0	42.0	42.0	W	5	2	5	59905	4	20	10	10	10	0	0	0	0	0	0	0	0	0	0	0	25						
	26	27.980	46	28.030	47	46.0	38.5	52.0	36.0	46.0	46.0	43.5	42.0	S	5	2	1	88182	-	-	10	10	10	1	0	0	0	0	0	0	0	0	0	0	26						
	27	28.430	45	28.800	46	43.5	34.0	53.0	28.0	42.0	41.0	35.0	34.0	W	5	2	5	40422	4	13	10	10	10	0	0	0	0	0	0	0	0	0	0	0	27						
	28	28.810	42	28.720	43	36.0	24.5	60.0	18.0	27.0	27.0	34.0	33.0	W	5	2	5	54032	-	-	3	10	10	2	0	0	0	0	0	0	0	0	0	0	28						
	29	28.530	40	28.380	43	41.0	29.5	64.0	22.0	33.0	32.0	29.0	28.0	S	5	2	1	72385	2	32	3	10	10	4	0	0	0	0	0	0	0	0	0	0	29						
	30	28.180	43	28.100	45	41.0	35.0	42.0	34.0	40.0	39.0	40.0	39.5	W	1.5	2	5	83372	6	31	10	10	10	0	0	0	0	0	0	0	0	0	0	0	30						
	31																																		31						
Sums.		1281	11	117	14	131	122	10	12	14	132	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12							
Means.		28.689	44.0	28.672	45.4	41.9	33.8	53.3	24.3	38.1	36.8	38.2	36.9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9							
Total Corrections for Instrumental Errors.		-100		-100																																					
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	32								

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = *28.550*  
for Temp. (Col. 2), = *28.549* - *0.039* = *28.529*  
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = *28.529*  
for Temp. (Col. 4), = *28.529* - *0.039* = *28.530*  
Mean at Station, corrected, and at 32°, = *28.530*  
Correction for height, feet above Mean Sea-level, = *966*  
Mean, reduced to 32°, and Sea-level, = *29.496*  
Highest Reading, corrected for Index error, on the 13 th, = *29.540*  
Lowest Do. Do., on the 23 th, = *27.860*  
Difference, or Monthly Range, = *1.680*

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 6 th, = *52.0*  
Lowest in Month, corrected for Index errors, on the 28 th, = *24.5*  
Difference, or Monthly Range, = *34.5*  
"Corrected Mean" of all the Highest, (Col. 5), = *41.9*  
"Corrected Mean" of all the Lowest, (Col. 6), = *33.8*  
Difference, or Mean Daily Range, = *8.1*  
\*\* Calculated Mean Temperature of Month, = *37.8*  
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 6 th, = *85.0*  
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = *53.3*  
Lowest at Night, Black Bulb, (corrected for Index errors), on the 24 th, = *18.0*  
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = *29.3*  
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = *38.1*  
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = *36.8*  
†† Computed Temperature of Dew-Point, = *35.0*  
†† Do. Elastic Force of Vapour, = *2.12*  
†† Do. Weight of Vapour in a Cubic Foot of Air, = *89*  
†† Relative Humidity, (Saturation = 100), = *89*  
RAIN fell on 24 Days; Amount in Inches, = *7.08*

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Mean Velocity in miles per day.



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 a dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns, an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fail in achieving one of the main objects of Meteorological Observation.

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

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

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

An excellent Barometer constructed by Mr. Aick 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 far from the fluctuations of the surface of mercury in the cistern, are so 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 scales 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 horn, 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; a slight error here will vitiate the readings from the *verrier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be secured so as to form a tight plug to the cistern. Then *seize* 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 venturi, 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 pose from affecting the mercury. The use of a lens will greatly facilitate an accurate adjustment and reading of the Barometer.

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

**Self-registering Thermometers.**—Professor Phillips, 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 top of the tube, and must be discoloured from there by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

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

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

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

The *Hygrometer* consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions" Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the mesh must be of cotton 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 mesh 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 aforementioned requirements shall be complied with, as far as possible.

**Reading of the Thermometers.**—Great care must be taken to avoid the *error of refraction*, by bringing the eye exactly opposite the tip of the index, or *column* of mercury. The readings ought to be taken to tenths of a degree, and in the remarks thus the Thermometer will be read—29.8, 40.0, or 40.1; or, again, 40.4, 40.2, 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 44.4, and 40.7, more or less must be registered 40.2 or 40.3, and 40.7 or 40.8 respectively. In reading Kutherford's "Max." and "Min." Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

**Hour of observing Temperature.**—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological day. In the Society's schedules, the indications registered on the 24 are those of a series of phenomena commencing at 9 P.M. on the 24, and extending till 9 P.M. on the 25.

**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, it is earnestly recommended that extra observations be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, would be likely to give highly interesting and important results.

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

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

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

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W., (for example) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud column, an entry of  $\frac{2}{4}$ , (e.g.) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

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

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

**Temperature of the Sea.**—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 15th, and 25th of each month, the thermometer ought to be sunk exactly six feet (one fathom), and after ten minutes have elapsed, drawn up and read. When convenient, extra sea observations might be taken for other and greater depths, 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 Schönbach's or Meißner's papers are used. The paper is affixed by a pin to a board in the neighbourhood, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind, at the time of observation, in the following manner:—thus  $\frac{3}{4}$ , 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 "4.4"; 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 even to advantage, 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 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, other-wise unoccupied, or in two ruled off for the purpose, for that headed "Remarks." It is intended that observations by the Electrometer should be entered in this manner, or on the side-marginal. Additional remarks may be made on the margin.

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

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

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

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

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

EDINBURGH.

General Post Office Buildings,  
Secretary of the Meteorological Society of Scotland,

MR ALEXANDER BUCHAN,





During the MONTH of December 1872

**HYGROMETER**, Mean (corrected) A.M. and P.M. Reading of **Dry Bulb**, (Cols. 9 and 11), ..... = **35.7**

**Mean** (corrected) A.M. and P.M. Reading of **Wet Bulb**, (Cols. 10 and 12), ..... = **34.7**

## **Computed Temperature of Dew-Point**, ..... = **33.2**

## **Do. Elastic Force of Vapour**, ..... = **190**

## **Do. Weight of Vapour in a Cubic Foot of Air**, ... =

## **Relative Humidity**, (Saturation = 100), ..... = **91**

**RAIN** fell on **20 Days**; Amount in **Inches**, ..... = **4.60**

WIND.		SUMMARY.										
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.	
A.M.	0		5	2	11		6		1			
P.M.	3		3	6	8		8	1	2			
Mean.	5	0	4	4	10	0	7	1	1	.77		

**0.59**

The Rainfall during the year was 54.97 inches which is 25.62 inches more than in 1871, and the longest fall during the last 38 years, by 9.37 inches. Straw and turnips are both disappearing very fast and will be very scarce before grass. People and stock are healthy.



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

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

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

**Self-registering Thermometers.**—Professors Phillips, 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 Bathurst is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximum*." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found near the top of the tube, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally. The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least

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

**Verification of Thermometers.**—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers 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 specially vitiate the "*Hygrometric Deductions*," Observers are requested to attend to the following conditions:—

The bulbs must *hang down* by at least an inch free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the mesh 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 mesh 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 water-cup underneath. This arrangement must 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—89.9, 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 40.4°, respectively. So, also, 40.2, 40.3, 40.4, 40.5, 40.6, or 40.7, or 40.8, or 40.9, or 41.0, or 41.1, or 41.2, or 41.3, or 41.4, or 41.5, or 41.6, or 41.7, or 41.8, or 41.9, or 42.0, or 42.1, or 42.2, or 42.3, or 42.4, or 42.5, or 42.6, or 42.7, or 42.8, or 42.9, or 43.0, or 43.1, or 43.2, or 43.3, or 43.4, or 43.5, or 43.6, or 43.7, or 43.8, or 43.9, or 44.0, or 44.1, or 44.2, or 44.3, or 44.4, or 44.5, or 44.6, or 44.7, or 44.8, or 44.9, or 45.0, or 45.1, or 45.2, or 45.3, or 45.4, or 45.5, or 45.6, or 45.7, or 45.8, or 45.9, or 46.0, or 46.1, or 46.2, or 46.3, or 46.4, or 46.5, or 46.6, or 46.7, or 46.8, or 46.9, or 47.0, or 47.1, or 47.2, or 47.3, or 47.4, or 47.5, or 47.6, or 47.7, or 47.8, or 47.9, or 48.0, or 48.1, or 48.2, or 48.3, or 48.4, or 48.5, or 48.6, or 48.7, or 48.8, or 48.9, or 49.0, or 49.1, or 49.2, or 49.3, or 49.4, or 49.5, or 49.6, or 49.7, or 49.8, or 49.9, or 50.0, or 50.1, or 50.2, or 50.3, or 50.4, or 50.5, or 50.6, or 50.7, or 50.8, or 50.9, or 51.0, or 51.1, or 51.2, or 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