

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inverisk, County of Edinburgh, in Lat. 55° 50' 0" N, Long. 2° 24' 0" W, Distance from Sea one mile.Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet.During the MONTH of January 1871.

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 Deposition 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.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.											
		Barometer. * No.	Attach- ed Ther- mometer	Barometer. No.	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. in Sun's rays	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.			9 h. A.M.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	No. 8 inches.	No. 12 inches.					No. 22 inches.				
																																No.	No.	No.	No.
	1	29.70	38	29.68	45	35	30			27	27	32	31	S.W.	2	S.W.	4														gales of Wind occurred on the 6 th and 16 th Shooting Stars seen on the 25 th & eclipse of moon on the 6 th	1			
	2	29.73	40	29.74	55	34	23			32	31	31	31	S.W.	1	S.W.	1															2			
	3	29.85	42	29.94	46	33	22			25	25	33	32	S.W.	1	S.W.	1																3		
	4	29.92	40	29.85	62	41	38	Punch 38		22	22	40	39	S.W.	1	S.W.	2																	4	
	5	29.50	43	29.60	50	38	32			40	40	30	29	S	1	S	2																	5	
	6	29.64	46	29.36	51	45	30			38	38	36	35	S	5	S.W.	5																	6	
	7	29.26	47	29.26	50	42	31			34	34	35	34	S.W.	4	S.W.	3																	7	
	8	29.30	41	29.40	45	37	29			31	30	31	29	W	1	W	1																	8	
	9	29.32	40	29.40	44	32	27			31	29	29	28	W	1	S.W.	1																	9	
	10	29.56	43	29.57	44	34	23			28	27	25	25	N.W.	1	N.W.	1																	10	
	11	29.77	43	29.99	48	35	25			33	33	26	26	N.W.	1	N.W.	1																	11	
	12	30.12	43	30	49	36	32	Punch 33		25	25	34	33	S	1	S	2																	12	
	13	29.84	54	29.73	57	44	38			40	39	40	39	S.W.	2	S.W.	3																	13	
	14	29.45	57	29.40	53	46	40			44	43	43	42	S.W.	2	S	1																	14	
	15	29	53	28.74	54	46	32			42	41	34	33	S	3	S	3																	15	
	16	28.36	50	28.46	57	44	33			38	36	36	34	S.W.	5	S.W.	4																	16	
	17	29.60	56	29.64	57	40	30			35	34	34	33	S.W.	2	S.W.	1																	17	
	18	28.93	50	29.12	49	37	26			30	30	28	27	S.W.	1	S.W.	1																	18	
	19	29.24	47	29.49	46	36	28	Punch 28		26	26	31	29	S.W.	1	S.W.	1																	19	
	20	29.63	45	29.65	44	36	23			30	29	25	25	S.W.	1	W	1																	20	
	21	29.62	42	29.64	45	35	22	Punch 27		23	23	30	30	N.W.	1	W	1																	21	
	22	29.68	44	29.80	44	34	27			31	30	29	29	S.E.	1	S.W.	1																	22	
	23	29.90	44	30.12	43	33	23			32	32	25	25	S.W.	1	S.W.	1																	23	
	24	30.30	42	30.32	44	28	24	Punch 24		23	23	26	26	S	1	S	1																	24	
	25	30.24	42	30.14	48	22	24			34	34	30	30	S	1	S.W.	1																	25	
	26	30.04	43	30.18	60	30	24			25	25	25	25	S.W.	1	S.W.	1																	26	
	27	30.20	42	30.30	59	30	17			26	26	30	30	S.W.	1	S.E.	1																	27	
	28	30.30	40	30.20	47	30	28	Punch 19		21	21	30	30	S.E.	1	S.E.	1																	28	
	29	30.22	42	30.25	46	31	29			30	30	30	30	S.E.	1	S.E.	1																	29	
	30	30.25	42	30.20	49	33	29	Punch 29		31	30	32	32	S.E.	1	S.E.	1																	30	
	31	30.20	46	30.20	44	32	29			32	32	31	30	S.E.	2	S.E.	2																	31	
Sums.		148	9	148	11	189	20			29	15	41	21	49	51			126																	
Means.		29.699	44.7	29.730	49.5	36.3	27.8			30.9	30.5	31.3	30.7	14	1.6																				
† Total Corrections for Instrumental Errors.																																			
† Corrections for Diurnal Range.																																			
"Corrected Means."																																			
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 29.656
for Temp. (Col. 2), = 24.699..... - 0.43
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.644
for Temp. (Col. 4), = 29.699..... - 0.55
Mean at Station, corrected, and at 32°..... = 29.650
Correction for height, feet above Mean Sea-level,..... = .102
Mean, reduced to 32°, and Sea-level,..... = 29.752
Highest Reading, corrected for Index error, on the 17th,..... = 30.300
Lowest Do. Do., on the 16th,..... = 28.360
Difference, or Monthly Range,..... = 1.940

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 14th,..... = 46.0
Lowest in Month, corrected for Index errors, on the 2nd,..... = 17.0
Difference, or Monthly Range,..... = 29.0
"Corrected Mean" of all the Highest, (Col. 5),..... = 36.3
"Corrected Mean" of all the Lowest, (Col. 6),..... = 27.8
Difference, or Mean Daily Range,..... = 8.5
** Calculated Mean Temperature of Month,..... = 32.0

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 14th,..... =
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun,..... =
Lowest at Night, Black Bulb; (corrected for Index errors), on the 14th,..... =
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass,..... =
Difference of above Means or Range ("exposed"),..... =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11),..... = 31.1
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12),..... = 30.6
†† Computed Temperature of Dew-Point,..... = 29.3
†† Do. Elastic Force of Vapour,..... = .162
†† Do. Weight of Vapour in a Cubic Foot of Air, ... =
†† Relative Humidity, (Saturation = 100),..... = 92
RAIN fell on 8 Days; Amount in Inches,..... = 1.28

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.	1				2	14	10	2	1		1.6
P.M.	1				2	16	8	2			1.6
Mean.		1	0	0	2	15	9	3	2	0	1.60

2.56

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 Gummell or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

Walter Munro

(Signed)

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SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Imrosta, County of Edinburgh, in Lat 55° 50' 0" N, Long 3° 2' 40" W, Distance from Sea one miles.Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet.During the MONTH of Feb 1871.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.		SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.		SUNSHINE.	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 A.M.			P.M.		9 h. A.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity (0-5), and Direction.	Amount (0-10), and Species.		Velocity (0-5), and Direction.	Amount (0-10), and Species.	No. 3 inches.						No. 12 inches.	No. 22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† for Temp. (Col. 2), = 29.723
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† for Temp. (Col. 4), = 29.726
Mean at Station, corrected, and at 32°, = 29.724
Correction for height, feet above Mean Sea-level, = 10.1
Mean, reduced to 32°, and Sea-level, = 29.825
Highest Reading, corrected for Index error, on the 1st th, = 30.300
Lowest Do. Do., on the 5th th, = 29.200
Difference, or Monthly Range, = 1.100

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

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 17th, = 58.0
Lowest in Month, corrected for Index errors, on the 17th, = 29.0
Difference, or Monthly Range, = 29.0
"Corrected Mean" of all the Highest, (Col. 5), = 45.4
"Corrected Mean" of all the Lowest, (Col. 6), = 36.6
Difference, or Mean Daily Range, = 8.8
* Calculated Mean Temperature of Month, = 41.0

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 17th, = 58.0
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 45.4
Lowest at Night, Black Bulb, (corrected for Index errors), on the 17th, = 29.0
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 36.6
Difference of above Means or Range ("exposed"), = 8.8

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 40.0
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 38.7
† Computed Temperature of Dew-Point, = 37.0
† Do. Elastic Force of Vapour, = .220
† Do. Weight of Vapour in a Cubic Foot of Air, = 90
† Relative Humidity, (Saturation = 100), = 90
RAIN fell on // Days; Amount in Inches, = 1.79

WIND.		SUMMARY.					
Direction.		N	NE	E	SE	S	SW
A.M.	1						
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 3d; those from Other Places, not later if possible than the 6th. This Schedule not to be Grummal or Fastenal, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

William Munro

(Signed)

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 *thermometers*, 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-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. Lie 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 they are used, the *index-line* with those on its ivory frame, the screw, to form one *straight line* with those on its ivory frame, the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *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 to the cistern, and got rid of by inverting the Barometer (care being taken to prevent the loss of mercury) by planing 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 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 to open to the south. These Boxes may be had from the opticians, 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 drawbacks, both of which must be guarded against, and may be easily remedied by an observer. When the *columns* of spirit break, it may be 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 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 instructions should be hung horizontally.

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

from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the sun, while 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 glass, 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;—in no case under the bulb;—the muslin must be of medium fineness and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion for 15 or 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 "Maximum" Hygrometer is highly objectionable. The frame of the Thermometers is enclosed in a tin case, which also supplies 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—35°.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 40°.5, respectively. So also 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's "Max." and "Min." Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry bulbs, must be rapidly taken, being so readily affected by heat from the person of the observer.

Hour of observing Temperature.—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrences 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, 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.

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 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.

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 gauges. 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 condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W., (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of 2, cu-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 thermometers placed in the earth, their bulbs being sunk to 3, 12, and 24 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 the 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⁺, 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 for 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 occurrences 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 sun-spots on suns 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, 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.

(By Order) A. B.

EDINBURGH, 29th November 1895.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Leaf.	In Flower.	First Appearance.	First Out.	First Cut.
Alder.					
Ash.					
Beech.					
Birch.					
Blm.					
Larch.					
Time.					
Oak.					
Sycamore or Plane.					

FRUIT TREES.	In Leaf.	In Flower.	First Appearance.	First Out.	First Cut.
Apple.					
Black Currant.					
Cherry.					
Gum.					
Hawthorn.					
Holly.					
Laburnum.					
Lime.					
Plum.					
Strawberry.					
Mountain Ash or Rowan.					
Red Flowering Currant.					
Rhododendron.					
Whin.					

SHRUBS, ETC.	In Leaf.	In Flower.	First Appearance.	First Out.	First Cut.
Barberry.					
Boulevard or Elder.					
Broom.					
Hazel.					
Myrtle.					
Box.					
Black Currant.					
Apple.					
Black Currant.					
Cherry.					
Gum.					
Hawthorn.					
Holly.					
Laburnum.					
Lime.					
Plum.					
Strawberry.					
Mountain Ash or Rowan.					
Red Flowering Currant.					
Rhododendron.					
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, Potatoes, 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,

BOOK-POST.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55° 51' 0" N Long. 5° 2' 40" W Distance from Sea one miles.
Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of March 1871.
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.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.									
		Barometer.	Atta- ched Ther- mometer	Barometer.	Atta- ched Ther- mometer	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.			Velocity (0-6), and Direction.	Amount (0-10), and Species.	Velocity (0-6), and Direction.	Amount (0-10), and Species.	No.	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	inches.	30.34	54	30.30	55	42	32			53	32	34	33	SW	1	SW	1														gales of wind occurred on the 5th 8th & 12th	1	
2		30.20	53	30.16	60	53	44			34	32	50	49	SW	1	SW	1														first 12 Mmnet Ploppoms out on the 11th	2	
3		30.12	54	30.	60	58	36			50	48	42	41	SW	1	SW	1															11 Degrees of frost on the night of the 14th and Mornmgs of the 15th	3
4		29.88	58	29.70	61	57	42			46	44	46	44	SW	1	SW	1															hills covered with snow on the 16th	4
5		29.60	58	29.56	62	52	44			48	46	48	46	SW	5	SW	5	.03														Rain fell for the month 3.4 inch	5
6		29.42	58	29.30	60	55	35			47	45	40	38	SW	2	SW	3															and all wells in the Neighbourhood getting dry	6
7		29.52	57	29.50	58	47	35			38	36	41	39	SW	1	SW	2																7
8		29.40	56	29.64	59	44	33			37	36	38	37	SW	5	SW	2	.12															8
9		29.80	56	29.70	58	44	33			37	38	38	37	SW	2	SW	2	.25															9
10		29.80	53	29.70	56	44	34	Punch 37		35	34	40	38	SW	1	SW	1																10
11		29.56	54	29.56	58	49	39			40	39	44	43	SW	1	SW	2	.14															11
12		29.20	55	29.14	58	49	38			48	46	40	39	SW	5	SW	4	.10															12
13		29.20	54	29.60	54	48	32			41	39	37	35	SW	3	SW	3	.05															13
14		29.73	53	29.75	48	45	21			35	33	33	32	SW	1	SW	1	.10															14
15		29.78	44	29.45	49	39	32	Punch 32		25	24	34	33	SW	1	SW	1																15
16		29.73	43	30.10	50	41	29			33	32	32	30	SW	1	SW	1	.07															16
17		30.08	42	30.18	53	49	35			35	33	42	40	SW	1	SW	1																17
18		30.24	50	30.15	53	52	41			44	42	47	45	SW	1	SW	1																18
19		30.04	54	30.04	58	52	42			46	44	49	47	SW	3	SW	4																19
20		29.88	53	29.80	56	51	43			44	41	48	46	SW	2	SW	3																20
21		29.80	55	29.90	56	52	45			46	44	46	44	SW	3	SW	4																21
22		29.98	56	30.02	59	53	33			48	46	48	46	SW	2	SW	2																22
23		30.06	56	30.	50	56	36			38	36	40	39	SW	1	SW	1																23
24		29.90	54	29.80	52	44	32			39	39	38	38	SW	1	SW	1																24
25		29.80	50	29.95	56	56	40			39	38	45	43	SW	1	SW	1																25
26		30.01	56	30.08	57	55	36	Punch 36		45	43	40	38	SW	1	SW	1																26
27		30.25	55	30.37	56	45	30			42	39	34	31	SW	1	SW	1																27
28		30.52	54	30.55	54	44	28			34	31	33	31	SW	1	SW	2																28
29		30.45	53	30.34	54	53	33			34	33	36	34	SW	1	SW	1																29
30		30.30	52	30.16	57	52	42			38	36	48	46	SW	1	SW	1																30
31		29.90	53	29.93	54	52	34			38	42	41	38	SW	1	SW	2	.11															31
Sums.		158	13	139	15	14	11			16	13	13	16																				
Means.		29.837	54.3	29.885	56.0	49.5	35.9			39.5	37.2	40.2	39.4																				
* Total Corrections for Instrumental Errors.																																	
* Corrections for Diurnal Range.																																	
* Corrected Means.																																	
No. of		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†† = 29.817
for Temp. (Col. 2), = 29.887 - 0.070 = 29.817
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.811
for Temp. (Col. 4), = 29.885 - 0.074 = 29.811
Mean at Station, corrected, and at 32°, = 29.814
Correction for height, feet above Mean Sea-level, = 101
Mean, reduced to 32°, and Sea-level, = 29.915
Highest Reading, corrected for Index error, on the 28th, = 30.550
Lowest Do. Do., on the 12th, = 29.140
Difference, or Monthly Range, = 1.410

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 3th, = 58.0
Lowest in Month, corrected for Index errors, on the 14th, = 31.0
Difference, or Monthly Range, = 27.0
"Corrected Mean" of all the Highest, (Col. 5), = 49.5
"Corrected Mean" of all the Lowest, (Col. 6), = 35.9
Difference, or Mean Daily Range, = 14.6
** Calculated Mean Temperature of Month, = 42.7
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the th, =
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, =
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 40.3
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 38.9
†† Computed Temperature of Dew-Point, = 37.1
†† Do. Elastic Force of Vapour, = 22.1
†† Do. Weight of Vapour in a Cubic Foot of Air, =
†† Relative Humidity, (Saturation = 100), = 89
RAIN fell on 9 Days; Amount in Inches, = 0.94

WIND.		SUMMARY.							
Direction.		N	NE	E	SE	S	SW	W	NW
A.M.		4	1		4	3	18	1	
P.M.		1	6	2	2	1	16	1	
Mean.		2	4	1	3	3	17	1	0

3.05

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 McAnslane

(Signed)

125
122
8

425

James R.
March 1871-

APR 3 1971
MUSSELBURGH



SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Immerdale, County of Edinburgh, in Lat 55° 56' 0" N, Long. 3° 2' 40" W, Distance from Sea one mile.Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet.During the MONTH of April 1871.

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.		Readings of the Cup Anemometer. No. —		No. of hours in which it fell.		9 A.M.		P.M.		9 h. A.M.						Temperature of WELL, at depth of feet. No.		Temperature at 1 foot, and Dew- point.		9 A.M. 9 P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
		Barometer.	Atta- ched Ther- mometer.	Barometer.	Atta- ched Ther- mometer.	Max. No.	Min. No.	Max. in Sun's rays No.	Min. on Grass. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Dirrec- tion.	Force.	Dirrec- tion.	Force.	No.	Amount in inches.	No.	Amount (0—6), and Direction.	Velocity (0—10), and Direction.	Amount (0—10), and Species.	Hours.	No.	3 inches.	No.					12 inches.	No.	22 inches.	No.	3 inches.	No.	12 inches.	No.	22 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction $\frac{1}{2}$ for Temp. (Col. 2), = 29.688
"Corrected Mean" of Barometer at 9 P.M., minus the Correction $\frac{1}{2}$ for Temp. (Col. 4), = 29.691
Mean at Station, corrected, and at 32°, = 29.724
Correction for height, feet above Mean Sea-level, = 1.01
Mean, reduced to 32°, and Sea-level, = 29.825
Highest Reading, corrected for Index error, on the 6th, = 30.180
Lowest Do. Do. on the 19th, = 29.080
Difference, or Monthly Range, = 1.100

S.-R. THERMOMETER, (in shade, etc.) Highest in Month, (corrected for Index Errors), on the 12th, = 58.0
Lowest in Month, corrected for Index errors, on the 10th, = 28.0
Difference, or Monthly Range, = 30.0
"Corrected Mean" of all the High, (Col. 5), = 48.1
"Corrected Mean" of all the Low, (Col. 6), = 36.1
Difference, or Mean Daily Range, = 12.1
** Calculated Mean Temperature Month, = 42.1

S.-R. THERMOMETER, Black Bt in Sun, Highest, (corrected for Index Errors), on the 12th, = 58.0
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 58.0
Lowest at Night, Black Bulb, (corr'd for Index errors), on the 10th, = 28.0
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 28.0
Difference of above Means or Range (posed), = 30.0

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 40.8
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 39.5
Computed Temperature of Dew-Point, = 37.9
Do. Elastic Force of Vapour, = 2.28
Do. Weight of Vapour in a Cubic Foot of Air, = 89
Relative Humidity, (Saturation = 100), = 89
RAIN fell on 2 Days; Amount in Inches, = 5.11

WIND.		SUMMARY.									
Direction.	No.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.	6	7	4	6			3	4			1.30
P.M.	5	8	5	2	4	3	2	1			1.40
Mean.	5	8	4	4	2	3	3	1	0		1.35

N.B.—The Sums to be correctly added and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh, not later than 3d; 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 Maule

(Signed)

35
47

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

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

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

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

An excellent Barometer is constructed by Mr. Adie of London, the use of which is attended with the great convenience of requiring no *adjustment* of the cistern. Its *scale* 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 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 setting must be made;—with scrupulous accuracy; its slight error here will vitiate the readings from the *venter*.

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.

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 venter, 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 exact 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 exposed position, free from nearby 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 from the opticians, Self-registering Thermometers.—Professor Philip'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 Rudhorff 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-quieted 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 test-

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 woollen 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 Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the "Maximum" Thermometers ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested* form of this apparatus seriously vitiate the "Hygrometrical Deductions," Observers are specially requested to attend to the following conditions:—The bulbs must *hang down* by at least an inch, free from the scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb;—in no case under the bulbs;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always *clean* and *moist*, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by 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 *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read 59° 9, 40° 0, or 40° 1; or again, 40° 4, 40° 3, or 40° 6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40° 3, respectively. In reading Rudhorff'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 24th, 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 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.

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.

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 depth of the snow must be measured in some open place where no drift is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's

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

Observations of the 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 2, cu-st.

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

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

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

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

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

The paper is affixed, by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3 S., as an *zone* 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—0 is "4"; i.e., that it is *blowing fresh*.

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

Remarks.—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column.

Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been 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 any 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 schedule. 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 Masters.

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, 24th November 1862.

BOOK-POST.

EDINBURGH.

General Post Office Buildings,

Secretary of the Meteorological Society of Scotland,

MR ALEXANDER BUCHAN,

To

Inverness
April 1871

FOREST TREES.		FRUIT TREES.		MIGRATORY BIRDS.		FIRST ARRIVAL.		FIRST DEPARTURE.	
In flower.	In leaf.	First appearance.	First appearance.	First appearance.	First appearance.	First appearance.	First appearance.	First appearance.	First appearance.
Alder.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.
Aspen.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.
Beech.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.
Birch.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.
Elm.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.
Larch.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.
Lin.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.
Oak.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.
Sycamore or Plane.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.	Barley.
Apple.	Black Currant.	Black Currant.	Black Currant.	Black Currant.	Black Currant.	Black Currant.	Black Currant.	Black Currant.	Black Currant.
Cherry.	Cherry.	Cherry.	Cherry.	Cherry.	Cherry.	Cherry.	Cherry.	Cherry.	Cherry.
Corn.	Corn.	Corn.	Corn.	Corn.	Corn.	Corn.	Corn.	Corn.	Corn.
Teach.	Teach.	Teach.	Teach.	Teach.	Teach.	Teach.	Teach.	Teach.	Teach.
Plum.	Plum.	Plum.	Plum.	Plum.	Plum.	Plum.	Plum.	Plum.	Plum.
Strawberry.	Strawberry.	Strawberry.	Strawberry.	Strawberry.	Strawberry.	Strawberry.	Strawberry.	Strawberry.	Strawberry.
Swan.	Swan.	Swan.	Swan.	Swan.	Swan.	Swan.	Swan.	Swan.	Swan.
Rail or Corn Crane.	Rail or Corn Crane.	Rail or Corn Crane.	Rail or Corn Crane.	Rail or Corn Crane.	Rail or Corn Crane.	Rail or Corn Crane.	Rail or Corn Crane.	Rail or Corn Crane.	Rail or Corn Crane.
Whin.	Whin.	Whin.	Whin.	Whin.	Whin.	Whin.	Whin.	Whin.	Whin.
Rhododendron Ponticum.	Rhododendron Ponticum.	Rhododendron Ponticum.	Rhododendron Ponticum.	Rhododendron Ponticum.	Rhododendron Ponticum.	Rhododendron Ponticum.	Rhododendron Ponticum.	Rhododendron Ponticum.	Rhododendron Ponticum.
Red Flowering Currant.	Red Flowering Currant.	Red Flowering Currant.	Red Flowering Currant.	Red Flowering Currant.	Red Flowering Currant.	Red Flowering Currant.	Red Flowering Currant.	Red Flowering Currant.	Red Flowering Currant.
Mountain Ash or Rowan.	Mountain Ash or Rowan.	Mountain Ash or Rowan.	Mountain Ash or Rowan.	Mountain Ash or Rowan.	Mountain Ash or Rowan.	Mountain Ash or Rowan.	Mountain Ash or Rowan.	Mountain Ash or Rowan.	Mountain Ash or Rowan.
Mezereum.	Mezereum.	Mezereum.	Mezereum.	Mezereum.	Mezereum.	Mezereum.	Mezereum.	Mezereum.	Mezereum.
Lilac.	Lilac.	Lilac.	Lilac.	Lilac.	Lilac.	Lilac.	Lilac.	Lilac.	Lilac.
Laburnum.	Laburnum.	Laburnum.	Laburnum.	Laburnum.	Laburnum.	Laburnum.	Laburnum.	Laburnum.	Laburnum.
Holly.	Holly.	Holly.	Holly.	Holly.	Holly.	Holly.	Holly.	Holly.	Holly.
Hawthorn.	Hawthorn.	Hawthorn.	Hawthorn.	Hawthorn.	Hawthorn.	Hawthorn.	Hawthorn.	Hawthorn.	Hawthorn.
Hazel.	Hazel.	Hazel.	Hazel.	Hazel.	Hazel.	Hazel.	Hazel.	Hazel.	Hazel.
Broom.	Broom.	Broom.	Broom.	Broom.	Broom.	Broom.	Broom.	Broom.	Broom.
Bourtree or Elder.	Bourtree or Elder.	Bourtree or Elder.	Bourtree or Elder.	Bourtree or Elder.	Bourtree or Elder.	Bourtree or Elder.	Bourtree or Elder.	Bourtree or Elder.	Bourtree or Elder.
Barberry.	Barberry.	Barberry.	Barberry.	Barberry.	Barberry.	Barberry.	Barberry.	Barberry.	Barberry.
Shrub, etc.	Shrub, etc.	Shrub, etc.	Shrub, etc.	Shrub, etc.	Shrub, etc.	Shrub, etc.	Shrub, etc.	Shrub, etc.	Shrub, etc.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55° 56' 0" N, Long. 3° 2' 40" W, Distance from Sea one miles.
 Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of May 1871.
 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.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.									
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max.	Min.	Max. in Sun-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. 1.	No. 2.	No. 3.							
		* No. _____	_____	No. _____	_____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____			No. _____	No. _____	No. _____	No. _____	No. _____	No. _____	No. _____					No. _____	No. _____	No. _____
		inches.	°	inches.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	
	1	30.02	52	30.02	54	54	36			44	42	43	41	NW	1	NW	1															1	
	2	30.02	54	29.89	56	51	38			44	41	45	43	N	1	N	1															2	
	3	29.63	55	29.43	58	53	37			49	47	42	41	S	4	SW	4															3	
	4	29.56	53	29.65	58	55	40			47	45	46	45	NW	2	NW	2															4	
	5	30.	56	30.10	58	50	42			48	44	48	48	NW	1	NW	1															5	
	6	30.20	55	30.30	58	65	44			46	46	49	48	NW	1	N	1															6	
	7	30.38	60	30.38	63	68	40			54	53	49	47	NW	1	NW	1																7
	8	30.26	58	30.32	60	64	41			48	46	43	41	NW	1	NW	1																8
	9	30.28	57	30.41	59	55	37			46	44	41	39	NW	1	NW	1																9
	10	30.38	55	30.24	57	55	40			45	43	46	44	NW	1	N	1																10
	11	30.10	53	30.10	56	54	40			47	45	47	44	N	1	N	1																11
	12	30.10	52	30.10	56	54	36			48	45	41	39	N	1	N	1																12
	13	30.09	54	29.96	56	53	43			46	44	50	48	N	1	N	1																13
	14	29.90	57	29.90	58	54	37			48	45	51	49	NW	1	NW	1																14
	15	29.92	55	29.86	58	56	38			47	45	54	51	NW	1	NW	1																15
	16	29.86	57	30.05	57	54	30			51	49	35	33	N	1	NW	1																16
	17	30.	54	29.70	58	49	36			37	35	39	37	NW	2	NW	4																17
	18	29.84	50	29.90	53	57	42			46	44	50	48	N	1	N	1																18
	19	30.03	54	30.14	58	60	44			49	48	54	51	NW	1	NW	1																19
	20	30.10	56	30.20	60	66	42			54	52	53	51	N	3	N	1																20
	21	30.25	60	30.27	62	66	44			58	54	56	53	N	1	NW	1																21
	22	30.20	64	30.16	64	71	48			58	55	64	61	N	1	N	1																22
	23	30.08	64	30.	65	73	48			61	58	63	59	NW	1	NW	2																23
	24	29.92	64	29.80	65	72	52			56	54	60	58	NW	1	NW	1																24
	25	29.80	64	29.80	64	62	43			53	51	57	49	NW	1	NW	1																25
	26	29.84	60	29.94	65	65	43			56	53	53	51	NW	1	NW	1																26
	27	30.	62	30.18	64	67	48			53	50	58	54	NW	1	N	1																27
	28	30.58	64	30.38	65	67	47			56	53	53	52	NW	1	NW	2																28
	29	30.52	62	30.30	68	74	47			53	53	57	53	NW	1	NW	1																29
	30	30.22	64	30.18	68	72	53			56	54	59	57	NW	1	N	1																30
	31	30.18	67	30.10	64	63	50			59	57	53	53	NW	1	NW	1																31
Sums.		186	246	176	205	18	66			13	260	13	250	38	40			7															
Means.		30.060579	30.057602	60.6421						50.4484	50.2481			1.89	1.29																		
† Total Corrections for Instrumental Errors.		+034	+034																														
‡ 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.	meso-cirrus.
ci-cu.	cirro-cumulus.	n.	nimbus.
ci-s.	cirro-stratus.	r.	rain.
cu.	cumulus.	h. r.	heavy rain.
cu-s.	cumulo-stratus.	c. h. r.	continued heavy rain.
d.	dew.	s.	stratus.
f.	fog.	sc.	scud.
fr.	frost.	sh.	shower.
h. fr.	hoar-frost.	sn.	snow.
h.	haze.	so. ha.	solar halo.
h. d.	heavy dew.	sq.	squall.
hl.	hail.	sgs.	squalls.
l.	lightning.	t. s.	thunder.
li. cl.	light clouds.	t. s.	thunder storm.
li. sh.	light showers.	w.	wind.
lu. co.	lunar corona.	g.	gale of wind.
lu. ha.	lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, “corrected Mean” at 9 A.M., minus the Correction†† = 30.015
 for Temp. (Col. 2), = 30.044 - 0.029 = 30.015
 “Corrected Mean” of Barometer at 9 P.M., minus the Correction†† = 30.005
 for Temp. (Col. 4), = 30.091 - 0.086 = 30.005
Mean at Station, corrected, and at 32°, = 30.010
 Correction for height, feet above Mean Sea-level, = 110
Mean, reduced to 32°, and Sea-level, = 30.120
 Highest Reading, corrected for Index error, on the 7 th, = 30.380
 Lowest Do. Do., on the 3 th, = 29.430
 Difference, or **Monthly Range**, = 0.950

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month**, (corrected for Index Errors), on the 29 th, = 74.0
Lowest in Month, corrected for Index errors, on the 16 th, = 30.0
 Difference, or **Monthly Range**, = 44.0
 “Corrected Mean” of all the Highest, (Col. 5), = 60.6
 “Corrected Mean” of all the Lowest, (Col. 6), = 42.1
 Difference, or **Mean Daily Range**, = 18.5
 ** Calculated **Mean Temperature** of Month, = 51.4

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

HYGROMETER, **Mean** (corrected) A.M. and P.M. Reading of **Dry Bulb**, (Cols. 9 and 11), = 50.3
Mean (corrected) A.M. and P.M. Reading of **Wet Bulb**, (Cols. 10 and 12), = 48.2
 ‡ Computed **Temperature of Dew-Point**, = 46.0
 ‡ Do. **Elastic Force of Vapour**, = 3.11
 ‡ Do. **Weight of Vapour in a Cubic Foot of Air**, ... =
 ‡ **Relative Humidity**, (Saturation = 100), = 85
RAIN fell on 7 Days; Amount in Inches, = 0.71

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Mean Velocity in miles per day.
A.M.		5	6	1		1	1	8	9	1.19
P.M.		9	2	1	1	1	3	10	4	1.27
Mean.		7	4	1	1	1	2	9	6	1.24

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 Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by William McNeill

(Signed)

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inverkeithing, County of Edinburgh, in Lat. 55°56'0" N Long. 3°2'40" W Distance from Sea one miles
 Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of June 1871.
 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, 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 Thermometer.	Barometer.	Attached Thermometer.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches.	Velocity (0-5), and Direction.	Amount (0-10), and Species.	Velocity (0-5), and Direction.	Amount (0-10), and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.							
		* No.	°	No.	°	°	°	No.	°	°	°	°	°	°	°	°	°	°	No.	No.	No.	No.	No.	No.	No.	No.							
		inches.	"	inches.	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"					"		
	1	30.12	64	30.20	63	63	40			57	55	48	46	N	1	NW	1														Thunder with Lightning on the 11 th & 19 th	1	
	2	30.28	64	30.28	64	60	41			49	47	45	43	NW	1	NW	1														Thunder with no Lightning on the 18 th & 20 th	2	
	3	30.29	61	30.02	62	58	44			49	47	48	47	NW	1	NW	1														Rain fell for the month 2.98 inches	3	
	4	30.14	60	30.22	60	60	44			53	51	51	49	NW	1	NW	2														Wind has been light with a point of S or E in it for 26 days	4	
	5	30.23	60	30.20	61	62	51			58	57	56	54	N	1	N	1																
	6	30.13	60	30.13	62	64	44			54	54	54	52	N	1	NW	1																
	7	30.13	59	30.10	60	61	40			54	52	50	48	N	1	N	2																
	8	30.02	59	30.03	60	62	40			57	55	52	50	N	1	N	2																
	9	30.08	59	30.03	60	60	41			48	46	50	48	N	1	N	1																
	10	30.07	59	29.98	62	64	50			53	53	56	55	N	1	N	1																
	11	29.98	59	30.01	60	60	44			54	54	50	49	N	1	N	1																
	12	30.10	61	30.12	60	63	44			56	54	45	43	N	1	N	2																
	13	30.	62	29.90	63	68	53			56	54	53	53	N	1	N	1																
	14	29.89	64	29.95	72	62	49			58	57	55	53	N	1	N	1																
	15	29.95	60	29.84	67	61	48			56	56	57	54	N	1	N	1																
	16	29.80	60	29.74	67	59	49			53	53	56	55	N	1	N	1																
	17	29.68	62	29.48	63	66	48			60	58	58	57	N	1	N	1																
	18	29.45	62	29.44	61	63	47			57	53	53	53	N	1	N	1																
	19	29.50	63	29.53	64	68	52			60	58	58	56	N	1	N	1																
	20	29.62	61	29.64	62	64	47			60	58	57	52	N	1	N	1																
	21	29.84	60	29.95	60	59	40			53	57	50	48	N	1	N	1																
	22	29.95	60	30.03	60	59	44			50	48	49	47	N	1	N	2																
	23	30.08	60	30.13	60	58	42			50	48	50	47	N	2	N	2																
	24	30.22	60	30.21	58	60	44			53	50	57	51	N	1	N	1																
	25	30.20	59	30.30	60	61	40			56	54	47	45	N	1	N	1																
	26	30.30	60	30.20	64	62	45			57	49	57	53	N	1	N	1																
	27	30.07	64	29.80	62	67	49			56	53	53	52	N	1	N	1																
	28	29.56	62	29.64	62	60	50			53	52	58	56	N	2	N	2																
	29	29.74	60	29.58	65	60	51			57	57	57	56	N	1	N	1																
	30	29.60	60	29.68	63	66	51			58	56	55	53	N	2	N	2																
	31	29.60	60	29.68	63	66	51			58	56	55	53	N	2	N	2																
Suns.		11	8	29	6	11	10			13	14	13	14																				
Means.		29.964	60.7	29.945	62.1	62.0	45.7			54.6	52.9	52.4	50.7		1.1		1.3																
† Total Corrections for Instrumental Errors.		+0.34		+0.34																													
† 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.	" mist.		
ci-cu.	" cirro-cumulus.	p.	" nimbus.		
ci-s.	" cirro-stratus.	r.	" rain.		
cu.	" cumulus.	h. r.	" heavy rain.		
cu-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.		
d.	" dew.	s.	" stratus.		
f.	" fog.	sc.	" squall.		
fr.	" frost.	sl.	" sleet.		
h.-fr.	" hear-frost.	sn.	" snow.		
h.	" haze.	so. ha.	" solar halo.		
h. d.	" heavy dew.	sq.	" squall.		
hl.	" hail.	sqs.	" squalls.		
l.	" lightning.	t.	" thunder.		
li. cl.	" light clouds.	t. s.	" thunder storm.		
li. sh.	" light showers.	w.	" wind.		
lu. co.	" lunar corona.	g.	" gale of wind.		
lu. ha.	" lunar halo.				

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

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction†† = 29.909
 for Temp. (Col. 2), = 29.998 - 0.089 = 29.909
 "Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.888
 for Temp. (Col. 4), = 29.979 - 0.091 = 29.888
 Mean at Station, corrected, and at 32°, = 29.898
 Correction for height, feet above Mean Sea-level, = 1.00
 Mean, reduced to 32°, and Sea-level, = 29.998
 Highest Reading, corrected for Index error, on the 24th, = 30.300
 Lowest Do. Do., on the 18th, = 29.440
 Difference, or Monthly Range, = 0.860

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 13th, = 68.0
 Lowest in Month, corrected for Index errors, on the 18th, = 40.0
 Difference, or Monthly Range, = 28.0
 "Corrected Mean" of all the Highest, (Col. 5), = 62.0
 "Corrected Mean" of all the Lowest, (Col. 6), = 45.7
 Difference, or Mean Daily Range, = 16.3
 ** Calculated Mean Temperature of Month, = 53.8
 S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 13th, = 68.0
 "Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 62.0
 Lowest at Night, Black Bulb, (corrected for Index errors), on the 18th, = 40.0
 "Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 45.7
 Difference of above Means or Range ("exposed"), = 16.3

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 53.5
 Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 51.8
 †† Computed Temperature of Dew-Point, = 50.1
 †† Do. Elastic Force of Vapour, = 3.63
 †† Do. Weight of Vapour in a Cubic Foot of Air, = 8.9
 †† Relative Humidity, (Saturation = 100), = 89
 RAIN fell on 13 Days; Amount in Inches, = 2.98

WIND.		SUMMARY.									
Direction.		N	NE	E	SE	S	SW	W	NW	Mean Force.	Mean Velocity in miles per day.
A.M.										1.10	
P.M.										1.30	
Mean.		6	10	2	2	6	1	1	2	0	1.28

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 Ganned or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by William McAnastan

(Signed)

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

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then screw up the mercury to within a quarter of an inch of the top of the tube, and take down the instrument; it may then be carried with the cistern uppermost. Before suspending the Barometer for use, 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 stop 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 extremities adjusted carefully made. By raising and lowering the eye, 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 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 "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 denunciations, 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 instructions 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 rely 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 bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always clean and moist, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

One form of "Mason's" Hygrometer is highly objectionable, 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, and in decimals. Thus the Thermometer will read—38° 9', 40° 0', or 40° 1'; under, an exact coincidence with, or a little over or less must be registered 40° 2' or 40° 3', and 40° 1' or 40° 5' 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 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 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.

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

Clouds.—Convenient abbreviations for Lake Howard's

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

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W., (for example,) will indicate that the upper strata of clouds travel with extreme velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of 2, cast, (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 project 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. **Queens.**—Mention whether Schöner'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 8° S., as an *exemplum* only, on the schedule, will indicate that the ozone paper is tinted 8° S. on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4"; i.e., that it is blowing fresh.

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

Remarks.—The "Remarks" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, or 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 on the schedule. Additional remarks may be made on the margin. **Observations** in connection with the periodic return of the seasons, possess not only great scientific value, but are of considerable interest to the Agriculturist. The Council would direct the special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *ten days* 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, 20th November 1872.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.										In Flower.	First Appearance.	In Leaf.	Disbudded of Leaves.	Disbudded of	GEORGS.	Barley.	Bare or Bigg.	Oats.	Wheat.	Beans.	Larch.	Limbs.	Oak.	Sycamore or Plane.
																			</					

SHRUBS, ETC.	First in Blossom.	First in Fruit.	First in Seed.	First in Pod.	First in Husk.	First in Shell.	First in Stone.	First in Pit.	First in Core.	First in Seed.	First in Pod.	First in Husk.	First in Shell.	First in Stone.	First in Pit.	First in Core.
Barberry.																
Bouthee or Elder.																
Broom.																
Hawthorn.																
Holly.																
Laburnum.																
Lilac.																
Myrtles.																
Mountain Ash or Rowan.																
Red Flowering Currant.																
Rhododendron Pomifolium.																
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, Potatoes, disease prevails among cattle; and the Agricultural condition of the district generally.

BOOK-POST.

Secretary of the Meteorological Society of Scotland,

General Post Office Buildings,

EDINBURGH.

MR ALEXANDER BUCHAN,

To

James Buchanan
June 1871

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat 55° 56' 0" Long 2° 2' 40" Distance from Sea one miles.
Height of Cistern of the Barometer above Mean Sea-level 91 feet, above Ground 4 feet. During the MONTH of July 1871.
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.	Attach- ed Ther- mometer	Barometer. No.	Attach- ed Ther- mometer	Max. No.	Min. No.	Max. in Sun-rays No.	Min. on Grass No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches.	Velocity (0-6).	Amount (0-10).	Velocity (0-6).	Amount (0-10).	No. 8 inches.	No. 12 inches.	No. 22 inches.						
		inches.	°	inches.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°					°	°
	1	29.77	63	29.76	60	67	52			57	53	56	54	S	2	S	1											Thunder with Lightning on the 4 th & 5 th	1			
	2	29.78	61	29.67	64	71	53			63	63	58	57	S	2	SE	2											Thunder without Lightning on the 2 nd 22 nd & 23 rd	2			
	3	29.58	63	29.56	64	68	51			54	54	56	54	SW	1	SW	1											Rainbow on the 9 th & 28 th	3			
	4	29.57	60	29.60	61	64	51			57	56	57	57	SW	2	S	1											great Hail Shower on the 29 th	4			
	5	29.75	63	29.90	65	62	53			58	56	58	57	SW	1	SW	1												gale of wind on the 15 th	5		
	6	29.84	62	29.90	64	68	53			55	54	59	58	SW	3	SW	3												1/2 inch rain fell in 20 Min.	6		
	7	29.80	64	29.70	64	68	49			60	59	57	55	SW	2	SW	3												on the 22 nd	7		
	8	29.65	68	29.64	63	67	51			62	57	60	58	SW	1	SW	1												July has been a wet and cold month with little sun shine	8		
	9	29.72	66	29.80	64	63	52			60	55	82	52	SW	3	SW	3												Excess nearly a month behind last year	9		
	10	29.78	68	29.80	63	66	47			63	60	58	55	SW	1	SW	1														10	
	11	29.80	64	29.80	63	67	53			62	59	60	58	N	1	N	1														11	
	12	29.77	63	29.76	63	68	53			58	55	59	56	S	1	S	2														12	
	13	29.76	63	29.60	69	65	55			60	58	60	58	S	1	S	2														13	
	14	29.76	67	29.80	69	71	51			60	58	57	63	S	2	S	2														14	
	15	29.85	70	29.94	66	66	53			63	58	56	54	SW	3	SW	5														15	
	16	30.03	69	29.96	69	68	52			60	57	58	56	SW	2	SW	2														16	
	17	29.84	70	29.94	69	68	52			63	61	57	55	SW	4	SW	4														17	
	18	29.98	69	29.84	68	67	48			59	53	58	66	SW	1	SW	2														18	
	19	29.75	65	29.80	63	59	52			58	57	54	53	SW	1	SW	1														19	
	20	29.90	60	29.92	64	66	53			56	54	58	55	SW	1	SW	1														20	
	21	29.77	65	29.58	65	66	51			55	55	57	56	SW	1	SW	1														21	
	22	29.53	62	29.46	64	65	52			58	56	58	57	SW	1	SW	1														22	
	23	29.51	63	29.56	68	64	50			58	56	57	57	SW	1	SW	1														23	
	24	29.60	62	29.30	64	61	49			54	54	56	54	W	1	W	1														24	
	25	29.20	63	29.20	65	60	47			56	53	61	47	SW	1	SW	1														25	
	26	29.20	62	29.30	62	63	48			56	54	53	51	SW	1	SW	1														26	
	27	29.58	61	29.67	63	66	48			60	58	64	61	N	1	N	1														27	
	28	29.64	62	29.75	62	61	50			58	56	53	52	SW	1	SW	1														28	
	29	29.78	62	29.58	60	60	52			58	56	54	54	SW	1	SW	2														29	
	30	29.58	61	29.72	62	60	48			57	56	55	54	SW	1	SW	1														30	
	31	29.90	63	30	63	66	48			58	56	65	52	SW	1	SW	1														31	
	Sums.	2013	121	2198	133	161	28			168	203	201	148	46	51			390														
	Means.	29.701	639	29.709	643	652	509			586	569	567	548	1.48	1.64																	
	+ Total Corrections for Instru- mental Errors.	+034		+034																												
	+ Corrections for Diurnal Range.																															
	+ "Cor- rected Means."																															
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	

BAROMETER, "corrected Mean" at 9^h 23⁵ minus the Correction $\frac{1}{100}$ for Temp. (Col. 2) = 29.643
"Corrected Mean" of Barometer at 9 P.M. $\frac{709}{1000}$ minus the Correction $\frac{1}{100}$ for Temp. (Col. 4) = 29.649
Mean at Station, corrected, and at 32°, = 29.646
Correction for height, feet above Mean Sea-level, = 97
Mean, reduced to 32°, and Sea-level, = 29.743
Highest Reading, corrected for Index error, on the 16th, = 30.030
Lowest Do. Do., on the 25th, = 29.200
Difference, or Monthly Range, = 0.830

* Each instrument tested at the Office in Edinburgh bears the stamp "S.M.S.," and a number to be entered in the Heading; or the Number and Initials of the Maker may be given.
† The Diurnal Range for Scotland is as yet unknown.
‡ These "Hygrometrical Deductions" are calculated from Glashier's Hygrometrical Tables, Second Edition only.
§ While the Diurnal Range is unknown, the Arithmetic Mean of Col. 4, and it will be entered as the "Calculated Mean Temperature."
|| Any Observations not taken under the conditions specified in the Directions on the other side, or noted at the Top of each column, must be marked as such by the observer, in each Schedule. See over.

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 27th, = 71.0
Lowest in Month, corrected for Index errors, on the 27th, = 45.0
Difference, or Monthly Range, = 26.0
"Corrected Mean" of all the Highest, (Col. 5), = 65.2
"Corrected Mean" of all the Lowest, (Col. 6), = 50.9
Difference, or Mean Daily Range, = 14.3
** Calculated Mean Temperature of Month, = 58.0
S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the th, =
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, =
Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, =
Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 57.6
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 55.8
† Computed Temperature of Dew-Point, = 54.4
† Do. Elastic Force of Vapour, = 42.1
† Do. Weight of Vapour in a Cubic Foot of Air, =
† Relative Humidity, (Saturation = 100), = 88
RAIN fell on 14 Days; Amount in Inches, = 3.90

WIND.												SUMMARY.			
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.				
A.M.	2				8	16	5			1.44					
P.M.	2				17	10	3			1.64					
Mean.	2.00				17.5	12.4	0			1.56					

2.43

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
Returned verified by

William McNeilane

(Signed)

56
78
433

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

Their bulbs have a black coating of wax from radiation during night, which may easily be made, or menuded, 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 "*Miniumum*" should be freely exposed to the sun, and the "*Maximum*" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these thermometers; nor the sun's heat to affect the Minimum Thermometer by dissilation.

Observations of the clouds are made at J.A.M. and at sunrise 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" and Direction," $\frac{2}{3}$ W.,

column, an entry of $\frac{2}{2}$ cust- (eq.) will indicate that the higher (lower) species of the 2nd st- is the 2nd cust- of the 2nd st-.

regions are covered to the "amount," of 4-furths with *stratus* clouds; and that the sky is further obscured to the extent of 2-furths by lower clouds of the *cumulostratus* kind.

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

Underground life wonders.—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constantness,—the Council require 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 stoppings to collars, to prevent rain-water being conveyed to the bulbs by the stems; wooden frames must be made of the ground, for formation and agricultural

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by the water of the river water. At or near the time of high water, on the 3rd, 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 conveniently, six sea obser-

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

Cases.—Mention whether Scheele'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 3¹/₂, as an *exemplum* 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* *frth*.

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 tables can be given not hours assigned. The use of contractions ought, therefore, to be taken very advantage of.

tags 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 events which suggest a change in character, colour, or clouds, &c. of the sky, or the appearance of 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 when lofty hills are 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., 12 M., 3 P.M., 6 P.M., 9 P.M., and 10 P.M., should be registered, either in two columns, either-
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 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.

EDINBURGH, 12th November 1862.

BOOK-POST.

General Post

of Scotland,
Office Buildings,
EDINBURGH

[illegible][illegible]

	First in Blossom.	Last in Blossom.
Apple,		
Black Currant,		
Cherry,		

	In Leaf.	Diversed of Leaves.	Grown or mentioned
Bartley			
Bero o			
Oats,			
Wheat,			
Beans,			
Pears,			
Potato			
Turnip			
Rye G			

OBSERVATIONS		FOREST TREES.		SHRUBS, ETC.		Fruit.	
1		Alder,	Asp.	Beech,	Birch,	Elm,	Oak,
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Have the goodesses also to state any information you may be able to collect relative to the Crops of Grain, Hay, Potato, Turnips, etc., whether plentiful, or in perfection; whether any have suffered from blight, diseases, etc. Whether Potato-pests prevail among cattle; and the agricultural condition of the district generally.

SHRUBS, ETC.	Baccharis, Bontrea or Elder, Broom, Hazel, Hawthorn, Holly, Laburnum, Lilac, Mezerion, Mountain Ash or Hovaw, Rhododendron Ponticum, Vibn,	Apple, Black Currant, Cherry, Gean, Gooseberry, Loach, Pear, Plum, Strawberry,	First in Blossom.	First in Blossom.	Fruit Rep. generally.	Onckoo, Cantlew, House-Swallow, Lapwing, Plover, Sand-Martin, Starling, Swan, Hail or Corn Crake,	MIGRATORY BIRDS.	First Arrival.	Departure.
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1

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55° 51' 0" N Long. 1° 21' 40" W Distance from Sea 0.0 miles†Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet.During the MONTH of August 1871.

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, 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.	Attached Thermometer.	Barometer.	Attached Thermometer.	Max. No.	Min. No.	Max. in Sun's rays.	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches.	Velocity (0-5), and	Amount (0-10), and	Velocity (0-5), and	Amount (0-10), and	No. 12 inches.	No. 22 inches.						Temperature of WELL at depth of feet. No.	Temperature at 1 foot, and Dew-point.	9 A.M.	9 P.M.
		* No.		No.		No.	No.	No.	No.																									
		inches.		inches.																														
	1	29.46	63	29.40	61	66	56			62	60	59	57	W	2	W	1															Out Harrow commenced on the 10 th and Parley on the 12 th	1	
	2	29.85	66	29.70	68	68	56			66	63	60	57	W	2	W	1															Potato Disease first seen on the 15 th and the tubers now very much affected on the 24 th much Thunder	2	
	3	29.58	67	29.46	68	67	50			63	60	58	56	W	3	W	4															lightening accompanied with a gale of wind, and great rain. Beautiful Rainbow and Aurora at night -	3	
	4	29.45	66	29.82	66	66	52			58	56	56	53	W	3	W	1															Lunar Bow on the 31 st -	4	
	5	29.90	63	29.94	68	69	47			58	56	55	52	W	2	W	3															The bar crops are now all near in stalk, in this neighbourhood	5	
	6	30.10	67	30.20	69	69	52			60	58	60	58	W	3	W	1																6	
	7	30.16	66	30.10	69	76	54			62	60	64	62	W	1	W	1																7	
	8	30.16	69	30.16	69	77	56			67	64	67	64	W	1	W	1																8	
	9	30.20	69	30.10	70	78	56			64	61	68	65	W	1	W	1																9	
	10	30.08	70	30.04	71	80	62			68	65	69	65	W	2	W	2																10	
	11	30.06	72	30.10	72	75	57			67	64	64	61	W	1	W	1																11	
	12	30.10	71	30.13	71	72	54			64	61	63	60	W	1	W	1																12	
	13	30.10	70	30.10	70	69	58			66	63	60	58	W	2	W	1																13	
	14	30.12	70	30.09	70	73	49			64	61	60	58	W	1	W	1																14	
	15	30.06	70	30.	70	68	50			59	57	60	58	W	1	W	1																15	
	16	30.	69	29.96	68	67	50			61	59	56	54	W	1	W	1																16	
	17	29.85	66	29.65	71	68	56			57	55	57	55	W	1	W	1																17	
	18	29.54	68	29.58	70	67	50			61	59	56	56	W	1	W	1																18	
	19	29.67	66	29.92	66	67	50			58	55	56	54	W	2	W	1																19	
	20	29.85	66	29.51	66	64	43			56	56	53	53	W	1	W	1																20	
	21	29.77	64	30.06	64	62	42			53	52	53	53	W	1	W	1																21	
	22	30.05	60	29.80	65	64	53			54	52	56	54	W	2	W	1																22	
	23	29.70	61	29.71	66	66	50			60	58	56	54	W	2	W	4																23	
	24	29.57	60	29.23	67	66	50			58	56	54	52	W	2	W	5																24	
	25	29.64	60	29.70	64	63	46			56	54	56	53	W	4	W	2																25	
	26	29.65	62	30.18	67	64	47			53	52	56	57	W	4	W	3																26	
	27	30.30	63	30.34	65	64	49			53	52	57	53	W	2	W	1																27	
	28	30.41	63	30.35	68	70	48			57	53	58	56	W	1	W	1																28	
	29	30.20	66	30.10	69	72	50			56	54	60	58	W	1	W	1																29	
	30	30.02	68	29.93	71	75	57			59	58	64	61	W	1	W	1																30	
	31	29.90	68	29.90	73	73	54			62	59	63	61	W	1	W	1																31	
Sums.		12.10	12	13.8	14	16	12			15	14	14	14	520	47			2.14																
Means.		29.933	661	29.928	663	69.2	51.7			60.2	57.9	58.3	57.2	168	157																			
+ Total Corrections for Instrumental Errors.		+034		+034																														
+ 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†† = 29.866
for Temp. (Col. 2), = 29.967 - 10.1 = 29.866
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.855
for Temp. (Col. 4), = 29.962 - 10.1 = 29.860
Mean at Station, corrected, and at 32°, = 29.860
Correction for height, feet above Mean Sea-level, = 0.97
Mean, reduced to 32°, and Sea-level, = 29.957
Highest Reading, corrected for Index error, on the 28th, = 30.410
Lowest Do. Do., on the 14th, = 29.230
Difference, or Monthly Range, = 1.180

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 9th, = 78.0
Lowest in Month, corrected for Index errors, on the 21st, = 42.0
Difference, or Monthly Range, = 36.0
"Corrected Mean" of all the Highest, (Col. 5), = 69.2
"Corrected Mean" of all the Lowest, (Col. 6), = 51.7
Difference, or Mean Daily Range, = 17.5
** Calculated Mean Temperature of Month, = 60.5

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected for Index Errors), on the 14th, = 118.0
"Corrected Mean," (Col. 7), of Black Bulb, Max. in Sun, = 118.0
Lowest at Night, Black Bulb, (corrected for Index errors), on the 14th, = 118.0
"Corrected Mean," (Col. 8), of Black Bulb, Min. on grass, = 118.0
Difference of above Means or Range ("exposed"), = 118.0

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 59.8
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 57.5
†† Computed Temperature of Dew-Point, = 55.7
†† Do. Elastic Force of Vapour, = .441
†† Do. Weight of Vapour in a Cubic Foot of Air, = 86
†† Relative Humidity, (Saturation = 100), = 86
RAIN fell on 8 Days; Amount in Inches, = 2.14

WIND.		SUMMARY.									
Direction.		N.	NE	E	SE	S.	SW	W	NW	Calm or Variable.	Mean Force.
A.M.	2					3	4	10	2		1.68
P.M.	1					1	3	15	8		1.52
Mean.	200					1	3	15	9		1.60

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

Wm. Mitchell

(Signed)

137

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet.

During the MONTH of September 1879

The Hours of Observation are of Greenwich Time.

BAROMETER, "corrected Mean" at 9 A.M., <i>minus</i> the Correction $\uparrow \uparrow$ for Temp. (Col. 2), <u>29.958 - 0.06</u>	=	<u>29.872</u>
"Corrected Mean" of Barometer at 9 P.M., <i>minus</i> the Correction $\uparrow \uparrow$ for Temp. (Col. 4), <u>29.941 - 0.08</u>	=	<u>29.856</u>
Mean at Station, corrected, and at 32°,.....	=	<u>29.862</u>
Correction for height, feet above Mean Sea-level,.....	=	<u>99</u>
Mean, reduced to 32°, and Sea-level,.....	=	<u>29.961</u>
Highest Reading, corrected for Index error, on the 13 th,.....	=	<u>30.400</u>
Lowest Do. Do., on the 27 th,.....	=	<u>29.250</u>
Difference, or Monthly Range ,.....	=	<u>1.200</u>

S.-R. THERMETER , (in shade, etc.), Highest in Month , (corrected for Index Errors), on the / th,.....	=	<u>69.0</u>
Lowest in Month , corrected for Index errors, on the 28 th ,	=	<u>36.0</u>
Difference, or Monthly Range ,	=	<u>33.0</u>
"Corrected Mean " of all the Highest , (Col. 5),	=	<u>59.1</u>
"Corrected Mean " of all the Lowest , (Col. 6),	=	<u>44.8</u>
Difference, or Mean Daily Range ,	=	<u>14.3</u>
** Calculated Mean Temperature of Month,	=	<u>52.0</u>
<hr/>		
S.-R. THERMETER , Black Bulb in Sun , Highest , (corrected for Index Errors), on the / th,.....	=	
"Corrected Mean ," (Col. 7), of Black Bulb , Max. in Sun ,.....	=	
Lowest at Night , Black Bulb, (corrected for Index errors), on the / th,	=	
"Corrected Mean ," (Col. 8), of Black Bulb , Min. on grass,	=	
Difference of above Means or Range ("exposed"),	=	

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11),	=	51.0
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12),	=	49.7
† Computed Temperature of Dew-Point,	=	48.4
† Do. Elastic Force of Vapour,	=	340
† Do. Weight of Vapour in a Cubic Foot of Air, ...	=	
† Relative Humidity, (Saturation = 100),	=	91
RAIN fell on 0 Days; Amount in Inches,	=	8.23

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 Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and
Return verified by

(Signed)

114

437

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inverurie, County of Edinburgh, in Lat. 55° 56' 0" N Long 3° 2' 40" W, Distance from Sea an miles.Height of Cistern of the Barometer above Mean Sea-level 41 feet, above Ground 11 feet.During the MONTH of Oct 1871.

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 A.M.		P.M.		9 h. A.M.									
		Barometer.	Attached Thermometer.	Barometer.	Attached Thermometer.	No.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity (0-10).	Amount and Direction.	Velocity (0-10).	Amount and Direction.	No.	No.	No.							
	1	29.04	52	29.06	44	47	42		43	43	42	42	82	1	82	1		13									Stars shooting on the 9th with 4 degrees of frost which cut down all Bulbs and tender flowers	1			
	2	29.10	56	29.30	58	51	44		49	49	46	44	8	1	82	1		23									Red Sky at morning on the 23rd	2			
	3	29.40	54	29.56	58	49	31		45	44	37	37	82	2	82	2											Lunar halo on the 27th	3			
	4	29.70	53	29.60	56	53	43		38	38	47	46	82	1	82	1											Rain fell on 14 days & amount 2.42 inches	4			
	5	29.57	53	29.45	56	52	40		46	46	43	41	82	1	82	1		18											5		
	6	29.40	55	29.43	55	50	40		44	44	46	46	82	3	82	2		17											6		
	7	29.46	54	29.54	55	53	39		45	45	44	43	82	2	82	1														7	
	8	29.82	55	29.99	57	50	31		45	45	38	35	82	1	82	1		18												8	
	9	30.18	51	30.30	52	47	28		34	34	33	32	82	1	82	1														9	
	10	30.36	51	30.50	58	50	31		31	31	36	35	82	1	82	1														10	
	11	30.20	50	30.20	55	50	31		33	32	36	35	82	1	82	1														11	
	12	30.30	50	30.30	56	51	34		34	33	41	40	82	1	82	1														12	
	13	30.28	53	30.20	56	56	36		47	45	45	43	82	1	82	1														13	
	14	30.28	56	29.90	60	54	37		50	49	44	43	82	1	82	2														14	
	15	29.86	55	29.86	60	55	44		48	48	48	47	82	1	82	1		14												15	
	16	29.84	55	29.80	58	57	46		48	47	52	50	82	1	82	1		14												16	
	17	29.74	40	29.85	62	57	45		52	50	53	51	82	1	82	1														17	
	18	29.80	60	29.58	62	63	54		55	54	58	57	82	1	82	1														18	
	19	29.50	63	29.48	66	60	48		57	56	54	54	82	1	82	1		29												19	
	20	29.63	60	29.83	68	63	34		46	46	60	58	82	1	82	1														20	
	21	29.70	59	29.56	60	58	41		38	37	45	44	82	2	82	3		05												21	
	22	30.10	58	30.13	60	55	43		51	50	44	43	82	1	82	1														22	
	23	30.08	56	30.16	64	57	48		53	50	53	52	82	2	82	1														23	
	24	30.16	58	30.20	58	55	40		56	56	47	46	82	1	82	1		40												24	
	25	30.20	57	30.06	58	50	45		46	45	50	48	82	2	82	3														25	
	26	29.98	59	29.80	60	58	51		55	53	55	53	82	3	82	3														26	
	27	29.63	57	29.60	58	56	34		54	52	44	44	82	2	82	2		16												27	
	28	29.62	54	29.58	58	50	46		35	35	44	43	82	1	82	1		26												28	
	29	29.40	55	29.54	58	47	43		46	46	46	44	82	2	82	1		22												29	
	30	29.60	56	29.90	58	49	44		47	47	46	46	82	1	82	1		15												30	
	31	30.28	57	30.10	56	51	44		48	48	47	46	82	1	82	1														31	
Sums.		137	13	1510	16	12	11		16	14	14	12		41	42		7	252													
Means.		29.79	55	29.81	58	50	44		45	45	45	44		132	136																
† Total Corrections for Instrumental Errors.		+0.34		+0.34																											
‡ 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-cu.	cirro-cumulus.	n.	nimbus.
ci-s.	cirro-stratus.	r.	rain.
cu.	cumulus.	h. r.	heavy rain.
cu-s.	cumulo-stratus.	c. h. r.	continued heavy rain.
d.	dew.	s.	stratus.
f.	fog.	sc.	scud.
fr.	frost.	sl.	sleet.
h-fr.	hoar-frost.	sn.	snow.
h.	haze.	so. ha.	solar halo.
h. d.	heavy dew.	sq.	squall.
h.	hail.	sgs.	squalls.
l.	lightning.	t.	thunder.
h. cl.	light clouds.	t. s.	thunder storm.
h. sh.	light showers.	w.	wind.
lu. co.	lunar corona.	g.	gale of wind.
lu. ha.	lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M. minus the Correction†† = 29.755
for Temp. (Col. 2), = 29.827 - 0.072
"Corrected Mean" of Barometer at 9 P.M. minus the Correction†† = 29.769
for Temp. (Col. 4), = 29.840 - 0.071
Mean at Station, corrected, and at 32° = 29.762
Correction for height, feet above Mean Sea-level, = 1.00
Mean, reduced to 32°, and Sea-level, = 29.662
Highest Reading, corrected for Index error, on the 10 th, = 30.360
Lowest Do. Do., on the / th, = 29.040
Difference, or Monthly Range, = 1.320

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 18 th, = 63.0
Lowest in Month, corrected for Index errors, on the 9 th, = 28.0
Difference, or Monthly Range, = 35.0
"Corrected Mean" of all the Highest, (Col. 5), = 58.4
"Corrected Mean" of all the Lowest, (Col. 6), = 40.4
Difference, or Mean Daily Range, = 18.0
** Calculated Mean Temperature of Month, = 46.9

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 45.9
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 45.0
†† Computed Temperature of Dew-Point, = 44.0
†† Do. Elastic Force of Vapour, = 2.87
†† Do. Weight of Vapour in a Cubic Foot of Air, =
†† Relative Humidity, (Saturation = 100), = 93
RAIN fell on 14 Days; Amount in Inches, = 2.52

WIND.	SUMMARY.											
	Direction.	N	NE	E	SE	S	SW	W	NW	Cal'm or Variable.	Mean Force.	Mean Velocity in miles per day
A.M.		1	3	2	8	13	2	2			132	
P.M.			5	2	8	11	3	2			136	
Mean.		0	4	2	8	12	2	2	0		134	

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 Maclean

(Signed)

439 34

The Hours of Observation are of Greenwich Time.

$$\begin{array}{r} 153 \\ 76 \\ 5 \\ \hline 441 \end{array}$$

WITH REMARKS ON THE USE OF INSTRUMENTS.

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

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

When a Barometer having adjustable surfaces has been 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 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 *starry cap* 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 dipping 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.

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 lids forming the sides and floors of the Boxes are arranged so as to "protect" the Thermometers, and to allow a complete ventilation of their interior. The boxes are suspended on to the north. To accommodate a duplicate set of the instruments, the south side of the boxes is made open to the south. These Boxes may be had from opticians.

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

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 *Maximum* Thermometers ought frequently to be compared with the dry bulb of the Hygrometer. The fixing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice, or comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Observatory.

The bulbs must *hang down* by at least an inch free from the crates 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 casander the bulbs,—the muslin must be of

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 Thermometers shall be provided with air for as possible.

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, and, consequently, in winter at least, the extremes may occur at any hour; and, therefore, 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 27d, and extending till 9 p.m. on the 3d.

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

snow/falls melt, for convections, be registered in the rain gauge. 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 snow must be measured in some open place where no drift of the snow must be registered in addition to, and as a check upon, the indications of the run-gauge. For wind, rain, and snow, as in the case of rain, the observer cannot be too careful to note the nature of observations only; and nothing that partakes of the nature of deduction or inference.

Observations of the clouds are made at 3 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," 3, W., (for example,) will indicate that the upper strata of clouds travel with extreme velocity from S.W. to N.E. and the lower regions from W., with one-third the extreme speed of the former. Again, in the second "Cloud" column, 1, st., will indicate that the clouds are in the first stage of development.

Smashes.—The number of hours in which objects in the sun's east 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 rain, by 22" snags, 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 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.

Cases.—Mention whether Scholten's or Moffatt'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 *3.50*, as an *exemplum* 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 4.5, i.e., that it is *blowing free*.

Remarks—The “*Remarks*” column is too narrow, but can be avoided so. Some of the most valuable observations that can be taken are those for which no rules can be given nor homogenised. 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 changes, differences in character, column, 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 resorted,

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

(By Order) A. B.

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(By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOURST TREES.	In Flower.	In first buds	In leaf appears.	In leaf.	Dried or pressed of leaves.	Useful of mentioning variety.
Alder,						Barley,
Beech,						Pear or Bidge,
Birch,						Oats,
Elm,						Wheat,
Larch,						Beans,
Hornbeam,						Potatoes,
Oak,						Turnips,
Sycamore or Plane,						Iye Grass,

Have the goodness also to state any information you may be able to collect relative to the Crops of Grain, Hay, Potatoes, Turnips, Truies, etc., whether plentiful, or in perfection; and the Agricultural condition of the district generally.

BOOK-POST.

MR ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland

General Post Office Buildings.

EDINBURGH.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Perth, County of Edinburgh, in Lat 55° 56' 0" N, Long 3° 2' 40" W, Distance from Sea one miles.
Height of Cistern of the Barometer above Mean Sea-level fourty feet, above Ground 4 feet. During the MONTH of December 1871.
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.		No. of hours in which it fell.	Amount in inches.	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.	Min. on Grass.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.			No. 8 inches.	No. 12 inches.	No. 22 inches.	Temperature at 1 fathom, and Density.	9 A.M.	9 P.M.							
																										9 h. A.M.					9 h. P.M.	9 h. A.M.
	1	30.20	49	30.20	49	40	28			34	34	33	32	NE	2	NE	2														Stars shooting on the 8th	1
	2	30.18	48	30.10	49	40	31			32	31	34	33	NE	1	NE	1														very bad day at our room on the 17th	2
	3	30.11	45	30.16	45	35	27			32	31	31	30	NE	2	NE	2														gales of wind on the 17th 18th & 28	3
	4	30.20	45	30.26	48	37	24			31	30	27	26	NE	1	NE	1														Rainbow on the 18th	4
	5	30.15	44	30.10	42	37	29			29	28	31	30	W	1	W	1															
	6	30.18	44	30.10	45	36	26			30	29	26	25	NE	1	NE	1															
	7	30.14	44	30.18	46	38	30			35	34	35	32	NE	1	NE	1															
	8	30.30	44	30.26	47	38	31			33	31	34	33	NE	2	W	1															
	9	30.20	45	30.20	47	37	29			31	30	30	29	W	1	W	1															
	10	30.18	46	30.20	51	42	32			35	35	34	34	W	1	W	2															
	11	30.21	46	30.21	52	44	40			34	34	43	41	W	1	W	1															
	12	30.03	50	30.15	53	47	32			45	44	38	37	NE	4	NE	2															
	13	30.30	50	30.10	51	48	34			33	32	38	38	NE	1	NE	1															
	14	30.17	49	30.17	50	46	40			35	37	42	42	NE	1	NE	1															
	15	30.10	50	30.05	53	47	37			43	42	40	39	NE	2	NE	2															
	16	30.20	51	30.10	51	44	33			38	37	38	32	W	2	W	1															
	17	29.90	50	29.78	55	48	43			44	43	46	45	NE	5	NE	4															
	18	29.40	52	29.22	57	53	36			50	50	41	40	NE	5	NE	6															
	19	29.68	51	29.60	54	44	34			38	37	37	36	NE	3	NE	2															
	20	29.41	50	29.32	52	40	31			35	34	34	33	NE	1	NE	1															
	21	29.60	48	29.64	51	38	31			32	31	32	31	NE	1	NE	1															
	22	29.90	48	29.90	48	34	24			32	32	33	32	NE	1	NE	1															
	23	30.00	44	29.80	45	41	30			25	25	34	33	NE	1	NE	1															
	24	29.75	50	29.50	52	44	38			41	41	40	40	NE	1	NE	4															
	25	29.60	50	29.56	52	43	30			41	40	31	30	NE	3	NE	1															
	26	29.54	48	29.26	51	44	36			35	34	40	39	NE	2	NE	2															
	27	29.18	50	29.28	50	44	36			37	36	39	38	NE	1	NE	1															
	28	29.04	51	29.20	50	47	37			38	37	42	42	NE	5	NE	2															
	29	29.35	50	29.50	50	46	36			39	38	41	40	NE	1	NE	2															
	30	29.20	52	29.20	51	50	34			48	48	44	42	NE	3	NE	1															
	31	29.74	50	29.70	52	46	35			38	36	38	37	NE	2	NE	4															
Sums.		108	10	108	11	14	14			13	12	11	11																			
Means.		271	25A	26A	26A	78	84			195	171	191	161																			
† Total Corrections for Instrumental Errors.		+034		+034																												
† 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†† = 29.856
for Temp. (Col. 2), 29.909 - 0.53 = 29.856
"Corrected Mean" of Barometer at 9 P.M., minus the Correction†† = 29.828
for Temp. (Col. 4), 29.986 - 0.58 = 29.828
Mean at Station, corrected, and at 32°, = 29.842
Correction for height, feet above Mean Sea-level, = 1.01
Mean, reduced to 32°, and Sea-level, = 29.943
Highest Reading, corrected for Index error, on the 8th, = 50.300
Lowest Do. Do., on the 28th, = 29.040
Difference, or Monthly Range, = 1.260

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

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 8th, = 53.0
Lowest in Month, corrected for Index errors, on the 4th, 23, = 24.0
Difference, or Monthly Range, = 29.0
"Corrected Mean" of all the Highest, (Col. 5), = 42.5
"Corrected Mean" of all the Lowest, (Col. 6), = 32.7
Difference, or Mean Daily Range, = 9.8
** Calculated Mean Temperature of Month, = 37.6

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 36.3
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 35.3
†† Computed Temperature of Dew-Point, = 33.7
†† Do. Elastic Force of Vapour, = 1.96
†† Do. Weight of Vapour in a Cubic Foot of Air, =
†† Relative Humidity, (Saturation = 100), = 91
RAIN fell on 10 Days; Amount in Inches, = 1.73

WIND.	SUMMARY.									
	Direction.	N	NE	E	SE	S	SW	W	NW	Caln or Variable.
A.M.	2	2				9	11	5	2	190
P.M.	1	2				9	8	9	2	174
Mean.	2	2	0	9	9	7	2	0	1	182

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 McManis

(Signed)

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 incommensurate, may arise from dissimilarity in the position or shelter of instruments, or from different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that the persons who kindly furnish Reports to the Society will by their Monthly attention to the following Directions, secure for their labour 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 others, as specified, in the following remarks, punctually in the time of reading the instruments will be observed. Observers, in some few cases, may find this impossible; in such instances, they are specially requested to mark opposite to every reading at what time it was taken, if not at 9 o'clock.

Barometer.—*Weather glasses and Aneroids*, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. Not only may Barometer be used for Meteorological Observations, but it 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 marine-pipe 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 *venier*.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *serve* up the mercury to within an 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 Pan falls, 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. Observer's hands and person from 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 to open to the south. These Boxes may be had from the opticians, 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 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 amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *overhead* (i.e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the clouds' column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky *overhead* is half covered by clouds, 5 is entered as the *observation*, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of 2, *cu-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 rollers, 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.

EDINBURGH.

General Post Office Buildings,

Secretary of the Meteorological Society of Scotland,

MR ALEXANDER BUCHAN,

BOOK-POST.

FOREST TREES.		CROPS.		MIGRATORY BIRDS.		FAMILIES.		SUNSHINE, ETC.		WIND.					
Alfalfa.	Wheat.	Peas.	Beans.	Turnips.	Onions.	Apples.	Pears.	Plums.	Strawberries.	Black Currants.	Cherries.	Gooseberries.	Raspberries.	Strawberries.	Plums.
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Alfalfa.	Oats.	Wheat.	Barley.	Onions.	Apples.	Black Currants.	Cherries.	Gooseberries.	Raspberries.	Strawberries.	Plums.	Strawberries.	Plums.	Strawberries.	Plums.
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