SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thorshavn, County of Faroë Islands, in Lat. 62° 2½', Long. 6° 43' 8", Distance from Sea 50 feet ~~miles~~.

Height of Cistern of the Barometer above Mean Sea-level 34 40 feet, above Ground 4 feet. During the MONTH of January 1876.

The Hours of Observation are not of Greenwich Time.

Electricity	Days of Month	Barometer 9 h. A.M. Barometer * No. 91 (inches)	9 h. A.M. Attached Thermometer °	Barometer 9 h. P.M. Barometer No. 91 (inches)	9 h. P.M. Attached Thermometer °	Self-Registering Thermometers, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground: Max. No. 7165 °	Min. No. 3237 °	Exposed Black Bulbs: Max. in Sun's rays No. °	Min. on Grass No. °	Hygrometer No. 832 & 829. 9 h. A.M. Dry bulb °	9 h. A.M. Wet bulb °	9 h. P.M. Dry bulb °	9 h. P.M. Wet bulb °	Wind 9 h. A.M. Direction	9 h. A.M. Force	9 h. P.M. Direction	9 h. P.M. Force	Readings of the H-Cup Anemometer No. 9 h. A.M.
	1	29.318	60.	29.744	61.5	40.5	34.			38.	34.6	39.	34.8	SW.	3.	Calm	0.	
	2	29.888	63.5	29.842	61.	44.5	36.			42.8	40.	44.	41.3	SW	2	SE	3	
	3	29.720	58.	29.696	64.	48.5	42.			45.6	44.8	48.	47.	SE	4.	SE.	5	
	4	29.794	62.5	29.844	62.	53.	46.5			50.	48.6	51.	48.6	S	3	S	4	
	5	29.948	62.5	30.208	63.	52.	41.5			43.2	40.3	45.	41.	W	4	SW	3	
	6	30.260	54.	30.310	62.	48.	44.			45.	41.2	47.	45.	S.	2	S.	4.	
	7	30.404	56.5	30.464	61.	48.5	41.			46.	44.	42.3	39.2	SW	5	SW	5	
	8	30.260	53.5	30.178	58.5	43.5	39.			41.4	39.	41.8	38.2	SE.	5	S	5	
	9	30.160	52.5	30.376	61.	43.	35.			38.4	36.8	36.5	35.	SW	3	NW	2	
	10	30.342	54.5	30.100	60.5	46.	34.			42.6	38.8	46.	43.2	SW	3	SW	5.	
	11	29.894	54.	29.810	62.	47.5	38.			44.	42.2	40.2	39.	SW	2	Calm	0.	
	12	29.952	56.	30.340	62.	42.	34.			39.2	35.8	35.8	32.8	N	2	N	2	
	13	30.440	53.	30.242	59.5	45.	28.5			33.	31.5	44.8	41.2	Calm	0	SW	4	
	14	30.302	55.5	30.300	63.5	48.	39.			45.2	42.	42.8	39.	W	3	SW	1	
	15	29.892	59.	29.630	63.	51.	33.			50.	48.2	50.2	48.	SW	5	SW	6	
	16	29.600	58.5	29.882	59.	51.	36.			41.2	36.3	39.	35.	W	5	NW	4.	
	17	29.936	54.5	29.250	57.5	41.	32			38.2	35.4	37.6	36.8	E.	2	E.	5	
	18	29.558	53.5	29.620	60.	40.	33.5			36.	34.6	38.5	33.6	NW	3	NW	4.	
	19	29.100	54.5	29.104	59.5	45.5	34.5			43.	39.8	35.5	34.	SW	3	Calm	0.	
	20	29.288	54.	29.618	56.	36.5	21.5			27.1	25.	24.	21.	N	4	NW	3	
	21	29.812	51.5	29.914	62.	33.5	22.5			29.8	27.2	30.	26.	N	3	NW	1.	
	22	29.758	53.	29.268	60.	45.	27.5			39.	35.	44.	40.	S	2	SW	4	
	23	29.450	57.	29.082	59.5	51.	40.			44.5	41.8	45.4	41.2	SW	3	SW.	5	
	24	29.364	54.	29.864	60.5	46.5	34.			40.5	37.8	43.8	38.8	W	3	SW	4	
	25	29.588	62.	29.714	62.5	51.5	39.5			51.	48.4	49.	47.	SW	5	SW	5	
	26	29.540	60.5	29.712	60.	49.5	44.5			48.	45.	48.	46.	SW	3	SW	4	
	27	29.736	59.	29.804	62.5	50.5	45			49.	46.2	47.8	45.2	SW	4	SW	3	
	28	29.864	62	30.084	60.5	48.	40.			44.1	40.	43.4	39.8	SW	3	SW	1	
	29	29.812	55.5	29.682	62	51.	41.			46.	43.8	50.	46.2	S.	3.	S.	4.	
	30	29.792	59.	29.826	63.5	50.5	44.			47.2	45.	46.2	44.	SW	2	S.	2	
	31	29.664	59.	29.496	63.	51.	41.			45.	41.4	47.4	44.	SW	3	S.	5.	
	Sums.	924.436	1762.5	925.004	1892.5	1443.0	1142.0			1314.0	1230.5	1324.0	1231.9		97		103	
	Means.	29.821	56.8	29.839	61.0	46.5	36.8			42.4	39.7	42.7	39.7		3.1		3.3	
	† Total Corrections for Instrumental Errors.									÷0.2		÷0.2						
	‡ Corrections for Diurnal Range.																	
	"Corrected Means."									42.2	39.7	42.5	39.7					
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Days of Month	Rain: No. of hours in which it fell	Rain: Amount in inches. No. 78	Clouds 9 A.M. Velocity, (0—6), and Direction	Clouds 9 A.M. Amount, (0—10), and Species	Clouds P.M. Velocity, (0—6), and Direction	Clouds P.M. Amount, (0—10), and Species	Sunshine Hours	Thermometers under Ground 9 h. A.M. No. 3 inches °	No. 12 inches °	No. 22 inches °	Temperature of WELL at Depth of feet. No. °	Sea. No. 831 Temperature at 1 fathom, and Density °	Ozone 0—10. 9 A.M.	Ozone 9 P.M.	General Remarks. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms began and ended.*
1		0.40					—								hail, rain & snow.
2		0.03					—								
3		0.38					—								fog
4		0.42					—					46.			do
5		0.21					3					45.			
6		—					2								
7		0.17					—					45.			fog
8		0.03					—					44.4			
9		0.21					3								
10		0.10					—					43.8			
11		0.83					—								
12		0.07					4								
13		—					3.								
14		0.14					2½					44.5			Aur bor
15		1.56					—								fog
16		0.40					—								rain & hail
17		1.16					—								pm heavy rain
18		0.72					—					44.2			rain & hail
19		0.35					—					43.6			do & do
20		0.16					—					43.8			Snow
21		0.08					2					43.			do
22		0.41					—					43.			
23		0.43					—								Aur bor
24		0.65					—					43.7			lightning & thunder Rain & hail
25		0.84					—								
26		0.61					—								
27		0.18					—					44.5			hail & rain
28		0.01					—					44.			do & do
29		0.05					—					44.			
30		0.03					—								
31		0.11					1.					44.2			hail & rain
Sums.		10.74					20½					706.7			
Means.												44.2			
† Total Corrections for Instrumental Errors.												÷0.2			
‡ Corrections for Diurnal Range.															
"Corrected Means."												44.0			
No. of Column.	18	19	20	21	22	23	24	25	26	27	28	29	30		

NOTATION USED IN GENERAL REMARKS.

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

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction ++ for Temp. (Col. 2), = 29.821 − 0.075 = 29.746

"Corrected Mean" of Barometer at 9 P.M, *minus* the Correction ++ for Temp. (Col. 4), = 29.839 − 0.087 = 29.752

Mean at Station, corrected, and at 32°, = 29.749

Correction for height, 40 feet, above Mean Sea-level, = .038

Mean, reduced to 32°, and Sea-level, = 29.~~792~~ 787

Highest Reading, corrected for Index error, on the 7 th, pm. = 30.464

Lowest Do., Do., on the 23 th, = 29.082

Difference, or **Monthly Range,** = 1.382

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 4 th, = 53.0

Lowest in Month, corrected for Index errors, on the 20 th, = 21.5

Difference, or **Monthly Range,** = 31.5

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 46.5

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 36.8

Difference, or **Mean Daily Range,** = 9.7

** Calculated **Mean Temperature** of Month, = 41.7

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

"Corrected Me … Bulb, **Max. in Sun,** =

Lowest at N … for Index errors), on the th, … =

"Corrected Mea … **Bulb Min.** on grass, =

Difference of above … exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), = 42.4

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 39.7

‡‡ Computed **Temperature of Dew-Point,** = 36.4

‡‡ Do. **Elastic Force of Vapour,** = 0.216

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 2.5

‡‡ **Relative Humidity, (Saturation** = 100), = 80.1

RAIN fell on 29 **Days; Amount in Inches,** = 10.74

WIND. Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	3	..	1	2	4	15	4	1	1.	3.1	
P.M.	1	..	1	2	6	13	..	5	3	3.3	
Mean.	2	..	1	2	5	14	2	3	2.	3.2	

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* 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.*

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Ed… inburgh not later than the 3rd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by H. E. Höst

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

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

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

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

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

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

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

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

The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "*Maximum*" should 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 as are *not* graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the "*Minimum*" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "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 or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2 or 40°.3 and 40°.7 or 40°.8 respectively. In reading Rutherford's "*Max.*" and "*Min.*" Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *overhead* (*i. e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds'* column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of cloud is entered 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," $\frac{6,\ S.W.}{2,\ W.}$ (for example,) will indicate that the *upper* strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{4,\ st.}{2,\ cu\text{-}st.}$ (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of 2-*tenths* by lower clouds of the *cumulo-stratus* kind.

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

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

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

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

Ozone.—Mention whether Schönbein's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{N.W.}_{4}$, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4"; *i.e.*, that it is *blowing fresh*.

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

Remarks.—The "*Remarks*" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, auroræ boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

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

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

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

(By Order) A. B.

Edinburgh, *9th December 1865.*

Thos Shaw
Jan 7 1876

N
EDINBURGH
AP 7
76

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

SHIP LETTER

BOOK-POST.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Thorshavn*, County of *Faroe Islands*, in Lat. *62° 2½'*, Long. *6° 43' 8"*, Distance from Sea *50 feet* ~~miles.~~

Height of Cistern of the Barometer above Mean Sea-level *40* (*34*) feet, above Ground *4* feet. During the MONTH of *February* 18*76*.

The Hours of Observation are *not* of Greenwich Time.

Electricity	Days of Month	Barometer 9 h. A.M. Barometer * No. 91 (inches)	Attached Thermometer (°)	Barometer 9 h. P.M. Barometer No. 91 (inches)	Attached Thermometer (°)	Self-Registering Thermometers, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No. 7165 (°)	Min. No. 3237 (°)	Exposed Black Bulbs. Max. in Sun's rays No. (°)	Min. on Grass. No. (°)	Hygrometer No. 832 & 829. 9 h. A.M. Dry bulb (°)	Wet bulb (°)	9 h. P.M. Dry bulb (°)	Wet bulb (°)	Wind 9 h. A.M. Direction	Force	Wind 9 h. P.M. Direction	Force	Readings of the H Cup Anemometer No. 9 h. A.M.	Rain. No. of hours in which it fell	Amount in inches. No. 78	Clouds 9 A.M. Velocity, (0—6), and Direction	Amount, (0—10), and Species	Clouds P.M. Velocity, (0—6), and Direction	Amount, (0—10), and Species	Sunshine Hours	Thermometers under Ground 9 h. A.M. No. 3 inches (°)	No. 12 inches (°)	No. 22 inches (°)	Temperature of WELL at Depth of feet. No. (°)	Sea. No. 831 Temperature at 1 fathom, and Density (°)	Ozone 0—10. 9 A.M.	9 P.M.	General Remarks. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms began and ended.*	Days of Month
	1	29.330	59.	29.402	60.	49.5	37.			44.	41.8	40.2	37.2	SW.	3.	SW.	3.			0.30					—					44.4			hail & rain	1
	2	29.324	53.5	29.144	59.	42.	36.			41.1	37.5	39.	35.4	SW	3	SW.	3			0.12					—					43.2			hail	2
	3	29.132	56.5	29.666	59.5	40.5	31.			38.8	35.6	33.8	31.	W	3	N	2			0.28					—					43.8			rain & snow	3
	4	30.080	57.5	30.272	60.	36.5	30.5			34.	31.8	33.3	30.4	NW	1.5	N.	1.5			0.04					5					43.2			Snow	4
	5	30.278	48.5	30.204	61.5	38.	24.			33.3	31.	37.6	35.1	W.	0.5	SW	1.5			—					6					43.2				5
	6	30.148	60.5	30.214	62.5	44.5	36.5			43.2	42.	43.8	42.6	SW	1.5	SW	0.5			0.08					—									6
	7	30.260	60.5	30.236	61.5	44.5	39.			43.6	41.7	41.	37.2	SW.	2.	SW	0.5			0.02					—					43.8				7
	8	30.120	61.	30.106	60.	42.	34.5			41.	38.	40.	37.	SW	1	SW	1.5			0.06					5.					43.6			rain & snow	8
	9	30.060	60.	30.064	61.	42	34.5			39.	37.	39.	37.	SE	1	SE	2.			0.03					—					43.5				9
	10	30.152	58.5	30.184	62.5	44.5	32.5			40.2	37.5	34.	32.	SE	2	Calm	0.			—					4.									10
	11	30.058	60.	30.008	63.	40.	31.5			36.8	35.6	36.4	33.8	NE.	1	NE	1.			0.14					2					43.7				11
	12	30.074	55.5	30.020	60.	42.	34.			38.	35.4	36.7	35.	SE	2	E	2			0.14					3					43.2			rain & hail	12
	13	29.968	59.5	29.970	63	40.5	34.			39.8	36.	38.	35.6	SE.	2	E.	3.			0.12					2								rain, snow & hail	13
	14	29.936	55.	29.842	61.	40.	32.5			38.8	33.2	34.8	32.5	SE	3	SE	3			0.10					3					43.			Snow & hail	14
	15	29.528	55.	29.302	60.5	39.	31.5			36.	33.5	38.3	36.8	SE	4	SE	4.			0.28					—					43.				15
	16	29.210	60.5	29.276	62.5	45.	37.			43.	41.2	42.	40.5	E	2	NE	2			0.13					—									16
	17	29.356	62.5	29.328	62.5	47.5	36.			41.8	40.	37.4	35.2	Calm	0.	NE.	0.5			0.03					4.					43.6			Aur bor	17
	18	29.292	60.	29.162	61.	38.5	27.			33.6	30.2	28.	25.8	NE.	1.5	NE	3.			—					—					42.8				18
	19	29.252	49.5	29.500	61.	29.	19.			23.	21.	20.2	19.	N	2	N	3.			0.04					5					42.			Snow. Aur bor	19
	20	29.694	57.5	29.664	62	32.5	15.			23.	20.8	32.1	29.	N.	0.5	SW	2			0.01					1.								Snow	20
	21	29.330	54.	29.060	60.5	42.5	31.			39.8	38.	41.4	40.2	S.	3.	Calm	0.			0.06					—					42.				21
	22	29.208	57.	29.400	60.5	42.5	31.			34.8	32.6	33.	29.8	N	2	N	1.			0.01					—					42.5				22
	23	29.554	57.5	29.708	63.	35.5	26.5			35.2	30.6	29.	28.5	N.	0.5	N	3			0.20					3.					42.2			Snow. (the box p.m. full of snow)	23
	24	29.994	59.5	30.044	62	30.	19.5			26.4	24.4	20.	18.8	N	2.	N	2			0.07					4								do	24
	25	29.824	53.5	29.794	59.5	38.	19.			28.8	27.	35.5	32.	NW	1	E	3			0.08					5					42.2			Snow & hail. Aur bor.	25
	26	29.658	59.5	29.640	60.	38.5	32.			36.	33.7	35.	31.6	NE	3.	NE	3.			0.07					2					41.5			do & do. do	26
	27	29.618	60.5	29.690	59.	39.	32.			37.	33.	35.4	32.2	NE	3	NE	3			0.05					—								do & do.	27
	28	29.864	58.	29.818	60.	40.5	32.5			37.	34.8	37.8	33.2	NE	3	E.	3			0.14					2					41.5			Snow & rain	28
	29	29.450	55.	29.360	63.	39.	33.			37.5	34.	37.2	36.	SE	3	NW	0.5			0.25					—					42.				29
	30																																	30
	31																																	31
	Sums.	861.752	1665.0	862.078	1771.5	1163.5	889.5			1064.5	988.9	1029.9	960.4		57.0		57.5			2.85					56.					943.9				
	Means.	29.716	57.4	29.727	61.1	40.1	30.7			36.7	34.1	35.5	33.1		2.0		2.0													42.9				
	† Total Corrections for Instrumental Errors.									÷0.2		÷0.2																		÷0.2				
	‡ Corrections for Diurnal Range.																																	
	"Corrected Means."									36.5	34.1	35.3	33.1																	42.7				
	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.

Abbr.		Meaning	Abbr.		Meaning
a.	denotes	aurora.	m.	denotes	meteor.
ci.	"	cirrus.	ms.	"	meteors.
ci.-cu.	"	cirro-cumulus.	n.	"	nimbus.
ci.-s.	"	cirro-stratus.	r.	"	rain.
cu.	"	cumulus.	h. r.	"	heavy rain.
cu.-s.	"	cumulo-stratus.	c. h. r.	"	continued heavy rain.
d.	"	dew.	s	"	stratus.
f.	"	fog.	sc.	"	scud.
fr.	"	frost.	sl.	"	sleet.
h.-fr.	"	hoar-frost.	sn.	"	snow.
h.	"	haze.	so. ha.	"	solar halo.
h. d.	"	heavy dew.	sq.	"	squall.
hl.	"	hail.	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 †† for Temp. (Col. 2), = *29.716* — *0.076* = *29.640*

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = *29.727* — *0.086* = *29.641*

Mean at Station, corrected, and at 32°, = *29.640*

Correction for height, *40* feet, above Mean Sea-level, = *.038*

Mean, reduced to 32°, and Sea-level, = *29.678*

Highest Reading, corrected for Index error, on the *5* th, *a.m.* = *30.278*

Lowest Do., Do., on the *21* th, *p.m.* = *29.060*

Difference, or **Monthly Range,** = *1.218*

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the *1st* = *49.5*

Lowest in Month, corrected for Index errors, on the *20* th, = *15.*

Difference, or **Monthly Range,** = *34.5*

"Corrected **Mean**" **of all the Highest,** (Col. 5), = *40.1*

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = *30.7*

Difference, or **Mean Daily Range,** = *9.4*

** Calculated **Mean Temperature** of Month, = *35.4*

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

"Corrected **Mean,**" (Col. 7), of ... **Max. in Sun,** =

Lowest at Night, Black B... (Index errors), on the th, ... =

"Corrected **Mean**" (Col. ...) ... **Min.** on grass, =

Difference of above Means ..."), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), = *35.9*

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = *33.6*

‡‡ Computed **Temperature of Dew-Point,** = *30.1*

‡‡ Do. **Elastic Force of Vapour,** = *0.169*

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = *2.0*

‡‡ **Relative Humidity,** (Saturation = 100), = *78.8*

RAIN fell on *26* **Days; Amount in Inches,** = *2.85*

WIND. SUMMARY.

Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	5.	5.	1.	7.	1.	5.	2.	2.	1.	2.0	
P.M.	6.	6.	4	3	-	7	.	1	2	2.0	
Mean.	5.5	5.5	2.5	5.	0.5	6.	1.	1.5	1.5	2.0	

* 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.*

N.B.—The Sums to be correctly added, and the Means deduced. Returns from the "Principal Towns" should be in Edinburgh ... than the 3rd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

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

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

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

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

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

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

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

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

The above remarks apply equally to the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night. Their bulbs have a black coating, which may easily be made, or mended, by the application of a mixture of lamp black and printer's ink. They are placed in shallow blackened boxes, whose sides protect the bulbs from the wind. The "*Maximum*" should 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 as are *not* graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The self-registering, and especially the "*Minimum*" Thermometers, ought frequently to be compared with the dry bulb of the Hygrometer. The freezing-point of each Thermometer (marked by a scratch on the tube) ought to be tested once a year, in snow or melting ice. For comparison of Thermometers, a properly tested Thermometer may be had, on loan, by any observer, from the Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "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 immerson from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

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

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or *column* of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2 or 40°.3 and 40°.7 or 40°.8 respectively. In reading Rutherford's "*Max.*" and "*Min.*" Thermometers, the indication of that end of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of the Thermometers, especially of the wet and dry *bulbs*, must be rapidly taken, being so readily affected by heat from the person of the observer.

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

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

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

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *overhead* (*i. e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds'* column, though their appearances and changes ought to be noted among the "*Remarks.*" The amount of cloud is entered 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," $\frac{\text{6, S. W.}}{\text{2, W.}}$, (for example,) will indicate that the *upper* strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{\text{4, st.}}{\text{2, cu-st.}}$, (*e.g.*) will indicate that the higher regions are covered to the "amount" of 4-tenths with *stratus* clouds; and that the sky is further obscured to the extent of *2-tenths* by lower clouds of the *cumulo-stratus* kind.

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

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

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

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

Ozone.—Mention whether Schönbein's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{\text{N.W.}}_{4}$, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4": *i.e.*, that it is *blowing fresh*.

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

Remarks.—The "*Remarks*" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, auroræ boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

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

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

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

(By Order) A. B.

EDINBURGH, *9th December 1865.*

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK-POST.

SHIP LETTER

IN AP 7 76 EDINBURGH

Thorshavn
Jan.y 1876.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds first appear.	1st Leaf.	Divested of Leaves.	CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Raised.
Alder,					Barley,				
Ash,					Bere or Bigg,				
Beech,					Oats,				
Birch,					Wheat,				
Elm,					Beans,				
Larch,					Pease,				
Lime,					Potatoes,				
Oak,					Turnips,				
Sycamore or Plane,					Rye Grass,				

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

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thorshavn, County of Faroe Islands, in Lat. 62° 2½′, Long. 6° 43′ 8″, Distance from Sea 50 feet ~~miles.~~

Height of Cistern of the Barometer above Mean Sea-level 34 40 feet, above Ground 4 feet. During the MONTH of March 1876.

The Hours of Observation are not of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No. 91	Attached Thermometer	9 h. P.M. Barometer. No. 91	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max.	Min.	Exposed Black Bulbs. Max. in Sun's rays No.—	Min. on Grass. No.—	HYGROMETER. No. 832 & 829. 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H.Cup Anemometer. No.— 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches.	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	Amount (0—10), and Species.	— P.M. Velocity (0—6), and Direction.	Amount (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No.— 3 inches.	12 inches.	No.— 22 inches.	Temperature of WELL at depth of feet. No.	SEA. (1283) Temperature at 1 fathom, and Density,	OZONE. 0—10. 9 A.M.	9 P.M.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms, including Thunder and Lightning, began and ended.*	Days of Month.
		inches.	°	inches.	°	°	°	°	°	°	°	°	°															°	°	°	°						
	1	29.258	63.5	29.038	64.	46.5	34.			45.	42.1	41.	39.8	SE	2	SE	2			0.16							6.					42.5				1
	2	29.058	64.5	29.232	62.	45.	33.			42.4	40.8	34.8	33.	NE	1.5	Calm	0.			0.03							6.					42.8				2
	3	29.136	57.	28.648	64.	44.5	29.			39.9	37.7	43.4	42.6	E	3.	E	0.5			0.48							—								pm fog	3
	4	28.760	59.	29.208	63.5	46.	38			44.8	42	40.	37.8	N	2	NE	2.			0.47							3.					42.9				4
	5	29.444	60.5	29.106	64.	45.	34.			39.	36.2	38.	35.	NE	2	SE	2			—							7									5
	6	28.752	59.	28.730	65.	49.	35.			42.	40.4	39.	37.4	E	1	S	1			0.51							5					42.5				6
	7	28.768	57.5	29.102	60.	45.	35.			41.4	39.4	37.	33.4	N	0.5	NW	3.			0.08							—					42.8				7
	8	29.006	58.	28.554	59.	44.	31.			39.9	37.2	42.	39.8	S	3	SE	5			0.07							6					42.5			Bar. 11¾ pm 28.460 at 58°	8
	9	28.396	55.5	28.566	59.5	42.5	37.			40.	38.2	40.2	35.8	NE	4	NE	4			0.32							—								„ 12½ pm 28.424 at 56°.5. Rain & hail	9
	10	28.756	56.5	28.940	57.	41.	33.			36.8	34.4	34.8	32.8	NE	4	NE	4			0.31							—								SE & E	10
	11	29.160	52.5	29.320	60.5	38.	26.			32.2	30.5	26.2	25.1	N	3.	N	3			0.49							1½					42.2			rain & snow. Aur bor	11
	12	29.336	53.	29.364	56.5	30.	18			23.9	23.2	20.2	18.8	NE	2	NE	1.5			0.08							7.								Snow. do	12
	13	29.204	52.	28.736	56.5	38.	16.			24.5	22.8	36.2	34.8	Calm	0	SE	4.			0.02							—					41.8.			do Bar. 1 p.m. 29.110 at 56.5 5½ pm 28.914 at 56. 12 m.n. 28.578 at 55. 1 p.m. 28.418 at 62° 5 pm 28.346 at 59.5° 1 am 28.384 at 58. from 11 p.m. the wind = 5.	13
	14	28.440	58.5	28.320	59.5	40.	30.5			36.	32.	33.6	32.8	NW	4	SE	2.			0.63							6					42.				14
	15	28.796	60.5	29.186	61.5	35.5	21.			28.6	28	22.5	22.	N	5	N	5			0.61							—								The box full of Snow. Snow.	15
	16	29.384	54.	29.516	61.	25.5	20.			22.	20.6	19.5	19.	N	4	NW	3			0.15							5					41.6			Snow. Bar. midnight 29.474 & 62°	16
	17	29.640	56.5	30.044	61	31.5	18.			26.2	25.3	20.	19.	N	5	N	5.			0.43							—								a.m. the box full of snow Snow	17
	18	30.104	51.5	30.334	60.	26.5	16.5			23.2	22.6	23.	22.	N	4	N	4.			0.48							2								do do . do	18
	19	30.340	57.	30.300	60.5	31.	18.			26.	24.	22.	20.2	N	2	Calm	0			0.12							4								Snow	19
	20	30.140	54.5	30.062	62	39.	18.5			33.	29.	34.6	31.8	Calm	0	S	1			—							8.					40.6				20
	21	30.174	54.5	30.232	60.5	45.	31			37.2	33.2	37.4	34.3	NE	1	W	3.			—							9.					41.				21
	22	30.122	54.5	29.932	67.	46.	33.			40.	37.2	36.8	35.	NW	0.5	Calm	0			0.05							10					41.5				22
	23	29.540	60.	29.452	62.5	50.	33			41.5	40.7	34.	32.5	S	2.	Calm	0			0.06							6					42.				23
	24	29.720	55.5	30.018	59.5	49.5	33			41.4	37.	40.6	38.6	E	4	NE	4			0.01							3.					41.5				24
	25	30.012	56.5	29.836	64.5	41.	31.5			38.5	37	33.	31.4	Calm	0	N	3.			0.15							—					42.			Aur bor	25
	26	29.548	60.5	29.552	60.5	38.	28.			34.	33.	36.	34.4	N	4	NE	4.			0.93							—								Snow & rain	26
	27	29.650	57.5	29.764	59.5	41.	34.			37.4	36.2	37.	35.	E.	2.	E.	2.			0.29							—					41.				27
	28	29.784	58.	29.752	61.	44.	33.			41.4	38.4	36.	33.	NE	3	NE	3.			0.12							2								rain & hail	28
	29	29.748	58.5	29.800	60.	39.	31.5			35.5	31.6	36.2	32.4	NE	4	NE	4			0.03							—								do & do	29
	30	29.754	52	29.760	62.	40.	34.			37.5	34.4	38.	35.8	NE	4	NE	3			0.06							—					41.2			Snow, hail & rain	30
	31	29.708	60	29.664	63.5	43.	36.			39.8	38.7	42.4	41.2	NE	3	NE	2			0.17							—									31
	Sums.	911.638	1768.5	912.068	1897.5	1260.0	899.5			1111.0	1043.3	1055.4	996.5		79.5		80.			7.31							96½					754.4				
	Means.	29.408	57.	29.422	61.2	40.6	29.0			35.8	33.7	34.0	32.1		2.6		2.6															41.9				
	† Total Corrections for Instrumental Errors.									÷0.2		÷0.2																				÷0.2				
	‡ Corrections for Diurnal Range.																																				
	"Corrected Means."									35.6	33.7	33.8	32.1																			41.7				
	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.	s.	„ sleet.
h.-fr.	„ hoar-frost.	s.	„ 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 †† for Temp. (Col. 2), = 29.408 — 0.075 = 29.333

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.422 — 0.086 = 29.336

Mean at Station, corrected, and at 32°, = 29.335

Correction for height, 40 feet above Mean Sea-level, = .038

Mean, reduced to 32°, and Sea-level, = 29.373

Highest Reading, corrected for Index error, on the 19 th, a.m. = 30.340

Lowest Do. Do., on the 14 th, p.m. = 28.320

Difference, or **Monthly Range,** = 2.020.

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 23 th, = 50.0

Lowest in Month, corrected for Index errors, on the 13 th, = 16.0

Difference, or **Monthly Range,** = 34.0

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 40.6

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 29.0

Difference, or **Mean Daily Range,** = 11.6

** Calculated **Mean Temperature** of Month, = 34.8

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

"Corrected **Mean,**" (Col. 7), **of Black Bulb, Max. in Sun,** =

Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =

"Corrected **Mean,**" (Col. 8), **of Black Bulb, Min.** on grass, =

Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), = 34.7

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 32.9

‡‡ Computed **Temperature of Dew-Point,** = 30.

‡‡ Do. **Elastic Force of Vapour,** = 0.166

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 2.0

‡‡ **Relative Humidity, (Saturation = 100),** = 82.4

RAIN fell on 28 **Days; Amount in Inches,** = 7.31

WIND. SUMMARY.

Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	9	10	4	1	2	"	1	2	3	2.6	
P.M.	5	10	2	5	2	"	1	2	4	2.6	
Mean.	7	10.	3	3	2	"	0.5	2.	3.5	2.6	

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* 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.*

Observations made and Return verified by H. E. Hoss

(*Signed*)

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INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

One of the chief objects that the Scottish Meteorological Society proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 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 A.M. and 9 P.M. (Greenwich or Railway-Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is Fortin's Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down, viz.: as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, and take down the instrument; it should 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements,—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with Exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principle of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, 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. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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.

Reading of the Thermometer. In reading the Thermometer great care must be taken to bring the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read 39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼° and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Verification of Thermometers. No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being re-tested. The Self-Registering, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Nigretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETRIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Guage should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rainfall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may be noted among the Remarks. The amount of Cloud is entered from a scale of 0 to 10; thus, when the sky overhead is free from Clouds it is entered 0, when half covered by Clouds, 5, wholly covered, 10, 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:—Thus, in the column Velocity and Direction,

$$\frac{6,\ S.\ W.}{2,\ W.}$$

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 speed of the former. Again, in the second Cloud column, an entry of $\frac{4,\ st.}{2,\ cu\text{-}st,}$ 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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, their bulbs being sunk to depths of 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. The paper is affixed by a pin to a board in the Thermometer Box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3\frac{N.W.}{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general use are given at the foot of the column. Besides special and extraordinary Observations, great prominence ought to be given in this column to Prevalent Diseases, differences in character, colour, velocity, and direction between the Lower and Upper Strata of Clouds, the Colour of the Sky, etc. Remarks ought to be made on the occurrence of Meteors, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. The Council would direct the special attention of Observers to the registration of such phenomena, so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and approved before being used; and they consider it necessary 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, *December 1874.*

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

[illegible] Mar. 1876

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK POST.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Thorshavn*, County of *Faroë Islands*, in Lat. *62° 2½'*, Long. *6°43' 8"*, Distance from Sea *50 feet* ~~miles~~.

Height of Cistern of the Barometer above Mean Sea-level *40* (*34*) feet, above Ground *4* feet. During the MONTH of *April* 187*6*.

The Hours of Observation are (*not*) of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No. 91 (inches)	9 h. A.M. Attached Thermometer (°)	9 h. P.M. Barometer. No. 91 (inches)	9 h. P.M. Attached Thermometer (°)	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No. 7165 (°)	Min. No. 3237 (°)	Exposed Black Bulbs. Max. in Sun's rays No. (°)	Min. on Grass. No. (°)	HYGROMETER. No. 832 + 829. 9 h. A.M. Dry bulb (°)	9 h. A.M. Wet bulb (°)	9 h. P.M. Dry bulb (°)	9 h. P.M. Wet bulb (°)	WIND. 9 h. A.M. Direction.	9 h. A.M. Force	9 h. P.M. Direction.	9 h. P.M. Force	Readings of the H.Cup Anemometer. No. 9 h. A.M.	RAIN. No. of hours in which it fell.	Amount in inches. No. 78	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	9 A.M. Amount, (0—10), and Species.	P.M. Velocity (0—6), and Direction.	P.M. Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No. 3 inches. (°)	12 inches. (°)	No. 22 inches. (°)	Temperature of WELL at depth of feet. No. (°)	SEA. No. 831 Temperature at 1 fathom, and Density. (°)	OZONE. 0—10. 9 A.M.	9 P.M.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms, including Thunder and Lightning, began and ended.*	Days of Month.
	1	29.512	58.5	29.628	62.	48.	39.			41.6	40.6	42.2	39.8	Calm	0.	W.	2.			0.11					2.					42.				1
	2	29.696	60.5	29.686	62.5	49.	40.			44.8	41.8	45.	43.	SW.	2.	S.	4.			0.21					—									2
	3	29.564	56.5	29.580	62.	50.5	44.			48.	46.	48.	44.8	SW	4	SW	5			0.38					—					43.				3
	4	29.814	58.5	29.710	62.	51.	44.			46.5	42.4	50.2	48.	SW	5.	SW	5.			0.65					—									4
	5	29.796	58.5	30.024	61.	51.5	42.			47.8	43.	44.	40.5	W	4	W	4.			0.15					4.					43.				5
	6	30.322	64.	30.212	61.	48.5	37.5			44.4	39.2	43.	42.2	NW	1.	Calm	0.			0.19					5									6
	7	30.030	60.	29.844	62.	52.	42.			48.8	46.6	47.8	45.	W.	4.	W	5			0.11					—					43.5				7
	8	29.808	53.5	29.840	59.	49.	29.5			38.	33.	31.	29.	NW	3.	N	3.			—					—									8
	9	29.658	55.	29.554	58.	36.5	28.			34.4	31.4	30.4	29.8	NW	2	NE	2			0.30					2								Snow	9
	10	29.680	56.	29.646	58.5	32.5	24.5			28.4	26.8	26.6	25.4	N	5	N	4.			0.69					—					42.			do.	10
	11	29.656	53.5	29.846	60.	32.5	25.			30.	29.4	27.	25.	N	4	N	3.			0.77					—								a.m. the box full of snow: Snow	11
	12	29.862	60.5	29.934	61.5	31.	22.			29.2	27.8	29.	28.	N	4	N	4			0.59					—								Snow	12
	13	30.126	60.5	30.212	60.	34.	26.			30.4	28.8	29.	27.	N	3	N	2			0.55					6.								Snow	13
	14	30.308	54.	30.230	62.5	41.	24.			32.3	28.8	33.6	30.	NW	2	SW	1			—					10.									14
	15	29.954	57.5	29.828	59.5	43.	31.			40.6	38.5	41.6	40.	SE	4	S	4			0.15					—									15
	16	29.680	57.5	29.804	63.	50.	40.			48.3	46.	47.6	46.	S.	5	S.	5			0.16					—									16
	17	29.850	59.5	29.808	62.	49.	39.5			46.6	43.2	41.8	39.	SE	3	E	2			0.05					6									17
	18	29.654	60	29.604	61.	44.	38.			42.7	41.3	43.8	41.	E	3	NE	3			0.18					—					42.8				18
	19	29.484	59.5	29.402	61.	44.	37.			40.	38.	43.1	42.2	NE	4	NE	3			0.34					—					42.5				19
	20	29.382	62.5	29.496	62.	44.5	37.			43.8	42.5	38.4	36.	NE	3.	NE	3.			0.51.					—					42.4				20
	21	29.664	57.5	29.888	61.	38.	24.			33.7	31.3	25.	24.	NE	4	N	4			0.13					4.					42.5			Snow	21
	22	29.960	55.5	30.064	60.5	35.	22.5			30.2	28.8	30.5	29.	NW	4	N	4			0.30					2					42.2			Snow	22
	23	30.080	58.5	30.108	59.5	44.	30.			35.	31.9	41.	38.8	N	2	E	2			0.07					—									23
	24	30.152	58.5	30.110	60.	47.	38.			43.	41.5	43.	40.5	E	3	SE	3			0.10.					—									24
	25	30.054	54.	30.072	62.	46.5	39.			41.8	39.8	43.5	41.5	E	3	E	2			0.09					4									25
	26	30.142	60.	30.164	63.	49.	40.			47.8	43.8	42.	39.9	NE	1.5	NE	2			0.01					7									26
	27	30.064	57.	29.994	65.	47.	40.			43.6	41.2	44.	42.	NE	2.	NE	4.			—					—									27
	28	30.014	62.5	30.078	63.	52.	42.			45.	42.5	43.8	42.	SE	3	NE	2.			0.02					—									28
	29	30.112	62.5	30.172	62.	45.5	33.			42.6	40.	35.	34.	NE	2	N	3.			0.34					6								Rain & Snow	29
	30	30.184	59.5	30.228	63.	42.	31.			36.	32.	36.2	32.4	N	2	N	2			0.01					5									30
	31																																	31
Sums.		896.262 (14 15 10; 26)	1751.5 (15 10; 25)	896.766	1839.5	1327.5 (13 4; 12)	1029.5			1205.3 (13 12; 0)	1127.9	1167.1 (12 8; 26)	1105.8		91.5		92.			7.16					63.					425.9				
Means.		29.875	58.4	29.892	61.3	44.3	34.3			40.2	37.6	38.9	36.9		3.1		3.1													42.6				
† Total Corrections for Instrumental Errors.										÷0.2		÷0.2																		÷0.2				
‡ Corrections for Diurnal Range.																																		
"Corrected Means."										40.0	37.6	38.7	36.9																	42.4				
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.	s.	"	sleet.
h.-fr.	"	hoar-frost.	s.	"	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†† for Temp. (Col. 2), = 29.875 ..... — 0.080 = 29.795

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.892 .... — 0.088 = 29.804

Mean at Station, corrected, and at 32°, = 29.800

Correction for height, 40 feet above Mean Sea-level, = .038 (corrected to .030)

Mean, reduced to 32°, and Sea-level, = 29.838 (corrected to 29.830)

Highest Reading, corrected for Index error, on the 6 th, a.m. = 30.322

Lowest Do. Do., on the 20 th, a.m. = 29.382

Difference, or **Monthly Range,** = 0.940

* 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 7 th, & 28th = 52.0

Lowest in Month, corrected for Index errors, on the 12th, = 22.0

Difference, or **Monthly Range,** = 30.0

"Corrected **Mean" of all the Highest,** (Col. 5), = 44.3

"Corrected **Mean" of all the Lowest,** (Col. 6), = 34.3

Difference, or **Mean Daily Range,** = 10.0

** Calculated **Mean Temperature** of Month, = 39.7

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), = 39.4

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 37.3

‡‡ Computed **Temperature of Dew-Point,** = 34.6

‡‡ Do. **Elastic Force of Vapour,** = 0.201

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** ... = 2.3

‡‡ **Relative Humidity, (Saturation = 100),** = 83.2

RAIN fell on 27 **Days; Amount in Inches,** = 7.16

WIND. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	6	6	3	3	1	3	2	5	1.	3.1	
P.M.	9	7	3	1	3	3	3	.	1	3.1	
Mean.	7.5	6.5	3	2	2	3	2.5	2.5	1.	3.1	

Observations made and Return verified by H. E. Höst

(*Signed*)

31

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer.

Weather-Glasses and Aneroids, though well suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down, viz.: as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, and take down the instrument; it should 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers.

Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements.—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with Exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principle of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers.

The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, 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. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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.

Reading of the Thermometer.

In reading the Thermometer great care must be taken to bring the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read —39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Verification of Thermometers.

No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being re-tested. The Self-Registering, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Nigretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind.

Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction.

A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETRIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure.

The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges.

Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Guage should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base us they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rainfall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls.

Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may be noted among the Remarks. The amount of Cloud is entered from a scale of 0 to 10; thus, when the sky overhead is free from Clouds it is entered 0, when half covered by Clouds, 5, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, 6, S. W.

———— will indicate that the upper strata of Clouds travel with 2, W.

extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second 4, st.

Cloud column, an entry of———, will indicate that the higher 2, cu-st,

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

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine.

The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, their bulbs being sunk to depths of 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells.

The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone.

Mention what Test-Papers are used, Schönbein's or Moffat's, etc. The paper is affixed by a pin to a board in the Thermometer Box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{N.W.}_{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4, or blowing fresh.

Atmospheric Electricity.

Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks.

The Remarks column is unavoidably too narrow. 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 in general use 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, Aurorae Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons.

Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. The Council would direct the special attention of Observers to the registration of such phenomena, so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and approved before being used; and they consider it necessary 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, *December 1874.*

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

SHRUBS, ETC.	First in Blossom.
Barberry,	
Bourtree or Elder,	
Broom,	
Hazel,	
Hawthorn,	
Holly,	
Laburnum,	
Lilac,	
Mezereon,	
Mountain Ash or Rowan,	
Red Flowering Currant,	
Rhododendron Ponticum,	
White,	

FRUITS.	First in Blossom.	Fruit Ripe, generally.
Apple,		
Black Currant,		
Cherry,		
Gean,		
Gooseberry,		
Peach,		
Pear,		
Plum,		
Strawberry,		

CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Reaped.
Barley,				
Bere or Bigg,				
Oats,				
Wheat,				
Beans,				
Pease,				
Potatoes,				
Turnips,				
Rye Grass,				

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

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

To
MR ALEXANDER BUCHAN,
Secretary of the Meteorological Society of Scotland,
EDINBURGH.

Thos Stevenson
Apr. 1876.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Thorshavn*, County of *Faroë Islands*, in Lat. *62° 2½'*, Long. *6°43'8"*, Distance from Sea *50 feet* ~~miles~~.

Height of Cistern of the Barometer above Mean Sea-level *40* (*34*) feet, above Ground *4* feet. During the MONTH of *May* 187*6*.

The Hours of Observation are *not* of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No. 91 (inches)	9 h. A.M. Attached Thermometer (°)	9 h. P.M. Barometer. No. 91 (inches)	9 h. P.M. Attached Thermometer (°)	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground. Max. No. 7165 (°)	Min. No. 3237 (°)	Exposed Black Bulbs. Max. in Sun's rays No.___ (°)	Min. on Grass. No.___ (°)	HYGROMETER. No. N° 832 & 829. 9 h. A.M. Dry bulb (°)	9 h. A.M. Wet bulb (°)	9 h. P.M. Dry bulb (°)	9 h. P.M. Wet bulb (°)	WIND. 9 h. A.M. Direction.	9 h. A.M. Force	9 h. P.M. Direction.	9 h. P.M. Force
	1	30.264	62.	30.188	60.5	44.5	32.5			42.	36.	40.5	37.	Calm	0.	SW	2
	2	30.072	58.5	30.114	61.	48.	39.			45.5	42.	40.4	39.2	W	3	NE	2
	3	30.214	63.	30.206	62.	46.5	38.			41.3	40.4	44.2	42.6	E.	1	S.	1.
	4	30.054	62.5	29.938	60.5	50.5	43.			49.4	47.	47.2	46.	S.	3	SW	4.
	5	30.068	62.5	30.208	63.	53.	46.5			48.6	47.6	48.6	46.4	W	3	SW	1.5
	6	30.280.	63.	30.360	65.	56.5	43.			49.	46.	49.6	46.8	SE	2	Calm	0.
	7	30.432	67.	30.434	64.	56.	43.5			50.3	47.2	44.8	43.4	Calm	0	Calm	0.
	8	30.458	66.	30.530	62.5	51.5	40.			49.2	46.5	43.	42.	Calm	0	Calm	0
	9	30.552	60.5	30.530	60.	47.5	38.			43.	41.8	39.2	38.6	Calm	0	Calm	0
	10	30.532	63.	30.544	60.5	47.	34.			41.	40.5	42.5	41.8	Calm	0.	Calm	0
	11	30.512	59.	30.504	62.	48.5	39.			43.7	41.2	42.8	40.8	Calm	0	NE	2
	12	30.456	57.	30.460	60.5	49.	40.			44.8	42.	44.	41.6	NE	1	NE	1
	13	30.452	55.5	30.472	59.5	48.	41.5			46.6	42.8	43.	40.	E	1	E	1.
	14	30.466	58.	30.472	61.5	51.	37.			45.	40.8	41.	38.8	NE	1.5	Calm	0.
	15	30.436	66.	30.420	62.5	56.5	33.5			50.	43.2	48.	44.8	Calm	0.	Calm	0.
	16	30.366	62.5	30.476	64.	58.5	41.			56.8	49.	43.	40.	NW	2	NE	2
	17	30.540	65.	30.530	59.	51.	36.			49.	43.	41.	38.8	NE.	2	E.	2.
	18	30.504	55.	30.434	58.5	47.	39.			45.5	42.6	45.	42.	SE	2	S	3
	19	30.284	62.5	30.096	60.	54.	44.			51.8	46.7	47.	45.	S.	3	W	4.
	20	30.074	55.5	30.084	60.5	55.	42.			48.7	45.3	44.	40.2	W	3	NW	1
	21	29.994	57.5	29.928	62.	51.5	40.			46.6	43.	43.	41.	Calm	0.	NE	1.5
	22	29.862	61.5	29.864	60.	52.	41.			49.3	45.3	45.	43.5	NE	3	NE	3.
	23	29.972	61.	30.116	61.	52.5	41.5			48.2	44.2	43.5	39.	NE	2	NE	2
	24	30.122	60	30.022	60.5	55.	38.			47.8	42.8	45.2	42.2	N	2	N	2
	25	29.918	55.5	29.730	62.	57.5	41.5			46.7	43.8	50.8	47.8	W.	3	NW	2.
	26	29.702	62.5	29.688	59	55.5	44.5			52.	48.5	45.6	44.6	N	0.5	Calm	0.
	27	29.746	56.5	29.720	59.	51.5	44.5			48.4	47.	49.8	48.	SW	3.	NW	5
	28	29.770	57.	29.686	62.5	50.5	42.			46.	43.2	48.3	47.	E	3	W	3
	29	29.652	60.	29.440	63.	53.	46.			49.5	46.5	47.	45.	SW	3	SW	4
	30	29.364	63	29.596	62.5	53.5	43.5			49.8	46.8	47.2	45.2	SW	4	W	3
	31	29.834	64	29.902	61.5	53.5	43.			50.	45.4	48.2	46.	W	3	SW	4
Sums.		934.952	1882.5	934.692	1900.0	1605.5	1256.0			1475.5	1368.1	1392.4	1325.1		53.5		56.
Means.		30.160	60.7	30.151	61.3	51.8	40.5			47.6	44.1	44.9	42.7		1.7		1.8
† Total Corrections for Instrumental Errors.										÷0.2		÷0.2					
‡ Corrections for Diurnal Range.																	
"Corrected Means."										47.4	44.1	44.7	42.7				
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Days of Month.	Readings of the H.Cup Anemometer. No.___ 9 h. A.M.	RAIN. No. of hours in which it fell.	RAIN. Amount in inches. No. 78	CLOUDS. 9 A.M. Velocity (0—6), and Direction.	9 A.M. Amount, (0—10), and Species.	___ P.M. Velocity (0—6), and Direction.	P.M. Amount, (0—10), and Species.	SUNSHINE. Hours.	THERMOMETERS under Ground. 9 h. A.M. No.___ 3 inches. (°)	12 inches. (°)	No.___ 22 inches. (°)	Temperature of WELL at depth of ___ feet. No.___ (°)	SEA. N° 831 Temperature at 1 fathom, and Density. (°)	OZONE. 0—10. 9 A.M.	9 P.M.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms, including Thunder and Lightning, began and ended.*	Days of Month.
1			—					7.									1
2			0.19					—					43.6				2
3			0.13					—					43.			fog	3
4			0.58					—					44.				4
5			0.40					4								a m fog	5
6			—					13.					45.8				6
7			—					12									7
8			—					7.								pm fog	8
9			—					—					45.2			fog	9
10			—					—								fog	10
11			—					5					45.				11
12			—					—									12
13			—					—					44.8				13
14			—					12.									14
15			—					13.					46.				15
16			—					13.									16
17			—					10.									17
18			—					—									18
19			0.24					7					47.1				19
20			0.21					7.					45.2				20
21			0.01					3									21
22			0.14					—					46.				22
23			0.02					4.					45.5				23
24			0.02					8					45.6				24
25			—					—									25
26			0.01					—								pm fog	26
27			0.20					—					46.4			fog. from 1pm gale of wind	27
28			0.22					—									28
29			0.04					2									29
30			0.15					8								Rain & hail	30
31			0.09					7					47.4				31
Sums.			2.65					142					680.6				
Means.													45.4				
† Total Corrections for Instrumental Errors.													÷0.2				
‡ Corrections for Diurnal Range.																	
"Corrected Means."													45.2				
No. of Column.	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.		s. ,, sleet.	
h.-fr. ,, hoar-frost.		s. ,, 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 †† for Temp. (Col. 2), = 30.160 — 0.086 = 30.074

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 30.150 — 0.088 = 30.063

Mean at Station, corrected, and at 32°, = 30.068

Correction for height, 40 feet above Mean Sea-level, = .038

Mean, reduced to 32°, and Sea-level, = 30.106

Highest Reading, corrected for Index error, on the 9 th, a.m. = 30.552

Lowest Do. Do., on the 30 th, a.m. = 29.364

Difference, or **Monthly Range,** = 1.188

* 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 16 th, = 58.5

Lowest in Month, corrected for Index errors, on the 1st th, = 32.5

Difference, or **Monthly Range,** = 26.0

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 51.8

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 40.5

Difference, or **Mean Daily Range,** = 11.3

** Calculated **Mean Temperature** of Month, = 46.2

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

"Corrected **Mean,**" (Col. 7), **of Black Bulb, Max. in Sun,** =

Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =

"Corrected **Mean,**" (Col. 8), **of Black Bulb, Min.** on grass, =

Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), = 46.1

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 43.4

‡‡ Computed **Temperature of Dew-Point,** = 40.3

‡‡ Do. **Elastic Force of Vapour,** = 0.251

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 2.9

‡‡ **Relative Humidity, (Saturation = 100),** = 81.2

RAIN fell on 16 **Days; Amount in Inches,** = 2.65

WIND. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	2	5	3	2	2	3	5	1	8	1.7	
P.M.	1	7	2	,	2	5	3	3	8	1.8	
Mean.	1.5	6.	2.5	1.	2	4	4	2	8	1.8	

3.28

Observations made and Return verified by V. C. Host

(*Signed*)

18/14

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down, viz.: as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, and take down the instrument; it should 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements,—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with Exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principle of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, 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. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of those methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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.

Reading of the Thermometer. In reading the Thermometer great care must be taken to bring the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read —39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Verification of Thermometers. No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being re-tested. The Self-Registering, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Nigretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETRIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Ellabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Guage should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may be noted among the Remarks. The amount of Cloud is entered from a scale of 0 to 10; thus, when the sky overhead is free from Clouds it is entered 0, when half covered by Clouds, 5, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, $\frac{6,\ S.\ W.}{2,\ W.}$ 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 speed of the former. Again, in the second Cloud column, an entry of $\frac{4,\ st.}{2,\ cu\text{-}st,}$ 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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, their bulbs being sunk to depths of 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. The paper is affixed by a pin to a board in the Thermometer Box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3\frac{N.W.}{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general use are given at the foot of the column. Besides special and extraordinary Observations, great prominence ought to be given in this column to Prevalent Diseases, differences in character, colour, velocity, and direction between the Lower and Upper Strata of Clouds, the Colour of the Sky, etc. Remarks ought to be made on the occurrence of Meteors, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. The Council would direct the special attention of Observers to the registration of such phenomena, so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and approved before being used; and they consider it necessary 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, *December 1874.*

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotlan

EDINBURGH.

BOOK POST.

EDINBURGH 2 E JU 25 76

Thorshavn
May 1876

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Thorshavn*, County of *Faroë Islands*, in Lat. *62° 2½'*, Long. *6° 43' 8"*, Distance from Sea *50 feet* ~~miles~~.

Height of Cistern of the Barometer above Mean Sea-level *40* feet, above Ground *4* feet. During the MONTH of *June* 187*6*.

The Hours of Observation are *not* of Greenwich Time.

Days of Month	ELECTRICITY	BAROMETER 9 h. A.M. Barometer * No. 91 (inches)	9 h. A.M. Attached Thermometer (°)	BAROMETER 9 h. P.M. Barometer No. 91 (inches)	9 h. P.M. Attached Thermometer (°)	SELF-REGISTERING THERMOMETERS, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground: Max. No. 7165 (°)	Min. No. 3237 (°)	Exposed Black Bulbs: Max. in Sun's rays No. (°)	Min. on Grass No. (°)	HYGROMETER No. 832 & 829, 9 h. A.M. Dry bulb (°)	9 h. A.M. Wet bulb (°)	9 h. P.M. Dry bulb (°)	9 h. P.M. Wet bulb (°)	WIND 9 h. A.M. Direction	Force	WIND 9 h. P.M. Direction	Force
1		29.632	58.	29.694	63.	54.	47.5			51.3	50.	52.4	51.2	S	5	SW	5.
2		29.752	64.	29.658	60.5	55.	47.			53.	50.	51.2	50.	S	4	S	4
3		29.378	56.	29.030	59.	52.5	43.			47.4	46.7	44.8	43.	SE	4.	SW	2.
4		29.162	60.	29.250	58.	50.5	40.			48.	44.	43.5	40.5	SW	4	SW	3.
5		29.152	57.	29.406	59.	51.5	38.5			47.2	43.	45.3	42.2	SW	3	W	3
6		29.444	56	29.492	58.	52.	41.			46.	43.	46.2	43.	SW	2	SW	2
7		29.544	62.	29.520	59.	56.	43			50.	45	45.8	43.	SW	2	SW	2
8		29.540	54.5	29.724	59.	55.	42.			49.	45	47.	43.	S	2	NW	1.
9		29.978	59.	30.160	59	53	40.			46.8	42.8	41.	38.	N	2	Calm	0.
10		30.078	55.	29.790	59.	53.	39.			49.2	44.	50.	49.	SW	4	SW	3.
11		29.728	60	29.810	58	54.	45.5			49.5	48.2	47.	44.	SW	0.5	SW	1.
12		29.852	60.5	29.778	58.5	54.	43.			51.	46.	47.	45.	SW	2	SW	1.
13		29.544	58.5	29.728	59.	52.	43.			49.2	45.2	45.5	42.8	SE	2	SW	2
14		29.730	56.5	29.636	59.	50.	44.			47.2	45.	48.8	47.	SE	3	SE	2
15		29.514	56.5	29.628	59.5	53.	47.			50.	48.8	47.	46.	SE.	4	SE	2
16		29.692	58.5	29.700	59.	54.	43.5			50.	48.8	47.4	46.	Calm	0	SE.	0.5
17		29.598	59.	29.624	59.5	53.5	44.5			51.2	49.2	49.6	48.2	SE	2	E	0.5
18		29.702	62.	29.760	61.	58.5	43.			54.	49.7	51.	48.	Calm	0	Calm	0.
19		29.658	54.5	29.766	57.	51.5	48.5			48.7	48.	50.7	50.	SE	4	SE	4.
20		29.970	63.5	30.070	62.	60.	49.			53.4	51.	53.5	52.	SE.	4	E	1.
21		30.194	62.	30.148	63.	62.	49.			57.3	54.	53.	50.5	E	1	SE	3.
22		30.204	66.	30.250	61.	62.	49.5			60.	55.2	52.	50.	Calm	0.	E.	1.
23		30.352	61.	30.364	63.5	64.	49.			54.4	51.8	54.	52.	E.	1.	E.	1.
24		30.388	65.5	30.376	64.5	67.	47.			62.	57.	56.	52.	Calm	0	Calm	0.
25		30.448	65.	30.440	62.	63.	45.5			52.2	50.2	47.5	46.8	Calm	0	Calm	0.
26		30.372	67.	30.268	64.	65.5	45.			61.5	55.	53.2	51.	Calm	0	Calm	0
27		30.160	64.5	30.050	61.5	60.	46.			53.4	50.2	52.	51.	SW	2	SW	2
28		30.044	63.5	30.042	59.5	58	46.			53.	48.	48.3	45.	NW	3	N	3.
29		30.036	60	29.992	59.5	56.5	42.5			53.2	49.6	49.2	46.9	N	2	Calm	0.
30		29.894	57.	29.690	60.	55.	44.			51.9	48.9	50.	48.	SW	2	SE	3
31																	
Sums.		894.740	1802.5	894.844	1804.5	1686.0	1335.5			1551.0	1453.3	1469.9	1405.1		64.5		52.
Means.		29.825	60.1	29.828	60.1	56.2	44.5			51.7	48.8	49.	46.8		2.1		1.7
† Total Corrections for Instrumental Errors.										÷0.2		÷0.2					
‡ Corrections for Diurnal Range.																	
"Corrected Means."										51.5	48.4	48.8	46.8				
No. of Column.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Days of Month	Readings of the H. Cup Anemometer No. 9 h. A.M.	RAIN No. of hours in which it fell	Amount in inches No. 78	CLOUDS 9 A.M. Velocity (0—6), and Direction	9 A.M. Amount (0—10), and Species	P.M. Velocity (0—6), and Direction	P.M. Amount (0—10), and Species	SUNSHINE Hours	THERMOMETERS under Ground 9 h. A.M. No. 3 inches (°)	12 inches (°)	No. 22 inches (°)	Temperature of WELL at depth of feet. No. (°)	SEA. No. 831 Temperature at 1 fathom, and Density (°)	OZONE 0—10 9 A.M.	9 P.M.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms, including Thunder and Lightning, began and ended.*	Days of Month
1			0.61					—					47.2			fog & rain	1
2			0.07					—					47.6			do & do	2
3			0.89					—								do & do	3
4			0.36					—								rain & hail	4
5			0.12					7									5
6			0.25					6									6
7			0.09					10									7
8			0.08					8									8
9			0.01					6.									9
10			0.40					—									10
11			0.19					—								fog & rain	11
12			0.13					7.									12
13			0.24					—									13
14			0.04					—								rain & hail	14
15			0.20					—								fog & rain	15
16			0.01					6.								a.m. fog	16
17			—					6									17
18			—					10.									18
19			0.28					—				47.4				fog & rain	19
20			0.02														20
21			—					12									21
22			—					12									22
23			—					12				49.					23
24			—					14				51.5					24
25			—					4				49.5				fog ≡	25
26			—					14				50.5					26
27			0.02					7				50.5					27
28			0.04					5				50.					28
29			—					—									29
30			—					—				49.					30
31																	31
Sums.			4.05					146				492.2					
Means.												49.2					
† Total Corrections for Instrumental Errors.												÷0.2					
‡ Corrections for Diurnal Range.																	
"Corrected Means."												49.					
No. of Column.	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.	s. ,,	sleet.
h.-fr. ,,	hoar-frost.	s. ,,	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 †† for Temp. (Col. 2), = 29.825 — 0.084 = 29.741

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.828 — 0.084 = 29.744

Mean at Station, corrected, and at 32°, = 29.743

Correction for height, 40 feet above Mean Sea-level, = .037

Mean, reduced to 32°, and Sea-level, = 29.780

Highest Reading, corrected for Index error, on the 25 th, = 30.448

Lowest Do. Do., on the 3 th, = 29.030

Difference, or **Monthly Range,** = 1.418

* 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 24 th, = 67.0

Lowest in Month, corrected for Index errors, on the 5 th, = 38.5

Difference, or **Monthly Range,** = 28.5

"Corrected **Mean" of all the Highest,** (Col. 5), = 56.2

"Corrected **Mean" of all the Lowest,** (Col. 6), = 44.5

Difference, or **Mean Daily Range,** = 11.7

** Calculated **Mean Temperature** of Month, = 50.4

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), = 50.2

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 47.6

‡‡ Computed **Temperature of Dew-Point,** = 44.9

‡‡ Do. **Elastic Force of Vapour,** = 0.297

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 3.4

‡‡ **Relative Humidity, (Saturation = 100),** = 82.4

RAIN fell on 20 **Days; Amount in Inches,** = 4.05

WIND. SUMMARY.

Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	2	..	2	7	3	9	..	1.	6.	2.1	
P.M.	1.	.	4	6	1	10	1	1	6.	1.7	
Mean.	1.5	..	3	6.5	2	9.5	0.5	1.	6.	1.9	

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Observations made and Return verified by H. E. Höst

(*Signed*)

19,71

IN[illegible]CTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer.

Weather-Glasses and Aneroids, though well suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down, viz.: as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, and take down the instrument; it should 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers.

Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements,—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with Exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principle of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers.

The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, 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. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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.

Reading of the Thermometer.

In reading the Thermometer great care must be taken to bring the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read −39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Verification of Thermometers.

No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being re-tested. The Self-Registering, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Nigretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind.

Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction.

A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETRIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure.

The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges.

Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Guage should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rainfall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls.

Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may be noted among the Remarks. The amount of Cloud is entered from a scale of 0 to 10; thus, when the sky overhead is free from Clouds it is entered 0, when half covered by Clouds, 5, wholly covered, 10, 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:—Thus, in the column Velocity and Direction,

6, S. W.
——— will indicate that the upper strata of Clouds travel with
2, W.

extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second

4, st.
Cloud column, an entry of ———, will indicate that the higher
2, cu-st,

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

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine.

The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, their bulbs being sunk to depths of 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells.

The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone.

Mention what Test-Papers are used, Schönbein's or Moffat's, etc. The paper is affixed by a pin to a board in the Thermometer Box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{N.W.}_{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4, or blowing fresh.

Atmospheric Electricity.

Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks.

The Remarks column is unavoidably too narrow. 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 in general use 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, Aurorae Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons.

Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. The Council would direct the special attention of Observers to the registration of such phenomena, so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and approved before being used; and they consider it necessary 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, *December 1874.*

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

SHRUBS, ETC.	First in Blossom.
Barberry,	
Bourtree or Elder,	
Broom,	
Hazel,	
Hawthorn,	
Holly,	
Laburnum,	
Lilac,	
Mezereon,	
Mountain Ash or Rowan,	
Red Flowering Currant,	
Rhododendron Ponticum,	
Whin,	

FRUITS.	First in Blossom.	Fruit Ripe, generally.
Apple,		
Black Currant,		
Cherry,		
Gean,		
Gooseberry,		
Peach,		
Pear,		
Plum,		
Strawberry,		

CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Raised.
Barley,				
Bere or Bigg,				
Oats,				
Wheat,				
Beans,				
Peas,				
Potatoes,				
Turnips,				
Rye Grass,				

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

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

BOOK POST.

To
MR ALEXANDER BUCHAN,
Secretary of the Meteorological Society of Scotland,
EDINBURGH.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thorshavn, County of Faroë Islands, in Lat. 62°2½', Long. 6°43'8", Distance from Sea 50 feet ~~miles~~.

Height of Cistern of the Barometer above Mean Sea-level 34 feet, above Ground 4 feet. During the MONTH of July 1876.

The Hours of Observation are (not) of Greenwich Time.

Days of Month	Barometer 9 h. A.M. (* No. 91) inches	Attached Thermometer °	Barometer 9 h. P.M. (No. 91) inches	Attached Thermometer °	Self-Registering Thermometers, Protected in Shade, 4 feet above Ground, Max. (No. 7165) °	Min. (No. 3237) °	Exposed Black Bulbs, Max. in Sun's rays °	Min. on Grass °	Hygrometer (No. 832 & 829) 9 h. A.M. Dry bulb °	9 h. A.M. Wet bulb °	9 h. P.M. Dry bulb °	9 h. P.M. Wet bulb °
1	29.414	55.5	29.284	60.5	56.5	48.			52.	51.2	49.8	48.6
2	29.480	59.	29.706	60.5	56.5	47.5			53.5	50.	50.	48.
3	29.876	57.5	29.760	59.5	54.	47.5			53.	47.7	49.	48.
4	29.656	59.5	29.786	59.	57.5	48.			56.3	53.8	51.	49.8
5	29.544	57.5	29.074	58.	52.	48			50.1	49.2	51.	50.2
6	29.254	58.5	29.514	59.5	52.	48.			49.8	48	49.5	48.2
7	29.658	57.5	29.728	60.	56.	46.5			51.6	47.2	48.8	46.
8	29.726	59.5	29.660	57.5	57.5	39.5			54.	51.2	50.6	50.
9	29.406	56.5	29.314	57.5	54.	46.			52.2	51.2	48.	46.5
10	29.484	57.	29.804	60.	54.	46.			50.8	48.	47.5	44.
11	30.064	56.5	30.154	58.	58.	44.			49.	43.8	49.	46.5
12	29.644	54.5	29.960	60.	56.5	47.			53.	52.2	48.2	45.8
13	30.132	57.	30.038	60.5	57.	46.5			51.2	48.9	56.	54.5
14	30.068	62.5	30.228	61.5	56.5	50.			54.	51.	51.9	49.9
15	30.260	57.5	30.266	60.5	55.	49.5			51.	49.8	51.2	50.6
16	30.080	66.	30.040	60.5	61.	48.			59.8	55.8	50.2	48.8
17	30.020	57.	30.100	61.	56.	47.5			52.	50.	51.	49.
18	29.778	57.	29.926	57.	53.5	47.			50.	49.5	49.7	48.2
19	29.934	56.	29.956	57.	58.5	47.5			53.9	52.5	51.	48.7
20	29.932	57	29.920	55.	53.5	48.5			52.	51.	51.4	50.8
21	29.992	57.	30.016	60.5	56.	50.			53.9	51.4	52.	51.2
22	30.006	58.	30.014	59.	57.	47.			55.	51.8	49.2	47.8
23	29.992	57.	29.752	59.5	56.5	47.			53.	50.	52.8	51.6
24	29.874	59.	29.896	60.	56.	48.			54.	52.9	50.5	47.2
25	29.772	60.5	29.626	60.	56.	47.5			53.	49.	50.6	47.
26	29.532	57.5	29.742	58.5	54.5	44.5			52.8	49.	47.4	44.2
27	29.604	60.	29.542	59.	57.	45.5			54.	49.7	51.5	49.
28	29.292	56.	29.256	60.	54.5	47.5			50.5	49.8	49.	47.8
29	29.168	56.	29.396	58.	54.	43.5			51.8	50.2	46.	43.
30	29.310	54.	29.350	61.	51.	39.			46.2	45.	49.	47.4
31	29.472	58.5	29.494	57.5	56.5	44.			53.8	48.	48.	45.
Sums.	921.424	1792.5	922.302	1836.0	1724.5	1444.0			1627.2	1548.8	1550.8	1493.3
Means.	29.723	57.8	29.752	59.2	55.6	46.6			52.5	50.0	50.0	48.2
† Total Corrections for Instrumental Errors.												
‡ Corrections for Diurnal Range.												
"Corrected Means."												
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12

Days of Month	Wind 9 h. A.M. Direction	Force	Wind 9 h. P.M. Direction	Force	Rain, Amount in inches (No. 78)	Sunshine, Hours	Sea (No. 831), Temperature at 1 fathom, and Density °	General Remarks
1	S	3	W.	3	0.94	—	50.2	fog
2	SW	3	SW	4	0.09	—	49.	
3	W	2	S	3	0.125	—	49.5	
4	N	0.5	NE	0.5	0.395	—	49.5	
5	Calm	0.	SE	3.	0.17	—	49.5	fog in the night 5th–6th violent gale of wind & heavy rain.
6	W	5	SW	4	1.92	—	49.0	do
7	SW	4	Calm	0.	0.18	5.	49.5	
8	Calm	0	Calm	0.	—	6	50.5	p.m. fog
9	SW.	1.	W.	0.5	0.40	—	49.	
10	N	2	N	3	0.12	4		
11	N	2	S	2	—	10		
12	SW	4	N	2	1.62	—		fog & rain
13	SE	1	SW	3	0.08	—	49.5	
14	SW	4	SW	3	0.24	2		
15	SW	4	SW	3	0.03	—	50	p.m. fog
16	W	3	W	4	0.01	3.		
17	W	3	W	3.	0.075	—	49.7	
18	SE	1	Calm	0	0.295	—		fog
19	S	1	W	2	0.035	—	49.5	
20	SW	2	SW	3	0.425	—		
21	W	3	SW	0.5	0.30	—		
22	Calm	0	SW	1.	0.03	10.	51.	
23	SW	2	SW	5.	0.47	—		
24	SW.	4	SW	4.	0.15	—		
25	SW	4	SW	3	0.06	8	49.8	
26	NW	3	W	2	0.13	10.		
27	SW	5	SW	4.	—	—		
28	SE	4	SW	1.5	0.125	—		rain & fog.
29	Calm	0	W.	2.	0.06	—		
30	E.	1.5	SW	2	0.215	—		rain & fog
31	W.	0.5	W.	1.5	0.01	10	50.5	
Sums.		72.5		72.5	8.70	68	795.5	
Means.		2.3		2.3			49.7	
† Total Corrections for Instrumental Errors.							÷0.2	
‡ Corrections for Diurnal Range.								
"Corrected Means."							49.5	
No. of Column.	13	14	15	16	19	24	29	

(Printed columns with no entries: 17 Readings of the H. Cup Anemometer, 9 h. A.M.; 18 Rain, No. of hours in which it fell; 20–23 Clouds, 9 A.M. and P.M., Velocity (0–6) and Direction, Amount (0–10) and Species; 25–27 Thermometers under Ground, 9 h. A.M., 3, 12 and 22 inches; 28 Temperature of Well; 30 Ozone, 0–10, 9 A.M. and 9 P.M.; Electricity. 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.)

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.	s.	" sleet.
h.-fr.	" hoar-frost.	s.	" 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†† for Temp. (Col. 2), = 29.723 — 0.078 = 29.645

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction†† for Temp. (Col. 4), = 29.752 — 0.081 = 29.671

Mean at Station, corrected, and at 32°, = 29.658

Correction for height, 34 feet above Mean Sea-level, = .037

Mean, reduced to 32°, and Sea-level, = 29.695

Highest Reading, corrected for Index error, on the 15 th, p.m. = 30.266

Lowest Do. Do., on the 5 th, p.m. = 29.074

Difference, or **Monthly Range,** = 1.192

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 16 th, = 61.0

Lowest in Month, corrected for Index errors, on the 30 th, = 39.0

Difference, or **Monthly Range,** = 22.0

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 55.6

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 46.6

Difference, or **Mean Daily Range,** = 9.0

** Calculated **Mean Temperature** of Month, = 51.1

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), = 51.2

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 49.1

‡‡ Computed **Temperature of Dew-Point,** = 46.9

‡‡ Do. **Elastic Force of Vapour,** = 0.323

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 3.6

‡‡ **Relative Humidity, (Saturation = 100),** = 85.5

RAIN fell on 28 **Days; Amount in Inches,** = 8.70

WIND. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	3	"	1	3	2	11	6	1	4	2.3	
P.M.	2	1	"	1	2	14	8	"	3	2.3	
Mean.	2.5	0.5	0.5	2.	2	12.5	7.	0.5	3.5	2.3	

5.29

* 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.*

Observations made and Return verified by H. H. Cost

(*Signed*)

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INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer.

Weather-Glasses and Aneroids, though well suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down, viz.: as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, and take down the instrument; it should 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers.

The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers.

Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements,—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with Exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principle of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers.

The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, 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. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer.

The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 he covered, and altogether placed to the side, and a little below the level of the wet bulb, but 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.

Reading of the Thermometer.

In reading the Thermometer great care must be taken to bring the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read −39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Verification of Thermometers.

No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being re-tested. The Self-Registering, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Nigretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind.

Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1, As regards Direction.

A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETRIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure.

The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges.

Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Guage should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base us they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rainfall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls.

Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may be noted among the Remarks. The amount of Cloud is entered from a scale of 0 to 10; thus, when the sky overhead is free from Clouds it is entered 0, when half covered by Clouds, 5, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, 6, S. W.

———— will indicate that the upper strata of Clouds travel with
2, W.

extreme velocity from S.W., and those in the lower regions from W., with one-third the speed of the former. Again, in the second
4, st.

Cloud column, an entry of ————, will indicate that the higher
2, cu-st,

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

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine.

The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, their bulbs being sunk to depths of 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells.

The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Mention what Test-Papers are used, Schönbein's or Moffat's, etc.

Ozone.

The paper is affixed by a pin to a board in the Thermometer Box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{\frac{N.W.}{4}}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4, or blowing fresh.

Atmospheric Electricity.

Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks.

The Remarks column is unavoidably too narrow. 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 in general use are given at the foot of the column. Besides special and extraordinary Observations, great prominence ought to be given in this column to Prevalent Diseases, differences in character, colour, velocity, and direction between the Lower and Upper Strata of Clouds, the Colour of the Sky, etc. Remarks ought to be made on the occurrence of Meteors, Auroræ Borealeş, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons.

Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. The Council would direct the special attention of Observers to the registration of such phenomena, so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and approved before being used; and they consider it necessary 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, *December 1874.*

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

SHRUBS, ETC.	First in Blossom.
Barberry,	
Bourtree or Elder,	
Broom,	
Hazel,	
Hawthorn,	
Holly,	
Laburnum,	
Lilac,	
Mezereon,	
Mountain Ash or Rowan,	
Red Flowering Currant,	
Rhododendron Ponticum,	
Whin,	

FRUITS.	First in Blossom.	Fruit Ripe, generally.
Apple,		
Black Currant,		
Cherry,		
Gean,		
Gooseberry,		
Peach,		
Pear,		
Plum,		
Strawberry,		

CROPS, mentioning variety.	Sowing or Planting.
Barley,	
Bere or Bigg,	
Oats,	
Wheat,	
Beans,	
Pease,	
Potatoes,	
Turnips,	
Rye Grass,	

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

	Appearing above Ground.	In Ear or Flower.	First Cut or Pulled.

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

Thos Shaw
July 1876.

To
Mr ALEXANDER BUCHAN,
Secretary of the Meteorological Society of Scotland,
EDINBURGH.

BOOK POST.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Thorshavn*, County of *Faroë Islands*, in Lat. *62° 2½'*, Long. *6° 43' 8"*, Distance from Sea *50 feet* ~~miles.~~

Height of Cistern of the Barometer above Mean Sea-level *34* feet, above Ground *4* feet. During the MONTH of *August* 187*6*.

The Hours of Observation are *not* of Greenwich Time.

Days of Month	Electricity	Barometer 9 h. A.M. Barometer * No. 91 (inches)	9 h. A.M. Attached Thermometer (°)	Barometer 9 h. P.M. Barometer No. 91 (inches)	9 h. P.M. Attached Thermometer (°)	Self-Registering Thermometers, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground: Max. No. 7165 (°)	Min. No. 3237 (°)	Exposed Black Bulbs: Max. in Sun's rays No. (°)	Min. on Grass No. (°)
1		29.426	55.	29.632	59.	54.	45.		
2		29.718	57.	29.702	58.5	60.	40.		
3		29.340	55.	29.084	58.5	53.5	48.		
4		29.012	57.5	29.392	61.5	57.	49.5		
5		29.754	57.	29.944	62.	57.5	48.		
6		29.808	57.5	29.556	59.	55.	49.5		
7		29.528	58.	29.678	60.5	54.5	50.		
8		29.772	58.	29.592	60.	56.	50.		
9		29.442	58.	29.630	60.5	55.	47.		
10		29.772	58.5	29.608	60.5	54.	47.		
11		29.640	60.	29.814	61.	57.	51.		
12		29.926	60.5	30.062	61.5	57.5	51.		
13		30.132	60.	30.186	58.	55.	46.5		
14		30.150	56.5	30.148	58.5	51.5	46.5		
15		30.132	56.	30.140	60.	56.	48.		
16		30.166	62.5	30.196	61.	61.5	48.		
17		30.250	64.	30.232	60.5	64	46.		
18		30.256	64.5	30.244	62.5	65.5	47.		
19		30.210	64.5	30.124	62.	65.	49.		
20		30.106	67.	30.028	64.5	71.5	47.		
21		29.932	61.5	29.880	60.5	56.5	49.		
22		29.858	58.	29.866	58.	52.	43.		
23		29.874	56.	29.880	61.	55.	42.		
24		29.902	58.	29.920	58.5	55.	40.5		
25		29.914	60.	29.856	60.5	56.5	40.5		
26		29.524	56.	29.660	59.	50.	43.		
27		29.864	57.5	29.932	60.5	55.	43.5		
28		29.784	57.5	29.688	60.	51.5	45.		
29		29.660	59.5	29.600	60.	58.	46.5		
30		29.482	57.5	29.420	61.5	53.	43.5		
31		29.510	59.5	29.744	61.5	52.	48.5		
Sums.		923.844	1828.0	924.438	1870.5	1755.5	1439.0		
Means.		29.801	59.	29.821	60.3	56.6	46.4		
† Total Corrections for Instrumental Errors.									
‡ Corrections for Diurnal Range.									
"Corrected Means."									
No. of Column.		1	2	3	4	5	6	7	8

Days of Month	Hygrometer No. 832 & 829, 9 h. A.M. Dry bulb (°)	9 h. A.M. Wet bulb (°)	9 h. P.M. Dry bulb (°)	9 h. P.M. Wet bulb (°)	Wind 9 h. A.M. Direction	9 h. A.M. Force	Wind 9 h. P.M. Direction	9 h. P.M. Force	Readings of the H.Cup Anemometer No. 9 h. A.M.
1	51.3	48	46.7	43.8	NW	1.	NW	2	
2	51.8	47.8	50.	48.	SE.	3.	SE	1.	
3	50.8	50.	51.	50.5	ENE	4.	ENE	3.	
4	54.3	53.	52.8	50.3	Calm	0.	NW	3.	
5	53.5	50.8	50.5	48.	W.	2.	SW	3.	
6	51.2	49.8	52.	51.	S.	4	SW	3.	
7	53.2	52.1	51.2	50.5	SW	4	SW	3.	
8	52.2	50.4	51.6	51.	SW	4	WSW	4	
9	54.2	53.	49.	46.	S.	4	SW	3.	
10	51.	48.5	53.8	52.2	SW	4	SW	5.	
11	54.8	51.2	52.6	51.	SW	5	SW	4.	
12	56.5	55.2	54.	53.2	SW	5	SW	4	
13	54.8	53.6	48.	46.9	NE	1	NE	1	
14	50.2	49.8	49.5	49.	NE	1.5	NE	2	
15	51.2	50.8	51.	50.2	SE.	1.	Calm	0.	
16	58.5	55.	51.8	50.5	NE	0.5	Calm	0	
17	61.	56.8	50.	46.	Calm	0.	Calm	0.	
18	61.	55.6	52.5	51.	Calm	0.	Calm	0.	
19	62.	57.8	52.	51.2	Calm	0.	Calm	0.	
20	65.8	57.	54.2	52.2	Calm	0	SW	0.5	
21	53.5	51.5	50.2	47.4	Calm	0	Calm	0.	
22	48.2	45.	46.2	43.	N	2	N	2	
23	48.4	44.	44.	41.5	N	3	N	3	
24	48.	42.6	45.	40.2	N	4	N	3	
25	53.3	45.8	45.	42.5	NW	2	Calm	0.	
26	49.	48.	48.2	45.4	SE	2	NE	3.	
27	51.5	46.2	48.	45.8	NE	0.5	SE	1.	
28	49.6	47.	49.	47.2	SE	3	SE	3.	
29	52.8	50.	49.	47.	E.	1.	E	0.5	
30	52.2	50.	51.	50	NE	2	NE	3	
31	51.	50	50.	48.	NE	3	NE	2.	
Sums.	1656.8	1566.3	1549.8	1490.5		66.5		62.	
Means.	53.4	50.5	50.0	48.1		2.1		2.0	
† Total Corrections for Instrumental Errors.									
‡ Corrections for Diurnal Range.									
"Corrected Means."									
No. of Column.	9	10	11	12	13	14	15	16	17

Days of Month	Rain: No. of hours in which it fell	Rain: Amount in inches No. 78	Clouds 9 A.M. Velocity (0—6), and Direction	9 A.M. Amount (0—10), and Species	Clouds P.M. Velocity (0—6), and Direction	P.M. Amount (0—10), and Species	Sunshine Hours	Thermometers under Ground 9 h. A.M. No. 3 inches (°)	12 inches (°)	No. 22 inches (°)	Temperature of WELL at depth of feet. No. (°)	Sea No. 831 Temperature at 1 fathom, and Density (°)	Ozone 0—10 9 A.M.	Ozone 9 P.M.	General Remarks
1		0.02					—					50.			
2		—					7								
3		0.84					—								
4		0.37					—					49.8			
5		—					10.					49.8			
6		0.20					—								rain & fog.
7		0.57					—					50.2			do. & do.
8		0.64					—								do. & do.
9		0.37					4								a.m. do. & do.
10		0.51					—								
11		0.69					5								
12		0.36					—								fog & rain
13		0.22					—								fog
14		0.04					—					50.2			do.
15		0.03					—								do.
16		—					13.								
17		—					12					52.2			
18		—					12					51.2			
19		—					12								
20		—					13								
21		0.05					—					51.2			
22		—					6.					50.7			
23		0.01					12								
24		0.08					12					50.4			
25		—					7.								
26		0.40.					—								
27		0.02					3								
28		0.22					—								
29		—					8					50.2			
30		0.74					—								
31		1.01					—								
Sums.		7.39					136					555.9			
Means.												50.5			
† Total Corrections for Instrumental Errors.												÷0.2			
‡ Corrections for Diurnal Range.															
"Corrected Means."												50.3			
No. of Column.	18	19	20	21	22	23	24	25	26	27	28	29	30		

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.

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.	s.	,,	sleet.
h.-fr.	,,	hoar-frost.	s.	,,	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†† for Temp. (Col. 2), = 29.801 — 0.081 = 29.720

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction†† for Temp. (Col. 4), = 29.821 — 0.085 = 29.736

Mean at Station, corrected, and at 32°, = 29.728

Correction for height, 34 feet above Mean Sea-level, = .037

Mean, reduced to 32°, and Sea-level, = 29.765

Highest Reading, corrected for Index error, on the 18 th, a.m. = 30.256

Lowest Do. Do., on the 4 th, a.m. = 29.012

Difference, or **Monthly Range,** = 1.244

* 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 20 th, = 71.5

Lowest in Month, corrected for Index errors, on the 2 th, = 40.0

Difference, or **Monthly Range,** = 31.5

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 56.6

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 46.4

Difference, or **Mean Daily Range,** = 10.2

** Calculated **Mean Temperature** of Month, = 51.5

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), = 51.7

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 49.3

‡‡ Computed **Temperature of Dew-Point,** = 46.9

‡‡ Do. **Elastic Force of Vapour,** = 0.322

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 3.6

‡‡ **Relative Humidity,** (Saturation = 100), = 83.9

RAIN fell on 21 **Days; Amount in Inches,** = 7.39

WIND. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	3	7	1	4	2	5.	1	2	6	2.1	
P.M.	3	6	1	3	.	9	.	2	7	2.0	
Mean.	3	6.5	1	3.5	1.	7.	0.5	2	6.5	2.05	

4.20

Observations made and Return verified by H. Host

(*Signed*)

1025
4400

Thorshavn
Aug. 1st 1876

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

SHIP LETTER

BOOK POST.

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

One of the chief objects that the Scottish Meteorological Society proposed to itself when the Society was established in 1855, was to secure perfect uniformity in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is Fortin's Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down, viz.: as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, and take down the instrument; it should 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of four feet above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of uniformity of height above ground, and method in protecting the Thermometers, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements,—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with Exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principle of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, 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. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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.

Reading of the Thermometer. In reading the Thermometer great care must be taken to bring the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Verification of Thermometers. No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being re-tested. The Self-Registering, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Nigretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called Storm Stations, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to Barometric Gradients, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Guage should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may be noted among the Remarks. The amount of Cloud is entered from a scale of 0 to 10; thus, when the sky overhead is free from Clouds it is entered 0, when half covered by Clouds, 5, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, $\frac{6, \text{S. W.}}{2, \text{W.}}$ 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 speed of the former. Again, in the second Cloud column, an entry of $\frac{4, \text{st.}}{2, \text{cu-st,}}$ 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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, their bulbs being sunk to depths of 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. The paper is affixed by a pin to a board in the Thermometer Box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3\frac{\text{N.W.}}{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general use are given at the foot of the column. Besides special and extraordinary Observations, great prominence ought to be given in this column to Prevalent Diseases, differences in character, colour, velocity, and direction between the Lower and Upper Strata of Clouds, the Colour of the Sky, etc. Remarks ought to be made on the occurrence of Meteors, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. The Council would direct the special attention of Observers to the registration of such phenomena, so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and approved before being used; and they consider it necessary 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, *December 1874.*

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Thorshavn, County of Faroë Islands, in Lat. 62°2½', Long. 6°43'8", Distance from Sea 50 feet ~~miles~~.

Height of Cistern of the Barometer above Mean Sea-level 34 feet, above Ground 4 feet. During the MONTH of September 1876.

The Hours of Observation are not of Greenwich Time.

Days of Month	Barometer 9 h. A.M. Barometer * No. 91 (inches)	Barometer 9 h. A.M. Attached Thermometer (°)	Barometer 9 h. P.M. Barometer No. 91 (inches)	Barometer 9 h. P.M. Attached Thermometer (°)	Self-Registering Thermometers, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground: Max. No. 7165 (°)	Min. No. 3237 (°)	Exposed Black Bulbs: Max. in Sun's rays No. (°)	Min. on Grass No. (°)	Hygrometer No. 832 & 829. 9 h. A.M. Dry bulb (°)	9 h. A.M. Wet bulb (°)	9 h. P.M. Dry bulb (°)	9 h. P.M. Wet bulb (°)	Wind 9 h. A.M. Direction	Force	Wind 9 h. P.M. Direction	Force
1	29.888	60.	29.962	60.	52.	40.			50.8	46.3	41.8	39.5	NE	3.	NE.	2.
2	29.926	55.5	29.900	59.5	53.	36.			48.	43.	37.	35.5	N	2	N	2
3	29.896	55.5	29.944	58.5	54.5	32.			48.8	43.8	42.4	39.6	E	1	NE	1.
4	29.878	58.5	29.704	58.	52.5	40.			48.2	44.	47.	46.	NE	1.5	E.	3.
5	29.480	57.	29.276	59.5	53.5	45.			49.8	48.	48.4	45.2	NE	4	NE	4.
6	29.236	60.	29.280	61.5	53.	46.5			50.4	47.6	48.4	47.	N	3	NW	3
7	29.210	59.	29.254	60.	54.5	47.			50.5	49.	50.	48.	W	3	Calm	0
8	29.550	57.	29.740	62.	59.5	48.			51.	50.	50.	48.	E.	1	N	3.
9	29.862	57	30.050	60.5	54.	45.			52.8	50.2	47.	45.	NE	2	E	2
10	30.084	58.5	30.034	58.5	50.	43.5			46.8	43.4	46.2	42.8	NE	3	NE	3
11	29.986	62.	29.978.	63.	50.5	42.			49.	45.	44.3	42.	N	4	N	4
12	29.974	55.5	30.068	63.5	51.5	41.			46.	44.1	45.8	44.	N	4	N	4.
13	30.020	60.5	30.006	60.5	51.5	41.			48.8	45.8	43.	41.8	N	3	N	2
14	29.960	55.5	29.980	60.	52.	39.			49.5	47.	47.5	46.2	N	1	E	2
15	29.932	57.	29.924	61.	53.	46.			50.	49.2	49.8	49.	NE.	0.5	E	0.5
16	29.888	59.	29.960	61.	54.	47.			51.8	50.5	48.2	47.	SE	3	NE	2.
17	29.844	56.5	29.800	61.	51.5	44.			48.8	46.8	48.8	47.	NE	2	NE	1
18	29.802	57.	29.928	60.	51.	44.			47.5	46.	45.5	43.	N	2	N	3
19	30.162	57.5	30.332	61.5	51.	40.			46.2	44.	40.8	39.	N	2	N	1
20	30.380	60.5	30.372	61.5	50.	39.			46.	42.5	45.	43.	NE.	0.5	SE.	2
21	30.252	57.	30.158	62.	50.	43.			47.5	45.8	49.5	48.2	SE	3.	SE	3
22	30.034	62.	29.946	61.5	52.	48.5			50.5	50.	50.8	50.4	SE	2	E	1
23	29.852	60.	29.834	62.	51.5	48.			50.5	50	51.	50.5	E.	0.5	E	1
24	29.850	62.5	29.834	64.5	51.5	48.			50.4	50.	50.	49.5	SE	2.	Calm	0.
25	29.868	60.	29.882	64.	54.	48.			51.3	51.	50.8	50.	Calm	0.	Calm	0.
26	29.844	60	29.888	63.	53.	49.			50.8	50.2	50.2	50.	Calm	0.	Calm	0.
27	29.904	59.	29.892	61.5	54.	44.			49.8	49.2	46.2	45.8	SE	1.	Calm	0.
28	29.824	61.5	29.870	61.5	53.	43.			50.	49.	45.	43.	Calm	0.	E.	3.
29	29.948	59.5	29.946	59.5	50.	37.			44.5	40.6	40.5	38.3	NE	1	NE	1
30	29.920	55.5	30.042	60.	50.	36.			46.	42.6	40.	37.4	NE	1.5	NE	1.5
31																
Sums.	896.254	1756.0	896.784	1830.5	1571.5	1290.5			1472.0	1404.6	1390.9	1341.7		56.5		55
Means.	29.875	58.5	29.893	61.0	52.4	43.0			49.1	46.8	46.3	44.7		1.9		1.8
† Total Corrections for Instrumental Errors.																
‡ Corrections for Diurnal Range.																
"Corrected Means."																
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Days of Month	Readings of the H. Cup Anemometer No. 9 h. A.M.	Rain: No. of hours in which it fell	Rain: Amount in inches No. 78	Clouds 9 A.M. Velocity (0—6), and Direction	Clouds 9 A.M. Amount (0—10), and Species	Clouds P.M. Velocity (0—6), and Direction	Clouds P.M. Amount (0—10), and Species	Sunshine Hours	Thermometers under Ground 9 h. A.M. No. 3 inches (°)	12 inches (°)	No. 22 inches (°)	Temperature of Well at depth of feet. No. (°)	Sea: Temperature at 1 fathom, and Density, N° 831 (°)	Ozone 0—10 9 A.M.	Ozone 9 P.M.	General Remarks
1			—					4.					50.2			
2			0.01					6								
3			—					8.								
4			0.05					9.								
5			0.18.					—					50.			
6			—					—					50.1			
7			0.01					—								
8			0.04					8.								
9			0.01					—					50.1			
10			0.01					—								
11			—					3.								
12			—					7.					49.5			
13			—					7								Aur. bor.
14			—					4								
15			0.03					—								fog
16			0.05					—					49.8			
17			0.005					—								
18			—					—								
19			0.005					5					49.6			
20			—					—								
21			—					—					49.2			
22			0.04					—					49.2			fog
23			0.12					—					49.5			fog
24			0.84					—								fog
25			0.19					—					50.			fog
26			0.19					—								fog
27			0.29					—					50.2			fog
28			—					—								
29			—					7								
30			—					6								
31																
Sums.			2.07					74					597.4			
Means.													49.8			
† Total Corrections for Instrumental Errors.													÷ 0.2			
‡ Corrections for Diurnal Range.																
"Corrected Means."													49.6			
No. of Column.	17	18	19	20	21	22	23	24	25	26	27	28	29	30		

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.*

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.	s.	,, sleet.
h.-fr.	,, hoar-frost.	s.	,, 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	B[illegible]
0·5	Very light air	2·	Fresh breeze	5	[illegible]
1·	Light air	3·	Very fresh	6	Viol[illegible]

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction†† for Temp. (Col. 2), = 29.875 — 0.080 = 29.795

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction†† for Temp. (Col. 4), = 29.893 — 0.087 = 29.806

Mean at Station, corrected, and at 32°, = 29.801

Correction for height, 34 feet above Mean Sea-level, = .037

Mean, reduced to 32°, and Sea-level, = 29.838

Highest Reading, corrected for Index error, on the 20 th, a.m = 30.380

Lowest Do. Do., on the 7 th, a.m. = 29.210

Difference, or **Monthly Range,** = 1.170

* 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 8 th, = 59.5

Lowest in Month, corrected for Index errors, on the 3 th, = 32.0

Difference, or **Monthly Range,** = 27.5

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 52.4

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 43.0

Difference, or **Mean Daily Range,** = 9.4

** Calculated **Mean Temperature** of Month, = 47.7

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), = 47.7

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 45.7

‡‡ Computed **Temperature of Dew-Point,** = 43.5

‡‡ Do. **Elastic Force of Vapour,** = 0.283

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 3.2

‡‡ **Relative Humidity, (Saturation = 100),** = 86.7

RAIN fell on 17 **Days; Amount in Inches,** = 2.07

WIND. SUMMARY.

Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	8	10	3	5	"	"	1	"	3	1.9	
P.M.	7	8	7	2	"	"	"	1	5	1.8	
Mean.	7.5	9.	5.	3.5	"	"	0.5	0.5	4	1.85	

3'42

Observations made and Return verified by H. C. Müller

(Signed)

925
1480
185

Thorshavn
Sept 1876.

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK POST.

SHIP LETTER

EDINBURGH N 2 OC 24 76

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down, viz.: as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, and take down the instrument; it should 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements,—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with Exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principle of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, 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. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 an inch from any board on which it may be suspended; the water-cup must be covered, and altogether placed to the side, and a little below the level of the wet bulb, but 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.

Reading of the Thermometer. In reading the Thermometer great care must be taken to bring the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read —39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Verification of Thermometers. No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being re-tested. The Self-Registering, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Nigretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETRIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Guage should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base us they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may be noted among the Remarks. The amount of Cloud is entered from a scale of 0 to 10; thus, when the sky overhead is free from Clouds it is entered 0, when half covered by Clouds, 5, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, $\frac{6,\ S.\ W.}{2,\ W.}$ 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 speed of the former. Again, in the second Cloud column, an entry of $\frac{4,\ st.}{2,\ cu\text{-}st,}$, 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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, their bulbs being sunk to depths of 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. The paper is affixed by a pin to a board in the Thermometer Box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{\frac{N.W}{4}}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general use are given at the foot of the column. Besides special and extraordinary Observations, great prominence ought to be given in this column to Prevalent Diseases, differences in character, colour, velocity, and direction between the Lower and Upper Strata of Clouds, the Colour of the Sky, etc. Remarks ought to be made on the occurrence of Meteors, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. The Council would direct the special attention of Observers to the registration of such phenomena, so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and approved before being used; and they consider it necessary 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, *December 1874.*

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Thorshavn*, County of *Faroë Islands*, in Lat. *62° 2½'*, Long. *6° 43' 8"*, Distance from Sea *50 feet* ~~miles~~.
Height of Cistern of the Barometer above Mean Sea-level *34* feet, above Ground *4* feet. During the MONTH of *October* 187*6*.
The Hours of Observation are *not* of Greenwich Time.

Electricity	Days of Month	Barometer 9 h. A.M. Barometer *No. *91* (inches)	Barometer 9 h. A.M. Attached Thermometer (°)	Barometer 9 h. P.M. Barometer No. *91* (inches)	Barometer 9 h. P.M. Attached Thermometer (°)	Self-Registering Thermometers, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground: Max. No. *7165* (°)	Min. No. *3237* (°)	Exposed Black Bulbs: Max. in Sun's rays No. (°)	Min. on Grass No. (°)	Hygrometer No. *832 & 829*. 9 h. A.M. Dry bulb (°)	9 h. A.M. Wet bulb (°)	9 h. P.M. Dry bulb (°)	9 h. P.M. Wet bulb (°)	Wind 9 h. A.M. Direction	Force	Wind 9 h. P.M. Direction	Force	Readings of the H. Cup Anemometer No. 9 h. A.M.	Rain: No. of hours in which it fell	Rain: Amount in inches No. *78*	Clouds 9 A.M. Velocity (0—6), and Direction	Clouds 9 A.M. Amount (0—10), and Species	Clouds P.M. Velocity (0—6), and Direction	Clouds P.M. Amount (0—10), and Species	Sunshine Hours	Thermometers under Ground 9 h. A.M. No. 3 inches (°)	No. 12 inches (°)	No. 22 inches (°)	Temperature of WELL at depth of feet. No. (°)	Sea No. *831* Temperature at 1 fathom, and Density (°)	Ozone 0—10, 9 A.M.	Ozone 9 P.M.	General Remarks. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms, including Thunder and Lightning, began and ended.*	Days of Month
	1	30.160.	58.	30.278	60.5	45.	34.5	43.		43.	39.9	35.8	33.8	N	1	Calm	0.			0.02					3.									1
	2	30.256	54.5	30.204	60.	47.	30.			43.5	41.	45.8	44.	SW	1.5	W	2.			—					4.					48.8				2
	3	30.162	56.5	29.992	59.5	52.	34.			44.	42.	48.4	47.2	Calm	0.	SE	3.			—					3.					49.1				3
	4	29.744	60.	29.606	62.	51.	46.			49.	48.8	50.3	50.	SE.	4.	SE	3.			0.24					—					49.1			fog & rain	4
	5	29.668	62.	29.838	64.5	53.5	47.5			50.8	50.2	50.1	49.8	Calm	0	Calm	0.			0.16					—								fog	5
	6	29.710	63.5	29.628	63.	54.	47.			50.1	49.8	50.	49.	SE	2	S	2			0.64					—					50.			do	6
	7	29.526	59.5	29.352	61.	52.5	47.5			50.9	50.3	50.8	50.2	SE	2	S	3			0.39					—					49.7			do	7
	8	29.494	63.5	29.672	60.5	51.5	46			50.5	49.5	47.5	46.6	SW	2	W	1			0.38					—								do	8
	9	29.582	60.	29.402	62	48.	45.			47.	46.5	47.5	46.4	E.	1.5	NE	2			0.07					—								do	9
	10	29.080	60.	28.904	60.5	50.	44.5			46.2	45.2	49.	47.2	E.	4.	SW	3.			0.61					—					48.8				10
	11	28.946	58	28.926	60.5	50.	37.			45.	44.	47.	45.	Calm	0	Calm	0.			—					—					49.				11
	12	29.168	56.5	29.680	62.5	47.	37.			40.7	39.8	39.8	37.2	NW	1.5	NE	1.5			0.04					4									12
	13	29.768	58.5	29.570	58.	48	37.			41.4	40.5	47.	46.2	E	3	NE	3			0.10.					—								fog & rain	13
	14	29.568	56.	29.432	56.5	47.5	43.			45.7	44.6	45.	44.	E	3	E	4.			0.03					—					48.2				14
	15	29.354	58.	29.560	63.	53.5	43.			51.	49.	45.	44.	S.	3	Calm	0.			0.63					3									15
	16	29.520	61.	29.574	61.5	51.5	43.			50.8	48.9	50.	49.	SE.	3	SE	3			0.03					—									16
	17	29.524	57.5	29.726	60.5	53.	48.			51.	50.2	51.2	48.4	SE	3	SE	3			0.40					—					49.2				17
	18	29.760	60.5	29.872	62.5	53.	45.5			50.	49.	48.	46.5	Calm	0.	Calm	0.			—					—									18
	19	29.924	61.5	30.230	61.5	51.	39.			49.5	47.	40.	39.	Calm	0.	Calm	0			0.015					3					49.2				19
	20	30.388	57.5	30.428	60.	48.	33.			42.4	41.	45.5	43.2	Calm	0.	SE	2			—					2					48.8				20
	21	29.396	57.	30.354	59.5	50.	43.			49.5	47.2	49.	46.8	S.	3	S.	3			0.06					—					48.6				21
	22	30.342	58.5	30.394	66.	51.5	48.			50.	47.5	50.	48.2	S.	1.5	SW	1.			0.015					—									22
	23	30.398	57.5	30.320	60.	51.5	45.			48.9	47.8	47.8	45.4	Calm	0.	SE	2.			0.015					—					49.			fog	23
	24	30.196	58.	30.136	58.5	50.	44.5			48.	45.8	48.5	46.3	SE	3.	SE	3.			—					5					48.5				24
	25	29.990	56.	30.060	63.	53.5	47.5			48.	47.5	50.	48.	SE	5.	SW	2			0.265					—								fog & rain	25
	26	30.010	61.	30.010	64.	56.	46.			52.	50.5	48.2	46.	SW	4	W	3			0.355					—									26
	27	29.954	59.5	29.720	60.	51.5	47.			48.6	46.	50.8	48.8	SW	3	SW	5			0.06					—					48.5				27
	28	29.770	56.5	29.660	57.5	51.5	44.5			48.	45.	46.8	41.8	W	4	NW	4			0.30					—								in the night 28-29 violent gale of wind W	28
	29	29.756	55.5	29.766	56.	47.	27.5			37.	32.	28.7	27.8	NW	3	N	3.			0.225					—								Rain. Snow	29
	30	30.090	48.5	30.270	58.	35.5	26.			32.5	30.6	33.8	30.2	N	4	N	4			0.11					—					46.8			Snow	30
	31	30.338	50.	30.356	61.	35.	30.			33.8	31.	34.3	32.2	N	3	Calm	0.			0.08					—					47.			Snow	31
Sums.		923.542	1800.5	924.920	1883.5	1540.0	1276.5			1438.8	1388.1	1421.6	1368.2		68.		65.5			5.24					27					828.3				
Means.		29.792	58.1	29.836	60.8	49.7	41.2			46.4	44.8	45.9	44.1		2.2		2.1													48.7				
† Total Corrections for Instrumental Errors.																														-0.2				
‡ Corrections for Diurnal Range.																																		
"Corrected Means."																														48.5				
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.	s.	" sleet.
h.-fr.	" hoar-frost.	s.	" 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†† for Temp. (Col. 2), = 29.792 ..... — 0.079 = 29.713

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction†† for Temp. (Col. 4), = 29.836 .... — 0.085 = 29.751

Mean at Station, corrected, and at 32°, = 29.732

Correction for height, 34 feet above Mean Sea-level, = .037

Mean, reduced to 32°, and Sea-level, = 29.769

Highest Reading, corrected for Index error, on the 20 th, = 30.428

Lowest Do. Do., on the 10 th, = 28.904

Difference, or **Monthly Range,** = 1.524

* 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 26 th, = 56.0

Lowest in Month, corrected for Index errors, on the 30 th, = 26.0

Difference, or **Monthly Range,** = 30.0

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 49.7

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 41.2

Difference, or **Mean Daily Range,** = 8.5

** Calculated **Mean Temperature** of Month, = 45.5

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), = 46.2

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 44.5

‡‡ Computed **Temperature of Dew-Point,** = 42.6

‡‡ Do. **Elastic Force of Vapour,** = 0.274

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** ... = 3.2

‡‡ **Relative Humidity, (Saturation = 100),** = 88.1

RAIN fell on 25 **Days; Amount in Inches,** = 5.24

WIND. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	3	.	4	7	3	4	1	2	7	2.2	
P.M.	2	3	1	7	3	4	3	1	7	2.1	
Mean.	2.5	1.5	2.5	7	3	4	2	1.5	7	2.15	

4.62

Observations made and Return verified by H. C. Cort

(*Signed*)

1075
215
430

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the chief objects that the SCOTTISH METEOROLOGICAL SOCIETY proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is FORTIN'S Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down, viz.: as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, and take down the instrument; it should 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements,—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with Exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principle of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, 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. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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.

Reading of the Thermometer. In reading the Thermometer great care must be taken to bring the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼° and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Verification of Thermometers. No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being re-tested. The Self-Registering, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Nigretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETRIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Guage should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may be noted among the Remarks. The amount of Cloud is entered from a scale of 0 to 10; thus, when the sky overhead is free from Clouds it is entered 0, when half covered by Clouds, 5, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, $\frac{6, \text{S. W.}}{2, \text{W.}}$ 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 speed of the former. Again, in the second Cloud column, an entry of $\frac{4, \text{st.}}{2, \text{cu-st,}}$ 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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, their bulbs being sunk to depths of 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. The paper is affixed by a pin to a board in the Thermometer Box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3\frac{\text{N.W.}}{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general use are given at the foot of the column. Besides special and extraordinary Observations, great prominence ought to be given in this column to Prevalent Diseases, differences in character, colour, velocity, and direction between the Lower and Upper Strata of Clouds, the Colour of the Sky, etc. Remarks ought to be made on the occurrence of Meteors, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. The Council would direct the special attention of Observers to the registration of such phenomena, so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and approved before being used; and they consider it necessary 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, *December 1874.*

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

Thorshavn
Oct 1876

SHIP LETTER

THORSHAVN

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK POST.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Thorshavn*, County of *Faroë Islands*, in Lat. *62°2½'*, Long. *6°43' 8"*, Distance from Sea *50 feet* ~~miles~~.

Height of Cistern of the Barometer above Mean Sea-level *34* feet, above Ground *4* feet. During the MONTH of *November* 187*6*.

The Hours of Observation are *not* of Greenwich Time.

Days of Month	Barometer 9h. A.M. No. 91 (inches)	Attached Thermometer 9h. A.M. (°)	Barometer 9h. P.M. No. 91 (inches)	Attached Thermometer 9h. P.M. (°)	Self-Reg. Therm. Shade Max. No. 7165 (°)	Self-Reg. Therm. Shade Min. No. 3237 (°)	Black Bulb Max. in Sun's rays	Black Bulb Min. on Grass	Hygrometer No. 832 x 829, 9h. A.M. Dry bulb	9h. A.M. Wet bulb	9h. P.M. Dry bulb	9h. P.M. Wet bulb
1	30.000	58.	30.022	59.	50.5	36.			49.6	47.2	45.5	44.
2	29.970	58.	30.038	59.	50.	38.5			47.	44.5	40.5	39.
3	30.116	55.	30.268	62.	43.5	38.			41.	38.8	42.2	40.
4	30.316	60.5	30.282	63.	49.	36.			45.6	42.	43.4	42.
5	30.250	59.5	30.420	60.5	46.	35.			42.	39.5	36.4	34.8
6	30.474	55.5	30.520	61.	43.	31.5			34.	32.2	37.	33.7
7	30.490	52.5	30.514	58.5	41.	31.			35.8	33.	40.	36.6
8	30.476	55.	30.466	61.	42.5	33.5			40.1	36.8	38.6	35.8
9	30.376	53.5	30.368	59.5	40.	33.5			39.	35.8	36.8	35.
10	30.260	52.5	30.188	59.	40.	28.			32.8	31.6	30.2	29.
11	30.050	49.5	30.024	59.	40.	27.			34.4	32.	40.	37.3
12	30.044	54.	30.064	56.	44.	36.5			42.	37.4	41.	36.6
13	30.022	52.	30.004	57.5	43.5	38.			42.4	38.8	41.8	36.2
14	29.950	52.5	29.854	59.5	43.5	38.5			42.	36.6	43.5	38.7
15	29.474	53.	29.440	62.5	48.5	39.			44.	42.8	48.	47.2
16	29.628	63.5	29.750	61.	49.	45.			48.	47.2	47.2	46.8
17	29.754	61.5	29.778	61.	48.5	44.5			47.	46.	48.	47.
18	29.826	58.5	29.790	60.5	49.	44.			47.8	46.3	47.2	46.
19	29.624	61.5	29.646	63.5	48.5	43.5			46.2	44.9	47.	46.
20	29.900	62.	30.102	62.5	47.	40.5			45.	43.2	42.	40.8
21	30.188	58.	30.054	59.	47.	40.			44.	43.	45.2	43.5
22	29.952	58.5	29.780	60.5	48.5	44.5			47.3	45.	47.	46.2
23	29.660	60.5	29.836	63.5	52.	46.5			51.	50.	48.4	46.2
24	29.864	60.	29.884	60.5	49.	43.			46.	42.8	46.8	43.6
25	29.818	60.	29.648	60.	47.	41.			45.8	42.	42.8	41.
26	29.500	57.	29.332	61.5	45.	39.			41.2	39.8	42.2	39.2
27	29.454	59	29.540	57.5	42.5	32.5			37.8	36.	34.2	31.7
28	29.528	53.5	29.400	59.5	37.	28.5			31.4	29.8	36.8	34.8
29	29.474	54.5	29.640	62.5	43.	35.			39.	36.9	41.4	39.2
30	29.784	58	29.848	58	43.5	36.			41.1	37.2	38.	36.2
31												
Sums.	898.222	1707.0	898.500	1808.0	1361.5	1123.5			1270.3	1199.1	1259.1	1194.1
Means.	29.941	56.9	29.950	60.3	45.4	37.4			42.3	40.	42.	39.8
† Total Corrections for Instrumental Errors.												
‡ Corrections for Diurnal Range.												
"Corrected Means."												
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12

Days of Month	Wind 9h. A.M. Direction	Force	Wind 9h. P.M. Direction	Force	H.Cup Anemometer 9h. A.M.	Rain No. of hours	Rain Amount in inches No. 78	Clouds 9 A.M. Velocity	Clouds 9 A.M. Amount	Clouds P.M. Velocity	Clouds P.M. Amount	Sunshine Hours	Ground 3 inches	12 inches	22 inches	Well	Sea No. 831 Temp. at 1 fathom	Ozone 9 A.M.	Ozone 9 P.M.	General Remarks
1	NW	4	NW	1.5			0.99					—					47.6			
2	NW	1	E	2			0.18					2					47.8			
3	E	2	Calm	0.			0.025					—					46.4			
4	Calm	0	Calm	0.			—					5					47.3			
5	N	2.	NE	2			0.04					5								
6	N	0.5	N	0.5			—					6								
7	Calm	0.	NE	1.			—					—					46.8			
8	E	2	E	2			0.065					—					46.5			Snow. hail
9	SE	2	SW	1.5			0.16					—					45.6			do. do
10	NW	1	Calm	0.			—					2.					46.5			Aur. bor.
11	E.	1.	NE	3			0.065					—					46.5			Snow. hail
12	E.	3	E	4.			0.01					3								Rain. hail
13	SE	3	SE	3			0.015					3					45.5			
14	SE	4	SE	5			—					—					45.5			
15	E	4	Calm	0			0.465					—								fog x rain
16	Calm	0	SE	2			0.21					—					46.8			fog
17	SE	4	SE	3			0.33					—					46.7			fog
18	SE	2	SE	2			0.07					3					47.			
19	SE	4	E	0.5			0.61					—								fog x rain
20	N	0.5	NE	1.5			0.05					—					47.			
21	SE	2	S	2			0.04					—					46.			
22	S.	2	S	5.			0.27					—								
23	S	4	SW	2.			0.66					—								fog x rain
24	SE	2	SE	3			—					—					46.8			
25	SE	4	SE	3			0.075					—					46.5			
26	NE	3	N	3			0.19					—								
27	N	3	N	3			0.08					—								
28	N	1.5	N	1.5			0.01					4								Snow
29	E	1	NE	0.5			0.11					—								
30	NE	2	NE	3.			0.23					—					46.			
31																				
Sums.		64.		60.5			4.95					33.					884.8			
Means.		2.1		2.0													46.6			
† Total Corrections for Instrumental Errors.																	÷0.2			
‡ Corrections for Diurnal Range.																				
"Corrected Means."																	46.4			
No. of Column.	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		

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.*

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.		s. ,, sleet.	
h.-fr. ,, hoar-frost.		s. ,, 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†† for Temp. (Col. 2), = 29.941 — 0.076 = 29.865

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction†† for Temp. (Col. 4), = 29.950 — 0.085 = 29.865

Mean at Station, corrected, and at 32°, = 29.865

Correction for height, 34 feet above Mean Sea-level, = .038

Mean, reduced to 32°, and Sea-level, = 29.903

Highest Reading, corrected for Index error, on the 6 th, p.m. = 30.520

Lowest Do. Do., on the 26 th, p.m. = 29.332

Difference, or **Monthly Range,** = 1.188

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 23 th, = 52

Lowest in Month, corrected for Index errors, on the 11 th, = 27

Difference, or **Monthly Range,** = 25

"Corrected **Mean" of all the Highest,** (Col. 5), = 45.4

"Corrected **Mean" of all the Lowest,** (Col. 6), = 37.4

Difference, or **Mean Daily Range,** = 8.0

** Calculated **Mean Temperature** of Month, = 41.4

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

"Corrected **Mean,"** (Col. 7), **of Black Bulb, Max. in Sun,** =

Lowest at Night, Black Bulb, (corrected for Index errors), on the th, =

"Corrected **Mean,"** (Col. 8), **of Black Bulb, Min.** on grass, =

Difference of above Means or Range ("exposed"), =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** (Cols. 9 and 11), = 42.1

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 39.9

‡‡ Computed **Temperature of Dew-Point,** = 37.2

‡‡ Do. **Elastic Force of Vapour,** = 0.222

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 2.6

‡‡ **Relative Humidity, (Saturation = 100),** = 83.6

RAIN fell on 24 **Days; Amount in Inches,** = 4.95

WIND. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	5	2	6	9	2	"	"	3	3	2.1	
P.M.	4	6	4	7	2	2	"	1	4	2.0	
Mean.	4.5	4.	5.	8	2	1	"	2	3.5	2.05	

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* 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.*

Observations made and Return verified by H. C. Öst

(Signed)

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

One of the chief objects that the Scottish Meteorological Society proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is Fortin's Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down, viz.: as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, and take down the instrument; it should 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements,—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with Exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principle of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, 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. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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.

Reading of the Thermometer. In reading the Thermometer great care must be taken to bring the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read —39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40¼°, and 40¾°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Verification of Thermometers. No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being re-tested. The Self-Registering, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Nigretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called STORM STATIONS, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to BAROMETRIC GRADIENTS, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Guage should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base us they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rain-fall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may be noted among the Remarks. The amount of Cloud is entered from a scale of 0 to 10; thus, when the sky overhead is free from Clouds it is entered 0, when half covered by Clouds, 5, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, $\frac{6,\ S.\ W.}{2,\ W.}$ 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 speed of the former. Again, in the second Cloud column, an entry of $\frac{4,\ st.}{2,\ cu\text{-}st,}$ 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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, their bulbs being sunk to depths of 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. The paper is affixed by a pin to a board in the Thermometer Box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{N.W.}_{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—5 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general use are given at the foot of the column. Besides special and extraordinary Observations, great prominence ought to be given in this column to Prevalent Diseases, differences in character, colour, velocity, and direction between the Lower and Upper Strata of Clouds, the Colour of the Sky, etc. Remarks ought to be made on the occurrence of Meteors, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. The Council would direct the special attention of Observers to the registration of such phenomena, so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and approved before being used; and they consider it necessary 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, *December* 1874.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds First appear.	In Leaf.	Divested of Leaves.
Alder,				
Ash,				
Beech,				
Birch,				
Elm,				
Larch,				
Lime,				
Oak,				
Sycamore or Plane,				

CROPS, mentioning variety.	Sowing or Planting.	Appearing above Ground.	In Ear or Flower.	First Cut or Raised.
Barley,				
Bere or Bigg,				
Oats,				
Wheat,				
Beans,				
Pease,				
Potatoes,				
Turnips,				
Rye Grass,				

SHRUBS, ETC.	First in Blossom.
Barberry,	
Bourtree or Elder,	
Broom,	
Hazel,	
Hawthorn,	
Holly,	
Laburnum,	
Lilac,	
Mezereon,	
Mountain Ash or Rowan,	
Red Flowering Currant,	
Rhododendron Ponticum,	
Whin,	

FRUITS.	First in Blossom.	Fruit Ripe generally.
Apple,		
Black Currant,		
Cherry,		
Gean,		
Gooseberry,		
Peach,		
Pear,		
Plum,		
Strawberry,		

MIGRATORY BIRDS.	First Arrival.	Departure.
Cuckoo,		
Curlew,		
House-Swallow,		
Lapwing,		
Plover,		
Sand-Martin,		
Starling,		
Swan,		
Rail or Corn Crake,		

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

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK POST.

3K EDINBURGH DE 11 76

Thorshavn Nov. 1876

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at *Thorshavn*, County of *Faroë Islands*, in Lat. *62°2'½'*, Long. *6°43'8"*, Distance from Sea *50 feet* ~~miles~~.

Height of Cistern of the Barometer above Mean Sea-level *34* feet, above Ground *4* feet. During the MONTH of *December* 187*6* *(1876)*

The Hours of Observation are *not* of Greenwich Time.

Electricity	Days of Month	Barometer 9 h. A.M. Barometer * No. 91 (inches)	9 h. A.M. Attached Thermometer (°)	Barometer 9 h. P.M. Barometer No. 91 (inches)	9 h. P.M. Attached Thermometer (°)	Self-Registering Thermometers, Read Daily, at 9 P.M. Protected in Shade, 4 feet above Ground: Max. No. 7165 (°)	Min. No. 3237 (°)	Exposed Black Bulbs: Max. in Sun's rays No.— (°)	Min. on Grass No.— (°)	Hygrometer No. 832 & 829, 9 h. A.M. Dry bulb (°)	9 h. A.M. Wet bulb (°)	9 h. P.M. Dry bulb (°)	9 h. P.M. Wet bulb (°)	Wind 9 h. A.M. Direction	Force	Wind 9 h. P.M. Direction	Force	Readings of the H.Cup Anemometer No.— 9 h. A.M.	Rain: No. of hours in which it fell	Rain: Amount in inches, No. 78	Clouds 9 A.M.: Velocity (0—6), and Direction	Amount (0—10), and Species	Clouds — P.M.: Velocity (0—6), and Direction	Amount (0—10), and Species	Sunshine: Hours	Thermometers under Ground, 9 h. A.M.: No.— 3 inches (°)	— 12 inches (°)	No.— 22 inches (°)	Temperature of Well at depth of — feet. No. — (°)	Sea: Temperature at 1 fathom, and Density, No. 831 (°)	Ozone 0—10: 9 A.M.	9 P.M.	General Remarks	Days of Month
	1	29.804	53.	29.844	62.5	41.	35.	29.8	"	39.8	36.	40.	37.	NE	3.	NE	3.			0.07					—					46.				1
	2	29.884	55.5	29.886	60.	40.5	34.			36.8	34.2	37.	35.2	NE	2	NE	3.			0.07					—								rain & hail	2
	3	29.604	55.5	29.254	54.	43.	35.			39.3	36.5	42.8	38.4	E	3	SE	5			0.06					—									3
	4	28.940	50.	28.896.	57.5	43.5	38.5			42.	40.5	42.2	40.	SE	5.	SE	4			0.21					—									4
	5	28.794	55.5	28.804	59.	44.	39.5			42.7	40.1	42.	40.2	SE	4	SE	2			0.28					—									5
	6	28.856	58.5	28.794	59.5	47.	40.			45.5	44.	45.	43.2	SE	3	SE	5			0.26					—									6
	7	28.808	58.5	29.168	61.5	47.	40.5			44.2	43.1	47.	44.	S.	0.5	SW.	3			0.26					—					46.				7
	8	29.326	55.5	29.380	59.5	47.	38.			44.7	42.1	44.	40.	SW	3.	W	4			0.46					3					45.7				8
	9	29.556	54.5	29.790	60.	45.	38.			43.	38	42.	39	NW	4	Calm	0.			0.12					3					45.7				9
	10	29.828	56.	29.740	61.	48.	36.			44.	43.	47.	46.4	Calm	0	S.	2			0.12					—								fog	10
	11	29.630	60.5	29.512	61.5	48.5	42.			47.x	46.	46.3	45.5	S.	4	SE	3			0.52					—					46.2				11
	12	29.164	58.	29.330	62.	47.	40.			45.8	44.8	43.	40.5	SE	4	SW	2			0.22					—					46.				12
	13	29.520	59.	29.680	62.	46	33.			35.	34.	45.	42.5	Calm	0.	SE	2.			0.10					3.					46.				13
	14	29.702	61.5	29.736	61.	48.	40.5			46.2	44.	42.	40.5	SE	3.	Calm	0.			0.15					—					46.2				14
	15	29.826	59.5	29.890	61.5	47.	40.			44.	42.2	45.5	43.	SE	1.5	SE	3.			0.04					—									15
	16	30.008	58.	30.052	58.5	47.	40.			43.5	40.2	41.8	38.8	SE	4.	SE	4.			0.09					—					46.				16
	17	30.022	55.5	29.958	59.5	44.	39.			42.	38.	42.	37.	SE	4.	SE	4.			0.02					—					45.				17
	18	29.830	51.5	29.708	59.	43.	35.			39.8	37.	39.	36.5	E.	3	E	2			0.08					2					44.5				18
	19	29.644	53.	29.664	61.	41.	34.5			39.	35.	36.	32.	NE	3	NE	4.			0.07					—					43.2			rain & hail	19
	20	29.650	55.	29.782	58.	41.	31.			35.2	32	35.	31.5	NE	3	NE	5.			0.13					—					42.8			Snow & hail	20
	21	29.624	51.5	29.628	61.	37.	25			29.5	29.	28.	27.	NE	3	NE	3			0.22					—								do & do	21
	22	29.628	55.	29.632	62.5	35.5	25.			32.	31.	33.	32.5	NE	4	E	3			0.53					—					41.4			do & do	22
	23	29.664	55.	29.762	60.	37.	31.			35.	33.8	35.	32.5	E	4.	E	3			0.28					—					41.4			Snow. rain & hail	23
	24	29.876	51	30.076	61.	40.	33.			37.	33.5	38.5	35.2	SE	3	SE	2			0.04					—					42.2			Snow & hail	24
	25	30.136	58	30.140	59.5	40.5	34.			38.	36.	35.2	32.8	SE	1	Calm	0.			—					—					43.2				25
	26	30.054	56.5	29.872	57.5	41.	34.			38.	36.5	40.	36.8	S.	1	SE	4			0.05					—								rain & hail	26
	27	29.520	51.	29.370	59.5	41.5	33.			39.4	38.	37.1	36.	SE	4	Calm	0			0.15					—									27
	28	29.334	55.5	29.370	63.5	38.5	30.			36.2	35.	31.4	30.4	Calm	0.	Calm	0.			—					—					44.5				28
	29	29.580	57.5	29.604	58.	38.	30.			37.	35.6	34.5	32.5	N	0.5	NE	1.			—					—					44.2				29
	30	29.562	53.5	29.470	59.5	38.	32.5			36.8	34.8	35.2	34.	NE	1.5	NE	4			0.16					—								Snow & rain	30
	31	29.384	51.5	29.398	59.	36.	25.			30.2	29.5	27.	24.	NE	3.	NE	3.			0.60					—								Snow & hail	31
Sums.		916.758	1720.0	917.190	1859.5	1321.5	1082.0			1228.6	1163.4	1219.5	1144.9		82		83			5.36					11.					846.2				
Means.		29.573	55.5	29.587	60.	42.6	34.9			39.6	37.5	39.3	36.9		2.6		2.7													44.5				
† Total Corrections for Instrumental Errors.																														÷0.2				
‡ Corrections for Diurnal Range.																																		
"Corrected Means."																														44.3				
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		

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.*

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.	s.	,,	sleet.
h.-fr.	,,	hoar-frost.	s.	,,	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 †† for Temp. (Col. 2), = 29.573 — 0.071 = 29.502

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.587 — 0.083 = 29.504

Mean at Station, corrected, and at 32°, = 29.503

Correction for height, 34 feet above Mean Sea-level, = .038

Mean, reduced to 32°, and Sea-level, = 29.541

Highest Reading, corrected for Index error, on the 25th, p.m. = ~~48.5~~ 30.140

Lowest Do. Do., on the 6 th, p.m. (& 5th a.m.) = 28.794

Difference, or **Monthly Range,** = 1.346

* 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 11 th, = 48.5

Lowest in Month, corrected for Index errors, on the 21 th, 22th & 31th = 25.

Difference, or **Monthly Range,** = 23.5

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 42.6

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 34.9

Difference, or **Mean Daily Range,** = 7.7

** Calculated **Mean Temperature** of Month, = 38.7

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), = 39.5

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** (Cols. 10 and 12), = 37.2

‡‡ Computed **Temperature of Dew-Point,** = 34.2

‡‡ Do. **Elastic Force of Vapour,** = 0.198

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 2.3

‡‡ **Relative Humidity, (Saturation = 100),** = 81.6

RAIN fell on 28 **Days; Amount in Inches,** = 5.36

WIND. SUMMARY.

Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	1	8	3	11	3	1	"	1	3	2.6	
P.M.	"	8	3	11	1	2	1	"	5	2.7	
Mean.	0.5	8.	3	11.	2.	1.5	0.5	0.5	4.	2.65	

7.02

Observations made and Return verified by H. E. Høst

(Signed)

1325
1590
530
7.02

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

One of the chief objects that the Scottish Meteorological Society proposed to itself when the Society was established in 1855, was to secure PERFECT UNIFORMITY in the system of observation pursued at all its stations. Uniformity in the observations is absolutely necessary to justify the publication of Monthly Results from different observations, it being found that differences between the Returns from 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 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 A.M. and 9 P.M. (Greenwich or Railway Time only), as specified in the following remarks, or at the top of the columns 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 the time at which it was taken, if not at 9 A.M. or 9 P.M.

Barometer. Weather-Glasses and Aneroids, though well suited to indicate roughly variations of atmospheric pressure, are not fitted for scientific purposes. No Barometer should be used for Meteorological Observation that is not supplied with some means of adjustment or compensation which will secure that the height of the mercury in the tube is accurately measured from the fluctuating surface of the mercury in the cistern.

The Barometer in which the error arising from the fluctuating surface of the mercury in the cistern is entirely got rid of is Fortin's Barometer, the arrangement consisting in applying pressure by means of a screw to the bottom of the cistern, which is made of flexible leather, thus raising or depressing the surface till it just meets the ivory point which forms the zero point of the fixed scale.

The Barometer originally constructed by Mr Adie of London, and usually called the Board of Trade Barometer, has 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 is an excellent Barometer for ordinary Observers, inasmuch as it entirely eliminates the error of observation likely to arise in not a few cases in setting the instrument to the zero point of the fixed scale when the light is not good. To show the accuracy with which these Barometers are made, it may be stated, that one was compared, during a whole year, with the Society's Standard Barometer, particular care being given to make the comparison when atmospheric pressure was rising or falling very rapidly, with the result that none of the readings differed from those of the Standard more than 0·003 inch.

A modification of Fortin's Barometer is used at a number of the Society's Stations, by which the coincidence of the zero point with the surface of the mercury is 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.

It is absolutely necessary that the Barometer which is to be used, shall have been compared with a Standard Barometer.

The Barometer should be suspended in as good a light as can be secured, and to facilitate the reading, a piece of white paper may be put behind the tube. It must be hung truly perpendicular, and exposed to neither the sun's direct rays nor the heat of a fire, and must not be hung against a wall heated by a flue. The object being to secure that the whole instrument, including the brass fittings, the contained mercury, and the attached Thermometer, shall be, when read, at one uniform temperature, it is evident that the best position is that which is least liable to sudden changes of temperature.

In taking an Observation, the Attached Thermometer is first noted: the tube must then be gently tapped, and the cistern-adjustment carefully made. The eye, by raising and lowering 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 so as 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 facilitate an accurate adjustment and reading of the Barometer. A mistake not unfrequently made by those beginning to observe, consisting in setting the edge of the vernier to the level of the clear surface of the mercury which is in direct contact with the glass tube, must be carefully avoided.

The errors most frequently made in reading the Barometer are errors of 1·000 inch, 0·500 inch, and 0·050 inch; that is to say, instead of 29·365 inches, either of the following is sometimes set down, viz.: as 30·365 inches, 28·365 inches, 29·865 inches, or 29·815 inches. Experience having shown that even the very best Observers make these mistakes, particular attention is directed to the matter.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must first be screwed so as to form a tight plug to the cistern, thus preventing the escape of the mercury. Then screw up the mercury not quite to the top of the tube, but to within a quarter of an inch of it, and take down the instrument; it should 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 if, on inclining the instrument, a sharp tap is produced when the mercury strikes the top of the tube. If a dull tap is heard, there is air in the tube, which must be got rid of.

As Barometers are liable to be deranged by the introduction of air into their tubes, on removal from place to place, or in being roughly handled, it may be useful to Observers to know how the air may be expelled. First close up the cistern by screwing the ivory peg tight, so as to prevent the escape of mercury; then screw up the mercury to about half an inch from the top of the tube; and having slowly inverted the instrument, place the top of it on a yielding substance, such as the boot, and gently tap on the cistern with the palm of the hand, so as to induce the air to ascend through the column to the cistern, whence it may escape. Since there is the weight of two atmospheres—the pressure of the mercury in the Barometer, and the air outside—pressing on any air that may be inside the tube, it is usually a tedious operation to get it wholly expelled. After repeated trials, however, it is generally accomplished; and the clear metallic sound of the mercury, when gently struck against the top of the glass tube, will show when the whole of the air has been expelled. On hanging up the Barometer, care must be taken to screw down the mercury in the tube before unfastening the float of the cistern, for if this be not attended to, the mercury will flow out, and the instrument be seriously damaged.

Protection and Position of Thermometers. The Council of the Society recommend that the Self-Registering Thermometers, and the Dry and Wet Bulb Hygrometer, be kept in Stevenson's Louvre-boarded Box for Thermometers, painted white inside and outside, and screwed to four stout posts, also painted white, firmly fixed in the ground. The posts must be of such a length that when the Thermometers are hung in position the Bulbs of the Minimum Thermometer, and of the Dry and Wet Bulb Thermometers, will be exactly at the same height of FOUR FEET above the ground, the Maximum Thermometer being hung immediately above the Minimum Thermometer. The Thermometer Box is to be placed over a plot of grass, and in a free open space to which the sun's rays have free access during as much of the day as surrounding conditions enable the Observer to secure. The Thermometers are suspended on cross-laths in the centre of the Box, and face the door, which should open to the north.

The Council regard the question of UNIFORMITY OF HEIGHT ABOVE GROUND, AND METHOD IN PROTECTING THE THERMOMETERS, as vital in every system of Meteorological Observation, since without it Observations made at different Stations are incomparable, thus rendering it impossible to compare the Climates of places with each other as regards their most important features.

Self-Registering Thermometers. Professor Phillip's, and Negretti and Zambra's Maximum Thermometers, and Rutherford's Minimum Thermometer are recommended. It is recommended that these Thermometers be graduated on the glass stem. The Minimum Thermometer is liable to two derangements,—viz., the column of spirit breaking, and part of the spirit distilling by high temperature and lodging at the top of the tube. This derangement is of occasional occurrence with Protected Thermometers, but of frequent occurrence with Exposed Thermometers. Hence a systematic examination of Minimum Thermometers ought to be a regular part of the work carried on by each Observer.

Fortunately, Spirit Thermometers may be easily set right by any one, when the column of spirit chances to separate. Let the Thermometer be taken in the hand by the end farthest from the bulb, raised above the head, and then forcibly swung down towards the feet; the object being, on the principle of centrifugal force, to send down the detached portion of spirit till it unites with the column. A few throws, or swinging strokes, will generally be sufficient for the purpose; after which the Thermometer should be placed in a slanting position, to allow the rest of the spirit still adhering to the sides of the tube to drain down to the column. But another method must be adopted, if the portion of spirit in the top of the tube be small. Heat should be applied slowly and cautiously to the top end of the tube where the detached portion of spirit is, which, being turned into vapour by the heat, will condense on the surface of the unbroken column of spirit. Care must be taken that the heat is not applied too quickly; for if this be done, the tube will break and the instrument be destroyed. The best way to apply the requisite amount of heat, is by bringing the end of the tube slowly down towards a minute flame from a gas-burner; or if gas be not at hand, a piece of heated metal will serve instead.

Black-Bulb Thermometers. The bulbs of the Thermometers for registering the greatest heat from the sun's rays, and the least from radiation during night, 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. Black-bulbs enclosed in 'glass jackets' may also be used, being indeed preferable to the above. It must, however, be added, that the whole subject of the observation of Solar and Terrestrial Radiation is not yet in a sufficiently advanced state to warrant the exclusive recommendation of any one of these methods.

Dry and Wet Bulb Hygrometer. The Hygrometer in use at the Society's Stations consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved form of this apparatus seriously vitiate the Hygrometrical Observations, 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 altogether placed to the side, and a little below the level of the wet bulb, but 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.

Reading of the Thermometer. In reading the Thermometer great care must be taken to bring the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read −39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or $40\frac{1}{2}$°, respectively. So also $40\frac{1}{4}$°, and $40\frac{3}{4}$°, more or less must be registered 40°.2, or 40°.3, and 40°.7 or 40°.8 respectively. In reading Rutherford's Minimum Thermometer, the indication of that end of the index which is next the surface of the spirit is alone noted. On opening the Thermometer Box, the Dry and Wet Bulb Thermometers are to be first, and rapidly, read, inasmuch as they are 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 3d are those of a series of phenomena commencing at 9 P.M. on the 2d, and extending till 9 P.M. on the 3d.

Verification of Thermometers. No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a Standard Thermometer. When such Thermometers as are not graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being re-tested. The Self-Registering, 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.

In selecting instruments, the following points require attention:—The divisions of the vernier of Barometers in reference to their scales, and the perfect freedom of the Barometer from air; the correct numbering of the scale of every instrument; the rejection of Thermometers, the frameworks of which are not likely to stand exposure to the weather, as shown in the past by repeated and annoying breakages of Thermometers of similar construction; and as regards Maximum Thermometers, either Nigretti and Zambra's, or Phillip's, whether they will act at the highest temperatures they may be required to register. By the laws of the Society, Members and Observers have a right to have their instruments compared by the Secretary, and to advise with him regarding the purchase of instruments.

Wind. Very great care should be bestowed on the Observations of the Wind, the accuracy of which, both as regards Direction and Force, is so essential towards the right discussion of many of the more important problems of the science.

1. As regards Direction. A Wind-Vane ought to be elevated at least 12 feet above surrounding objects. When it oscillates incessantly, the mean direction should be taken. In all cases, but especially when the Vane is stationary, and when the wind is feeble, reference may be made to the direction of smoke, etc., in well-exposed situations. Careful observations are recommended to be made on the changes in the direction of the wind; and during storms, extra observations at every hour of Greenwich time. Such a system of simultaneous observation, pursued at different Stations, is likely to give highly valuable and important results, particularly in connection with the system of thickly-planted Stations over a limited district round Edinburgh called Storm Stations, in the course of being established by the Society for the systematic investigation of the relation of the force of the wind to Barometric Gradients, and other points connected with storms.

2. As regards Velocity and Pressure. The Council would recommend the Hemispherical-Cup Anemometer,—a self-registering instrument which shows the amount of Wind that passes it per day; from which also the mean Velocity of the Wind at the time of observation may be ascertained. For indicating the Force of the Wind at any particular hour of observation, the Pressure Anemometers recently brought under the notice of the Society by Mr T. Stevenson, the Honorary Secretary, and Mr R. Ballingall, the Society's Observer at Eallabus, are recommended as likely to secure uniformity in making observations on the Force of the Wind.

Rain Gauges. Many causes conspire to produce anomalies in Rain Returns, arising partly from the difficulty of obtaining a perfectly unobjectionable situation for observation, and partly from the defective nature of the instruments used. The Rain-Guage should not be placed on a slope or terrace, but on a level piece of ground, in as open a situation as the Observer can secure for it. As it is often difficult to obtain a position as free and unobstructed by surrounding objects as is desirable, care should be taken to place it at some distance from shrubs, trees, buildings, or other obstructions, at least as many feet from their base as they are in height. The more important directions, towards which it is most desirable to have a free exposure, are in the order of their importance, S.W., N.E., S.E., S., and W. The rim of the Gauge must be perfectly level, and fixed so that it will remain level in all weathers, and be at a height of one foot above ground, over grass. In such gauges as Fleming's, which are furnished with a measuring rod attached to a float, the rod ought to be fixed down, and the float rise to its height only at the time the instrument is read, it being found that a stem projecting above the rim of the gauge seriously interferes with the proper measurement of the Rainfall. When a measuring glass is used, care should be taken to hold it quite perpendicular. The Rain Gauge ought to be read daily at 9 A.M., and the reading entered in the Returns of the previous day. If the Gauge is read once a month, the reading is to be made on the first of the month, and the amount entered for the previous month.

Snow-falls. Snow-falls may, for convenience, be registered in the rain columns, under the following conditions:—When a Snow shower occurs, it should 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 the nomenclature of Clouds will be found on the other side. The amount of Cloud 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 may be noted among the Remarks. The amount of Cloud is entered from a scale of 0 to 10; thus, when the sky overhead is free from Clouds it is entered 0, when half covered by Clouds, 5, wholly covered, 10, 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:—Thus, in the column Velocity and Direction, $\frac{6, \text{S. W.}}{2, \text{W.}}$ 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 speed of the former. Again, in the second Cloud column, an entry of $\frac{4, \text{st.}}{2, \text{cu-st,}}$ 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.

Remarks on peculiar Clouds, accompanied with drawings, will assist materially in the development of a more exact nomenclature of Clouds, as well as throw light on the electrical, and other of the more obscure phenomena of Meteorology.

Sunshine. The approximate 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 growth of crops and plants generally, depend greatly 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 permanently fixed in the soil, their bulbs being sunk to depths of 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.

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 most important branch of Meteorology. The Council therefore recommend that the Temperature of the Sea be carefully taken by a properly constructed apparatus, from boats, or if this be impracticable, from the ends of piers and rocks round the coast, where it is not influenced by that of river water, and as little influenced as possible by currents sweeping along the coast, and thus acquiring the temperature of the land, either greatly heated by the sun or cooled by nocturnal radiation. At or near the time of high water, in cases where the observations cannot be taken daily, the observation may be made on the 5th, 15th, and 25th of each month. 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. It is also very desirable that observations on the daily Maxima and Minima by Thermometers continuously immersed, be instituted at points along the coast, by the method proposed by Mr T. Stevenson, and already commenced at Peterhead and Liverpool.

Temperature of Wells. The Temperature of the water at the bottom of Wells ought, when practicable, to be taken, both the depth of the Well and of the water being noted.

Ozone. Mention what Test-Papers are used, Schönbein's or Moffat's, etc. The paper is affixed by a pin to a board in the Thermometer Box, and the indications registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3\frac{\text{N.W.}}{4}$, as an Ozone entry in the schedule, will indicate that the Ozone paper is tinted as 3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4, or blowing fresh.

Atmospheric Electricity. Too much importance cannot be attached to the electric condition of the atmosphere in connection with terrestrial magnetism, barometrical, thermometrical, and meteorological phenomena generally. A proper Electrometer is, in truth, necessary to every complete meteorological observatory.

Remarks. The Remarks column is unavoidably too narrow. 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 in general use are given at the foot of the column. Besides special and extraordinary Observations, great prominence ought to be given in this column to Prevalent Diseases, differences in character, colour, velocity, and direction between the Lower and Upper Strata of Clouds, the Colour of the Sky, etc. Remarks ought to be made on the occurrence of Meteors, Auroræ Boreales, remarkable depressions, elevations, and fluctuations of the Barometer, Thunder-Storms, and remarkable falls of Snow, Hail, or Rain, the Hour of Storms of Wind commencing, attaining their maximum, and ending, as well as such notes on Storms as have been hinted at above. When lofty hills are in the vicinity of a Station, the Height of Clouds and of the Snow-line in winter should be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. should be registered, either in two columns, otherwise unoccupied, or ruled off for the purpose, from the column of "Remarks."

Observations in connection with the Periodic Return of the Seasons. Observations in connection with the Periodic Return of the Seasons, possess not only great scientific value, but are of considerable importance in connection with Agriculture, Horticulture, and Natural History. The Council would direct the special attention of Observers to the registration of such phenomena, so that the published Summaries may fairly represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm. The Annual Table, published yearly in the Society's Journal, will indicate the species of plants and animals to which special attention is more particularly directed.

The Council recommend Observers, before purchasing new instruments, and in repairing old ones, to communicate with the Meteorological Secretary, in order that every instrument may be examined and approved before being used; and they consider it necessary 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, *December 1874*.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

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

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

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

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

BOOK POST.

LEITH AP 3 77

[illegible] Dec 1876