SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inverness, County of _____, in Lat. _____, Long. _____, Distance from Sea _____ miles.

Height of Cistern of the Barometer above Mean Sea-level _____ feet, above Ground _____ feet. During the MONTH of January 1862.

The Hours of Observation are of Greenwich Time.

Days of Month	BAROMETER. 9 h. A.M. Barometer. * No. ____ (inches.)	9 h. A.M. Attached Thermometer (°)	9 h. P.M. Barometer. No. ____ (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. ____ (°)	Min. No. ____ (°)	Exposed Black Bulbs. Max. in Sun's rays No. ____ (°)	Min. on Grass No. ____ (°)	HYGROMETER. No. ____ 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.	9 h. P.M.	RAIN. No. of hours in which it fell.	Amount in inches. No. ____	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. (°)	No. ____ 12 inches. (°)	No. ____ 22 inches. (°)	Temperature of WELL at Depth of ____ feet. No. ____ (°)	SEA. Temperature at Inflection, 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	30.42	44	30.43	56	38	35			36	—	35	—	SE	—	SE	—				—	—														1
2	30.36	51	30.22	58	40	34			36	—	38	—	SSW	1	SW	1				.12	—														2
3	30.00	40	29.85	40	44	33			37	—	40	—	SW	1	SW	1				.16	2														3
4	29.70	41	29.70	49	40	33			36	33	37	35	SW	1	NW	1				—	3														4
5	29.76	43	29.90	48	39	31			35	30	32	30	NW	1	NW	1				—	4														5
6	29.96	43	29.94	48	40	34			34	31	38	36	NW	1	NW	1				—	4														6
7	29.88	50	29.65	50	45	36			38	31	41	39	W	1	SW	1				—	5														7
8	29.34	50	29.37	52	48	37			40	36	39	36	SW	—	SW	3				.10	2														8
9	29.16	51	29.20	54	54	38			40	38	44	41	SW	3	SW	3				.18	½														9
10	29.30	51	29.50	53	42	35			40	37	40	37	W	3	NW	3				.20	½														10
11	29.10	53	29.50	50	42	31			36	35	38	35	WNW	1	WNW	1				.63	½														11
12	29.56	50	29.62	49	44	35			36	34½	36	34	SW	1	W	1				.10	—														12
13	29.70	48	29.54	50	40	34			36	35	37	34	W	—	W	—				—	2														13
14	29.64	48	29.83	50	39	32			35	34	37	35	W	—	W	1				.10	—														14
15	29.87	48	29.85	50	40	33			34	33	38	35½	W	—	SE	1				—	—														15
16	29.80	48	29.78	50	40	34			35	34	38	35	SSE	1	SSE	3				.26	—														16
17	29.84	48	29.95	50	39	29			34	33	35	31	SSE	1	SSE	1				—	—														17
18	29.90	46	29.74	48	36	28			31	30	34	32	S	—	SE	1				—	2														18
19	29.73	45	29.73	46	32	27			30	29	30	27½	S	1	ESE	1				—	—														19
20	29.72	45	29.70	46	34	31			29	28	34	31½	ESE	1	SSE	1				—	—														20
21	29.60	45	29.52	46	35	32			33	31	33	30½	E	1	E	1				—	—														21
22	29.45	45	29.27	48	40	35			35	33	36	34	E	1	E	2				.02	—														22
23	29.40	46	29.32	48	43	37			40	38	37	35	ESE	2	SSE	2				.10	—														23
24	29.10	50	28.87	51	45	37	1		38	36	43	41	SSE	1	SE	1				.24	1½														24
25	29.50	48	29.80	48	44	34	1		39	36	35	34	ESE	1	SE	1					—														25
26	30.00	50	30.02	51	45	35			37	36	42	40	S	1	SW	1					3														26
27	29.95	51	29.79	52	47	39			45	44	44	43	S	1	SSE	3					4														27
28	29.50	51	29.40	53	48	41			42	40	46	44	SSE	3	SE	2					2														28
29	29.40	52	29.44	53	47	41			44	41	43	41	S	2	S	1					—														29
30	29.45	51	29.46	53	48	40			43	40	41	39	SW	1	SW	1					—														30
31	29.40	56	29.58	64	49	41			46	43	43	41	SW	1	SW	1				.46	—														31
Sums.	2049	247	2047		70	142			201	195	231	167		33		42				2·67															
Means.	29·661	47·7	29·660	50·0	42·3	34·6			37·2	35·0	38·2	36·0		1·1		1·4																			
† Total Corrections for Instrumental Errors.																																			
‡ Corrections for Diurnal Range.																																			
"Corrected Means."																																			
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.		m.	*denotes* meteor.	
ci.	„	cirrus.	ms.	„	meteors.
ci.-cu.	„	cirro-cumulus.	n.	„	nimbus.
ci.-s.	„	cirro-stratus.	r.	„	rain.
cu.	„	cumulus.	h. r.	„	heavy rain.
cu.-s.	„	cumulo-stratus.	c. h. r.	„	continued heavy rain.
d.	„	dew.	s.	„	stratus.
f.	„	fog.	sc.	„	scud.
fr.	„	frost.	sl.	„	sleet.
h.-fr.	„	hoar-frost.	sn.	„	snow.
h.	„	haze.	so. ha.	„	solar halo.
h. d.	„	heavy dew.	sq.	„	squall.
hl.	„	hail.	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), = 29.661 − 0.51 } = 29.610

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction ††) for Temp. (Col. 4), = 29.660 − 0.57 } = 29.603

Mean at Station, corrected, and at 32°, ... = 29.606

Correction for Height, feet, above Mean Sea-level, ... = 101

Mean, reduced to 32°, and Sea-level, ... = 29.707

Highest Reading, corrected for Index error, on the 1st, ... = 30.430

Lowest Do., Do., on the 24th, ... = 28.870

Difference, or **Monthly Range,** ..... = 1.560

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 9th, ... = 54.0

Lowest in Month, corrected for Index errors, on the 19th, ... = 27.0

Difference, or **Monthly Range,** ..... = 27.0

"Corrected **Mean**" **of all the Highest,** (Col. 5), ... = 42.3

"Corrected **Mean**" **of all the Lowest,** (Col, 6), ... = 34.6

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

** Calculated **Mean Temperature** of Month, ... = 38.4

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,** ..... = 37.7

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** ..... = 35.5

‡‡ Computed **Temperature of Dew-point,** ..... = 32.5

‡‡ Do. **Elastic Force of Vapour,** ..... = .185

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

‡‡ **Relative Humidity, (Saturation** = 100), ... = 82.

RAIN fell on 13 **Days; Amount in Inches,** ..... = 2.67

WIND. Direction.	SUMMARY. N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.			5	1	10	7	6	2		1·21	
P.M.			3	5	7	8	4	4		1·96	
Mean.			4	3	8	8	5	3		1·58	

* 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 not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by _____

(*Signed*) _____

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, if possible, 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 co-incidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, *to form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustible 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 "*Maximum*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximum*." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

The above remarks apply equally to the Thermometers for registering the greatest heat from the Sun's rays and the least degree of cold 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 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," "6, S.W." (for example,) will indicate that the *upper* strata of clouds travel with *extreme* velocity from S.W.; and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{4, \text{ str.}}{2, \text{ cir-str.}}$ (*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 2, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation, and agricultural condition of the soil in which these thermometers are placed.

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore, recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 5th, 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—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3$^{w}_{4}$, 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 Edinburgh is given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

The Council recommend that *term-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

EDINBURGH, 1st July 1861.

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,		
Other Birds, naming them—		

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

BOOK-POST.

EDINBURGH.

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, *St Andrew Square,*

To

Answered January 1862.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55° 56' 0" N. Long. 3° 2' 40" W. Distance from Sea one mile.

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of February 1862.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No.	Attached Thermometer	9 h. P.M. Barometer. No.	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read daily, at 9 P.M. Protected, in Shade, 4 feet above Ground. Max. No.	Min. No.	Exposed Black Bulbs. Max. in Sun's rays No.	Min. on Grass No.	HYGROMETER. No. 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.	9 h. P.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.	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.	No. 12 inches.	No. 22 inches.	Temperature of WELL at Depth of feet. No.	SEA. Temperature at 1 fathom, and Density.	OZONE. 0—10. 9 A.M.	9 P.M.	GENERAL REMARKS, As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms began and ended.*	Days of Month.
	inches.	°	inches.	°	°	°	°	°	°	°	°	°																							
1	29.62	54	29.86	54	45	42			46	42	42	40½	S	1	S	1				.26					1								They has been a month	1
2	29.73	54	29.78	52	53	42			50	47	49	47	SW	2	SSW	1				.12					-								of fine weather. the wind	2
3	29.90	56	29.95	56	49	45			45	43	46	44	SSW	1	SW	1½				-					½								light and for the first	3
4	29.96	56	29.90	57	54	42			41	47	49	46	SW	2	SW	2				-					2								half of the month generally	4
5	29.80	57	29.81	56	51	35			50	47	47	43	WSW	1	WSW	2				.41					2								from SW and the latter	5
6	30.00	56	30.10	52	47	30			47	44	33	29	WSW	-	W	1				.17					3								half from SE & NE with	6
7	30.35	46	30.50	46	35	28			34	30	33	31	NE	1	ENE	1				.16					2								a little rain but a high	7
8	30.60	43	30.60	46	33	23			29	28	27	25	E	1	ENE	1				-					2								Barom. Rainbows	8
9	30.63	46	30.54	47	37	25			27	25	28	26	SW	1	W	1				-					6								seen on 5th & 24th. Stars	9
10	30.44	45	30.27	45	41	40			27	24	40	39	SW	1	SW	1				-					6								Shooting seen on 9th & 20th	10
11	30.20	48	30.10	50	49	34			43	40	44	41½	SW	1	SW	1				-					5								Aurora on 28th	11
12	30.12	47	30.10	53	46	35			34	31	40	37	SW	-	S	1				-					3									12
13	30.12	48	30.13	54	44	37			36	34	39	37	SW	-	SW	-				-					5									13
14	30.15	49	30.17	54	44	36			40	37	34	35	SW	-	W	1				-					4									14
15	30.18	50	30.09	50	43	36			37	35	39	36	SW	-	S	-				-					-									15
16	30.08	50	29.80	56	42	34			38	35	35	32	SE	-	SE	1				-					2									16
17	29.60	50	29.39	48	41	34			37	35	38	35	SE	1	SE	1				-					2									17
18	29.30	50	29.20	50	46	35			37	35	45	42	SE	-	SSE	1				.03					1									18
19	29.50	50	29.35	53	54	45			37	35	48	45	SE	1	SE	1				-					1									19
20	29.30	51	29.59	55	53	41			48	45	45	41	SSE	2	SSE	1				-					2									20
21	29.73	52	29.61	54	54	44			44	41	46	42	SSE	1	SSE	1½				-					5									21
22	29.71	54	29.93	54	54	38			46	43	43	40	SSE	1	SE	1				-					3									22
23	30.13	54	30.24	55	54	40			47	44½	48	45	SSE	1	SE	1				-					5									23
24	30.30	50	30.26	52	48	35			40	37	39	36	E	1	E	1				-					1									24
25	30.30	50	30.43	50	43	37			38	35	38	35	E	1	E	1				-					-									25
26	30.50	49	30.50	50	42	37			39	36	38	35	E	1	E	2				.06					1									26
27	30.46	49	30.37	50	41	36			35	33	38	35	NE	1	ENE	2				.03					-									27
28	30.30	50	30.20	50	46	35			38	35	40	36	NE	2	NNE	2				.02					2									28
29																																			29
30																																			30
31																																			31
Sums.	841·01	1414	840·80	1459	1289	1019			1110	1043·5	1134	1056		25		32				1·26		1			65·5									
Means.	30·034	50·5	30·028	52	46	36·4			39·6	37·2	40·5	37·7		·9		1				·45					2·3									
† Total Corrections for Instrumental Errors.																																			
‡ Corrections for Diurnal Range.																																			
"Corrected Means."																																			
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31				

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.		m.	*denotes* meteor.	
ci.	„	cirrus.	ms.	„	meteors.
ci.-cu.	„	cirro-cumulus.	n.	„	nimbus.
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), = (30·040 − ·055) = 29·982

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction††) for Temp. (Col. 4), = (30·030 − ·063) = 29·967

Mean at Station, corrected, and at 32°, ... = 29·974

Correction for Height, feet, above Mean Sea-level, ... = ·101

Mean, reduced to 32°, and Sea-level, ... = 30·075

Highest Reading, corrected for Index error, on the 9 th, ... = 30·630

Lowest Do., Do., on the 20 th, ... = 29·300

Difference, or **Monthly Range**, ... = 1·330

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 4 th, 5 ..... = 54·0

Lowest in Month, corrected for Index errors, on the 8 th, ... = 28·0

Difference, or **Monthly Range**, ... = 26·0

"Corrected **Mean**" **of all the Highest**, (Col. 5), ... = 46·0

"Corrected **Mean**" **of all the Lowest**, (Col, 6), ... = 36·4

Difference, or **Mean Daily Range**, ... = 9·6

** Calculated **Mean Temperature** of Month, ... = 39·2

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**, ... = 40·0

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb**, ... = 37·4

‡‡ Computed **Temperature of Dew-point**, ... = 34·0

‡‡ Do. **Elastic Force of Vapour**, ... = ·196

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

‡‡ **Relative Humidity**, (**Saturation** = 100), ... = 79·0

RAIN fell on 9 **Days; Amount in Inches**, ... = 1·45

WIND. SUMMARY. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.		3	4	4	7	8	2			·81	
P.M.	1		6	5	7	5	4			1·00	
Mean.	1	2	5	4	7	6	3			·90	

* 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 not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by { _____ _____

(Signed) William McAuslane

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF I

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 co-incidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, *to form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustible 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

The above remarks apply equally to the Thermometers for registering the greatest heat from the Sun's rays and the least, 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 clouds 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 50 *n*.

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—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{\frac{3}{4}}$ W., as 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 much importance when the self-registering Thermometers are read, since, in winter at least, the extremes may occur at any hour; and it is necessary to refer their occurrence to their proper meteorological *day*. In the Society's schedules, the indications registered on the *2nd*, and extending till 9 P.M. 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 above all surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary for hours, when the wind is feeble, reference must be made to the direction of the lower strata of clouds overhead, and to the motion 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, or in two ruled off for the purpose, from that of the Society's schedules, 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, and partly from the defective nature of the Lind's Anemometer is also recommended: the method of *Estimating* Wind Force by such tables as that given in the Society's Schedules, is, to say the least, unsatisfactory.

Rain-gauges.—Many causes conspire to produce anomalies in rain returns. They arise, partly, from unfavourable exposure of the instruments used. If 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 Council recommend that *term-day* observations be taken; *viz.*, on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

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

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

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,		
Other Birds, naming them—		

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

EDINBURGH, 17th July 1861.

BOOK-POST.

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

EDINBURGH MR 2 62

MUSSELBURGH MR 2 62

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55°56′0″ N, Long. 3°2′40″ W, Distance from Sea 1 miles.

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of March 1862.

The Hours of Observation are of Greenwich Time.

Days of Month	BAROMETER. 9 h. A.M. Barometer. No.	Attached Thermometer	9 h. P.M. Barometer. No.	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read daily, at 9 P.M. Protected, in Shade, 4 feet above Ground. Max. No.	Min. No.	Exposed Black Bulbs. Max. in Sun's rays No.	Min. on Grass. No.	HYGROMETER. No. 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.
	inches.	°	inches.	°	°	°	°	°	°	°	°	°
1	30.17	50	29.87	48	41	30			37	33	34	31
2	29.53	48	29.29	47	43	16			35	31	29	26
3	29.26	42	29.35	34	37	16			17	15	24	21
4	29.50	44	29.61	42	36	21			18	16	27	25
5	29.50	46	29.60	41	40	35			31	29	36	34
6	29.73	44	29.22	44	43	32			36	34	33	31
7	28.95	46	29.17	50	50	38			38	37	47	45
8	29.30	49	29.40	54	58	43			42	38	50	46
9	29.30	51	29.35	57	55	37			50	46	46	44
10	29.54	52	29.88	55	56	37			48	45	42	38
11	29.57	53	29.50	54	49	40			45	41	47	44
12	29.62	52	29.90	53	49	40			44	42	41	39
13	30.14	51	30.30	52	47	37			43	40	40	35
14	30.31	50	30.30	57	45	40			44	42	41	38
15	30.29	51	30.23	57	43	36			43	40	39	37
16	30.14	50	30.00	59	41	36			40	37	37	34
17	29.98	50	29.87	52	44	36			38	34	39	36
18	29.80	50	29.78	52	42	36			38	36	39	36
19	29.78	48	29.76	48	43	32			38	34	35	31½
20	29.76	48	29.70	48	43	28			35	32	33	29½
21	29.78	47	29.80	47	44	30			34	31	32	30
22	29.83	48	29.95	47	40	30			34	32	31	30
23	29.90	49	29.76	48	44	31			37	34	33	30
24	29.61	49	29.65	48	44	33			36	34	37	34
25	29.65	48	29.66	48	43	34			34	33	36	33
26	29.64	47	29.54	54	41	35			35	35	38	36
27	29.46	49	29.40	50	43	36			40	39	41	40
28	29.32	48	29.29	50	44	36			38	37	37	36
29	29.28	48	29.36	50	46	33			38	37	38	37
30	29.38	49	29.42	50	45	34			40	38	39	37
31	29.46	49	29.57	50	48	38			40	37	41	39
Sums.	919.38	1506	919.48	1546	1387	1036			1166	1089	1162	1053
Means.	29.666	48.6	29.666	49.8	44.7	33.4			37.6	35.1	37.5	35.3

Days of Month	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H-Cup Anemometer. No. 9 h. A.M.	9 h. P.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.	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.
1	E	1	E	1				–					2
2	WSW	1	NW	2				.21					3
3	NW	1	NW	1				–					3
4	NW	1	NW	1				–					6
5	SSE	3	SSE	3				.14					–
6	SW	1	NE	2				1.16					–
7	SSW	1	SW	2				.20					–
8	SW	1	SW	1				–					6
9	SW	1	SW	1				–					4
10	SW	1	SW	1				–					6
11	SW	1	SW	–				.10					–
12	SW	–	SW	–				–					2
13	ENE	1	NE	1				.02					2
14	NE	1	NNE	1				.15					–
15	NNE	1	ENE	1				–					–
16	NE	1	ENE	1				–					1
17	ENE	1	ENE	1				–					–
18	NE	1	NE	1				.01					–
19	NE	1	NE	1				.16					1
20	NE	1	NNE	1				.34					–
21	N	1	SE	1				.04					4
22	SSE	–	ENE	1				.20					–
23	NE	1	E	1				–					3
24	E	1	E	2				.12					½
25	E	2	E	2				.34					½
26	E	1	NE	1				.20					–
27	E	1	E	1				.02					–
28	E	1	E	1				.03					–
29	ENE	1	ENE	2				.08					½
30	E	1	NE	1				–					½
31	NE	1	NE	1				.06					–
Sums.		32		37				3.08					45
Means.		1.03		1.20				.099					1.45

Days of Month	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. 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									1
2									2
3									3
4									4
5									5
6									6
7									7
8									8
9									9
10									10
11									11
12									12
13									13
14									14
15									15
16									16
17									17
18									18
19									19
20									20
21									21
22									22
23									23
24									24
25									25
26									26
27									27
28									28
29									29
30									30
31									31

† Total Corrections for Instrumental Errors.

‡ Corrections for Diurnal Range.

"Corrected Means."

No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.		m.	*denotes* meteor.	
ci.	„	cirrus.	ms.	„	meteors.
ci.-cu.	„	cirro-cumulus.	n.	„	nimbus.
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), = 29.666 – .052 = 29.614

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction ++ for Temp. (Col. 4), = 29.666 – .054 = 29.612

Mean at Station, corrected, and at 32°, = 29.613

Correction for Height, 90 feet, above Mean Sea-level, = .101

Mean, reduced to 32°, and Sea-level, = 29.714

Highest Reading, corrected for Index error, on the 14 th, = 30.310

Lowest Do., Do., on the 7 th, = 28.950

Difference, or **Monthly Range,** = 1.360

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 8 th, = 58.0

Lowest in Month, corrected for Index errors, on the 2nd & 3rd, = 16.0

Difference, or **Monthly Range,** = 42.0

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 44.7

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 33.4

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

** Calculated **Mean Temperature** of Month, = 39.0

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** = 37.6

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** = 35.2 ~~34.6~~

‡‡ Computed **Temperature of Dew-point,** = 31 ~~30.5~~

‡‡ Do. **Elastic Force of Vapour,** = .181 ~~.170~~

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 81

‡‡ **Relative Humidity, (Saturation = 100),** = ~~77~~

RAIN fell on 19 **Days; Amount in Inches,** = 3.08

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	7	10		3	6	1	2		1.06	
P.M.	2	7	11	1	2	5		3		1.44	
Mean.	2	7	10	1	2	6	1	2		1.25	
	1	10	11	1	1						

* 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 not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by { William McAuslane

(*Signed*) _____

A.B.

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INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

One of the objects of immediate importance, that the Scottish Meteorological Society has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly 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 co-incidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, *to form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustible 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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

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

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "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 $40\frac{1}{2}°$, 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 "*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-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds'* column, though their 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—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{N.W.}_{4}$, 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. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

EDINBURGH, 17*th July* 1861.

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,				
Pease,				
Potatoes,				
Turnips,				
Rye Grass,				

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

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

Inverness
March 1862.

To
Mr ALEXANDER BUCHAN,
Secretary of the Meteorological Society of Scotland,
10, St Andrew Square,
EDINBURGH.

BOOK-POST.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Mid-Lothian in Lat. 55°56′0″N, Long. 3°2′40″W, Distance from Sea One mile*

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of April 1862.

The Hours of Observation are of Greenwich Time.

Electricity	Days of Month	Barometer 9 h. A.M. Barometer * No. (inches)	Barometer 9 h. A.M. Attached Thermometer (°)	Barometer 9 h. P.M. Barometer No. (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. (°)	Protected Min. No. (°)	Exposed Black Bulbs Max. in Sun's rays No. (°)	Exposed Min. on Grass No. (°)	Hygrometer No. 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
	1	29.60	51	29.40	53	54	47			47	45	49	46	S	2	S	3
	2	29.23	54	29.32	56	55	43			51	50	50	47	SSW	2	SSW	2
	3	29.44	55	29.80	56	59	34			48	46	41	38	SW	1	SW	2
	4	29.88	53	30.00	54	50	33			44	42	42	39	SW	1	SW	1
	5	29.84	54	29.55	54	49	42			39	37	45	44	SE	1	SE	1
	6	29.80	54	30.10	55	52	35			44	42	39	36	N	1	N	1
	7	30.22	54	30.25	54	52	44			39	37	45	44	W	1	N	1
	8	30.28	55	30.27	56	59	36			51	50	45	44	SSE	-	NE	1
	9	30.24	55	30.20	56	55	35			43	41	44	42	SE	1	NNE	1
	10	30.20	54	30.30	56	56	33			45	42	41	39	NE	1	N	1
	11	30.36	53	30.37	52	45	26			40	38	31	28	N	1	N	1
	12	30.30	51	30.20	52	43	29			30	28	35	32	NW	2	NE	1
	13	30.20	53	30.21	51	48	33			36	34	36	33	NW	1	NNW	2
	14	30.14	54	30.00	50	42	34			38	37	38	37	SE	2	SSE	2
	15	30.20	54	30.12	51	54	39			37	35	40	38	SE	-	NE	1
	16	29.80	51	29.57	52	53	37			45	42½	40	38	SW	3	SW	2
	17	29.57	51	29.56	54	52	41			43	41	43	40	SW	2	SW	1
	18	29.54	54	29.58	54	56	45			56	54	47	46	SW	3	SW	1
	19	29.35	57	29.57	56	60	40			55	52½	43	41	SW	3	SSW	3
	20	29.80	58	29.87	56	59	43			50	47	44	42	SW	2	SW	1
	21	29.88	57	29.80	58	59	49			48	47	51	50	SW	-	SW	1
	22	29.60	56	29.20	56	56	45			54	52	47	46	SSW	1	SSW	2
	23	29.30	59	29.56	58	54	44			52	49	49	47	S	2	W	1
	24	29.74	60	29.84	58	59	44			49	46	47	46	SW	2	SW	1
	25	29.80	59	29.90	56	48	37			48	47	43	42	NE	1	ENE	1
	26	29.94	54	29.98	54	57	35			44	42	44	42	SE	1	NW	1
	27	30.00	54	30.01	56	61	42			46	44	46	44	S	-	SW	1
	28	30.04	56	30.19	60	68	45			53	49	49	45	SW	1	S	1
	29	30.22	60	30.17	64	71	46			56	52	54	51	SW	1	SW	1
	30	30.10	62	30.00	66	73	48			56	53	58	52	S	1	NE	1
	31																
Sums.		26.61	152	26.89	174	159	284			187	122	126	59		40		40
Means.		29.887	55.1	29.896	55.8	55.3	39.5			46.2	44.1	44.2	42.0		1.33		1.33
† 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.	Anemometer 9 h. P.M.	Rain: No. of hours in which it fell	Rain: Amount in inches No.	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: Temperature at 1 fathom, and Density (°)	Ozone 0–10 9 A.M.	Ozone 9 P.M.
1				.10					1							
2				-					3							
3				-					6							
4				-					2							
5				.34					2							
6				-					4							
7				-					2							
8				-					4							
9				-					5							
10				-					6							
11				-					7							
12				.03					5							
13				-					4							
14				.31					-							
15				-					3							
16				-					1							
17				.14					2							
18				.02					4							
19				.19					5							
20				-					6							
21				.04					5							
22				.06					-							
23				-					4							
24				.05					3							
25				.50					.							
26				-					5							
27				-					6							
28				-					5							
29				-					8							
30				.					7							
31																
Sums.				1.78					115							
Means.									3.8							
No. of Column.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

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.*

This has been a month of good weather. Strong wind Occurred on the 16th and 18th but no gales. Rain fell on 11 days Quantity fallen 1.78 Inch. a Slight frost on the 11th and 12th Rainbows seen on the 17th 18th 19th 22nd 23rd and 24th the month ended with very hot weather. every thing generally Late

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.	m.	*denotes* meteor.
ci.	" cirrus.	ms.	" meteors.
ci.-cu.	" cirro-cumulus.	n.	" nimbus.
ci.-s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu.-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" scud.
fr.	" frost.	sl.	" sleet.
h.-fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
hl.	" hail.	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), = 29.887 – .071 = 29.816

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.896 – .073 = 29.823

Mean at Station, corrected, and at 32°, = 29.820

Correction for Height, 90 feet, above Mean Sea-level, = 101

Mean, reduced to 32°, and Sea-level, = 29.921

Highest Reading, corrected for Index error, on the 11 th, = 30.370

Lowest Do., Do., on the 22 th, = 29.200

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

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 30 th, = 73.0

Lowest in Month, corrected for Index errors, on the 11 th, = 26.0

Difference, or **Monthly Range,** = 47.0

"Corrected **Mean" of all the Highest,** (Col. 5), = 55.3

"Corrected **Mean" of all the Lowest,** (Col, 6), = 39.5

Difference, or **Mean Daily Range,** = 15.8

** Calculated **Mean Temperature** of Month, = 47.4

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,** = 45.2

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** = 43.0

‡‡ Computed **Temperature of Dew-point,** = 40.5

‡‡ Do. **Elastic Force of Vapour,** = .251

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

‡‡ **Relative Humidity, (Saturation** = 100), = 84

RAIN fell on 11 **Days; Amount in Inches,** = 1.78

WIND. SUMMARY.

Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	3	2		5	7	11		2		2.12	
P.M.	6	4	1	1	5	10	2	1		2.12	
Mean.	4	3	1	3	6	10	1	2		2.12	

11

* 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 not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by William McAuslane

(*Signed*)

AB

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 co-incidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, *to form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustible 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 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 "*Maximum*" 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 sliding the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes that has not been carefully *tested* by comparison with a *Standard Thermometer*. When such Thermometers as are *not* graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used, without being *re-tested*. The freezing point of each Thermometer, (marked by a scratch on the stem, but merely on the tubes) ought to be tested once a year, in spring, in snow or melting ice. For comparison of the 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 to be compared with the dry bulb of the Hygrometer. The column, an entry of $\frac{2, \text{ cu-st.}}{4, \text{ st.}}$ (*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—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3^{sw}_{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, aurore boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns 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 *noon-day* observations be taken; —viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

EDINBURGH, 17*th July* 1861.

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,		
Other Birds, naming them—		

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

BOOK-POST.

EDINBURGH.

10, St Andrew Square,

Secretary of the Meteorological Society of Scotland.

MR ALEXANDER BUCHAN,

To

Answered April 1862

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Mid-Lothian, in Lat. 55°56′0″N. Long. 3°2′40″W. Distance from Sea One mile.

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of May 1862.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER. 9 h. A.M. Barometer. No.	BAROMETER. 9 h. A.M. Attached Thermometer.	BAROMETER. 9 h. P.M. Barometer. No.	BAROMETER. 9 h. P.M. 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. 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.
	inches.	°	inches.	°	°	°	°	°	°	°	°	°
1	29.87	56	29.91	62	65	42			47	46	50	49½
2	30.20	57	30.23	58	69	38			46	45	46	44
3	30.23	58	30.08	58	59	40			50	47	44	41
4	29.91	58	29.85	57	58	45			51	48	47	46
5	29.95	57	30.00	58	59	45			52	50	50	48
6	30.04	57	30.03	58	61	48			54	53	51	50
7	29.90	59	29.65	58	65	47			52	51	50	49
8	29.55	59	29.63	60	62	47			52	51½	52	50
9	29.57	58	29.52	58	64	45			56	53	51	49
10	29.45	59	29.53	59	62	45			55	53½	52	50
11	29.50	59	29.52	60	62	45			53	51	50	47
12	29.68	57	29.85	56	61	43			48	47	48	46
13	30.00	55	29.96	55	58	35			48	45	45	43
14	29.95	56	30.07	58	68	36			52	49	47	45
15	30.10	55	30.08	55	58	37			46	43	49	47
16	29.94	54	29.94	56	58	40			43	42½	50	49½
17	30.03	58	30.10	60	64	50			56	55	55	53
18	30.09	60	30.00	63	65	52			60	58½	56	54
19	30.00	61	29.86	61	62	54			59	57	56	53
20	29.60	62	29.44	58	64	44			61	57	48	46
21	29.43	57	29.42	56	62	37			52	49	47	45
22	29.46	57	29.59	56	66	40			54	53	49	46
23	29.60	57	29.60	58	65	45			56	55½	52	50
24	29.67	56	29.78	60	62	45			53	52	49	48
25	29.88	60	29.93	62	64	50			55	53	51	49
26	29.94	58	29.80	60	62	44			53	51	50	49
27	29.79	58	29.83	58	64	42			52	51	48	46
28	29.84	58	29.83	58	64	48			54	50	52	49
29	29.83	58	29.82	62	67	52			54	52	55	54
30	29.64	60	29.59	62	60	50			58	57	51	50
31	29.86	60	30.03	62	73	44			56	55	54	52½
Sums.	924·16	1794	924·07	1825	1953	1381			1640	1581½	1555	1496·5
Means.	29·812	57·9	29·809	58·9	63·0	44·5			52·9	51·0	50·2	48·3
† 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	9 h. P.M. Direction.	Force	Readings of the H-Cup Anemometer. No. 9 h. A.M.	9 h. P.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.	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.	No. 12 inches.	No. 22 inches.	Temperature of WELL at Depth of feet. No.	SEA. Temperature at 1 fathom, and Density.	OZONE. 0—10. 9 A.M.	9 P.M.
														°	°	°	°	°		
1	NE	1	NW	1				.70					4							
2	NE	1	ENE	1				.02					4							
3	ENE	1	E	1				-					6							
4	ESE	2	E	2				-					4							
5	E	-	E	1				-					2							
6	E	1	ENE	1				.18					1							
7	E	1	SE	1				.59					2							
8	SW	2	SW	2				.16					3							
9	SW	1	SW	1				.01					5							
10	W	1	W	1				-					4							
11	WSW	1	W	1				-					5							
12	NE	1	NE	1				.02					5							
13	NNE	1	N	1				-					4							
14	NE	1	NE	1				-					6							
15	NE	1	NE	1				-					8							
16	NE	-	NE	1				.40					-							
17	SW	1	SW	1				-					1							
18	SSW	1	SW	1				-					1							
19	SW	2	SSW	1				-					3							
20	S	2	S	2				.02					5							
21	SE	2	ENE	1				.04					6							
22	WNW	2	W	1½				.02					1							
23	W	1	W	1				.01					1							
24	W	2	W	2				.02					4							
25	W	2	SW	2				.01					3							
26	WSW	2	SSW	1				-					2							
27	SW	1	SW	1				.20					4							
28	SW	1	W	1				.10					4							
29	W	1	W	1				.04					2							
30	W	1	W	1				.34					-							
31	NW	-	SSE	1				.10					-							
Sums.								2·98					108							
Means.																				
† Total Corrections for Instrumental Errors.																				
‡ Corrections for Diurnal Range.																				
"Corrected Means."																				
No. of Column.	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

Days of Month.	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	May has been a very
2	fine month and every
3	thing growing rapidly
4	Rain fell on 19 days and
5	there has been no frost
6	during the month
7	wind has blown from
8	North and East 14 days
9	and very light no gale
10	all the month Thunder
11	heard on the 1st 8th & 29th
12	accompanied with lightning
13	every time. Laburnums
14	& Lilacs in full flower
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.		m.	*denotes* meteor.	
ci.	„	cirrus.	ms.	„	meteors.
ci.-cu.	„	cirro-cumulus.	n.	„	nimbus.
ci.-s.	„	cirro-stratus.	r.	„	rain.
cu.	„	cumulus.	h. r.	„	heavy rain.
cu.-s.	„	cumulo-stratus.	c. h. r.	„	continued heavy rain.
d.	„	dew.	s.	„	stratus.
f.	„	fog.	sc.	„	scud.
fr.	„	frost.	sl.	„	sleet.
h.-fr.	„	hoar-frost.	sn.	„	snow.
h.	„	haze.	so. ha.	„	solar halo.
h. d.	„	heavy dew.	sq.	„	squall.
hl.	„	hail.	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), = 29·812 − ·079 = 29·733

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29·809 − ·081 = 29·728

Mean at Station, corrected, and at 32°, = 29·730

Correction for Height, feet, above Mean Sea-level, = 101

Mean, reduced to 32°, and Sea-level, = 29·831

Highest Reading, corrected for Index error, on the 2nd th, = 30·230

Lowest Do., Do., on the 21 th, = 29·420

Difference, or **Monthly Range**, = 0·810

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 31 th, = 73·0

Lowest in Month, corrected for Index errors, on the 13 th, = 35·0

Difference, or **Monthly Range**, = 38·0

"Corrected **Mean" of all the Highest**, (Col. 5), = 63·0

"Corrected **Mean" of all the Lowest**, (Col. 6), = 44·5

Difference, or **Mean Daily Range**, = 18·5

** Calculated **Mean Temperature** of Month, = 53·8

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**, = 51·6

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb**, = 49·6

‡‡ Computed **Temperature of Dew-point**, = 47·6

‡‡ Do. **Elastic Force of Vapour**, = ·331

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air**, = 86

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

RAIN fell on 19 **Days; Amount in Inches**, = 2·98

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	6	5	1	2	6	9	1		1·44	
P.M.	1	4	6	1	4	6	8	1		1·41	
Mean.	1	5	6	1	3	6	8	1		1·42	

* 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 not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by William Macfarlane

(*Signed*)

AB.

Inverness, May 1862.

To

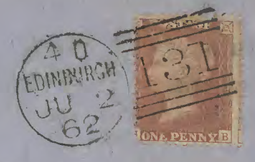
Mr ALEXANDER BUCHAN,

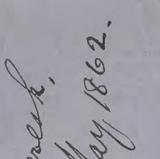
Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

BOOK-POST.





INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS,

WITH REMARKS ON THE USE OF INSTRUMENTS.

One of the objects of immediate importance, that the Scottish Meteorological Society has proposed to itself, is to secure a *perfect uniformity* in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different observations; and it is found that differences between the Returns from any two Stations, so very 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 fluctuating surface 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 by the Council; if properly tested and attended to, they are both well adapted to Meteorological purposes.

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

When a Barometer having adjustible 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 "*Maximum*" Thermometer of Rutherford is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximum*." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

The above remarks apply equally to the Thermometer 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, the "*Minimum*" should rest on wooden supports a few inches from the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the Sun's heat, to affect the alcohol by distillation.

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes that has not been carefully *tested* by comparison with a *Standard Thermometer*. When Thermometers as are *not* graduated on the stem, but mercury 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 trifling 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 the 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 fine cotton, which also supplies it with water. It must be seen that the observer that the muslin is always *clean* and *moist*, and of water pure. In frosty weather observation is a matter of delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the time 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 foremention 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—59·9, 40°·0, or 40°·; 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 respectively. So also 40¼°, and 40⅝°, 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 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. only, as indicating the greatest and least temperature in the 24 hours preceding. It is not a matter of difference 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, and the 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 indications of 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 special attention of Observers to the registration of such phenomena; that the published Summaries may fairly represent the whole of Scotland. Observation ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year on a selected piece of ground or farm.

The Council recommend that *term-day* observations be taken; —viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

EDINBURGH, 17th July 1861.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds first appear.	In Leaf.	Diverted 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,					Other Birds, naming them—		
Red Flowering Currant,							
Rhododendron Pontieum,							
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 *Inveresk*, County of *Mid-Lothian* in Lat. *55°56′0″N.* Long. *3°2′40″W.* Distance from Sea *One* miles.

Height of Cistern of the Barometer above Mean Sea-level *90* feet, above Ground *4* feet. During the MONTH of *June* 1862.

The Hours of Observation are of Greenwich Time.

Days of Month	Barometer 9 h. A.M. (inches)	Attached Thermometer	Barometer 9 h. P.M. (inches)	Attached Thermometer	Self-Reg. Max. (day)	Self-Reg. Min. (night)	Hygrometer 9 h. A.M. Dry bulb	Wet bulb	Hygrometer 9 h. P.M. Dry bulb	Wet bulb	Wind 9 h. A.M. Direction	Force	Wind 9 h. P.M. Direction	Force	Rain, Amount in inches	Sunshine Hours
1	30.14	62	30.04	62	64	44	57	54	51	49	NE	1	NE	1	-	8
2	30.00	61	29.96	62	65	48	55	52	56	53	NE	1	SW	1	.02	4
3	29.91	61	29.87	61	63	45	53	52	50	49	SW	1	SW	1	.26	½
4	29.84	60	29.75	60	61	44	56	54	49	48	SW	3	SW	2	.30	1
5	29.67	59	29.59	60	62	45	54	53	49	48	S	2	S	2	.24	1
6	29.50	58	29.10	61	60	51	50	50	57	55	S	1	ESE	2	.31	-
7	29.15	60	29.50	60	65	49	57	55	52	50	SW	5	W	6	.10	3
8	29.55	60	29.76	61	64	48	55	53	51	49	SW	2	SW	3	.02	5
9	29.84	60	29.88	60	63	42	54	53	49	47½	SW	1	NW	2	.28	3
10	29.90	00	29.76	60	59	48	54	52½	51	50	SW	2	SE	2	.50	2
11	29.50	59	29.27	59	55	50	52	51	52	51	ENE	2	SE	2	.08	-
12	29.20	60	29.07	60	63	45	58	57	53	52½	S	1	NE	1	.20	1
13	29.10	60	29.20	61	63	50	56	55	53	52	NE	-	SW	1	.30	-
14	29.40	60	29.52	60	59	50	52	51	53	51½	NW	-	NW	1	.10	.
15	29.70	60	29.83	62	69	49	57	54	55	53	NW	1	NNW	1	.14	5
16	30.00	60	30.08	60	64	46	55	52½	55	50	N	.	ENE	1	.	5
17	29.95	61	29.82	60	64	46	60	57	51	49	N	1	NW	1	.17	3
18	30.00	60	30.08	60	66	48	56	53	52	50	NW	1	WNW	1	.01	6
19	29.98	60	29.86	60	68	50	54	51½	53	50	SW	1	W	1	.10	3
20	29.80	60	29.84	60	64	49	56	53	52	50	W	1	W	2	.	5
21	29.69	60	29.60	60	65	48	51	50	52	50	W	1	W	2	.03	4
22	29.64	60	29.56	60	57	45	50	49½	54	52½	W	2	NW	1	.19	-
23	29.82	60	29.81	60	67	54	53	50½	55	52	N	1	NW	1	.09	8
24	29.83	61	30.04	62	66	51	58	57	53	52	WNW	1½	NNE	1	.06	2
25	30.10	61	30.05	62	67	54	58	55	55	53	NE	1	W	2	-	3
26	29.90	64	29.75	60	63	46	58	56	50	48	W	2	NW	1	-	4
27	29.64	62	29.75	60	66	48	55	51½	52	50	NW	1	N	1	.10	2
28	29.88	61	29.93	64	70	52	58	53	55	52½	N	1	SW	2	—	6
29	29.80	62	29.76	61	62	46	61	58	54	51	W	1	W	1	.02	½
30	29.79	61	29.75	60	61	48	58	53	51	48	W	2	W	2	.01	3
31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3·43	
Sums.	22.22	1813	891.78	1818	105 / [illegible]	23[illegible] / 1448	1661	1597	1575	1516½		40½		48	3·63	88
Means.	29·741	60·4	29·726	60·6	63·5	48·0	55·4	53·2	52·3	50·5		1·35		1·6		

General Remarks: June has been a very wet and cold month. Vegetation has made very little progress. Rain fell on 24 days but the quantity has not been so great, the guage only registering 3·63 inches. There has been a great want of sunshine, not quite averaging 3 hours a day. Wind blew a heavy gale from SW and W on the 7th. Rainbow seen on the 8th. Loud thunder accompanied with lightning and great rain on the 10th at 12 O'clock noon.

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.	m.	*denotes* meteor.
ci.	" cirrus.	ms.	" meteors.
ci.-cu.	" cirro-cumulus.	n.	" nimbus.
ci.-s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu.-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" scud.
fr.	" frost.	sl.	" sleet.
h.-fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
hl.	" hail.	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), = 29.741 − .085 = 29·656

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.726 − .085 = 29·641

Mean at Station, corrected, and at 32°, = 29·648

Correction for Height, feet, above Mean Sea-level, = ·101

Mean, reduced to 32°, and Sea-level, = 29·749

Highest Reading, corrected for Index error, on the 1 th, = 30·140

Lowest Do., Do., on the th, = 29·070

Difference, or **Monthly Range,** = 1·070

* 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 28 th, = 70·0

Lowest in Month, corrected for Index errors, on the 9 th, = 42·0

Difference, or **Monthly Range,** = 28·0

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 63·5

"Corrected **Mean**" **of all the Lowest,** (Col, 6), = 48·0

Difference, or **Mean Daily Range,** = 15·5

** Calculated **Mean Temperature** of Month, = 55·8

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,** = 53·8

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** = 51·8

‡‡ Computed **Temperature of Dew-point,** = 50·3

‡‡ Do. **Elastic Force of Vapour,** = ·350

‡‡ Do. **Weight of Vapour in a Cubic Foot of Air,** = 86

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

RAIN fell on 24 **Days; Amount in Inches,** = 3·63

WIND. SUMMARY.

Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	4	4	1		3	6	8	4		1·86	
P.M.	3	2	2	2	1	6	9	6		2·56	
Mean.	4	3	1	1	2	6	9	5		2·21	

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

Observations made and Return verified by W. Maustan

(*Signed*)

AB

38

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 co-incidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, *to form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustible 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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

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

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "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-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds'* column, though their 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—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{N.W.}_{4}$, 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. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

EDINBURGH, 17*th July* 1861.

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,					Other Birds, naming them—		
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.

Inveresk,
June 1862

MUSSELBURGH
JY 1
62

BOOK-POST.

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

12 M.
EDINBURGH
JY 2
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SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Mid-Lothian, in Lat. 55° 56' 0" N. Long. 3° 2' 40" W. Distance from Sea One miles.

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of July 1862.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No.	Attached Thermometer	9 h. P.M. Barometer. No.	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read daily, at 9 P.M. Protected, in Shade, 4 feet above Ground. Max. No.	Min. No.	Exposed Black Bulbs. Max. in Sun's rays No.	Min. on Grass. No.	HYGROMETER. No. 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.	9 h. P.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.	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.	No. 12 inches.	No. 22 inches.	Temperature of WELL at Depth of feet. No.	SEA. Temperature at 1 fathom, and Density.	OZONE. 0—10. 9 A.M.	9 P.M.	GENERAL REMARKS, As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms began and ended.*	Days of Month.
	inches.	°	inches.	°	°	°	°	°	°	°	°	°															°	°	°	°						
1	29.75	61	29.68	60	67	48	"	"	58	55	52	49	W	2	WNW	2				.01					2								July has been another	1
2	29.60	61	29.61	58	69	47	.	.	56	54	48	46	W	2	WNW	1				.02					3								month of very extraordinary	2
3	29.66	60	29.68	60	65	48	.	.	54	52	50	47½	WNW	1	W	2				-					5								weather. Cold and want	3
4	29.73	60	29.77	62	68	44	.	.	56	53½	52	49	W	1	WNW	1				.01					4								of sunshine. Sun only	4
5	29.78	61	29.56	62	63	49	.	.	56	54	52	51½	E	1	E	2				.20					4								averaged 3 Hours per day	5
6	29.40	60	29.42	62	53	47	.	.	51	51	51	51	ENE	2	NE	2				.26					-								for the month	6
7	29.54	60	29.72	60	63	50	.	.	51	50	52	50	N	1	W	1				.01					-								Rain fell on 24 days	7
8	29.90	60	29.90	62	67	54	.	.	54	52½	54	52	SW	1	W	1				-					2								Quantity fallen in gauge	8
9	29.77	64	29.63	63	67	50	.	.	64	62½	57	53	SW	1	WSW	1				.15					1								2.79 Inches	9
10	29.60	64	29.73	61	65	50	.	.	56	55	54	51	WNW	1	NW	1				.14					2								Thunder heard on the 2nd	10
11	29.80	64	29.63	61	63	48	.	.	56	53	52	49	W	1	WNW	1				.04					2½								with a hail shower	11
12	29.37	62	29.52	62	60	47	.	.	53	52	53	51½	WNW	1	NW	1				.10					-								and again on the 4th but	12
13	29.70	62	29.63	64	67	53	.	.	61	57	57	55	W	1	WSW	1				.10					1								no Lightning seen at either	13
14	29.60	64	29.56	64	68	53	.	.	61	58½	58	55	WSW	2	SSW	2				.01					3								time Thunder accompanied	14
15	29.50	62	29.47	64	68	52	.	.	58	56	55	53	S	2	SW	2				.01					6								with lightening on 31	15
16	29.52	62	29.67	64	63	48	.	.	57	55½	53	51½	N	1	NNW	1				.06					-								Wind Blew a heavy gale	16
17	29.74	61	29.65	62	66	49	.	.	53	51½	54	52	W	2	S	2				.24					5								on the 19th and 25th which	17
18	29.84	62	29.81	64	69	49	.	.	54	52½	53	52	SW	3	SW	2				.10					4								did much Damage	18
19	29.46	63	29.65	64	65	49	.	.	59	57	52	51	SW	3	SW	6				.14					2								to field Crops, and garden	19
20	29.73	64	29.94	64	67	50	.	.	58	56	52	50	SW	3	W	2				.01					2½								crops	20
21	30.05	64	30.11	62	65	43	.	.	59	58	51	49	W	1	W	1				-					8									21
22	30.13	61	30.01	62	63	41	.	.	56	53	51	49	W	1	W	1				-					4									22
23	30.00	61	29.90	59	65	44	.	.	57	53½	51	49	W	1	SW	2				-					4									23
24	29.73	60	29.43	64	69	51	.	.	56	56	59	56	SW	2	SW	3				.66					-									24
25	29.51	62	30.00	62	68	45	.	.	58	56	52	50	SW	6	W	4				-					4									25
26	30.04	62	29.85	64	68	48	.	.	59	55	54	52	SW	1	SW	3				.01					4									26
27	29.84	62	29.90	63	65	48	.	.	57	53	50	47½	SW	3	SW	3				.01					2½									27
28	30.00	62	30.00	62	65	46	.	.	55	52½	50	48	SW	2	SW	2				.02					4									28
29	30.05	63	30.06	62	63	43	.	.	57	53½	49	47	SW	1	SW	1				-					6									29
30	30.06	63	29.95	62	63	50	.	.	55	52	54	52	SW	1	SW	1				.20					4									30
31	29.74	65	29.73	67	69	54	.	.	60	58½	62	60½	SW	1	SW	1				.28					3									31
Sums.	23.14	62	23.17	72	16 6	258			205	39.5	91	31								52					56												
Means.	29.746	62.0	29.747	62.3	65.4	48.3			56.6	54.5	52.9	51.0								1.70					1.81												
† Total Corrections for Instrumental Errors.																				0-6					0-6												
‡ Corrections for Diurnal Range.																																				
"Corrected Means."																																				
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					

Days of Month.	RAIN. Amount in inches.
1	.01
2	.02
3	-
4	.01
5	.20
6	.26
7	.01
8	-
9	.15
10	.14
11	.04
12	.10
13	.10
14	.01
15	.01
16	.06
17	.24
18	.10
19	.14
20	.01
21	-
22	-
23	-
24	.66
25	-
26	.01
27	.01
28	.02
29	-
30	.20
31	.28
Sums.	2.79

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.		m.	*denotes* meteor.	
ci.	„	cirrus.	ms.	„	meteors.
ci.-cu.	„	cirro-cumulus.	n.	„	nimbus.
ci.-s.	„	cirro-stratus.	r.	„	rain.
cu.	„	cumulus.	h. r.	„	heavy rain.
cu.-s.	„	cumulo-stratus.	c. h. r.	„	continued heavy rain.
d.	„	dew.	s.	„	stratus.
f.	„	fog.	sc.	„	scud.
fr.	„	frost.	sl.	„	sleet.
h.-fr.	„	hoar-frost.	sn.	„	snow.
h.	„	haze.	so. ha.	„	solar halo.
h. d.	„	heavy dew.	sq.	„	squall.
hl.	„	hail.	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), = 29.746 − 0.089 = 29.657

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.747 − 0.090 = 29.657

Mean at Station, corrected, and at 32°, = 29.657

Correction for Height, 90 feet, above Mean Sea-level, = .101

Mean, reduced to 32°, and Sea-level, = 29.758

Highest Reading, corrected for Index error, on the 22 th, = 30.130

Lowest Do., Do., on the 11 th, = 29.370

Difference, or **Monthly Range,** = 0.760

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 17 th, = 69.0

Lowest in Month, corrected for Index errors, on the 22th, = 41.0

Difference, or **Monthly Range,** = 28.1

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 65.4

"Corrected **Mean**" **of all the Lowest,** (Col. 6), = 48.3

Difference, or **Mean Daily Range,** = 17.1

** Calculated **Mean Temperature** of Month, = 56.8

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,** = 54.8

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** = 52.8

‡‡ Computed **Temperature of Dew-point,** = 51.4

‡‡ Do. **Elastic Force of Vapour,** = .372

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

‡‡ **Relative Humidity,** (**Saturation** = 100), = 87

RAIN fell on 24 **Days; Amount in Inches,** = 2.79

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	0	2	0	1	13	13	0	0	2·89	
P.M.	3	0	1	0	3	11	11	2	0	3·28	
Mean.	2	0	2	0	2	12	12	1	0	3·08	

11 11

* 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 not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by W Macfarlane

(*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.—*Wather-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 co-incidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, *to form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustible 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

The above remarks apply equally to the T registering the greatest heat from the Sun's ra from radiation during night. Their bulbs have which may easily be made, or mended, by the mixture of lamp black and printer's ink. Th shallow blackened boxes, whose sides protect th the "*Maximum*" should be freely exposed the surface of the grass, in an open situation. heat, to affect the alcohol by distillation.

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes that has not been carefully *tested* by comparison with a *Standard Thermometer*. When such Thermometers as are *not* graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be moved from their position on the Scale, and ought never afterwards to be used without being *re-tested*. The and especially the "*Minimum*" Thermometers, o to be compared with the dry bulb of the Hyg freezing point of each Thermometer, (marked the tube,) ought to be tested once a year, in s ice. For comparison of Thermometers, a prope mometer may be had, on loan, by any obse Meteorological Secretary.

The Hygrometer consists of two Thermomete not necessarily, mounted on one frame. As ap deviations from the approved and *well-tested for* ratus seriously vitiate the "Hygrometrical Deducti are specially requested to attend to the following The bulbs must *hang down* by at least an inch be such as will bring the tubes forward by an board on which it may be suspended;—the wat covered, and placed close to the side, and a little bel of medium fineness, and fastened at the neck of t cotton, which also supplies it with water. It mus the observer that the muslin is always *clean* and water pure. In frosty weather observation is a n delicacy, and must be made with great care. Th of observation. From the film of ice thus form will proceed as from the moist cloth in ordinary ci

One form of "Mason's" Hygrometer is highly The frame of the Thermometers is enclosed in a t also supports the water cup underneath. This arra be immediately altered by pulling the boxwood fra tin case, and hanging them side by side, so that the requirements shall be complied with, as far as poss

Reading of the Thermometer.—Great care must avoid the effects of refraction, by bringing the eye site the tip of the index or *column* of mercury. ought to be taken to tenths of a degree, and note Thus the Thermometer will be read—39°·2, 40°·0 again, 40°·4, 40°·5, or 40°·6, according as it ind under; an exact coincidence with, or a little over respectively. So also 40$\frac{1}{2}$°, and 40$\frac{3}{4}$°; more or registered 40°·2 or 40°·3, and 40°·7 or 40°·8 resp reading Rutherford's "*Max.*" and "*Min.*" Therm indication of that end of the *index* which is next of the mercury or alcohol is alone noted. Rea Thermometers, especially of the wet and dry *bu* rapidly taken, being so readily affected by heat fro of the observer.

Hour of Observing Temperature.—The Hygrome 9 A.M. and 9 P.M. The self-registering Thermome at 9 P.M. only, as indicating the greatest and lea temperature in the 24 hours preceding. It is not a difference when the self-registering Thermometers a in winter at least, the extremes may occur at any ho necessary to refer their occurrence to their proper m *day.* In the Society's schedules, the indications regi *3rd* are those of a series of phenomena commenci on the *2nd*, and extending till 9 P.M. on the *3rd*.

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

Careful observations ought to be made on the cha direction of the wind; and during storms, extra ought to be made at every hour of Greenwich tim system of simultaneous observation, pursued at differ would be likely to give highly interesting and impor

The Council would strongly recommend that eve tory be furnished with a Hemispherical-Cup Ane a self-registering instrument which shows the amou that passes it per day; from which also the Velocity at the time of observation may be ascertained. Fo the Force of the Wind, at any particular hour of *Lind's Anemometer* is also recommended: the meti *mating* Wind Force by such tables as that given in t is, to say the least, unsatisfactory.

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

Snow-falls may, *for convenience*, be registered columns, under the following conditions:—When as occurs it must be noted in the "Remarks," and th affixed to the depth of water received in gauge. Th the snow must be measured in some open place whe is observed, and registered in addition to, and as a c the indications of the rain-gauge. For wind, rain, and indeed in every column, the observer cannot be too register *observations* only; and nothing that partak nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howar

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 usually of their amount, we ought not to take them into account in the *clouds* column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky *overhead* is *half-covered* by clouds, 5 is entered as the *observation*, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," "2, W.," (for example,) will indicate that the *upper* strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{2}{4}$ 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—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3°W., as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4:" *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, aurore boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

The Council recommend that *term-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

EDINBURGH, *17th July* 1861.

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,					Other Birds, naming them—		
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.

BOOK-POST.

EDINBURGH.

To Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, *St Andrew Square,*

Answered Aug 1862

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Mid-Lothian, in Lat. 55°56'0"N, Long. 3°2'40"W, Distance from Sea One mile.

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of August 1862.

The Hours of Observation are of Greenwich Time.

Days of Month	Barometer 9 h. A.M. (inches)	Attached Thermometer 9 h. A.M.	Barometer 9 h. P.M. (inches)	Attached Thermometer 9 h. P.M.	Self-Registering Thermometers, Protected, in Shade, 4 feet above Ground, Max.	Min.	Exposed Black Bulbs, Max. in Sun's rays	Min. on Grass	Hygrometer 9 h. A.M. Dry bulb	Wet bulb	Hygrometer 9 h. P.M. Dry bulb	Wet bulb	Wind 9 h. A.M. Direction	Force	Wind 9 h. P.M. Direction	Force	Rain, Amount in inches	Sunshine, Hours
1	29.80	65	29.81	67	67	53	.	.	61	59	59	57	SW	1	SW	1	.30	3
2	29.80	65	29.89	64	66	51	.	.	60	54	53	51	SW	2	SW	1	-	3½
3	29.95	65	30.00	64	69	53	.	.	61	57	55	52	SW	1	SW	1	-	1
4	29.95	65	29.74	65	68	56	.	.	65	60	61	58	S	1	S	1	-	1
5	29.95	65	29.45	63	69	50	.	.	60	57	56	55	SW	1	S	1	-	2
6	29.45	62	29.50	62	64	51	.	.	58	57	54	53	W	2	S	1	.65	-
7	29.41	62	29.20	62	54	51	.	.	56	55	54	54	SE	1	N	-	1.20	-
8	29.30	61	29.55	62	68	51	.	.	54	51	56	54	NE	-	NE	-	.65	-
9	29.71	62	29.81	62	64	52	.	.	58	55	56	53	N	2	N	1	-	2
10	29.80	62	29.90	61	64	50	.	.	58	55	56	54	NW	1	NW	1	-	3
11	30.02	62	30.03	61	60	51	.	.	57	55	55	54	E	-	NW	-	-	2
12	29.99	61	29.83	65	61	54	.	.	56	55	58	57½	S	1	S	-	-	1
13	29.83	65	29.67	66	67	57	.	.	63	60	58	57½	S	1	S	1	.46	-
14	29.64	65	29.70	64	64	54	.	.	63	60	57	55	S	1	S	-	.57	-
15	29.82	62	29.90	64	66	53	.	.	58	57	57	56	ENE	1	ENE	1	.16	2½
16	29.95	64	29.97	65	63	52	.	.	58	58	58	57	NE	1	ENE	1	.05	1½
17	29.93	64	29.98	65	69	49	.	.	59	56	59	54	NE	1	NE	1	-	4
18	29.94	64	29.86	66	68	54	.	.	59	56	56	53	SW	1	SW	2	-	5
19	29.70	66	29.80	64	66	47	.	.	63	58	54	50	SW	3	SW	2	.04	3
20	30.00	66	29.98	65	65	44	.	.	60	55	56	53	SW	1	SW	1	-	5
21	29.95	66	29.90	67	68	52	.	.	63	59	58	54	SW	1	SW	1	-	7
22	29.80	63	29.90	64	63	46	.	.	58	57	54	52	SW	1	SW	1	.06	2
23	29.99	62	30.10	62	63	42	.	.	55	53	46	45	SW	1	SW	1	-	6
24	30.20	61	30.27	62	65	50	-	.	54	51	53	50½	NNE	1	NNE	1	-	7
25	30.20	61	30.14	64	65	47	.	.	60	56	56	55	SE	1	NE	1	-	1
26	30.04	63	30.04	64	66	53	.	.	56	53	54	51	WSW	1	SW	1	-	2
27	30.00	62	30.04	64	70	52	.	.	60	57	59	57	SW	1	SE	1	-	5
28	30.10	63	30.17	66	66	54	.	.	62	60	59	58	SE	1	ENE	1	-	1
29	30.24	64	30.23	65	65	53	.	.	59	58	55	54	NE	0	NE	-	-	2
30	30.20	63	30.15	62	65	51	.	.	58	57	53	51	NE	-	NE	-	-	3
31	30.17	63	30.17	63	65	52	.	.	58	55	54	52	NE	-	NE	1	-	2
Sums.	2784	104	2768	120	163	35			280	196	179	117.5		31		26	4.14	77.5
Means.	29.900	63.3	29.893	63.9	65.3	51.1			59.0	56.3	55.8	53.8		1.0		.84		
† 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	20	25

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.*

We have had again a great want of sun shine this month averaging only 2½ hours per day — there has been more dry days than the previous 2 months but the quantity of rain fall has been greater — there was a great fall on the 6th & 7th and the river Esk flowing over all its Banks. Potatoe Disease first seen in the garden on the 13th and is now very bad. Barley & Wheat Shearing commenced in this Neighbourhood on Monday the 25th and is now becoming general

W M

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.	m.	*denotes* meteor.
ci.	" cirrus.	ms.	" meteors.
ci.-cu.	" cirro-cumulus.	n.	" nimbus.
ci.-s.	" cirro-stratus.	r.	" rain.
cu.	" cumulus.	h. r.	" heavy rain.
cu.-s.	" cumulo-stratus.	c. h. r.	" continued heavy rain.
d.	" dew.	s.	" stratus.
f.	" fog.	sc.	" scud.
fr.	" frost.	sl.	" sleet.
h.-fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. ha.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
hl.	" hail.	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), = 29.900 – .093 = 29.807

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.893 – .094 = 29.799

Mean at Station, corrected, and at 32°, = 29.803

Correction for Height, feet, above Mean Sea-level, = .101

Mean, reduced to 32°, and Sea-level, = 29.904

Highest Reading, corrected for Index error, on the 24th, = 30.270

Lowest Do., Do., on the 7th, = 29.200

Difference, or **Monthly Range,** = 1.070

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 27th, = 70.0

Lowest in Month, corrected for Index errors, on the 23th, = 42.0

Difference, or **Monthly Range,** = 28.0

"Corrected **Mean" of all the Highest,** (Col. 5), = 65.3

"Corrected **Mean" of all the Lowest,** (Col. 6), = 51.1

Difference, or **Mean Daily Range,** = 14.2

** Calculated **Mean Temperature** of Month, = 58.2

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,** = 57.4

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** = 55.0

‡‡ Computed **Temperature of Dew-point,** = 52.8

‡‡ Do. **Elastic Force of Vapour,** = .400

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

‡‡ **Relative Humidity, (Saturation** = 100), = 85

RAIN fell on 10 **Days; Amount in Inches,** = 4.14

WIND. Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	2	6	2	3	4		2	1		1.00	
P.M.	3	6		1	6			2		0.71	
Mean.	2	6	2	2	5	11	1	2		0.86	

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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 Edinburgh not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by [illegible]

(Signed)

AB.

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

BOOK-POST.

Aug. 1862.

METEOROLOGICAL OBSERVATIONS.

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

When a Barometer having adjustible 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 their 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 is recommended when graduated on the glass stem and affixed to a frame separate from the "*Maximum*." This Thermometer is liable to two derangements, both of which must be guarded against, and may be easily remedied by an observer. When the *column* of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

The above remarks apply, equally to the Thermometers for registering the greatest heat from the Sun's rays and the least from radiation during night. Their bulbs have a blackened surface, 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*" supported on wooden supports a few inches above the surface of the grass, in an open situation. Snow must not be allowed to cover either of these Thermometers; nor the Sun's heat, to affect the alcohol by distillation.

Verification of the Thermometers.—No instrument ought to be used for Meteorological purposes that has not been carefully *tested* by comparison with a *Standard Thermometer*. The Thermometers as are *not* graduated on the stem, but have an attached scale, undergo repairs, they are very liable to be removed 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 to be compared with the dry bulb of the Hygrometer at every freezing point of each Thermometer, (marked by a film of ice. For comparison of Thermometers, a properly-tested Meteorological Secretary.

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparent deviations from the approved and *well-tested form of* Hygrometer may be had, on loan, by any observer, ratus seriously vitiate the Hygrometrical Deductions, are specially requested to attend to the following caution. The bulbs must *hang down* by at least an inch free scales and frame to which they are attached;—the frame must be such as will bring the tubes forward by an inch, board on which it may be suspended;—the water-cup must be covered, and placed to the side, and a little below the bulbs;—the wet bulb,—in no case under the bulbs;—the muslin of medium fineness, and fastened at the neck of the bulb cotton, which also supplies it with water. It must be s the observer that the muslin is always *clean* and *moist* water pure. In frosty weather observation is a matter of delicacy, and must be made with great care. The bulb moistened by immersion from 15 to 30 minutes before of observation. From the film of ice thus formed ev will proceed as from the moist cloth in ordinary circumstances. One form of "Mason's" Hygrometer is highly objec The frame of the Thermometers is enclosed in a tin ca also supports the water cup underneath. This arrangem be immediately altered by pulling the boxwood frame o tin case, and hanging them side by side, so that the forem requirements shall be complied with, as far as possible.

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

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

Wind.—A wind-vane ought to be elevated 12 feet at leas surrounding objects. When it oscillates incessantly, th direction must be taken; and when it is stationary, and direction in which the wind is feeble, reference must be m of the lower strata of clouds overhead, and to the direc smoke, etc.

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

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

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

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

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

The amount of cloud in the atmosphere ought to be estimated from the greater or less observation of the sky *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds'* column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of cloud is entered 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," $\frac{6}{2}$ S.W., (for example) will indicate that the *upper* strata of clouds travel with *extreme* velocity from S.W., and that 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 $\frac{4}{2}$ st. $\frac{1}{2}$ 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—Moffat's are preferred. The paper is affixed by a pin to a Board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3^{NW}_{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. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,)

A. B

EDINBURGH, 17th *July* 1861.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leaf Buds first appear.	In Leaf.	Dressed 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,					Other Birds, naming them—		
Red Flowering Currant,							
Rhododendron Pontticum,							
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 Inveresk, County of Mid Lothian, in Lat. 55°56'0.5 Long. 3°2'40" W. Distance from Sea One miles.

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of September 1862.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No. ____	Attached Thermometer	9 h. P.M. Barometer. No. ____	Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read daily, at 9 P.M. Protected, in Shade, 4 feet above Ground. Max. No. ____	Min. No. ____	Exposed Black Bulbs. Max. in Sun's rays No. ____	Min. on Grass. No. ____	HYGROMETER. No. ____ 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.	9 h. P.M.	RAIN. No. of hours in which it fell.	Amount in inches. No. ____	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.	No. ____ 12 inches.	No. ____ 22 inches.	Temperature of WELL 36 Depth of ____ feet. No. ____	SEA. Temperature at 1 fathom, and Density.	OZONE. 0—10. 9 A.M.	9 P.M.	GENERAL REMARKS, As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms began and ended.*	Days of Month.
	inches.	°	inches.	°	°	°	°	°	°	°	°	°																										
1	30.16	62	30.00	63	63	48			56	54	56	55	NE	1½	NE	–				.14				1											The weather in Sept.	1
2	29.80	62	29.55	64	67	47			55	54	56	55	N	1	N	1				–				6											has been much better	2
3	29.50	61	29.40	63	63	52			56	55	54	53½	N	1	N	1				.34				1											than the three previous	3
4	29.53	61	29.74	62	63	48			56	55½	51	51	W	1	W	1				.46				2											months being less rainfall	4
5	29.89	62	29.90	60	63	50			56	54	54	52	W	1	W	1				–				5											and more Sun shine	5
6	29.90	63	29.83	65	66	54			58	56	59	57	W	1	W	1				–				6											on the 4th much Thunder	6
7	29.88	64	29.97	65	67	45			60	57	54	52½	W	2	W	1½				–				5½											lightening & rain from	7
8	29.97	63	29.96	64	67	42			60	56	55	54	SW	2	SW	2				.01				4½											3 o'clock to 6 P.M.	8
9	29.94	62	29.90	62	64	40			56	52	47	45	SW	1	SW	1				–				4½											Winds Variable but very	9
10	29.92	63	29.95	60	60	40			51	48	45	44	SW	1	NW	1				.01				4											light	10
11	30.05	66	30.06	59	57	44			50	47	46	45	SW	1	SSW	1				–				6												11
12	29.90	60	29.79	62	61	58			58	58	59	58	SW	2	SW	3				.14				2												12
13	29.54	62	29.64	61	63	44			60	58	48	48	SW	3	SW	3				.49				–												13
14	29.80	60	30.03	60	61	37			52	51½	50	49	NW	1	NW	1				–				7												14
15	30.16	58	30.19	60	58	42			45	44	46	45	NE	1	NE	1				–				4												15
16	30.34	58	30.40	59	61	41			50	50	50	50	NE	–	NE	1				.04				2												16
17	30.44	59	30.42	61	65	46			51	50	53	52	NE	1	NW	1				–				6												17
18	30.40	60	30.42	64	68	55			56	54	60	58	SW	1	SW	1				–				6												18
19	30.44	63	30.44	64	65	52			61	59	56	54	SW	–	SW	1				–				5												19
20	30.40	64	30.36	66	67	52			55	53	57	54	SW	–	SE	1				–				6												20
21	30.40	64	30.40	64	58	47			55	52	50	45	ENE	1	E	1				–				–												21
22	30.35	60	30.25	58	59	38			52	48	44	41	SW	–	W	1				–				4												22
23	30.20	60	30.14	57	55	40			44	41	42	40	NW	1	NW	1				–				5												23
24	30.06	60	29.90	59	54	48			51	47	50	46	NE	1	NE	1				–				4												24
25	29.88	60	29.84	62	64	48			50	48	55	52	SW	1	SW	1				.34				1												25
26	29.80	59	29.81	61	61	52			54	50	54	52	S	1	S	1				.06				2												26
27	29.89	59	29.87	63	65	45			55	52	53	50	SE	1	SE	1				.06				1												27
28	29.89	58	29.87	62	61	51			51	49	56	54	SE	1	SE	1				–				3												28
29	29.82	61	29.71	63	64	55			56	54	57	54	ESE	1	E	1				.04				5												29
30	29.55	63	29.61	62	60	47			58	55	54	49	SW	1	S	3				–				4												30
31																																						31
Sums.	29.81	37	29.41	53	70	208			128	61	51	15		315		305				2.13				103.5														
Means.	29.994	61.2	29.980	61.8	62.3	46.9			54.3	52.0	51.7	50.5		10.5		1.22																						
† Total Corrections for Instrumental Errors.																																						
‡ Corrections for Diurnal Range.																																						
"Corrected Means."																																						
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31							

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.		m.	*denotes* meteor.	
ci.	„	cirrus.	ms.	„	meteors.
ci.-cu.	„	cirro-cumulus.	n.	„	nimbus.
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), = 29.994 − .037 = 29.904

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction ++ for Temp. (Col. 4), = 29.980 − .089 = 29.891

Mean at Station, corrected, and at 32°, ... = 29.898

Correction for Height, 90 feet, above Mean Sea-level, ... = .101

Mean, reduced to 32°, and Sea-level, ... = 29.999

Highest Reading, corrected for Index error, on the 17 th, 19 ..... = 30.440

Lowest Do., Do., on the 4 th, ... = 29.530

Difference, or **Monthly Range,** ..... = 0.911

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 18 th, ... = 68.0

Lowest in Month, corrected for Index errors, on the 14 th, ... = 37.0

Difference, or **Monthly Range,** ..... = 31.0

"Corrected **Mean**" **of all the Highest,** (Col. 5), ... = 62.3

"Corrected **Mean**" **of all the Lowest,** (Col, 6), ... = 46.9

Difference, or **Mean Daily Range,** ..... = 15.4

** Calculated **Mean Temperature** of Month, ... = 53.6

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** ..... = 53.0

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** ..... = 51.2

‡‡ Computed **Temperature of Dew-point,** ..... = 49.4

‡‡ Do. **Elastic Force of Vapour,** ..... = .352

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

‡‡ **Relative Humidity, (Saturation** = 100), ... = 87

RAIN fell on 12 **Days; Amount in Inches,** ..... = 2.13

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	5	2	2	1	12	4	2		1·10	
P.M.	2	6	2	2	3	7	5	3		1·49	
Mean.	2	6	2	2	2	9	5	2		1·30	

* 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*.
** When 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 not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by William M'Cowlane

(*Signed*) _____

AB

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 co-incidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, *to form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustible 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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

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

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "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-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely, and thus, being unable to judge of their amount, we ought not to take them into account in the 'clouds' column, though their 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—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $\frac{3}{4}$, 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 observers by the Electrometer should be entered in this manner, or on the side-margin. Additional remarks may be made on the margin.

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

The Council recommend that *term-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

Edinburgh, 17th July 1861.

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,					Other Birds, naming them—		
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.

Inveresk
September 1862

To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

EDINBURGH.

BOOK-POST.

POSTAGE ONE PENNY

EDINBURGH OC 1 62

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Mid-Lothian, in Lat. 55°56'0"N, Long. 3°2'40"W, Distance from Sea 6nu miles.

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of October 1862.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER. 9 h. A.M. Barometer. No.	Attached Thermometer	9 h. P.M. Barometer. No.	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. 9 h. A.M. Dry bulb.	Wet bulb.	9 h. P.M. Dry bulb.	Wet bulb.
	inches.	°	inches.	°	°	°	°	°	°	°	°	°
1	29.84	61	29.71	62	58	52			53	48	57	55
2	29.80	62	29.90	64	65	53			61	57	54	50
3	29.96	63	30.20	64	65	45			63	60	55	53
4	30.35	61	30.46	60	59	37			56	51	44	42
5	30.40	60	30.22	62	62	48			53	49	56	54
6	30.00	61	29.90	61	60	40			52	49	50	48
7	30.10	60	30.24	58	55	44			44	42	45	43
8	30.34	60	30.35	60	63	35			52	50	49	47
9	30.38	57	30.27	58	55	42			40	38	44	45
10	30.20	59	30.03	58	60	45			52	50	44	45
11	29.93	58	29.72	61	57	50			50	48	54	51
12	29.38	60	29.40	60	60	44			55	52	49	45
13	29.44	58	29.53	58	55	46			50	47	49	45
14	29.61	58	29.61	59	60	47			51	48	49	48
15	29.69	58	29.60	61	55	44			49	49	51	49
16	29.63	58	29.50	60	54	43			48	48	49	47
17	29.14	55	29.20	56	51	37			44	43½	38	37
18	29.23	55	29.34	53	50	37			45	44½	39	38
19	29.25	53	28.59	60	52	38			45	44	47	46
20	28.75	53	29.10	52	45	38			39	38	42	41
21	29.35	54	29.54	54	46	44			40	38	44	42
22	28.86	57	28.97	56	55	37			55	55	42	41
23	28.54	53	29.16	54	48	33			39	39	43	42
24	29.40	52	29.70	52	43	33			39	37	36	34½
25	29.50	52	29.17	56	57	42			43	41	53	51½
26	29.30	61	29.50	54	50	42			44	44	48	43
27	29.30	52	29.29	53	49	38			43	43	42	42
28	29.50	54	29.66	52	46	32			39	38	39	38
29	29.83	52	29.90	50	44	31			36	36	34	34
30	29.84	50	29.77	51	46	34			33	33	37	36½
31	29.70	51	29.74	54	54	43			47	46	48	47
Sums.	29.5[9]56	20[8]	20.[15]27	223[10]	129[12]	34[13]			22[13]6	16[13]6	19[17]4	14[14]05
Means.	29.631	58[7]	29.654	51·2	54·2	41·1			47·1	45·4	46·3	44·5
† Total Corrections for Instrumental Errors.												
‡ Corrections for Diurnal Range.												
"Corrected Means."												
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12

Days of Month.	WIND. 9 h. A.M. Direction.	Force	9 h. P.M. Direction.	Force	Readings of the H-Cup Anemometer. No. 9 h. A.M.	9 h. P.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.	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.	No. 12 inches.	No. 22 inches.	Temperature of WELL at Depth of feet. No.	SEA. Temperature at 1 fathom, and Density.	OZONE. 0—10. 9 A.M.	9 P.M.	GENERAL REMARKS, As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms began and ended.*	Days of Month.
	°		°										Hours.	°	°	°	°	°				
1	SW	3	S	3				-					4								Strong gales & wind on the	1
2	SW	2	WSW	2				.					3								14th 22nd 23rd & 27th	2
3	SW	3	W	1				.					2								Stars Shooting on the 9th 18th	3
4	NW	1	NW	1				.					4								22nd 26th & 28th	4
5	SW	1	WSW	1				.					3								Aurora Seen on the 4th 9th	5
6	S	1	S	1				.14					3								11th 12th & 30th	6
7	W	1	W	1				.					4								Rainbows Seen on the 16th	7
8	SW	1	SW	1				.					4								17th 18th & 25th	8
9	SW	1	S	1				.					3								Thunder heard on the 17th	9
10	SSE	1	SE	1				.					4								Barometer Lowest on the	10
11	SE	-	SE	-				.					-								19th at 11 Oclock P.M. 28.40	11
12	S	2	SW	3				.20					1									12
13	SW	3	SW	2				.06					4									13
14	SW	3	SW	4				.04					6									14
15	SW	1	SW	1				-					1									15
16	SW	1	SW	1				-					4									16
17	SW	3	SW	3				.60					1									17
18	SW	3	SW	2				.20					2½									18
19	SW	2	W	2				.90					3									19
20	W	3	SW	2				.04					2									20
21	SW	2	SW	1½				.04					4									21
22	SW	5	SW	3				.54					1									22
23	SW	5	W	1				.04					2									23
24	W	1	W	1				-					4									24
25	SW	2	SW	2				.14					2									25
26	SW	3	SW	2				.23					1									26
27	SW	5	W	3				.79					-									27
28	W	2	W	1				-					4									28
29	W	1	W	1				-					5									29
30	S	1	SSE	1				-					3									30
31	SE	1	SE	1				-					2									31
Sums.								396					81·5									
Means.								2·06					2·63									
† Total Corrections for Instrumental Errors.																						
‡ Corrections for Diurnal Range.																						
"Corrected Means."																						
No. of Column.	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.		m.	*denotes* meteor.	
ci.	„	cirrus.	ms.	„	meteors.
ci.-cu.	„	cirro-cumulus.	n.	„	nimbus.
ci.-s.	„	cirro-stratus.	r.	„	rain.
cu.	„	cumulus.	h. r.	„	heavy rain.
cu.-s.	„	cumulo-stratus.	c. h. r.	„	continued heavy rain.
d.	„	dew.	s.	„	stratus.
f.	„	fog.	sc.	„	scud.
fr.	„	frost.	sl.	„	sleet.
h.-fr.	„	hoar-frost.	sn.	„	snow.
h.	„	haze.	so. ha.	„	solar halo.
h. d.	„	heavy dew.	sq.	„	squall.
hl.	„	hail.	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), = 29.631 − 0.74 = 29.557

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction †† for Temp. (Col. 4), = 29.654 − 0.76 = 29.678

Mean at Station, corrected, and at 32°, = 29.568

Correction for Height, feet, above Mean Sea-level, = 101

Mean, reduced to 32°, and Sea-level, = 29.669

Highest Reading, corrected for Index error, on the 4th, = 30.460

Lowest Do., Do., on the 23th, = 26.54

Difference, or **Monthly Range,** = 1.920

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 2th, 3 = 65.0

Lowest in Month, corrected for Index errors, on the 29th, = 31.0

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

"Corrected **Mean" of all the Highest,** (Col. 5), = 54.2

"Corrected **Mean" of all the Lowest,** (Col. 6), = 41.1

Difference, or **Mean Daily Range,** = 13.1

** Calculated **Mean Temperature** of Month, = 47.6

S.-R. THERMOMETER [redacted] ulb, in Sun, Highest, (corrected, for Index Errors =

"Corrected **Mean," [redacted] Black Bulb, Max. in Sun,** =

Lowest at Night, [redacted] rrected for Index errors), on the th, =

"Corrected **Mean," [redacted] lack Bulb Min.** on grass, =

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb,** = 46.7

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** = 45.0

‡‡ Computed **Temperature of Dew-point,** = 43.1

‡‡ Do. **Elastic Force of Vapour,** = .279

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

‡‡ **Relative Humidity,** (**Saturation** = 100), = 88

RAIN fell on 14 **Days; Amount in Inches,** = 3.96

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	4	19	5	1		4·24	
P.M.			1	3	3	13	10	1		2·44	
Mean.	0	0	1	3	3	16	7	1		3·34	

* 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 not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by W. McFarlane

(*Signed*) _____

AB.

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

When a Barometer having adjustible 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 to the instruments. The instruments are suspended on cross-laths, in the centre of the Box, and face the door opening to the north. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had at the Society's Office.

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

The above remarks apply equally to the Thermometers for registering the greatest heats and the least cold from the Sun's rays and the greater or less obscuration of the sky *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *cloud*-column, though their appearances and changes ought to be noted among the "*Remarks*." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky *overhead* is *half-covered* by clouds, 5 is entered as the *observation*, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W., (for example), will indicate that the *upper* strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{4}{2}$, 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 seas 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—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3°, 3, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4;" *i.e.*, that it is *blowing fresh*.

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

Remarks.—The "*Remarks*" column is too narrow, but unavoidably so. Some of the most valuable observations that can be taken are those for which no rules can be given 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, colony, velocity, and direction between the lower and upper-strata of clouds, the colour of the sky, etc. Remarks remarkable depressions and elevations of the barometer, thunder storms and remarkable falls of snow, hail, or rain, the hour of storms and remarkable falls of snow, hail, or rain, the hour of storms on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

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

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

The Council recommend that *term-day* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

EDINBURGH, 17*th July* 1861.

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 cotton, which also supplies it with yarn. It must be seen to by the observer that the muslin is always *clean* and *moist*, and water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be taken but once 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 foremention 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 above, under, an exact coincidence with, or a little over 40°, or 40°·5 respectively. So also 40$\frac{1}{4}$°, and 40$\frac{3}{4}$°, more or less, must be registered 40°·2 or 40°·8, and 40°·7 or 40°·8 respectively. In reading Rutherford's "*Max.*" and "*Min.*" Thermometers, especially of the *index* which is next to the surface of the mercury or alcohol is alone noted. Readings of 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. only, as indicating the greatest and least degree of temperature in the 24 hours preceding. It is not a matter of much difference 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 A.M. on the *2nd*, and extending till 9 P.M. on the *3rd*.

Wind.—A wind-vane ought to be elevated 12 feet at least, above 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, or 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 indication of 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 return 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 entered to the depth of water received in gauge. The depth of the snow must be measured in some open place where no drifting is observed, and registered in addition to, and as a check upon, the indications of the rain-gauge. For wind, rain, and snow, indeed in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

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

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,		
Other Birds, naming them—		

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

10, *St Andrew Square,*

EDINBURGH.

[redacted]

MUSSELBURGH 29 OCT

Answered Oct. 30th 1862

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Mid-Lothian, in Lat. 55°56'0"N Long. 3°2'40"W Distance from Sea One miles.

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of November 1862.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No. ____ (inches.)	BAROMETER. 9 h. A.M. Attached Thermometer (°)	BAROMETER. 9 h. P.M. Barometer. No.____ (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.____ (°)	Protected, in Shade, 4 feet above Ground. Min. No.____ (°)	Exposed Black Bulbs. Max. in Sun's rays No.____ (°)	Exposed Black Bulbs. Min. on Grass No.____ (°)	HYGROMETER. No.____ 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.	9 h. P.M.	RAIN. No. of hours in which it fell.	RAIN. Amount in inches. No.____	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. (°)	No.____ 12 inches.	No.____ 22 inches.	Temperature of WELL at Depth of ____ feet. No.____ (°)	SEA. Temperature at 1 fathom, and Density. (°)	OZONE. 0—10. 9 A.M.	9 P.M.	GENERAL REMARKS, As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms began and ended.*	Days of Month.
1	29.80	55	29.82	56	56	37	1	1	47	46	47	45	S	1	S	1			–														No Gales this month but Winds very light	1
2	29.89	56	29.95	56	56	47	—	—	44	42	48	43	SW	1	SW	2			–															2
3	29.94	57	29.86	58	58	48			50	47	51	49	S	1	SW	1			–														Dense foggs on the 15th 19th	3
4	29.86	56	30.04	56	50	31			50	48	38	37	SW	1	SW	1			–														20th 21st & 25th	4
5	30.11	50	29.97	53	43	28			32	31	36	35	SW	1	NE	1			.02														Snow 2 Inches deep on the 27th	5
6	30.00	50	30.10	56	42	29			30	30	32	31	NE	1	E	1			–														Sharp frost on the 23d & 24th	6
7	30.24	50	30.27	54	43	34			32	31½	40	38½	S	1	S	1			–														Rain under the average	7
8	30.04	52	29.41	56	49	37			41	38	48	47	SW	1	WSW	3			.10														Rainbow on the 9th	8
9	29.83	51	29.13	54	49	32			41	39	36	35	SW	1	SW	2			.16															9
10	29.05	50	28.98	48	39	31			32	32	32	31	S	1	SW	2			.44															10
11	29.24	50	29.62	48	40	26			34	33	32	31	SW	2	SW	1			–															11
12	29.90	48	30.08	44	38	25			27	27	29	27	SSW	1	SSW	1			–															12
13	29.94	44	29.75	48	40	35			29	28	40	38	S	1	SW	1			.10															13
14	29.86	48	30.02	52	43	28			39	38	38	30	SW	1	SW	1			–															14
15	30.16	40	30.17	48	39	29			29	28	31	29	S	1	W	2			–															15
16	30.16	49	30.30	59	43	28			40	37	35	33	W	1	W	2			–															16
17	30.40	50	30.36	50	39	30			29	27	35	33	W	1	W	1			–															17
18	30.34	49	30.34	50	43	26			34	31	31	29	S	1	W	1			–															18
19	30.38	48	30.35	48	46	34			31	30	35	34	N	1	N	1			–															19
20	30.34	47	30.30	50	40	34			35	35	34	32	SSE	1	SSE	1			–															20
21	30.21	48	30.10	49	43	33			37	36	36	33	SSE	1	S	1			.16															21
22	29.94	49	29.77	46	40	30			36	34½	33	31	SW	1	SW	1			–															22
23	29.71	47	29.77	48	39	23			31	30	28	26	SW	1	SW	1			–															23
24	29.80	43	29.86	50	33	23			25	25	28	26	SW	1	SW	1			–															24
25	29.90	42	29.90	50	29	24			23	23	27	27	S	1	S	1			–															25
26	29.68	42	29.45	46	35	31			31	30	33	31	SW	1	SW	1			–															26
27	29.34	44	29.39	46	39	28			33	32	34	32	S	1	SW	2			.54															27
28	29.66	47	29.70	49	40	34			30	29	40	38	SW	1	E	2			–															28
29	29.70	46	29.67	48	43	32			33	31	39	34	E	2	SE	1			–															29
30	29.74	44	29.80	50	40	33			34	33	37	36	SE	1	SE	1			–															30
31																																				31
Sums.	896.61	1460	896.23	1528	1277	943			1039	1002	1083	1050½		32		39			1.52																	
Means.	29.882	48.7	29.874	50.93	42.6	31.43			34.63	33.4	36.1	35.01		1.06		1.3																				
† Total Corrections for Instrumental Errors.																																				
‡ Corrections for Diurnal Range.																																				
"Corrected Means."																																				
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.	m.	*denotes* meteor.
ci.	„ cirrus.	ms.	„ meteors.
ci.-cu.	„ cirro-cumulus.	n.	„ nimbus.
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), = 29.888 ..... 0.53) = 29.835

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction ††) for Temp. (Col. 4), = 29.874 ..... 0.59) = 29.815

Mean at Station, corrected, and at 32°, ... = 29.825

Correction for Height, feet, above Mean Sea-level, ... = 101

Mean, reduced to 32°, and Sea-level, ... = 29.926

Highest Reading, corrected for Index error, on the 17 th, ... = 30.400

Lowest Do., Do., on the 11 th, ... = 28.980

Difference, or **Monthly Range**, ... = 1.420

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 3 th, ... = 58.0

Lowest in Month, corrected for Indexrors, on the 24 th, ... = 23.0

Difference, or **Monthly Range**, ... = 35.0

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

"Corrected **Mean**" **of all the Lowes** (Col, 6), ... = 31.4

Difference, or **Mean Daily Range**, ... = 11.2

** Calculated **Mean Temperature** of nth, ... = 37.0

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading **of Dry Bulb**, ... = 35.8

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb**, ... = 34.2

‡‡ Computed **Temperature of Dew-point**, ... = 31.8

‡‡ Do. **Elastic Force of Vapour**, ... = 180

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

‡‡ **Relative Humidity**, (Saturation = 100), ... = 86

RAIN fell on 7 **Days; Amount in Inches**, ... = 1.52

WIND.	SUMMARY.										
Direction.	N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	1	1	1	1	11	12	3	–		1.10	
P.M.	1	1	2	2	6	13	5	–		1.67	
Mean.	1	1	2	1	8	13	4			1.36	

* 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 not later than 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by William M'Farlane

(*Signed*) _____

AB

Please send out some more blank schedules—.

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 co-incidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, *to form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustible 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

The above rules 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 the column, among the "*Hemerides*." The amount of cloud is entered from a scale of 0 to 10; thus, when the sky *overhead* is *half-covered* by clouds, 5 is entered as the *observation*, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, as illustrating the condition and currents of the upper and lower regions of the atmosphere. The entries in the schedule are to be made in the following manner:—In the column "Velocity and Direction," 2, W.; (for example,) will indicate that the *upper* strata of clouds travel with *antrypæ* velocity from S.W., while those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{2}{4}$, *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 25 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—Moffat's are preferred. The papers should be 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 $3\frac{4}{4}$, 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, aurora boreales, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, 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 *temp.-dog* observations be taken;—viz., on the 21st days of March, June, September, and December. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

EDINBURGH, 17*th July* 1861.

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,		
Other Birds, naming them—		

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

BOOK-POST.

EDINBURGH.

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square,

To

Mr ALEXANDER BUCHAN,

Nov. 1862.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Inveresk, County of Edinburgh, in Lat. 55°56′0″N. Long. 3° 2′ 40″W. Distance from Sea One miles.

Height of Cistern of the Barometer above Mean Sea-level 90 feet, above Ground 4 feet. During the MONTH of December 1862.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER. 9 h. A.M. Barometer. * No.___	9 h. A.M. Attached Thermometer	9 h. P.M. Barometer. No.___	9 h. P.M. Attached Thermometer	SELF-REGISTERING THERMOMETERS, Read daily, at 9 P.M. Protected, in Shade, 4 feet above Ground. Max. No.	Min. No.	Exposed Black Bulbs. Max. in Sun's rays No.___	Min. on Grass No.___	HYGROMETER. No.___ 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.	9 h. P.M.	RAIN. No. of hours in which it fell.	Amount in inches. No.___	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.	No. 12 inches.	No. 22 inches.	Temperature of WELL at Depth of ___ feet. No.___	SEA. Temperature at 1 fathom, and Density.	OZONE. 0—10. 9 A.M.	9 P.M.	GENERAL REMARKS, As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. *Mention the hour at which Storms began and ended.*	Days of Month.
	inches.	°	inches.	°	°	°	°	°	°	°	°	°																										
1	29.71	43	29.67	50	43	36			32	31	43	42	SE	1	SE	1				.03					1										Decr has been a very	1
2	29.70	46	29.70	51	45	40			43	41	42	40	SE	1	E	1				–					–										open Month, gales of Wind	2
3	29.73	49	29.71	52	48	41			45	43	46	45	E	1	SE	1				–					1										on the 15th 16th 18th & 25th	3
4	29.76	51	29.80	52	48	44			46	44	45	44	E	1	SE	1½				–					–										Aurora seen on the 14th & 26th	4
5	29.82	52	29.62	55	51	46			47	45	51	49	SE	1½	S	1½				–					2										Shooting Stars 13th 20th 22nd & 30th	5
6	29.60	54	29.61	56	55	46			52	49	50	48	SW	2	SW	2				–					1										Thunder on 11th 13th & 30th	6
7	29.70	55	29.84	53	49	35			48	45	44	43	SW	2	SW	2				.04					6										Eclipse of the moon 6th	7
8	29.66	51	29.92	52	50	37			40	34	41	40	SW	2	SW	1				.40					4										Birds Singing 30th & 31st	8
9	29.78	52	29.50	55	52	41			40	38	51	50	SW	1	S	1				.20					–											9
10	29.50	52	29.63	52	51	36			42	40	41	40	S	2	S	1				.16					3											10
11	29.62	50	29.73	48	42	31			41	40	35	34	S	1	S	1				.10					4											11
12	30.02	50	29.86	52	43	34			34	32	37	36	S	1½	S	1				–					2											12
13	29.70	51	29.89	50	43	34			40	37	39	38	W	1	W	1				–					–											13
14	30.04	50	30.10	52	48	42			43	41	45	43	W	2	W	2				–					1											14
15	30.00	51	29.90	53	48	47			42	41	48	47	S	2	S	5				–					1											15
16	29.90	53	30.00	54	49	38			49	47	41	40	S	5	SSW	1				.38					–											16
17	30.10	51	30.14	52	44	40			38	37	40	39	SW	1	SW	2				~~.44~~					2											17
18	29.80	51	29.33	54	53	43			45	42	49	48	SW	3	W	5				.24					–											18
19	29.34	51	29.27	50	49	32			46	42	36	36	W	3	WSW	3				.04					–											19
20	29.30	50	29.64	48	43	32			36	34	37	36	SW	1½	SW	1				~~.44~~					2											20
21	30.10	46	30.21	49	40	34			36	33	37	36	SW	1	SW	1				–					3											21
22	30.12	50	29.90	51	48	38			36	34	46	45	W	1	W	2				.14					1											22
23	29.94	51	30.06	54	50	42			39	37	48	47	W	1	W	1				~~.12~~					2½											23
24	29.98	50	29.84	54	48	44			44	40	48	47	WSW	2	SW	2				~~.08~~					3											24
25	30.00	51	29.30	56	50	41			46	43	49	48	SW	2	SW	5				.06					1½											25
26	29.85	52	30.17	50	48	35			42	39	36	33	W	3	W	2				.20					2											26
27	29.90	51	29.75	52	52	39			37	35	51	49	W	3	W	3				.26					½											27
28	29.69	50	29.56	52	52	44			45	43	42	40	SW	2	SW	2				–					3											28
29	29.00	51	29.12	54	52	37			48	43	40	37	SW	1	SW	1				.14					1											29
30	29.30	50	29.70	50	45	33			40	38	36	35	SW	1	SW	1				–					1											30
31	29.90	50	29.63	52	47	34			40	39	46	45	SW	1	SW	3				.26					–											31
Sums.	~~722.84~~	1365	~~928.80~~	1615	1486	1229			1321	1232	1330	1300		59.5		68				2.65					62.5											
Means.	29.769	55.7	29.735	55.2	48.0	39.6			42.6	40.0	42.9	41.6		1.7		1.87																				
† Total Corrections for Instrumental Errors.																																				
‡ Corrections for Diurnal Range.																																				
"Corrected Means."																																				
No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					

NOTATION USED IN GENERAL REMARKS.

a.	*denotes* aurora.		m.	*denotes* meteor.	
ci.	„	cirrus.	ms.	„	meteors.
ci.-cu.	„	cirro-cumulus.	n.	„	nimbus.
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), = 29.769 – 0.72 = 29.697

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction ††) for Temp. (Col. 4), = 29.735 – 0.72 = 29.663

Mean at Station, corrected, and at 32°, = 29.680

Correction for Height, feet, above Mean Sea-level, = 101

Mean, reduced to 32°, and Sea-level, = 29.781

Highest Reading, corrected for Index error, on the 21 th, = 30.210

Lowest Do., Do., on the th, = 29.000

Difference, or **Monthly Range,** = 1.210

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month** (corrected for Index errors), on the 6 th, = 55.0

Lowest in Month, corrected for Index errors, on the 11 th, = 31.0

Difference, or **Monthly Range,** = 24.0

"Corrected **Mean**" **of all the Highest,** (Col. 5), = 48.0

"Corrected **Mean**" **of all the Lowest,** (Col, 6), = 39.6

Difference, or **Mean Daily Range,** = 8.4

** Calculated **Mean Temperature** of Month, = 43.8

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,** = 42.8

Mean (corrected) A.M. and P.M. Reading **of Wet Bulb,** = 40.8

‡‡ Computed **Temperature of Dew-point,** = 37.8

‡‡ Do. **Elastic Force of Vapour,** = 233

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

‡‡ **Relative Humidity, (Saturation** = 100), = 85

RAIN fell on 15 **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	2	6	10	8	3		2·89	
P.M.			1	3	7	9	8	3		3·50	
Mean.	0	0	2	2	7	9	8	3		3·20	

* 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 not later than the 2nd; those from Other Places, not later if possible than the 6th. This Schedule not to be Gummed or Fastened, and Forwarded by Book Post, prepaid.

Observations made and Return verified by William Rankine

(*Signed*) _____

AB.

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 co-incidence being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When the *index-line* on this little piston-rod is brought, by the adjusting screw, *to form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

When a Barometer having adjustible 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. This instrument must be hung perfectly horizontal; the bulb end should incline slightly downwards, rather than the other.

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

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

The Hygrometer consists of two Thermometers usually, but not necessarily, mounted on one frame. As apparently slight deviations from the approved and *well-tested form* of this apparatus seriously vitiate the "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 $40\frac{1}{2}$°, 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 "*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-gauge. For wind, rain, and snow, as indeed in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *overhead* (*i.e.*, within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds'* column, though their 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," $\frac{6,\ \text{S.W.}}{2,\ \text{W.}}$, (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 $\frac{4,\ \text{st.}}{2,\ \text{cu-st.}}$, (*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—Moffat's are preferred. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus $3^{\text{N.W.}}_{4}$, 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. For these hourly observations separate schedules will be furnished to observers.

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

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

(By Order,) A. B.

Edinburgh, 17*th July* 1861.

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 Reaped.
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,....					Other Birds, naming them—		
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.

Inveresk
Dec 1862

MUSSELBURGH
JA 3
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To

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

10, St Andrew Square.

EDINBURGH.

BOOK-POST.

EDINBURGH
JA 3
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