

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Valkeith Gardens, County of Midlothian, in Lat. _____, Long. _____, Distance from Sea 3 miles.
 Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet. During the MONTH of January 1888.
 The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS.				SEA.		OZONE.		GENERAL REMARKS.	Days of Month.		
	9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		Readings of the H. Cap Anemometer.		9 A.M.		P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		9 P.M.					
	Baromet.	Attach- ed Ther- mometer	Baromet.	Attach- ed Ther- mometer	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	No. of hours in which it fell.	Amount in inches.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	No. 3 inches.	No. 12 inches.	No. 22 inches.	Temperature of WELL at Depth of feet. No.	Temperature at 1 foot, and Drizzle.	0-10.	9 A.M. 9 P.M.					
	Inches.		Inches.																															
1	30.10	41	30.9	41	37	30			33.5	33	34.5	33	SE		SE																Dull throughout	1		
2	30.20	40	30.25	41	35	29.5			34	32.5	35	33.5	E		E																Dull throughout slight snow	2		
3	30.23	39	30.20	32.5	35	26			28.5	28	28	28.5	S		SE																Sunshine at 11 till 4 snow in	3		
4	30.10	40	30.03	40	36	22			35	34	36	35	NE		NE																showers of snow throughout	4		
5	30.05	42	30.05	42	36	34			35	35	36	35	E		E																changeable throughout	5		
6	30.05	41.5	30.11	43	40	30			36.5	36	39	36.5	E		E																Overcast & drizzling rain	6		
7	30.01	43	30.03	44	45	35			37.5	37	39	38.5	E		E																Dull and like rain throughout	7		
8	30.10	44	30.11	44	39.5	35			37	36	37	35	E		SE																Do.	8		
9	30.08	43	30.04	40	38	33.5			37	35	34.5	32.5	SE		S																Passing clouds rather cold	9		
10	30.38	36	29.90	41	33.5	24			28	27	30	29	S		S																Slight sunshine slightly hazy	10		
11	29.58	40	29.46	40	36	28			34	32.5	35.5	35	S		SW																Fall of snow ending with rain	11		
12	29.49	42.5	29.40	44	47	33			42	41	44	41	SW		SW																	Dull slight rain	12	
13	29.22	41	29.46	43	42	38.5			36	35.5	40	39	SW		SW																	Rain throughout	13	
14	29.05	48	29.02	43.5	54	34			49	47	47	45	SW		SW																	High winds and rain throughout	14	
15	29.18	44	29.55	44	42	36			39	37.5	42	39	SW		SW																	Very stormy high wind & rain	15	
16	29.70	45	29.39	51	52	39			46	43	52	49	SW		W																	Do.	16	
17	29.30	49	29.25	47	50	40			47	44	42	41	SW		SW																	Showers with high wind	17	
18	28.86	47	28.30	48	47	37.5			43	41	43	42.5	S		SW																	Heavy showers throughout	18	
19	28.64	46	28.90	46	45	38			41	39	39	37	W		SW																	Glimpse of sun mild very fine	19	
20	29.12	45	29.27	40	38	30			32	30	31	29	SW		NE																	Bright sunshine	20	
21	29.40	43	29.48	40	41	24.5			30	29	32	31	SW		SW																	Sunshine slight passing clouds	21	
22	29.18	38.5	29.26	40	38	22.5			33.7	32	37	35	NE		NE																	Shadows of sun passing clouds	22	
23	29.70	39	29.95	40	38.5	28			31	31	32	32	NE		E																	Cloudy and overcast throughout	23	
24	29.72	38	29.15	40	38	24			32	32	35	35.5	S		S																	High wind showers of hail and rain	24	
25	28.96	43	29.45	43	40.5	38			43	40	41	38	W		W																	Bright sunshine very fine	25	
26	29.91	41.5	30.05	42	41	33			37	33	37	36	SW		W																	Do.	26	
27	29.80	44	29.84	48	50	35			44	42.5	48	47	W		W																		Cloudy and very mild	27
28	29.68	47	29.75	42	47	43			46	42	37	34	W		W																		Bright sunshine very fine	28
29	29.81	42	29.94	42	43	32.5			37	33.5	40	37.5	W		W																		Sunshine slight passing clouds	29
30	29.60	45	29.68	48	51	37.5			45	43	49	47	W		SW																		High wind cloudy throughout	30
31	29.30	50	29.96	51	52	44			52	49	50	48	W		W																		Very stormy high wind and rain	31
Sums.	129	12	12.12	71	142	144			152	133																								
MEAN	19.49	29.019	93	85					118.07	113.10																								
Co. to Total	42.8																																	
Co. to Instrumental Errors.	29.629	42.8	29.643	42.7					38.1	36.5																								
Corrected Means.					32.3				38.6370																									
No. of sum.	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				

METER, "corrected Mean" at 9 A.M., minus the Correction $\frac{1}{2}$ for Temp. (Col. 2), = 29.591
 "corrected Mean" of Barometer at 9 P.M., minus the Correction $\frac{1}{2}$ for Temp. (Col. 4), = 29.591
 Mean at Station, corrected, and at 32°, = 29.591
 Correction for height, feet, above Mean Sea-level, = .209
 Mean, reduced to 32°, and Sea-level, = 29.800
 Highest Reading, corrected for Index error, on the 3rd th, = 30.230
 Lowest Do., Do., on the 18th th, = 28.300
 Difference, or Monthly Range, = 1.930

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 14th th, = 54.0
 Lowest in Month, corrected for Index errors, on the 4th th, = 21.6
 Difference, or Monthly Range, = 32.4
 "Corrected Mean" of all the Highest, (Col. 5), = 42.3
 "Corrected Mean" of all the Lowest, (Col. 6), = 32.3
 Difference, or Mean Daily Range, = 10.0
 * Calculated Mean Temperature of Month, = 37.3

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 38.6 38.6
 Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 34.8 37.0
 Computed Temperature of Dew-Point, = 20.3 34.8
 Do. Elastic Force of Vapour, = 2.03
 Do. Weight of Vapour in a Cubic Foot of Air, = 8
 Relative Humidity, (Saturation = 100), = 87
 RAIN fell on 15 Days; Amount in Inches, = 2.87

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

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

Observations made and Return verified by

(Signed) Wm. Thomson

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SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Salisbury Gardens, County of Midlothian, in Lat. _____, Long. _____, Distance from Sea 3 miles.

During the MONTH of _____ 18_____

The Hours of Observation are of Greenwich Time.

BAROMETER,	"Corrected Mean" at 9 A.M., <i>minus</i> the Correction ++}	
	for Temp. (Col. 2), = <u>29.686</u>	- <u>0.046</u> } = <u>29.640</u>
"Corrected Mean"	of Barometer at 9 P.M., <i>minus</i> the Correction ++}	
	for Temp. (Col. 4), =	=
Mean at Station, corrected, and at 32°,	.....	<u>29.640</u>
Correction for height,	feet, above Mean Sea-level,	= <u>.209</u>
Mean, reduced to 32°, and Sea-level,	.....	<u>29.849</u>
Highest Reading, corrected for Index error, on the ⁴⁵ th,.....		= <u>30.250</u> 300
Lowest Do., Do., on the 1 th,.....		= <u>28.480</u>
Difference, or Monthly Range,	.....	= <u>1.770</u> 820

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 2 / th,	= 59.0
Lowest in Month, corrected for Index errors, on the 4 th,	= 26.6
Difference, or Monthly Range,	= 32.4
" Corrected Mean " of all the Highest, (Col. 5),	= 47.6
" Corrected Mean " of all the Lowest, (Col. 6),	= 36.8 3
Difference, or Mean Daily Range,	= 11.8 3
** Calculated Mean Temperature of Month,	= 42.0

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11),	= 42.6
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12),	= 39.89
†† Computed Temperature of Dew-Point ,	= 36.46
†† Do. Elastic Force of Vapour ,	= 2.157
†† Do. Weight of Vapour in a Cubic Foot of Air ,	=
†† Relative Humidity , (Saturation = 100),	= 80
RAIN fell on 8 th Days; Amount in Inches,	= 1.30

WIND.	SUMMARY.										Mean Force.	Mean Velocity in miles per day.
	Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.		
A.M.	0	0	0	0	1	11	13	4	0			
P.M.	1	0	0	0	1	8	15	4	0			
Mean.	0	0	0	0	1	10	14	4	0			

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 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 these 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 (naming 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 *thermids*, 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 should have been compared with a *Standard*.

Two modern repaired Barometers have been approved of by the Council; if Meteorological purposes.

An excellent Barometer constructed by Mr. Alite 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 convenience being indicated by a little ivory float, whose stem passes freely through the lid and case of the cistern. When screws, *to form one straight line* with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this *preliminary* setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the *vernier*.

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

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

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

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

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

The above remarks apply equally to the Thermometers for

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

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

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

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

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

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

Ozone.—Mention whether Schönbain's or Moffet's papers are used. The paper is affixed by a pin to a board in a 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 S⁴, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as "4" 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 not hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been limited at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 a.m. and 9 p.m. ought to be registered, either in two columns, otherwise unrecorded, 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 of the *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 fully represent the whole of Scotland. Observations ought to be confined to individual trees and shrubs; to particular species of birds; and, in the case of crops, to specified sorts reared from year to year, on a selected piece of ground or farm.

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

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

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

(By Order) A. B.

Enacted 9th December, 1862.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	Barley.	Beech.	Birch.	Elm.	Larch.	Lime.	Oak.	Sycamore or Plane.
In flower.								
First appearance.								
In leaf.								
Discoloured leaves.								
CROPS.	Barley.	Bare or Bigg.	Oats.	Wheat.	Beans.	Peas.	Turnips.	Rye Grass.
Sowing or planting.								
Flowering or above ground.								
Harvesting.								
First Cut.	In Ear.	In Flower.	In Leaf.	First Cut.	First Cut.	First Cut.	First Cut.	First Cut.

SHRUBS, ETC.	Barberry.	Boultree or Elder.	Broom.	Hazel.	Hawthorn.	Holly.	Laurum.	Lilac.	Mezereum.	Mountain Ash or Rowan.	Red Flowering Currant.	Rhododendron Ponticum.	Whin.
First in blossom.													
FRUITS.	Apple.	Black Currant.	Cherry.	Gean.	Hawberry.	Peach.	Plum.	Strawberry.					
First in blossom.													
First in fruit ripe.													
MIGRATORY BIRDS.	Cuckoo.	Curlew.	House-Swallow.	Lapwing.	Plover.	Sand-Martin.	Starling.	Swan.	Rail or Corn Crake.				
First Arrival.													
Departure.													

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

BOOK-POST.

To

M. ALEXANDER BUCHAN.

Secretary of the Meteorological Society of Scotland.

EDINBURGH.

Dall 1868.



SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalrath Gardens, County of Mid Lothian, in Lat. _____, Long. _____, Distance from Sea 3 miles.
Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet. During the MONTH of March 1888.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER. No. —				WIND.				RAIN.				CLOUDS.				THERMOMETERS. under Ground.				TEMPERATURE of WELL at Depth of feet. No.	SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.		Days of Month.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
		9 h. A.M.		6 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		9 A.M.		P.M.		9 h. A.M.		9 h. P.M.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
		Baromet. No.	Atmos. Therm. No.	Baromet. No.	Atmos. Therm. No.	Max. No.	Min. No.	Max. No.	Min. No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity, (0—10), and Direction.	Amount, (0—10), and Species.	Velocity, (0—10), and Direction.	Amount, (0—10), and Species.	No. 3 inches.	No. 13 inches.	No. 23 inches.	No. 3 inches.	No. 13 inches.	No. 23 inches.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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BAROMETER, "corrected Mean" at 9 A.M., minus the Correction \pm for Temp. (Col. 2), = 29.541
"Corrected Mean" of Barometer at 9 P.M., minus the Correction \pm for Temp. (Col. 4), = 29.541
Mean at Station, corrected, and at 32°, = 29.541
Correction for height, feet, above Mean Sea-level, = 209
Mean, reduced to 32° and Sea-level, = 29.750
Highest Reading, corrected for Index error, on the 29 th, = 30.400
Lowest Do., Do., on the 8 th, = 28.600
Difference, or Monthly Range, = 1.800

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 28 th, = 58.0
Lowest in Month, corrected for Index errors, on the 25 th, = 26.6
Difference, or Monthly Range, = 31.4
"Corrected Mean" of all the Highest, (Col. 5), = 50.0
"Corrected Mean" of all the Lowest, (Col. 6), = 36.7
Difference, or Mean Daily Range, = 13.3
** Calculated Mean Temperature of Month, = 43.4

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 44.9
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 41.5
†† Computed Temperature of Dew-Point, = 37.6
†† Do. Elastic Force of Vapour, = .225
†† Do. Weight of Vapour in a Cubic Foot of Air, =
†† Relative Humidity, (Saturation = 100), = 75
RAIN fell on 8 Days; Amount in Inches, = 1.70

WIND.		SUMMARY.									
Direction		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		0	0	0	1	0	10	16	5	0	
P.M.		0	0	0	0	1	13	12	5	0	
Mean.		0	0	0	0	0	12	14	5	0	

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

Observations made and
Return verified by

(Signed)

Mr. Morrison

INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

ONE of the objects of immediate importance that the Scottish Meteorological Society has proposed to itself is to secure a perfect uniformity in the system of observation pursued at all its Stations. A certain degree of uniformity is absolutely necessary to justify the publication of Monthly Results from different Observations; and it is found that differences between the returns from any two Stations so very considerable as to render them quite incompatible may arise from dissimilarity in the position or shelter of instruments, different hours of observation, or even from the use of differently constructed instruments. It is therefore hoped, that those persons who kindly furnish Reports to the Society will by a scrupulous attention to the following Directions, secure for their Monthly Returns an accuracy and value commensurate with the labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Reports, 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) 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.—Whether glasses and aneroids, though admirably adapted, as the latter certainly are, to indicate variations of atmospheric pressure, are not well fitted for scientific purposes. No 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 scales of the cistern are of leather, and thus, by aid of a screw acting on the bottom, the surface of the contained mercury can be adjusted to the zero-point of the fixed scale; the stem passes freely through the lid and case of the cistern. When screws, to form one straight line with those on its ivory frame, the surface of the mercury is then at the exact height from which the scale is graduated. In taking an observation, this preliminary setting must be made with scrupulous accuracy; as a slight error here will vitiate the readings from the vernier.

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

The Barometer should be suspended in a good 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 south. To accommodate a duplicate set of instruments, which is most desirable, doors are also made to open to the south. These Boxes may be had at the Society's Office.

Self Registering Thermometer.—Professor Phillips's, and Negretti and Zamboni'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 decangements, both of which must be guarded against, and may be easily remedied by an observer. When the column of spirit breaks, it may be re-united by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper globe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

The above remarks apply equally to the Thermometers for Clouds.—Convenient abbreviations for Luke Howard's

Clouds, under the following conditions;—when a Show 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, see the indications in every column, the observer cannot be too careful to register observations only; and nothing that partakes of the nature of deduction or inference.

Columns.—Convenient abbreviations for Luke Howard's columns, under the following conditions;—when a Show 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, see the indications in every column, the observer cannot be too careful to register observations only; and nothing that partakes of the nature of deduction or inference.

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INSTRUCTIONS FOR TAKING METEOROLOGICAL OBSERVATIONS.

WITH REMARKS ON THE USE OF INSTRUMENTS.

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 on a scale of 0 to 10; thus, when the sky overhead is half covered by clouds, 5 is entered as the observation, and so on.

Observations of the clouds are made at 9 A.M. and at sunset, 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," (e.g., for example,) will indicate that the upper strata of clouds travel with extreme velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{2}{4}$ (e.g.,) will indicate that the higher regions are covered to the "amount" of 4 tenths with stratus clouds; and that the sky is further obscured to the extent of 2 tenths by lower clouds of the cumulostratus kind.

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

Temperature of the Sea.—A knowledge of the temperature of the sea is not only in itself, but in its relations to that of our island, a very important branch of Meteorology. The Council, therefore recommend that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by that of river water. At or near the time of high water, on the 3d, 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 Schönbien's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 5^{8.5}, as an ozone entry on the schedule, will indicate that the ozone paper is tinted as 4.3 on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4.4; 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 connections ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich, and a list of such as are recognised and in use at the observatory, and Southampton, are given at the foot of the column. Besides special and extraordinary observations, great prominence ought to be given in this column to prevalent diseases, differences in character, colour, velocity, and direction between the lower and upper strata of clouds, the colour of the sky, etc. Remarks ought to be made on the occurrence of meteors, aurora borealis, remarkable depressions and elevations of the barometer, thunder storms, and remarkable falls of snow, hail, or rain, the hour of storms of wind attaining their maximum, as well as such notes on storms as have been hinted at above. When lofty hills are in the vicinity of an Observatory, the height of clouds and of the snow-line in winter ought to be recorded.

By the use of abbreviations, the state of the weather at 9 A.M. and 9 P.M. ought to be registered, either in two columns, otherwise unoccupied, or in 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-margins. Additional remarks may be made on the margins.

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

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

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

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

(By Order) A. B.

Enacted, 26th December, 1857.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	Flower.	In first buds.	In leaf.	Dissemin. of leaves.	CROPS.	Sowing or planting.	Boiling or above ground.	In flower.	First or latest.
Alder,					Barley,				
Beech,					Bore or Bigg,				
Birch,					Oats,				
Elm,					Wheat,				
Larch,					Beans,				
Linne,					Potatoes,				
Oak,					Turnips,				
Sycamore or Plane,					Rye Grass,				

SHRUBS, ETC.	First in blossom.	Apple.	Black Currant,	Cherry,	Cean,	Gooseberry,	Teach,	Pear,	Stalling,	Swan,	Rail or Corn Crane,	Whin,
Barberry,												
Boutree or Elder,												
Broom,												
Hezel,												
Hawthorn,												
Holly,												
Mountain Ash or Rowan,												
Rod Flowering Currant,												
Rhododendron Ponticum,												
Whin,												

Have the goodness also to state any information you may be able to collect from blight, disease, etc. Whether Hay, Potatoes, Turnips, Fruits, etc., whether plentiful, or in perfection; and the agricultural condition of the district generally.

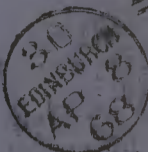
BOOK-POST.

Mr. ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

Delivered
March 1868.



SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith Gardens, County of Midlothian, in Lat. _____, Long. _____, Distance from Sea 3 miles.Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.During the MONTH of April 1868.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.				
		9 h. A.M.		3 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		3 h. P.M.		9 h. A.M.		3 h. P.M.		No. of hours in which it fell.	Amount in inches.	0 A.M.		P.M.		9 h. A.M.										
		Barometer No.	Attached Thermometer No.	Barometer No.	Attached Thermometer No.	Max. No.	Min. No.	Max. No.	Min. on Grass No.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.			Velocity (0-10) and Direction.	Amount (0-10) and Species.	Velocity (0-10) and Direction.	Amount (0-10) and Species.	No. 19 inches.	No. 22 inches.	No. 25 inches.								
		Inches.		Inches.																														
	1	30.20	53	30.28	55	58	45			53	47	52	47	W		W														Cloudy with glimpses of sun	1			
	2	30.28	51	30.18	56	60	36			47	39	54.5	48	W		SW														Do	2			
	3	30.05	52	29.95	56	57	40			42.5	46	52	46	SW		SW														Do	3			
	4	29.85	53	29.85	55	57	42			49	44	52	46	SW		SW														Do	4			
	5	29.78	53	29.65	56	55	42			51	46	50	48	SW		W														Cloudy A.M. drizzling rain P.M.	5			
	6	29.65	52	29.78	52	55	42			48.5	42.5	49	43	SW		W														Cloudy with glimpses of sun	6			
	7	29.60	52	29.55	51	45	41			49	48	42	41	S		E														Rain all day	7			
	8	29.67	43	29.70	44	42	34			37	36	39	35	E		SE														Cloudy with showers of sleet	8			
	9	29.80	43	29.85	48	46	33			39	35	42	37	SE		SE															Cloudy with bluffs of sun	9		
	10	29.95	47	29.96	48	49	34			41	36	46	45	SW		SW															Do	10		
	11	29.95	47	29.94	50	50	30			46	41	48	46	W		S															Sunshine with passing clouds	11		
	12	29.91	47	29.85	50	50	34			44	40	48	44	SW		SW															Sunshine A.M. cloudy P.M.	12		
	13	29.95	50	30.	53	53	41			48	44	49	45	SE		SE															Cloudy throughout	13		
	14	30.10	45	30.08	53	54	30			46	42	51	47	SE		S															Sunshine throughout	14		
	15	30.15	55	30.10	58	59	43			55	50	57	52	W		W															Sunshine A.M. cloudy P.M.	15		
	16	30.05	57	30.	60	64	49			56	53	57	53	SW		W															Bright sunshine very fine	16		
	17	29.93	56	29.83	53	57	44			50	48	47	45	W		W															Rain all day	17		
	18	29.80	52	29.70	50	49	41			50	45	45	43	E		E															Cloudy with rain	18		
	19	29.35	50	29.	52	48	40			45	43	47	45	SE		SE															High wind & rain	19		
	20	28.80	52	28.90	54	54	44			47	45	50	48	SE		SE															Rain A.M. cloudy P.M.	20		
	21	28.75	54	28.85	55	54	43			52	47	51	45	SW		W															Showers with bluffs of sun	21		
	22	29.35	54	29.30	53	56	43			53	48	52	45	W		SW															Sunshine A.M. Rain P.M.	22		
	23	29.30	53	29.45	54	56	40			51	46	50	47	W		W															Sunshine A.M. cloudy P.M.	23		
	24	29.50	52	29.55	53	58	39			49	45	51	47	W		W															Bright sunshine very fine	24		
	25	29.80	52	29.94	55	55	41			47	43	50	45	SE		S															Sunshine with passing clouds	25		
	26	29.95	51.5	29.95	58.2	60.5	38			48	46	56.3	48.2	SW		SW															Showers with sunshine	26		
	27	29.80	54	29.60	54	54	45			49	46	46	43	W		W																Do	27	
	28	29.60	51	29.55	53	51	36			48	43	49	46	W		W																Sunshine A.M. cloudy P.M.	28	
	29	29.50	51	29.60	55	53	38			47	44	50	44	W		W																Cloudy with glimpses of sun, High	29	
	30	29.60	54	29.80	55	55	43			52	45	50	43	W		W																Bright sunshine very fine	30	
	31																																	
	Sums.	178	9			14	19			24	16	14																						
	Means.	21.87	34			11.65	11.91			14.47	13.23																							
	† Total Corrections for Instrumental Errors.	29.72	51.2			53.9	39.7			48.2	44.1																							
	† Corrections for Diurnal Range.					-4				+5	+5	+5	+5																					
	"Corrected Means."					39.3				48.7	44.6																							
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			

NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	cirrus.	ms.	meteors.
ci. en.	cirro-cumulus.	n.	nimbus.
ci. s.	cirro-stratus.	r.	rain.
cu.	cumulus.	h. r.	heavy rain.
cu. s.	cumulo-stratus.	e. h. r.	continued heavy rain.
d.	dew.	s.	stagnant.
f.	fog.	sc.	scud.
fr.	frost.	sl.	sleet.
h. fr.	hoar-frost.	sn.	snow.
h.	haze.	so. ha.	solar halo.
h. d.	heavy dew.	sq.	squall.
h.	hail.	sgs.	squalls.
li.	lightning.	th.	thunder.
li. cl.	light clouds.	t. s.	thunder storm.
li. sh.	light showers.	w.	wind.
li. co.	light corona.	g.	gale of wind.
li. 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 \pm for Temp. (Col. 2), = 29.729..... - 0.059..... = 29.670

"Corrected Mean" of Barometer at 9 P.M., minus the Correction \pm for Temp. (Col. 4), = = 29.670

Mean at Station, corrected, and at 32', = 29.670

Correction for height, feet, above Mean Sea-level, = .209

Mean, reduced to 32', and Sea-level, = 29.879

Highest Reading, corrected for Index error, on the 2 th, = 30.280

Lowest "Do., Do., on the 21 th, = 28.750

Difference, or Monthly Range, = 1.530

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 16 th, = 64.0

Lowest in Month, corrected for Index errors, on the 11 th, = 29.6

Difference, or Monthly Range, = 34.4

"Corrected Mean" of all the Highest, (Col. 5), = 53.9

"Corrected Mean" of all the Lowest, (Col. 6), = 39.3

Difference, or Mean Daily Range, = 14.6

** Calculated Mean Temperature of Month, = 46.6

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

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

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

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

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 48.7

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 44.6

†† Computed Temperature of Dew-Point, = 40.2

†† Do. Elastic Force of Vapour, = .249

†† Do. Weight of Vapour in a Cubic Foot of Air, = .72

†† Relative Humidity, (Saturation = 100), = 72

RAIN fell on 9 Days; Amount in Inches, = 2.00

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	2	4	1	7	12	2	0		
P.M.		0	2	2	3	3	4	13	3	0		
Mean.		0	2	2	4	2	6	15	2	0		

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

Observations made and
Return verified by

(Signed)

W. Morrison

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Waltham Gardens, County of Middlesex, in Lat. _____, Long. _____, Distance from Sea 3 miles.

Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.

During the MONTH of May 1868.

The Hours of Observation are of Greenwich Time.

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction $\left. \begin{array}{l} \text{for Temp. (Col. 2),} \\ \text{ } \end{array} \right\} = 29.690$

"Corrected Mean" of Barometer at 9 p.m., *minus* the Correction $\frac{1}{11}$ } = _____
for Temp. (Col. 4), = - } _____

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

Highest Reading, corrected for Index error, on the 5th,..... = 30.170

Lowest Do., Do., on the 23th,..... = 29.150

Difference, or **Monthly Range**, = 7.020

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 29 th, = 72.0

Lowest in Month, corrected for Index errors, on the 6 th, = 30.6

"Corrected Mean" of all the Highest, (Col. 5), = 60.7

"Corrected Mean" of all the Lowest, (Col. 6), = 44'3"

*** Calculated Mean Temperature of Month, 52.5

S.-R. THERMOMETER, Black Bulb in Sun, Highest, (corrected, for
Influence of 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, =

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry

Bulb, (Cols. 9 and 11), = 54'4

Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols.

10 and 12), = 49'6

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

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

Relative Humidity, (Saturation = 100), = 70

RAIN fell on 9 Days; Amount in inches, = 1.60	
WIND	SUMMARY.

Direction	N	NE	E	SE	S	SW	W	NW	Calcs on Variables	Mean Force	Mean Velocity in miles per day.
A.M.	0	0	0	6	1	6	17	1	0		
P.M.	0	0	2	3	2	5	15	0	0		
Mean	0	0	1	4	2	7	16	1	0		

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 every 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 *Anemometers*, 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 convenience 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 will vitiate the readings from the *vernier*.

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

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

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

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

Self-registering Thermometers.—Professor Phillips's, and Negretti and Zambra's Patent "*Maximum*" Thermometers are recommended; printed directions for their use may be obtained with each instrument. The "*Minimum*" Thermometer of Butherford is recommended when graduated on the glass scale, and affixed to a frame separate from the "*Maximum*." This Thermometer is liable to two drawbacks, both of which must be guarded against, and may be easily remedied by an observer. When the *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 loop, and must be discoloured from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be lying horizontally.

The above remarks apply equally to the Thermometers for

registering the greatest heat from the sun's rays, and the least amount of cloud in the atmosphere ought to be estimated from the greater or less 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," $2\frac{1}{2}$ W. (for example,) will indicate that the upper strata of clouds travel with *extreme* velocity from S.W., and those in the lower regions from W., with one-third the (*extreme*) speed of the former. Again, in the second "Cloud" column, an entry of $2\frac{1}{2}$, (e.g.) will indicate that the higher regions are covered to the "amount" of 4-baths with *stratus* clouds; and that the sky is further obscured to the extent of 2-baths 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 Selohorn's or Moffet's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind, at the time of observation, in the following manner;—thus 3° 4', as an *ozone* entry, in the schedule, will indicate that the ozone paper is tinted as 4° 4' on the scale, that the wind is from the N.W., and that its force on the scale 0-6 is 4° 4'; i.e., that it is *blowing fresh*.

Electricity.—Too much importance cannot be attached to electric condition of the atmosphere in connection with terrestrial magnetism, and as a meteorological phenomenon. A proper Electrometer is necessary to every complete meteorological observatory. **Remarks.**—The "*Remarks*" column is too narrow, but unavoidable so. Some of the most valuable observations that can be taken are those for which no rules can be given nor hours assigned. The use of contractions ought, therefore, to be taken every advantage of, and a list of such as are recognised and in use at Greenwich and Southampton, are given at the foot of the column. Besides 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 in a selected piece of ground or farm. The Council recommend that *term day* observations be taken;—viz., on the 21st days of March, June, September, and December.

Full directions for the use of the instruments mentioned above have been printed, and may be had along with them from the makers. The Council have agreed to recommend that observers, before purchasing new instruments, should communicate with the Meteorological Secretary; and they consider it desirable that he should have full power to reject any instrument which, on being presented for comparison, does not afford him satisfaction.

(By Order) A. B.
EDINBURGH, 24th December 1865.

Convenient abbreviations for Luke Howard's

nature of deduction or inference.

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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 in a selected piece of ground or farm. The Council recommend that *term day* observations be taken;—viz., on the 21st days of March, June, September, and December.

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

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

(By Order) A. B.

EDINBURGH, 24th December 1865.

Convenient abbreviations for Luke Howard's

nature of deduction or inference.

Dalziel

May 1868.

BOOK-POST.

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	In Flower.	Leafy Buds first appear.	In Leaf.	Decayed or dropping of leaves.	Barley or Bigg.	Oats.	Wheat.	Beans.	Potatoes.	Turnips.	Sycamore or Plane.
Alder.											
Asch.											
Beech.											
Birch.											
Elm.											
Larch.											
Lime.											
Oak.											

SHRUBS, ETC.	First in Blossom.	Apple.	Black Currant.	Cherry.	Cean.	Gooseberry.	Holly.	Laburnum.	Lilac.	Mezereum.	Mountain Ash or Rowan.	Red Flowering Currant.	Rhododendron Ponticum.	Whip.
Barberry.														
Bouvier or Elder.														
Broom.														
Haz.														
Hawthorn.														
Lilac.														
Mezereum.														
Mountain Ash or Rowan.														
Red Flowering Currant.														
Rhododendron Ponticum.														
Whip.														

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 *Dalkeith Gardens*, County of *Middlesex*, in Lat. _____, Long. _____, Distance from Sea *3* miles.Height of Cistern of the Barometer above Mean Sea-level *190* feet, above Ground *4* feet.During the MONTH of *June* 18*68*.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS. Read Daily, at 9 P.M.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS. under Ground.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.
		9 h. A.M.		6 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.		9 h. A.M.		6 h. P.M.						
		Baromet.	Attach- ed Ther- mometer	Baromet.	Attach- ed Ther- mometer	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	Velocity, (0-10), and Direction.	Amount, (0-10), and Species.	No. 1.	No. 2.	No. 3.						
		inches.		inches.																										
	1	29.80	63	29.75	66	71	42			63	56	62	54	N	N												Sunshine with passing clouds	1		
	2	28.80	61	29.81	63	61	49			55	49	57	49	N	N												Cloudy throughout	2		
	3	29.85	61	29.70	61	63	41			55	47	50	48	N	N												Cloudy with blinks of sun	3		
	4	29.65	61	29.85	63	62	49			50	49	59	50	N	N												Do	4		
	5	29.95	58	29.97	64	64	42			52	46	61	53	N	N												Cloudy A.M. Sunshine P.M.	5		
	6	29.73	62	29.90	63	63	53			59	55	56	55	N	N												Do	6		
	7	29.93	60	29.93	59	59	46			54	53	57	46	N	N												Bright sunshine with high wind	7		
	8	30	57	29.95	60	61	42			54	46	55	53	N	N												Sunshine A.M. Cloudy P.M.	8		
	9	29.90	57	29.93	60	61	48			54	49	57	56	N	N												Cloudy with blinks of sun	9		
	10	29.93	55	29.95	62	64	42			55	42	58	53	N	N												Cloudy with occasional sunshine	10		
	11	30	58	30.05	64	65	48			53	52	61	55	N	N												Do	11		
	12	30.30	61	30.25	61	60	49			56	51	57	54	N	N													Bright sunshine very fine	12	
	13	29.95	64	29.98	65	65	54			60	55	60	54	N	N													Sunshine with passing clouds	13	
	14	29.95	64	29.85	70	71	48			63	55	66	58	N	N													Cloudy 4 M. Showery P.M.	14	
	15	29.41	63	30.03	64	63	52			59	51	59	50	N	N													Sunshine with passing clouds	15	
	16	30.10	61	29.97	65	62	44			58	51	61	59	N	N													Bright sunshine very fine	16	
	17	29.90	62	30.05	63	62	51			56	50	57	49	N	N													Do	17	
	18	30.20	61	30.15	66	73	39			60	50	62	56	N	N													Do	18	
	19	30.13	63	30.05	75	82	45			65	58	75	63	N	SE													Bright sun A.M. thunder from 4 till 7	19	
	20	29.95	65	30.35	72	81	43			63	56	65	60	SE	S													Cloudy with showers 9 M. sunshine P.M.	20	
	21	30.25	67	30.25	70	78	54			64	60	65	64	SE	SE													Cloudy with blinks of sun	21	
	22	30.13	62	30.20	69	68	53			56	52	64	55	S	SE													Sunshine with passing clouds	22	
	23	30.17	66	30.15	67	66	46			62	55	63	53	N	N													Cloudy with blinks of sun	23	
	24	30.15	62	30.20	65	63	53			55	50	57	50	N	N													Sunshine throughout	24	
	25	30.20	62	30.20	64	62	49			56	50	56	49	N	N													Cloudy with glimpses of sun	25	
	26	30.25	59	30.40	63	62	47			54	47	59	51	N	N													Cloudy throughout	26	
	27	30.30	63	30.30	63	62	54			62	59	60	54	N	N													Bright sunshine very fine	27	
	28	30.40	62	30.45	74	72	44			57	52	72	59	N	N													Do	28	
	29	30.45	61	30.45	66	73	44			61	55	61	57	N	N													Do	29	
	30	30.45	64	30.50	71	73	48			63	57	69	61	SE	SE													Bright sunshine very warm	30	
	31																													

NOTATION USED IN GENERAL REMARKS.

a.	denotes aurora.	m.	denotes meteor.
ci.	" cirrus.	ns.	" nocturnal.
ci. cu.	" cirro-cumulus.	n.	" nimbus.
ci. cs.	" 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.	se.	" sea.
fr.	" frost.	sl.	" sleet.
h. fr.	" hoar-frost.	sn.	" snow.
h.	" haze.	so. h.	" solar halo.
h. d.	" heavy dew.	sq.	" squall.
h. l.	" hail.	sqs.	" squalls.
l.	" lightning.	t.	" thunder.
li. cl.	" light clouds.	t. s.	" thunder storm.
li. sh.	" light showers.	w.	" wind.
li. co.	" lunar corona.		
li. h.	" lunar halo.		

TABLE FOR ESTIMATING FORCE OF WIND.

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

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction $\frac{0.57}{100}$ for Temp. (Col. 2), = 29.914
"Corrected Mean" of Barometer at 9 P.M., minus the Correction $\frac{0.90}{100}$ for Temp. (Col. 4), = 29.914
Mean at Station, corrected, and at 32°, = 29.914
Correction for height, feet, above Mean Sea-level, = 207
Mean, reduced to 32°, and Sea-level, = 30.121
Highest Reading, corrected for Index error, on the 30th, = 30.500
Lowest Do., Do., on the 4th, = 29.650
Difference, or Monthly Range, = 0.850

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 17th, = 82.0
Lowest in Month, corrected for Index errors, on the 18th, = 38.6
Difference, or Monthly Range, = 43.4
"Corrected Mean" of all the Highest, (Col. 5), = 66.4
"Corrected Mean" of all the Lowest, (Col. 6), = 47.1
Difference, or Mean Daily Range, = 19.3
** Calculated Mean Temperature of Month, = 66.8

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 57.6
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 52.4
Computed Temperature of Dew-Point, = 47.7
Do. Elastic Force of Vapour, = 3.31
Do. Weight of Vapour in a Cubic Foot of Air, =
Relative Humidity, (Saturation = 100), = 70
RAIN fell on 2 Days; Amount in Inches, = 0.35

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

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

Observations made and
Return verified by

(Signed)

Mr. Thomson

The Hours of Observation are of Greenwich Time.

BAROMETER,	"Corrected Mean" at 9 A.M., <i>minus</i> the Correction $\uparrow\uparrow$ for Temp. (Col. 2), = <u>29.580</u>	$\uparrow\uparrow$ = <u>29.580</u>
	"Corrected Mean" of Barometer at 9 P.M., <i>minus</i> the Correction $\uparrow\uparrow$ for Temp. (Col. 4), =	=
Mean at Station, corrected, and at 32",	.....	= <u>29.580</u>
Correction for height,	feet, above Mean Sea-level,	= <u>.209</u>
Mean, reduced to 32", and Sea-level,	.....	= <u>30.087</u>
Highest Reading, corrected for Index error, on the 24 th.....		= <u>30.400</u>
Lowest Do.,	on the 29 th.....	= <u>29.450</u>
Difference, or Monthly Range,		= <u>0.950</u>

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 5 th, = 86.0

Lowest in Month, corrected for Index errors, on the 6 th, = 41.6

Difference, or **Monthly Range,** = 44.4

“ Corrected **Mean** ” of all the **Highest,** (Col. 5), = 71.6

“ Corrected **Mean** ” of all the **Lowest,** (Col. 6), = 50.6

Difference, or **Mean Daily Range,** = 21.0

**** Calculated Mean Temperature** of Month, = 61.1

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

HYGROMETER, Man (corrected) A.M. and P.M. Reading of Dry Bulb , (Cols. 9 and 11),	= 62.8
Mean (corrected) A.M. and P.M. Reading of Wet Bulb , (Cols. 10 and 12),	= 56.8
‡‡ Computed Temperature of Dew-Point ,	= 51.7
‡‡ Do. Elastic Force of Vapour ,	= 38
‡‡ Do. Weight of Vapour in a Cubic Foot of Air ,	=
‡‡ Relative Humidity , (Saturation = 100),	= 68
RAIN fell on / Days; Amount in Inches ,	= 0.35

RAIN fell on / **Days; Amount in Inches,** = 0.35

WIND.		SUMMARY.									
Direction	N	NE	E	SE	S	SW	W	NW	Calms or Variable.	Mean Force.	Mean Velocity in miles per day
A.M.	1	1	5	8	1	0	14	1	0		
P.M.	1	1	7	5	0	1	14	2	0		
Mean.	1	1	0	6	1	0	14	2	0		

*Observations made and
Return verified by*

Tom Thomson

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 should have been compared with a *Standard*.

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

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

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

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

In *taking an Observation*, the attached Thermometer is first noted; the tube must then be gently tapped and the cistern adjustment carefully made. By raising and lowering the eye, it must be brought into the plane of the back and front of the index,—usually the lower edge of the venetian, 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 1 foot above grass in an exposed position, free from purely 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, the doors are also made to open to the south. These Boxes may be had at the Society's Office.

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

The above remarks apply equally to the Thermometers for

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

Verification of Thermometers.—No instrument ought to be used for Meteorological purposes till it has been carefully tested by comparison with a *Standard Thermometer*. When such Thermometers are as *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 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 *approximate* 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 applied 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 enclosed in a tin case, which also supports the water cup underneath. This arrangement must be immediately altered by pulling the boxwood frame out of the tin case, and hanging them side by side, so that the forementioned requirements shall be complied with, as far as possible.

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

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

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

Clouds.—Convenient abbreviations for Luke Howard's

nomenclature of clouds will be found on the other side. The amount of cloud in the atmosphere ought to be estimated from the greater or less obscuration of the sky *overhead* (i. e., within 20° or 30° of the zenith). The strata of clouds that appear near the horizon are viewed obliquely; and thus, being unable to judge of their amount, we ought not to take them into account in the *clouds* column, though their appearance and changes ought to be noted among the "*Remarks*." The amount of land 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," 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 2, (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 observed to the extent of 2-tenths by lower clouds of the *cumulo-stratus* kind.

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

Underground Thermometers.—As the germination and health of crops and plants greatly depend on the temperature of the soil,—its amount and constancy,—the Council recommend that 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 Seligson's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3°, as an *ozone* entry in the schedule, will indicate that the ozone paper is tinted as 3° on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is "4"; i.e., that it is *blowing fresh*.

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

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

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

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

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

(By Order) A. B.

EDINBURGH, 30th December, 1865.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

FOREST TREES.	PLANTS.	CROPS.	GRAZING OF VARIOUS VARIETIES.	PLANTS.	GRAZING OF VARIOUS VARIETIES.
Alder,	Barley,	Barley,	Barley,	Barley,	Barley,
Ash,	Beech,	Beech,	Beech,	Beech,	Beech,
Birch,	Birch,	Birch,	Birch,	Birch,	Birch,
Elm,	Elm,	Elm,	Elm,	Elm,	Elm,
Larch,	Larch,	Larch,	Larch,	Larch,	Larch,
Lincoln,	Lincoln,	Lincoln,	Lincoln,	Lincoln,	Lincoln,
Oak,	Oak,	Oak,	Oak,	Oak,	Oak,
Spruce or Pine,	Spruce or Pine,	Spruce or Pine,	Spruce or Pine,	Spruce or Pine,	Spruce or Pine,

SHRUBS, ETC.	FRUITS.	MIGRATORY BIRDS.	First in Fruit Mags.	First in Blossom.	First in Blossom.
Baccharis,	Apple,	Cuckoo,	Arrival.	Departure.	Departure.
Bourne or Elder,	Black Currant,	House-Sparrow,	Arrival.	Departure.	Departure.
Broom,	Cherry,	Lapwing,	Arrival.	Departure.	Departure.
Hazel,	Gooseberry,	Plover,	Arrival.	Departure.	Departure.
Holly,	Leach,	Sand-Martin,	Arrival.	Departure.	Departure.
Laburnum,	Pear,	Starling,	Arrival.	Departure.	Departure.
Lincoln,	Plum,	Swan,	Arrival.	Departure.	Departure.
Mountain Ash or Rowan,	Strawberry,	Rail or Corn Crake,	Arrival.	Departure.	Departure.
Red Flowering Currant,			Arrival.	Departure.	Departure.
Rhododendron Ponticum,			Arrival.	Departure.	Departure.
Whin,			Arrival.	Departure.	Departure.

Have the goodness also to state any information you may be able to collect relative to the Crops of Grain, Hay, Potatoes, Turnips, 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.

Mr. ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

Delivered
July 1866.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Calnith Gardens, County of Midlothian, in Lat. _____, Long. _____, Distance from Sea 3 miles.

Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.

During the MONTH of August 1868.

The Hours of Observation are of Greenwich Time.

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction $\uparrow\uparrow$ = 29.625
for Temp. (Col. 2), = 28.266.... - 9.361....

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction $\uparrow\uparrow$ =
for Temp. (Col. 4), = -

Mean at Station, corrected, and at 32°, = 29.625

Correction for height, feet, above Mean Sea-level, = 1.209

Mean, reduced to 32°, and Sea-level, = 29.834

Highest Reading, corrected for Index error, on the 1st th, = 30.120

Lowest Do., on the 23rd th, = 29.170

Difference, or **Monthly Range,** = 0.950

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 4 th, 87.0 = 87.0

Lowest in Month, corrected for Index errors, on the 31 th, 45.6 ~~46.5~~ = 41.0

Difference, or **Monthly Range,** = 46.0

" Corrected **Mean** " of all the **Highest,** (Col. 5), = 66.9

" Corrected **Mean** " of all the **Lowest,** (Col. 6), = 52.1

Difference, or **Mean Daily Range,** = 14.8

**** Calculated Mean Temperature** of Month, = 59.5

S.-R. THERMO	Bulb in Sun, Highest, (corrected, for	
Ind.	th,	=
" Corrected I	f Black Bulb, Max. in Sun,	=
Lowest at	b, (corrected for Index errors), on the	th, ... =
" Corrected I	f Black Bulb Min. on grass,	=
Difference of	ange ("exposed"),	=

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry	
Bulb, (Cols. 9 and 11),	= <u>57.6</u> 60.6
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols.	
10 and 12),	= <u>55.0</u> 56.0
## Computed Temperature of Dew-Point,	= <u>50.9</u> 52.0
## Do. Elastic Force of Vapour,	= <u>.255</u> 388
## Do. Weight of Vapour in a Cubic Foot of Air,	=
## Relative Humidity, (Saturation = 100),	= <u>73</u>
RAIN fell on 8 Days; Amount in Inches,	= <u>3.55</u>

WIND.	SUMMARY.											
	Direction	N	NE	E	SE	S	SW	W	NW	Caln or Variable.	Mean Force.	Mean Velocity in miles per day.
A.M.	1	0	2	2	4	3	1	0	0			
P.M.	2	2	2	2	3	4	1	0	0			
Mean.	2	1	2	2	3	3	1	0	0			

Observations made and
Return verified by

(Signed).

Mr. Brownson

WITH REMARKS ON THE USE OF INSTRUMENTS.

Hour of Observation.—The Council recommended 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*.

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

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.

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

scutes and frame to which tubes are attached;—the frame must be such as may 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 water-bulb;—in case under the bulks;—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 *wet*, and that the water pure. In frosty weather observation is a matter of much delicacy and must be made with great care. The bulb must be noticed by immersion from 15 to 30 minutes before the hour of observation. From the fin of the thus formed evaporation will proceed as from the wet cloth in ordinary circumstances.

One form of "Alcohol's" Hygrometer is highly obtainable. 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 recommended requirements shall be complied with, as far as possible.

Hour of observing Temperature.—The Hygrometer is read at 9 A.M. and 9 P.M. The self-registering Thermometers are read at 9 P.M. only, as indicating the greatest and least degrees of temperature in the 24 hours preceding. It is not a matter of indifference when the self-registering Thermometers are read, 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 placed 12 feet at least above surrounding objects. When it scillates 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.

Rain-gauges.—Many cases conspire to produce anomalies in rain returns. They arise, partly, from unfavorable situation for observation and partly from the defective nature of the instruments used. It is, indeed, difficult to obtain an unexceptionable position for the rain-gauge; but in all cases the gauge must be sunk in the ground till its edges are on a level with the close cut grass 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 included in every column, the observer cannot be too careful to register *observations* only; and nothing that partakes of the nature of deduction or inference.

WITH REMARKS ON THE USE OF INSTRUMENTS.

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" $\frac{2}{3}$ S.W. and Direction" (for example,) will indicate that the upper strata of clouds travel with extreme velocity from S.W. and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" 4. st.

Underground Thermometers.—As the germination and height of crops and plants greatly depend on the temperature of the soil—it is amount and constantly, the Council recommend that observations in this interesting department be made at 9 A.M., by the sun's rays placed on a level surface being sand, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833,

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

Ozone.—Mention whether Schönbien's or Moffat's papers are used. 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 *ozone*, as an *ozone* entry in the schedule, will indicate that the *ozone* paper is turned as "3" on the scale, if the wind is from the N.W., and that is force on the scale 0—6 is $\alpha \cdot 1 \cdot 2$, i.e., that it is *Unclear Free*.

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

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 commencing observations, should inform the Secretary of the Meteorological Society; 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.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

[illegible]

SHRUBS, ETC.		Barberry,	Apple,	FRUITS.		First in Blossom.	First in Fruit Ripen- generally.	MIGRATORY BIRDS.		First Arrival.	Departure.
		Hawthorn,	Gooseberry,								
		Holly,	Teach,								
		Laburnum,	Pear,								
		Lilac,	Plum,								
		Mexazon,	Strawberry,								
		Mountain Ash or Rowan,									
		Red Flowering Currant,									
		Rhododendron Ponticum,									
		Whin,									

(By Order) A. B.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith Gardens, County of Midlothian, in Lat. _____, Long. _____, Distance from Sea 3 miles.Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.During the MONTH of September 1868.

The Hours of Observation are of Greenwich Time.

Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depression or Elevation of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.				
	9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.										
	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.	No.	Inches.			
1	29.85	61	29.95	63	62	57			56	54	58	55	W	W																	Cloudy throughout	1	
2	30.10	62	30.05	62	70	50			62	56	65	63	W	W																	Sunshine very fine	2	
3	29.90	60	29.73	66	68	49			58	56	61	58	W	W																	Cloudy with showers	3	
4	29.90	60	29.90	65	68	45			57	54	63	60	W	W																	Cloudy with blinks of sun	4	
5	30	67	30.05	66	73	58			68	62	68	62	W	W																	Bright sun very fine	5	
6	30.03	69	30	70	84	56			74	66	71	62	W	W																	Do	6	
7	29.90	70	29.95	73	72	57			72	65	61	58	W	W																	Cloudy with blinks of sun	7	
8	30.10	59	30.25	61	64	45			55	49	55	50	W	W																	Sunshine throughout	8	
9	30.35	55	30.25	60	63	39			57	51	56	52	W	W																	A very fine day	9	
10	30.05	59	29.98	62	67	45			60	54	60	57	W	W																	Sunshine, A.M. Cloudy P.M.	10	
11	30	58	30	58	56	51			58	52	53	53	W	W																	Rain throughout	11	
12	30.10	54	30.10	55	54	47			50	45	49	44	W	W																	Shower, of sun A.M. Cloudy P.M.	12	
13	30.05	49	30	49	51	39			50	45	48	44	W	W																	Sunshine with passing clouds	13	
14	29.85	57	29.95	53	57	36			48	45	50	46	W	W																	Cloudy throughout	14	
15	30	54	29.95	54	54	46			50	46	57	47	W	W																	Do	15	
16	29.90	55	29.85	55	54	46			50	47	57	48	W	W																	Do	16	
17	29.75	54	29.70	54	53	45			49	47	49	46	W	W																	Do	17	
18	29.65	56	29.70	55	56	46			53	51	54	53	W	W																	Do	18	
19	29.55	57	29.60	57	54	50			53	52	54	53	W	W																	Cloudy with showers	19	
20	29.50	59	29.60	61	64	50			58	55	59	66	W	W																	Heavy rain throughout	20	
21	29.75	60	29.75	61	63	52			61	57	57	53	W	W																	Sunshine with passing clouds	21	
22	29.80	58	29.74	58	57	51			54	53	54	53	W	W																	Do	22	
23	29.55	57	29.45	57	57	59			54	50	53	51	W	W																	Cloudy throughout	23	
24	29.45	56	29.50	56	60	49			52	51	57	50	W	W																	Cloudy with showers	24	
25	29.55	53	29.45	54	56	45			52	49	48	46	W	W																	Do	25	
26	29.55	53	29.55	55	53	45			48	47	50	48	W	W																	Sunshine with passing clouds	26	
27	29.25	58	29.45	58	62	47			55	54	59	52	W	W																	Cloudy with blinks of sun	27	
28	29.13	57	29.15	57	62	49			55	53	53	57	W	W																	Passing clouds A.M. rain P.M.	28	
29	28.90	58	28.90	56	62	46			58	63	51	51	W	W																	Sunshine with passing clouds	29	
30	29.15	54	29.45	57	49	48			49	48	47	45	W	W																	Cloudy with thunder showers	30	
31																																Stormy	31

BAROMETER, "corrected Mean" at 9 ⁶⁰ minus the Correction \pm = 29.655 682
for Temp. (Col. 2), = 29.75 078
"Corrected Mean" of Barometer at 9 P.M., minus the Correction \pm = 29.655 682
for Temp. (Col. 4), = 29.75 078
Mean at Station, corrected, and at 32, = 29.682
Correction for height, feet, above Mean Sea-level, = .209
Mean, reduced to 32, and Sea-level, = 29.891
Highest Reading, corrected for Index error, on the 9 th, = 30.350
Lowest Do., Do., on the 29 th, = 28.900
Difference, or Monthly Range, = 1.450

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 6 th, = 84.0
Lowest in Month, corrected for Index errors, on the 11 th, = 35.6
Difference, or Monthly Range, = 48.4
"Corrected Mean" of all the Highest, (Col. 5), = 60.7
"Corrected Mean" of all the Lowest, (Col. 6), = 47.8
Difference, or Mean Daily Range, = 12.9
* Calculated Mean Temperature of Month, = 54.2

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 56.3
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 52.8
* Computed Temperature of Dew-Point, = 49.6
* Do. Elastic Force of Vapour, = 3.65 356
* Do. Weight of Vapour in a Cubic Foot of Air, =
* Relative Humidity, (Saturation = 100), = 78
RAIN fell on 8 Days; Amount in Inches, = 2.20

WIND.		SUMMARY.									
Direction		N	NE	E	SE	S	SW	W	NW	Calm or Variable.	Mean Force.
A.M.		0	3	7	3	4	2	9	2	0	
P.M.		0	1	12	3	2	2	8	2	0	
Month.		0	2	10	3	3	2	8	2	0	

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

Observations made and
Return verified by

(Signed)

Mr. Thomson

WITH REMARKS ON THE USE OF INSTRUMENTS.

Hour of Observation.—The Council recommend that Observations be made precisely at 9 o'clock (Greenwich or Railway Time only) twice a-day for some, and once (morning or evening) for other instruments, as specified, in the following remarks, 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 as will supply 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*.

An excellent Barometer is constructed by Mr A. de la Roche, 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 inclines 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 tenuity, and thus, by aid of a screw, resting on the bottom, the surface of the contained mercury can be adjusted to the *zero-point* of the fixed scale. When their convenience 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*.

The Barometer should be suspended in a good *bellie*, 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 least of a fire.

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

Verification of Thermometers. No instrument ought to be used for Meteorological purposes till it has been carefully *tested* by comparison with a *Standard Thermometer*. When such Thermometers are *not* graduated on the stem, but merely on an attached scale, undergo repairs, they are very liable to be 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 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, 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 bulbs must hang *loose* 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 convex, 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 *even* and *moist*, and never 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 earth in ordinary circumstances.

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 40.0-1; or 40.1-2; or 40.2-3, or 40.3-4, or 40.4-5, or 40.5-6, or 40.6-7, or 40.7-8, or 40.8-9, or 40.9-0; or 41.0-1, or 41.1-2, or 41.2-3, or 41.3-4, or 41.4-5, or 41.5-6, or 41.6-7, or 41.7-8, or 41.8-9, or 41.9-0; or 42.0-1, or 42.1-2, or 42.2-3, or 42.3-4, or 42.4-5, or 42.5-6, or 42.6-7, or 42.7-8, or 42.8-9, or 42.9-0; or 43.0-1, or 43.1-2, or 43.2-3, or 43.3-4, or 43.4-5, or 43.5-6, or 43.6-7, or 43.7-8, or 43.8-9, or 43.9-0; or 44.0-1, or 44.1-2, or 44.2-3, or 44.3-4, or 44.4-5, or 44.5-6, or 44.6-7, or 44.7-8, or 44.8-9, or 44.9-0; or 45.0-1, or 45.1-2, or 45.2-3, or 45.3-4, or 45.4-5, or 45.5-6, or 45.6-7, or 45.7-8, or 45.8-9, or 45.9-0; or 46.0-1, or 46.1-2, or 46.2-3, or 46.3-4, or 46.4-5, or 46.5-6, or 46.6-7, or 46.7-8, or 46.8-9, or 46.9-0; or 47.0-1, or 47.1-2, or 47.2-3, or 47.3-4, or 47.4-5, or 47.5-6, or 47.6-7, or 47.7-8, or 47.8-9, or 47.9-0; or 48.0-1, or 48.1-2, or 48.2-3, or 48.3-4, or 48.4-5, or 48.5-6, or 48.6-7, or 48.7-8, or 48.8-9, or 48.9-0; or 49.0-1, or 49.1-2, or 49.2-3, or 49.3-4, or 49.4-5, or 49.5-6, or 49.6-7, or 49.7-8, or 49.8-9, or 49.9-0; or 50.0-1, or 50.1-2, or 50.2-3, or 50.3-4, or 50.4-5, or 50.5-6, or 50.6-7, or 50.7-8, or 50.8-9, or 50.9-0; or 51.0-1, or 51.1-2, or 51.2-3, or 51.3-4, or 51.4-5, or 51.5-6, or 51.6-7, or 51.7-8, or 51.8-9, or 51.9-0; or 52.0-1, or 52.1-2, or 52.2-3, or 52.3-4, or 52.4-5, or 52.5-6, or 52.6-7, or 52.7-8, or 52.8-9, or 52.9-0; or 53.0-1, or 53.1-2, or 53.2-3, or 53.3-4, or 53.4-5, or 53.5-6, or 53.6-7, or 53.7-8, or 53.8-9, or 53.9-0; or 54.0-1, or 54.1-2, or 54.2-3, or 54.3-4, or 54.4-5, or 54.5-6, or 54.6-7, or 54.7-8, or 54.8-9, or 54.9-0; or 55.0-1, or 55.1-2, or 55.2-3, or 55.3-4, or 55.4-5, or 55.5-6, or 55.6-7, or 55.7-8, or 55.8-9, or 55.9-0; or 56.0-1, or 56.1-2, or 56.2-3, or 56.3-4, or 56.4-5, or 56.5-6, or 56.6-7, or 56.7-8, or 56.8-9, or 56.9-0; or 57.0-1, or 57.1-2, or 57.2-3, or 57.3-4, or 57.4-5, or 57.5-6, or 57.6-7, or 57.7-8, or 57.8-9, or 57.9-0; or 58.0-1, or 58.1-2, or 58.2-3, or 58.3-4, or 58.4-5, or 58.5-6, or 58.6-7, or 58.7-8, or 58.8-9, or 58.9-0; or 59.0-1, or 59.1-2, or 59.2-3, or 59.3-4, or 59.4-5, or 59.5-6, or 59.6-7, or 59.7-8, or 59.8-9, or 59.9-0; or 60.0-1, or 60.1-2, or 60.2-3, or 60.3-4, or 60.4-5, or 60.5-6, or 60.6-7, or 60.7-8, or 60.8-9, or 60.9-0; or 61.0-1, or 61.1-2, or 61.2-3, or 61.3-4, or 61.4-5, or 61.5-6, or 61.6-7, or 61.7-8, or 61.8-9, or 61.9-0; or 62.0-1, or 62.1-2, or 62.2-3, or 62.3-4, or 62.4-5, or 62.5-6, or 62.6-7, or 62.7-8, or 62.8-9, or 62.9-0; or 63.0-1, or 63.1-2, or 63.2-3, or 63.3-4, or 63.4-5, or 63.5-6, or 63.6-7, or 63.7-8, or 63.8-9, or 63.9-0; or 64.0-1, or 64.1-2, or 64.2-3, or 64.3-4, or 64.4-5, or 64.5-6, or 64.6-7, or 64.7-8, or 64.8-9, or 64.9-0; or 65.0-1, or 65.1-2, or 65.2-3, or 65.3-4, or 65.4-5, or 65.5-6, or 65.6-7, or 65.7-8, or 65.8-9, or 65.9-0; or 66.0-1, or 66.1-2, or 66.2-3, or 66.3-4, or 66.4-5, or 66.5-6, or 66.6-7, or 66.7-8, or 66.8-9, or 66.9-0; or 67.0-1, or 67.1-2, or 67.2-3, or 67.3-4, or 67.4-5, or 67.5-6, or 67.6-7, or 67.7-8, or 67.8-9, or 67.9-0; or 68.0-1, or 68.1-2, or 68.2-3, or 68.3-4, or 68.4-5, or 68.5-6, or 68.6-7, or 68.7-8, or 68.8-9, or 68.9-0; or 69.0-1, or 69.1-2, or 69.2-3, or 69.3-4, or 69.4-5, or 69.5-6, or 69.6-7, or 69.7-8, or 69.8-9, or 69.9-0; or 70.0-1, or 70.1-2, or 70.2-3, or 70.3-4, or 70.4-5, or 70.5-6, or 70.6-7, or 70.7-8, or 70.8-9, or 70.9-0; or 71.0-1, or 71.1-2, or 71.2-3, or 71.3-4, or 71.4-5, or 71.5-6, or 71.6-7, or 71.7-8, or 71.8-9, or 71.9-0; or 72.0-1, or 72.1-2, or 72.2-3, or 72.3-4, or 72.4-5, or 72.5-6, or 72.6-7, or 72.7-8, or 72.8-9, or 72.9-0; or 73.0-1, or 73.1-2, or 73.2-3, or 73.3-4, or 73.4-5, or 73.5-6, or 73.6-7, or 73.7-8, or 73.8-9, or 73.9-0; or 74.0-1, or 74.1-2, or 74.2-3, or 74.3-4, or 74.4-5, or 74.5-6, or 74.6-7, or 74.7-8, or 74.8-9, or 74.9-0; or 75.0-1, or 75.1-2, or 75.2-3, or 75.3-4, or 75.4-5, or 75.5-6, or 75.6-7, or 75.7-8, or 75.8-9, or 75.9-0; or 76.0-1, or 76.1-2, or 76.2-3, or 76.3-4, or 76.4-5, or 76.5-6, or 76.6-7, or 76.7-8, or 76.8-9, or 76.9-0; or 77.0-1, or 77.1-2, or 77.2-3, or 77.3-4, or 77.4-5, or 77.5-6, or 77.6-7, or 77.7-8, or 77.8-9, or 77.9-0; or 78.0-1, or 78.1-2, or 78.2-3, or 78.3-4, or 78.4-5, or 78.5-6, or 78.6-7, or 78.7-8, or 78.8-9, or 78.9-0; or 79.0-1, or 79.1-2, or 79.2-3, or 79.3-4, or 79.4-5, or 79.5-6, or 79.6-7, or 79.7-8, or 79.8-9, or 79.9-0; or 80.0-1, or 80.1-2, or 80.2-3, or 80.3-4, or 80.4-5, or 80.5-6, or 80.6-7, or 80.7-8, or 80.8-9, or 80.9-0; or 81.0-1, or 81.1-2, or 81.2-3, or 81.3-4, or 81.4-5, or 81.5-6, or 81.6-7, or 81.7-8, or 81.8-9, or 81.9-0; or 82.0-1, or 82.1-2, or 82.2-3, or 82.3-4, or 82.4-5, or 82.5-6, or 82.6-7, or 82.7-8, or 82.8-9, or 82.9-0; or 83.0-1, or 83.1-2, or 83.2-3, or 83.3-4, or 83.4-5, or 83.5-6, or 83.6-7, or 83.7-8, or 83.8-9, or 83.9-0; or 84.0-1, or 84.1-2, or 84.2-3, or 84.3-4, or 84.4-5, or 84.5-6, or 84.6-7, or 84.7-8, or 84.

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 be highly interesting and important events.

Snow-falls may, for *forecasting*, be registered in the rain columns under the following conditions:—when a Snow 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, as a check upon, the indications of the rain-gauge. For wind, rain, and snow, as indicated in every column, the observer cannot be too careful to register *disruptions* only; and nothing that partakes of the nature of deduction or inference.

WITH REMARKS ON THE USE OF INSTRUMENTS.

Observations of the clouds are made at 3 A.M. and at sunset as illustrating the condition and contents 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" ³ *W*, ⁴ *W*, ⁵ *W*, (for example) will indicate that the "Direction," ² *W*, ⁶ *W*, ⁷ *W*, (for example) will indicate that the upper strata of the 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," ⁴, ⁵, ⁶, ⁷, ⁸, ⁹, ¹⁰, ¹¹, ¹², ¹³, ¹⁴, ¹⁵, ¹⁶, ¹⁷, ¹⁸, ¹⁹, ²⁰, ²¹, ²², ²³, ²⁴, ²⁵, ²⁶, ²⁷, ²⁸, ²⁹, ³⁰, ³¹, ³², ³³, ³⁴, ³⁵, ³⁶, ³⁷, ³⁸, ³⁹, ⁴⁰, ⁴¹, ⁴², ⁴³, ⁴⁴, ⁴⁵, ⁴⁶, ⁴⁷, ⁴⁸, ⁴⁹, ⁵⁰, ⁵¹, ⁵², ⁵³, ⁵⁴, ⁵⁵, ⁵⁶, ⁵⁷, ⁵⁸, ⁵⁹, ⁶⁰, ⁶¹, ⁶², ⁶³, ⁶⁴, ⁶⁵, ⁶⁶, ⁶⁷, ⁶⁸, ⁶⁹, ⁷⁰, ⁷¹, ⁷², ⁷³, ⁷⁴, ⁷⁵, ⁷⁶, ⁷⁷, ⁷⁸, ⁷⁹, ⁸⁰, ⁸¹, ⁸², ⁸³, ⁸⁴, ⁸⁵, ⁸⁶, ⁸⁷, ⁸⁸, ⁸⁹, ⁹⁰, ⁹¹, ⁹², ⁹³, ⁹⁴, ⁹⁵, ⁹⁶, ⁹⁷, ⁹⁸, ⁹⁹, ¹⁰⁰, ¹⁰¹, ¹⁰², ¹⁰³, ¹⁰⁴, ¹⁰⁵, ¹⁰⁶, ¹⁰⁷, ¹⁰⁸, ¹⁰⁹, ¹¹⁰, ¹¹¹, ¹¹², ¹¹³, ¹¹⁴, ¹¹⁵, ¹¹⁶, ¹¹⁷, ¹¹⁸, ¹¹⁹, ¹²⁰, ¹²¹, ¹²², ¹²³, ¹²⁴, ¹²⁵, ¹²⁶, ¹²⁷, ¹²⁸, ¹²⁹, ¹³⁰, ¹³¹, ¹³², ¹³³, ¹³⁴, ¹³⁵, ¹³⁶, ¹³⁷, ¹³⁸, ¹³⁹, ¹⁴⁰, ¹⁴¹, ¹⁴², ¹⁴³, ¹⁴⁴, ¹⁴⁵, ¹⁴⁶, ¹⁴⁷, ¹⁴⁸, ¹⁴⁹, ¹⁵⁰, ¹⁵¹, ¹⁵², ¹⁵³, ¹⁵⁴, ¹⁵⁵, ¹⁵⁶, ¹⁵⁷, ¹⁵⁸, ¹⁵⁹, ¹⁶⁰, ¹⁶¹, ¹⁶², ¹⁶³, ¹⁶⁴, ¹⁶⁵, ¹⁶⁶, ¹⁶⁷, ¹⁶⁸, ¹⁶⁹, ¹⁷⁰, ¹⁷¹, ¹⁷², ¹⁷³, ¹⁷⁴, ¹⁷⁵, ¹⁷⁶, ¹⁷⁷, ¹⁷⁸, ¹⁷⁹, ¹⁸⁰, ¹⁸¹, ¹⁸², ¹⁸³, ¹⁸⁴, ¹⁸⁵, ¹⁸⁶, ¹⁸⁷, ¹⁸⁸, ¹⁸⁹, ¹⁹⁰, ¹⁹¹, ¹⁹², ¹⁹³, ¹⁹⁴, ¹⁹⁵, ¹⁹⁶, ¹⁹⁷, ¹⁹⁸, ¹⁹⁹, ²⁰⁰, ²⁰¹, ²⁰², ²⁰³, ²⁰⁴, ²⁰⁵, ²⁰⁶, ²⁰⁷, ²⁰⁸, ²⁰⁹, ²¹⁰, ²¹¹, ²¹², ²¹³, ²¹⁴, ²¹⁵, ²¹⁶, ²¹⁷, ²¹⁸, ²¹⁹, ²²⁰, ²²¹, ²²², ²²³, ²²⁴, ²²⁵, ²²⁶, ²²⁷, ²²⁸, ²²⁹, ²³⁰, ²³¹, ²³², ²³³, ²³⁴, ²³⁵, ²³⁶, ²³⁷, ²³⁸, ²³⁹, ²⁴⁰, ²⁴¹, ²⁴², ²⁴³, ²⁴⁴, ²⁴⁵, ²⁴⁶, ²⁴⁷, ²⁴⁸, ²⁴⁹, ²⁵⁰, ²⁵¹, ²⁵², ²⁵³, ²⁵⁴, ²⁵⁵, ²⁵⁶, ²⁵⁷, ²⁵⁸, ²⁵⁹, ²⁶⁰, ²⁶¹, ²⁶², ²⁶³, ²⁶⁴, ²⁶⁵, ²⁶⁶, ²⁶⁷, ²⁶⁸, ²⁶⁹, ²⁷⁰, ²⁷¹, ²⁷², ²⁷³, ²⁷⁴, ²⁷⁵, ²⁷⁶, ²⁷⁷, ²⁷⁸, ²⁷⁹, ²⁸⁰, ²⁸¹, ²⁸², ²⁸³, ²⁸⁴, ²⁸⁵, ²⁸⁶, ²⁸⁷, ²⁸⁸, ²⁸⁹, ²⁹⁰, ²⁹¹, ²⁹², ²⁹³, ²⁹⁴, ²⁹⁵, ²⁹⁶, ²⁹⁷, ²⁹⁸, ²⁹⁹, ³⁰⁰, ³⁰¹, ³⁰², ³⁰³, ³⁰⁴, ³⁰⁵, ³⁰⁶, ³⁰⁷, ³⁰⁸, ³⁰⁹, ³¹⁰, ³¹¹, ³¹², ³¹³, ³¹⁴, ³¹⁵, ³¹⁶, ³¹⁷, ³¹⁸, ³¹⁹, ³²⁰, ³²¹, ³²², ³²³, ³²⁴, ³²⁵, ³²⁶, ³²⁷, ³²⁸, ³²⁹, ³³⁰, ³³¹, ³³², ³³³, ³³⁴, ³³⁵, ³³⁶, ³³⁷, ³³⁸, ³³⁹, ³⁴⁰, ³⁴¹, ³⁴², ³⁴³, ³⁴⁴, ³⁴⁵, ³⁴⁶, ³⁴⁷, ³⁴⁸, ³⁴⁹, ³⁵⁰, ³⁵¹, ³⁵², ³⁵³, ³⁵⁴, ³⁵⁵, ³⁵⁶, ³⁵⁷, ³⁵⁸, ³⁵⁹, ³⁶⁰, ³⁶¹, ³⁶², ³⁶³, ³⁶⁴, ³⁶⁵, ³⁶⁶, ³⁶⁷, ³⁶⁸, ³⁶⁹, ³⁷⁰, ³⁷¹, ³⁷², ³⁷³, ³⁷⁴, ³⁷⁵, ³⁷⁶, ³⁷⁷, ³⁷⁸, ³⁷⁹, ³⁸⁰, ³⁸¹, ³⁸², ³⁸³, ³⁸⁴, ³⁸⁵, ³⁸⁶, ³⁸⁷, ³⁸⁸, ³⁸⁹, ³⁹⁰, ³⁹¹, ³⁹², ³⁹³, ³⁹⁴, ³⁹⁵, ³⁹⁶, ³⁹⁷, ³⁹⁸, ³⁹⁹, ⁴⁰⁰, ⁴⁰¹, ⁴⁰², ⁴⁰³, ⁴⁰⁴, ⁴⁰⁵, ⁴⁰⁶, ⁴⁰⁷, ⁴⁰⁸, ⁴⁰⁹, ⁴¹⁰, ⁴¹¹, ⁴¹², ⁴¹³, ⁴¹⁴, ⁴¹⁵, ⁴¹⁶, ⁴¹⁷, ⁴¹⁸, ⁴¹⁹, ⁴²⁰, ⁴²¹, ⁴²², ⁴²³, ⁴²⁴, ⁴²⁵, ⁴²⁶, ⁴²⁷, ⁴²⁸, ⁴²⁹, ⁴³⁰, ⁴³¹, ⁴³², ⁴³³, ⁴³⁴, ⁴³⁵, ⁴³⁶, ⁴³⁷, ⁴³⁸, ⁴³⁹, ⁴⁴⁰, ⁴⁴¹, ⁴⁴², ⁴⁴³, ⁴⁴⁴, ⁴⁴⁵,

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

Underground Thermometry.—As the examination and health of crops and plants greatly depend on the temperature of the soil,—its amount and consistency,—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 Wells.—The temperature of the water at the bottoms of wells ought, when practicable, to be taken, and the depth of the well and note recorded.

Ozone.—Mention whether Scholten's or Moffat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M.

It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—this *g.w.*, as an *ozone* entry in this schedule, will indicate that the ozone paper is dried as "3" on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is *w.4*; i.e., that it is *blowing fresh*.

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

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

FOREST TREES.					
In flower.		Alder,	.	.	.
		Asp,	.	.	.
		Beech,	.	.	.
		Birch,	.	.	.
		Elm,	.	.	.
		Larch,	.	.	.
		Pine,	.	.	.
		Oak,	.	.	.
Sycamore or Plane,					
In leaf first appear.					
In leaf.					
Divested of leaves.					
		Barley,	.	.	.
		Bare or Bligh,	.	.	.
		Oats,	.	.	.
		Wheat,	.	.	.
		Beans,	.	.	.
		Peas,	.	.	.
		Potatoes,	.	.	.
		Turnips,	.	.	.
		Rye Grass,	.	.	.
GROPS.					
Soaking or planting.					
Appearing above ground.					
In flower or fruit cut.					

[illegible]

SHRUBS, ETC.		FRUITS.		MIGRATORY BIRDS.	
First in Blossom.	Last in Blossom.	First in Blossom.	First in Generally.	First Arrival.	Departure.
Barberry,	Apple,	Cherry,	Cuckoo,		
Bontee or Elder,	Black Currant,	Cherry,	House-Swallow,		
Broom,		Gean,	Lapwing,		
Hazel,		Gooseberry,	Plover,		
Hawthorn,		Peach,	Sand-Martin,		
Holly,		Teat,	Starling,		
Laburnum,		Plum,	Swan,		
Mezeron,		Strawberry,	Hail or Corn Crake,		
Mountain Ash or Rowan,					
Red Flowering Currant,					
Rhododendron Ponticum,					
Willow,					

(By Order) A. B.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith Gardens, County of Midlothian, in Lat. _____, Long. _____, Distance from Sea 3 miles.Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.During the MONTH of October 1888.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS.			SEA.	OZONE.	GENERAL REMARKS.	Days of Month.				
		0 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		0 h. A.M.		9 h. P.M.		0 h. A.M.		9 h. P.M.		No. of hours in which it fell.	Amount in inches.	0 A.M.		P.M.		9 h. A.M.										
		Barometre.	Attached Thermometer.	Barometre.	Attached Thermometer.	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.			Velocity, (0-10), and Direction.	Amount, (0-10), and Direction.	Velocity, (0-10), and Direction.	Amount, (0-10), and Direction.	No. 8 inches.	No. 13 inches.	No. 22 inches.								
		Inches.	°	Inches.	°	°	°	°	°	°	°	°	°																					
	1	29.80	49.3	29.90	49	53	41			47	43	43	41	SE	1/2														Sunshine A.M. showery P.M.	1				
	2	30	50	30	51	54	36			47	44	46	45	W	1/2														cloudy with blinks of sun	2				
	3	29.87	50.5	29.70	53	53	41			47	45	49	47	W	1/2														cloudy throughout	3				
	4	29.30	50	29.65	52.5	53	42			45	43	48	46	S	1/2														Sunshine A.M. Cloudy P.M.	4				
	5	29.85	49.5	29.80	51	60	38			51	47	48	44	W	1/2														Sunshine throughout except	5				
	6	29.55	53	29.65	56	58	45			55	52	52	49	SW	1/2														Cloudy throughout	6				
	7	29.65	57	29.70	52	55	41			48	45	47	45	W	1/2														Sunshine A.M. cloudy P.M.	7				
	8	29.80	57.5	29.70	53	53	43			49	46	52	49	W	1/2														cloudy with blinks of sun	8				
	9	29.55	56	29.50	56	59	50			54	53	53	51	SW	1/2														cloudy with showers	9				
	10	29.93	49.5	29.95	52	57	38			46	45	48	48	W	1/2														Sunshine very fine	10				
	11	29.47	54	30	53	62	43			55	53	52	49	W	1/2														cloudy with blinks of sun	11				
	12	29.80	54	29.85	55	57	42			54	50	54	51	W	1/2														cloudy throughout	12				
	13	29.40	54	29.45	51	54	49			57	48	45	43	W	1/2														Sunshine with passing clouds	13				
	14	30	46	29.93	50	56	34.5			43	40	47	43	W	1/2														High wind with showers	14				
	15	29.30	56	29.40	52	58	45			55	54	47	45	SW	1/2														cloudy with high wind	15				
	16	29.25	50	29.10	47	46	39			46	42	41	39	W	1/2														Sunshine with passing clouds	16				
	17	29.20	41	29.30	45	48	35			43	40	40	39	W	1/2														Do	Do	Do	17		
	18	29.45	43	29.45	42	45	34			40	38	35	34	W	1/2														cloudy throughout	18				
	19	29.48	43	29.75	46	46	30			38	37	42	39	W	1/2														Sunshine, very fine	19				
	20	29.87	40	29.60	42	47	28			37	32	40	37	W	1/2														Do	Do	Do	20		
	21	29.40	45	29.55	44	49	37			41	40	44	43	SW	1/2														Sunshine A.M. Passing clouds P.M.	21				
	22	29.75	45	29.80	52	52	37			44	41	43	41	SW	1/2														Sunshine with showers	22				
	23	29.40	48	29.50	46	49	38			45	42	41	38	W	1/2														Rain throughout	23				
	24	29.25	44	29.70	46	46	34			40	38	41	40	W	1/2														Overcast throughout	24				
	25	29.40	46	29.45	46	50	38			45	41	42	40	W	1/2														cloudy with showers	25				
	26	29.45	45	29.50	46	48	38			45	41	42	40	W	1/2														Do	Do	Do	26		
	27	29.75	43	29.80	44	47	36			41	37	41	38	W	1/2														Sunshine throughout	27				
	28	30	44	29.60	47	47	34.5			42	40	45	43	SW	1/2															cloudy A.M. Rain P.M.	28			
	29	29.30	42	29.50	45	46	38			41	39	41	38	W	1/2														Sunshine A.M. showery P.M.	29				
	30	29.78	42	29.60	57	52	38			46	42.5	51	47	W	1/2															cloudy with high wind	30			
	31	29.80	52	29.70	58	58	48			52	50	58	55	W	1/2															blinks of sun A.M. cloudy P.M.	31			
	Suns.	179	112	184	12	6	18	18		13	10																							
	Means.	20.002495	20.782975	10181210		522				193	1096																							
	† Total Corrections for Instrumental Errors.	29.645480	29.670497	622391						46.2435																								
	† Corrections for Diurnal Range.																																	
	"Corrected Means."					387				467440																								
	No. of Column.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			

BAROMETER, "corrected Mean" at 9 A.M., minus the Correction $\frac{1}{100}$ for Temp. (Col. 2), = 29.593
"Corrected Mean" of Barometer at 9 P.M., minus the Correction $\frac{1}{100}$ for Temp. (Col. 4), = 29.645
Mean at Station, corrected, and at 32°, = 29.604593
Correction for height, feet, above Mean Sea-level, = .209
Mean, reduced to 32°, and Sea-level, = 29.584802
Highest Reading, corrected for Index error, on the 2 th, = 30.000
Lowest Do., Do., on the 24 th, = 29.250
Difference, or Monthly Range, = 0.750

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 11 th, = 62.0
Lowest in Month, corrected for Index errors, on the 20 th, = 27.6
Difference, or Monthly Range, = 34.4
"Corrected Mean" of all the Highest, (Col. 5), = 52.2
"Corrected Mean" of all the Lowest, (Col. 6), = 38.7
Difference, or Mean Daily Range, = 13.5
** Calculated Mean Temperature of Month, = 45.4

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

HYGROMETER, Mean (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11), = 46.7
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12), = 44.0
†† Computed Temperature of Dew-Point, = 40.9
†† Do. Elastic Force of Vapour, = .257
†† Do. Weight of Vapour in a Cubic Foot of Air, =
†† Relative Humidity, (Saturation = 100), = 81
RAIN fell on 8 Days; Amount in Inches, = 1.10

WIND.	SUMMARY.									
	Direction	N	NE	E	SE	S	SW	W	NW	Caln or Variable.
A.M.		0	0	0	1	1	2	2	5	0
P.M.		0	1	1	1	0	3	2	4	0
Mean.		0	1	0	1	1	2	2	4	0

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

Observations made and
Return verified by

(Signed)

J. Thomson pro W. Thomson

WITH REMARKS ON THE USE OF INSTRUMENTS.

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then *erect* 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, 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 still 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 sun's direct rays, nor the heat of a fire.

One form of "Mason's" Pyrometer 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 readings must be taken to tenths of a degree, and noted in decimals. Thus the readings of the wet and dry bulb are 40°·0, 40°·1, or 40°·2; 40°·4, 40°·5, 40°·6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40½°, respectively. So also 40½° and 40¾° are read 40·5 and 40·75, respectively. 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, especially of the wet and dry *bulbs* must be rapidly taken, being so readily affected by heat from the person observing.

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 vote strongly recommend that every observer be furnished with a Hemispherical-Cup Anemometer;—a self-registering instrument which shows the amount of Wind that passes in 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, the *Wind's Anemometer* is also recommended; the method of *Estimating* Wind Force by such tables as that given in the schedule is to say the least, unsatisfactory.

Clouds.—Convenient abbreviations for Luke Howard's

WITH REMARKS ON THE USE OF INSTRUMENTS.

Temperature of the Sea.—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 recommended that the temperature of the sea be carefully taken by a properly constructed apparatus, from the ends of piers and rocks round the coast, where it is not influenced by the flow 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.

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

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

(By Order) A. B.

OBSERVATIONS IN CONNECTION WITH THE PERIODICAL RETURN OF THE SEASONS.

[illegible]

(By Order) A. B.

SCOTTISH METEOROLOGICAL SOCIETY.

Observations taken at Dalkeith Gardens, County of Mid. Lothian, in Lat. _____, Long. _____, Distance from Sea 3 miles.Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.During the MONTH of November 1868.

The Hours of Observation are of Greenwich Time.

ELECTRICITY.	Days of Month.	BAROMETER.				SELF-REGISTERING THERMOMETERS.				HYGROMETER.				WIND.				RAIN.		CLOUDS.				THERMOMETERS.			SEA.	OZONE.	GENERAL REMARKS. As to occurrence of Thunder, Lightning, Storms, Hail, Meteors, Remarkable Depressions or Elevations of Barometer, Prevalent Diseases, etc. Mention the hour at which Storms began and ended.	Days of Month.					
		9 h. A.M.		9 h. P.M.		Protected in Shade, 4 feet above Ground.		Exposed Black Bulbs.		9 h. A.M.		9 h. P.M.		9 h. A.M.		9 h. P.M.		No. of hours in which it fell.	Amount in inches.	9 A.M.		P.M.		9 h. A.M.											
		Barometer.	Atmospheric Thermometer.	Barometer.	Atmospheric Thermometer.	Max.	Min.	Max.	Min.	Dry bulb.	Wet bulb.	Dry bulb.	Wet bulb.	Direction.	Force.	Direction.	Force.			Velocity (0-10), and Direction.	Amount (0-10), and Species.	Velocity (0-10), and Direction.	Amount (0-10), and Species.	No.	No.	No.									
																															No.	Inches.	No.	Inches.	No.
	1	29.65	58	29.60	54	61	55			60	57	47	46	S.W.	W																	High wind with heavy showers	1		
	2	29.75	50	29.65	51	50	41			46	43	44	42	W	W																	Clouds with showers	2		
	3	29.15	52	29.15	50	50	40			48	46	46	45	W	W																	Rain throughout	3		
	4	29.20	47	29.07	42	46	38			41	39	37	35	N.W.	W																	Sunshine with passing clouds, A.M. Storm	4		
	5	29.35	40.5	29.50	41	41	32			36	33	35	33	W	N.W.																	Sunshine with passing clouds	5		
	6	29.70	39	29.74	40	37	32			34	30	32	30	N	N																	Very cold with showers of snow	6		
	7	29.87	35	29.70	41	40	26			32	31	39	38	N.W.	W																	Sunshine A.M. Cloudy, P.M.	7		
	8	29.80	37	29.95	40	42	28			33	32	38	36	N.E.	W																	Sunshine with passing clouds	8		
	9	30.10	41	30.20	43	44	29			39	37	40	39	W	W																	Cloudy, slight glimpses of sun	9		
	10	30.10	44	30.05	39	45	37			41	40	32	31	W	W																	Sunshine with passing clouds	10		
	11	30.20	42	30.28	44	46	28.5			40	36.5	42	39.5	S.E.	S.W.																	Bright, A.M. Cloudy, P.M.	11		
	12	30.45	44	30.46	44.5	43	38			39.8	37	35	34.5	S.W.	W																	Overcast throughout	12		
	13	30.50	42	30.42	45.5	45	30			36.8	35	44	42.7	N.W.	W																	Fine, Overcast, Very dull	13		
	14	30.43	44.6	30.30	45.3	45	38.5			42	39.8	43	41.8	N.E.	N.E.																	Dull, glimpses of sun. Rain	14		
	15	30.55	45	30.30	42.5	45	39			42	40	36	35.5	N.E.	W																	Fine but dull, A.M. Glimpses of sun, P.M.	15		
	16	30.20	39.5	30.15	44	42	30			34.5	33	41.8	39.8	S.E.	S.E.																	Cloudy, Rain, Sun, Dull	16		
	17	30.25	45.5	30.30	44	44	37			43	41.2	39.3	39	N.E.	N.E.																	Cloudy, Rain, Glimpses of sun	17		
	18	30.30	43.7	30.25	44	43	37			39.5	38.5	40	39.2	S.W.	S.W.																	Foggy, passing clouds, Very fine. Rain	18		
	19	30.35	42	30.30	42	38.5	34.7			35.7	35.2	35.7	35.7	S.E.	S.W.																	Rain, Cloudy and dull	19		
	20	30.10	41.2	29.93	41	37.5	34			37	33	37	33.7	S	S.W.																	Cloudy and dull throughout	20		
	21	29.60	38.8	29.15	45	45	30.5			34	32	45	42.5	S.W.	S.E.																	Dull, P.M. Sun, Dull P.M.	21		
	22	28.75	48	28.75	48	51.5	42.5			4.9	4.6	4.5	4.3	S.W.	S.E.																	Drizzle, P.M. Sun, Dull P.M.	22		
	23	29.05	47	29.35	45	43	41.5			4.3	4.15	4.05	39.3	N	N.W.																	Drizzle, P.M. Sun, Dull P.M.	23		
	24	29.70	42	29.65	43	40	34.5			36	35	39.5	37.5	N.E.	S																	Cloudy, A.M. Hail storm, Glimpses of sun	24		
	25	29.50	42.7	29.45	44.5	42.5	34.5			39	37	42.3	40	S.E.	S.E.																	Cloudy & sunny A.M. Rain, P.M.	25		
	26	29.70	43.3	29.80	44.7	44	37			39	38	41	40	S	S																	Drizzle and dull throughout	26		
	27	29.95	41.1	29.90	41.5	41	33.5			35	34.8	36	36	S	S																	Dull, Foggy, P.M.	27		
	28	29.85	44	29.75	43.7	41.5	35			40.5	39	40	38	S.E.	S.E.																	Very dull throughout	28		
	29	29.75	41.5	29.65	42	40	33			36.7	35	38	36	S.E.	S.E.																	Dull with glimpses of sun	29		
	30	29.50	43	29.45	45	40	36			39.5	37.3	40	38	S.E.	E																	G. Dull throughout.	30		
	31																																		
Sums.		137 12.5		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7		113 5 12.7			
Means.		29.832 43.5		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4		43.8 35.4			
* 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.	aurora.	sa.	sun.
cl.	clouds.	ss.	showers.
ci.	cirrus.	h.	hail.
ci.	cirro-cumulus.	l.	lightning.
ci.	cirro-stratus.	h. r.	heavy rain.
cu.	cumulus.	c. h. r.	continued heavy rain.
cu.	cumulo-stratus.	s.	storm.
d.	dew.	sc.	scud.
f.	fog.	sl.	sleet.
fr.	frost.	sn.	snow.
h. fr.	hoar-frost.	so. ha.	solar halo.
h.	haze.	sq.	squall.
h. d.	heavy dew.	sp.	squalls.
h. l.	hail.	t.	thunder.
l.	lightning.	t. s.	thunder storm.
h. cl.	light clouds.	w.	wind.
h. sh.	light showers.	g.	gale of wind.
h. co.	lunar corona.		
h. 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 \pm for Temp. (Col. 2), = 29.791
"Corrected Mean" of Barometer at 9 P.M., minus the Correction \pm for Temp. (Col. 4), = 29.791
Mean at Station, corrected, and at 32°, = 29.791
Correction for height, feet, above Mean Sea-level, = 2.09
Mean, reduced to 32°, and Sea-level, = 30.000
Highest Reading, corrected for Index error, on the 13th, = 30.500
Lowest Do., Do., on the 23th, = 28.750
Difference, or Monthly Range, = 1.750

S.-R. THERMOMETER, (in shade, etc.), Highest in Month, (corrected for Index Errors), on the 1th, = 61.0
Lowest in Month, corrected for Index errors, on the 7th, = 25.6
Difference, or Monthly Range, = 35.4
"Corrected Mean" of all the Highest, (Col. 5), = 43.8
"Corrected Mean" of all the Lowest, (Col. 6), = 35.0
Difference, or Mean Daily Range, = 8.8
** Calculated Mean Temperature of Month, = 39.4

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 their labour and pains involved in making them; and, for the Tables published by the Society, an entire comparableness among the several Returns, without which the Society's Reports must inevitably fall in achieving one of the main objects of Meteorological Observation.

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

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

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

When a Barometer having adjustable surfaces has to be removed from its fastenings, the ivory peg must be screwed so as to form a tight plug to the cistern. Then 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-unioned by striking the instrument repeatedly against the palm of the hand; when part of the spirit distils by high temperature, it will be found in the upper lobe, and must be dislodged from thence by heating that part over a lamp; the alcohol will evaporate and again condense in contact with the body of the liquid. These instruments should be hung horizontally.

The above remarks apply equally to the Thermometers for

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

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

The bulbs must hang down by at least an inch free from the scales and frame to which they are attached—the frame must be such as will bring the tubes forward by an inch, from any board on which it may be suspended; the water-cup must be covered, and placed to the side, and a little below the level of the wet bulb,—in no case under the bulb;—the muslin must be of medium fineness, and fastened at the neck of the bulb by the cotton, which also supplies it with water. It must be seen to by the observer that the muslin is always clean and moist, and the water pure. In frosty weather observation is a matter of much delicacy, and must be made with great care. The bulb must be moistened by immersion from 15 to 30 minutes before the hour of observation. From the film of ice thus formed evaporation will proceed as from the moist cloth in ordinary circumstances.

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

Reading of the Thermometer.—Great care must be taken to avoid the effects of refraction, by bringing the eye exactly opposite the tip of the index or column of mercury. The reading ought to be taken to tenths of a degree, and noted in decimals. Thus the Thermometer will be read—39°.9, 40°.0, or 40°.1; or again, 40°.4, 40°.5, or 40°.6, according as it indicates a little under, an exact coincidence with, or a little over 40°, or 40°.5 respectively. So also 40°.2, and 40°.3, more or less must be read. Rutherford's "Max." and "Min." Thermometers, the reading 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 exposure may occur at any hour; and it is necessary to refer their exposure to their proper meteorological day. In the Society's schedule, the indications registered at 9 P.M. 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 at least above surrounding objects. When it oscillates incessantly, the mean direction must be taken; and when it is stationary, the direction of the lower strata of clouds overhead, and to the direction of smoke, etc.

Careful observations ought to be made on the changes in the direction of the wind; and during storms, extra observations ought to be made at every hour of Greenwich time. Such a system of simultaneous observation, pursued at important 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-gauges. For wind, rain, and snow, as indicated in every column, the observer cannot be too careful to register observations only; and nothing that partakes of the nature of deduction or inference.

Clouds.—Convenient abbreviations for Luke Howard's

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

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

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

upper strata of clouds travel with extreme velocity from S.W., and those in the lower regions from W., with one-third the (extreme) speed of the former. Again, in the second "Cloud" column, an entry of $\frac{2}{4}$ st., (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.

Swathes.—The number of hours in which objects in the sun's rays cast shadows, should be entered in the proper column under **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 8, 12, and 22 inches, and the stems above ground protected from the sun's rays, and fitted with sloping tin collars, to prevent rain-water being conveyed to the bulbs by the stems or wooden frames. Mention must be made of the geological formation and agricultural condition of the soil in which these Thermometers are placed.

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

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

Ozone.—Mention whether Schönbain's or Mofat's papers are used. The paper is affixed by a pin to a board in the thermometer box, and the indication registered at 9 A.M. and 9 P.M. It is desired that these indications be registered in connection with the force and direction of the wind at the time of observation, in the following manner:—thus 3.5%, as an ozone entry in the schedule, will indicate that the ozone paper is tinted as "3," on the scale, that the wind is from the N.W., and that its force on the scale 0—6 is 4.4, i. e., that it is blowing fresh.

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

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

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

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

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

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

(By Order) A. B.

ENSCRIBED, 9th December, 1852.

FOREST TREES.		In flower.	In leaf.	Divested of leaves.	CROPS, mentioning variety.	Sothing or planting.	Above ground or in flower.	Below or in leaf.	MIGRATORY BIRDS.		First Arrival.	Departure.
Alder.	Barley.	...	...	...	Chickadee.	...	...	...
Beech.	Bore or Bigg.	...	...	...	Curlew.	...	...	...
Birch.	Oats.	...	...	...	House-Swallow.	...	...	...
Elm.	Wheat.	...	...	...	Lapwing.	...	...	...
Larch.	Beams.	...	...	...	Plover.	...	...	...
Lime.	Potatoes.	...	...	...	Sand-Martin.	...	...	...
Oak.	Turnips.	...	...	...	Starling.	...	...	...
Sycamore or Plane.	Rye Grass.	...	...	...	Swan.	...	...	...
SHRUBS, ETC.												
Barberry.	Apple.	...	...	...	Chickadee.	...	...	...
Boutree or Elder.	Black Currant.	...	...	...	Curlew.	...	...	...
Broom.	Hazel.	...	...	...	House-Swallow.	...	...	...
Hawthorn.	Grass.	...	...	...	Lapwing.	...	...	...
Holly.	Gooseberry.	...	...	...	Plover.	...	...	...
Laburnum.	Pear.	...	...	...	Sand-Martin.	...	...	...
Lilac.	Plum.	...	...	...	Starling.	...	...	...
Mezeor.	Strawberry.	...	...	...	Swan.	...	...	...
Mountain Ash or Rowan.	Rail or Corn Crake.	...	...	...	Chickadee.	...	...	...
Rod Flowering Currant.	Apple.	...	...	...	Curlew.	...	...	...
Rhododendron Ponticum.	Black Currant.	...	...	...	House-Swallow.	...	...	...
Whin.	Barley.	...	...	...	Lapwing.	...	...	...

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

BOOK-POST.

Mr ALEXANDER BUCHAN,

Secretary of the Meteorological Society of Scotland,

EDINBURGH.

To

Nov. 1868.

Dalhousie

SCOTTISH METEOROLOGICAL SOCIETY.

Height of Cistern of the Barometer above Mean Sea-level 190 feet, above Ground 4 feet.

During the MONTH of *December* 18*68*

The Hours of Observation are of Greenwich Time.

BAROMETER, "corrected Mean" at 9 A.M., *minus* the Correction $\frac{+1}{2}$
for Temp. (Col. 2), = 29.137 - 0.04 } = 29.137 140

"Corrected Mean" of Barometer at 9 P.M., *minus* the Correction $\frac{+1}{2}$
for Temp. (Col. 4), = - } =

Mean at Station, corrected, and at 32°, = 29.137 140

Correction for height, feet, above Mean Sea-level, = .209

Mean, reduced to 32°, and Sea-level, = 29.344 349

Highest Reading, corrected for Index error, on the 9th, = 30.050

Lowest Do., Do., on the 2th, = 28.250

Difference, or **Monthly Range,** = 1.800 800

S.-R. THERMOMETER, (in shade, etc.), **Highest in Month,** (corrected for Index Errors), on the 4th, = 56.0

Lowest in Month, corrected for Index errors, on the 12th, = 26.6

Difference, or Monthly Range, = 29.4

“Corrected **Mean**” of all the **Highest,** (Col. 5), 45.0 = 44.8

“Corrected **Mean**” of all the **Lowest,** (Col. 6), 36.2 = 36.2

Difference, or Mean Daily Range, 8.3 = 8.1

**** Calculated Mean Temperature of Month,** 40.8 = 40.8

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

HYGROMETER, Mann (corrected) A.M. and P.M. Reading of Dry Bulb, (Cols. 9 and 11),	=	41.3
Mean (corrected) A.M. and P.M. Reading of Wet Bulb, (Cols. 10 and 12),	=	39.9
†† Computed Temperature of Dew-Point ,	=	38.1
†† Do. Elastic Force of Vapour ,	=	.23
†† Do. Weight of Vapour in a Cubic Foot of Air ,	=	
†† Relative Humidity , (Saturation = 100),	=	89
RAIN fell on Days; Amount in Inches , 14	=	2.52

WIND.	SUMMARY.										Mean Force.	Mean Velocity in miles per day
	Direction	N	NE	E	SE	S	SW	W	NW	Calm or Variable.		
A.M.	1	1	1	2	7	14	3	2	0			
P.M.	9	3	1	1	10	10	4	2	0			
Mean.	1	2	1	2	8	12	3	2	0			

Observations made and
Return verified by

(Signed)

